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### Behavioural Model-Driven Validation of Software Product Lines

Devroey, Xavier; Perrouin, Gilles; Schobbens, Pierre; Heymans, Patrick; Baudry, Benoit

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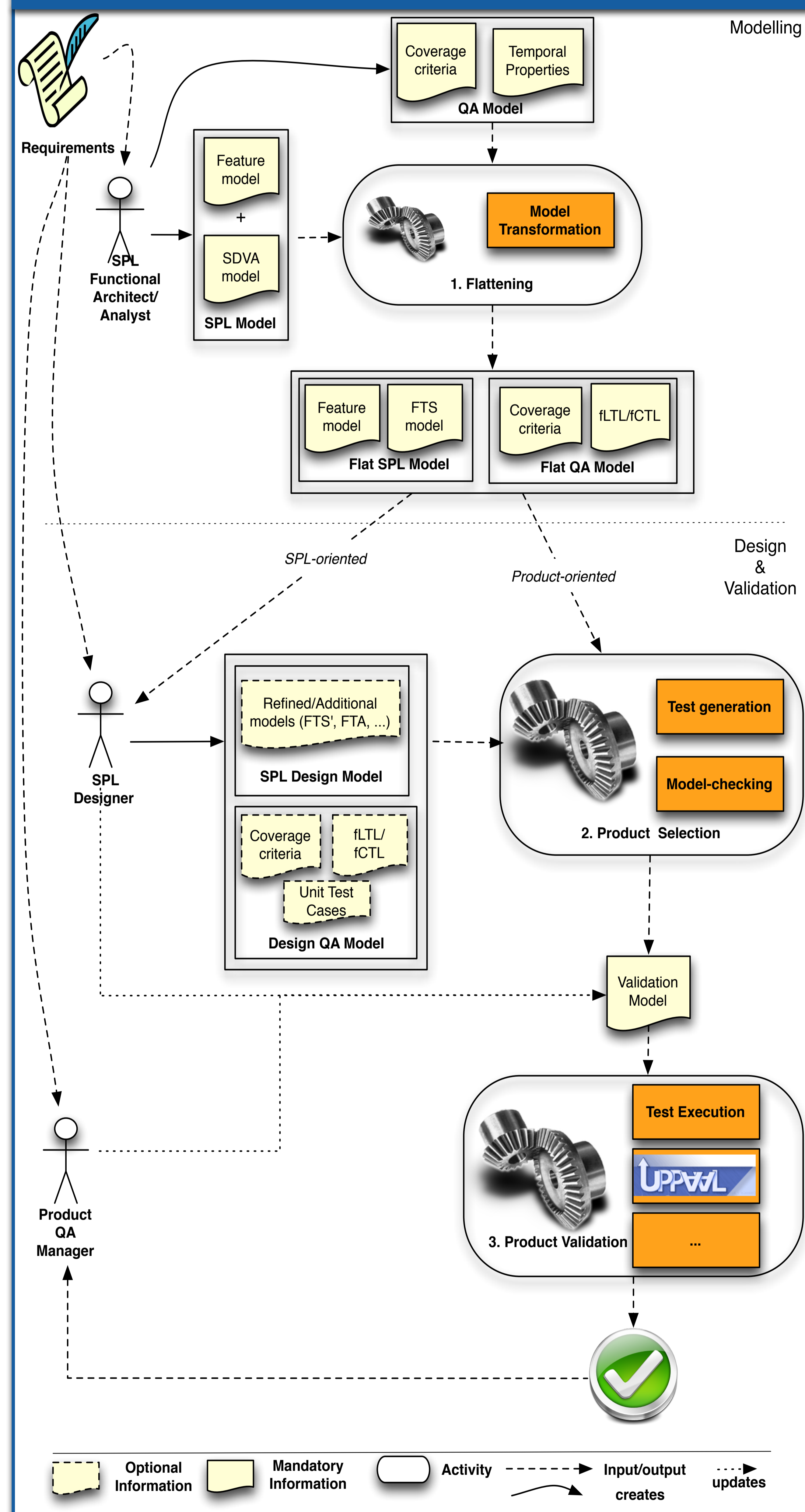
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## Highlights

- Combining Model-checking and Test-case Generation techniques in a Model-driven [2,4] Quality Assurance Framework
- Focus on Variability-aware Behavioural Models
- Formal Foundations (e.g. Featured Transition Systems [1]) suitable for Analysis and Checking
- Human-centric: Easily Understandable Input Models, Test Criteria and Results

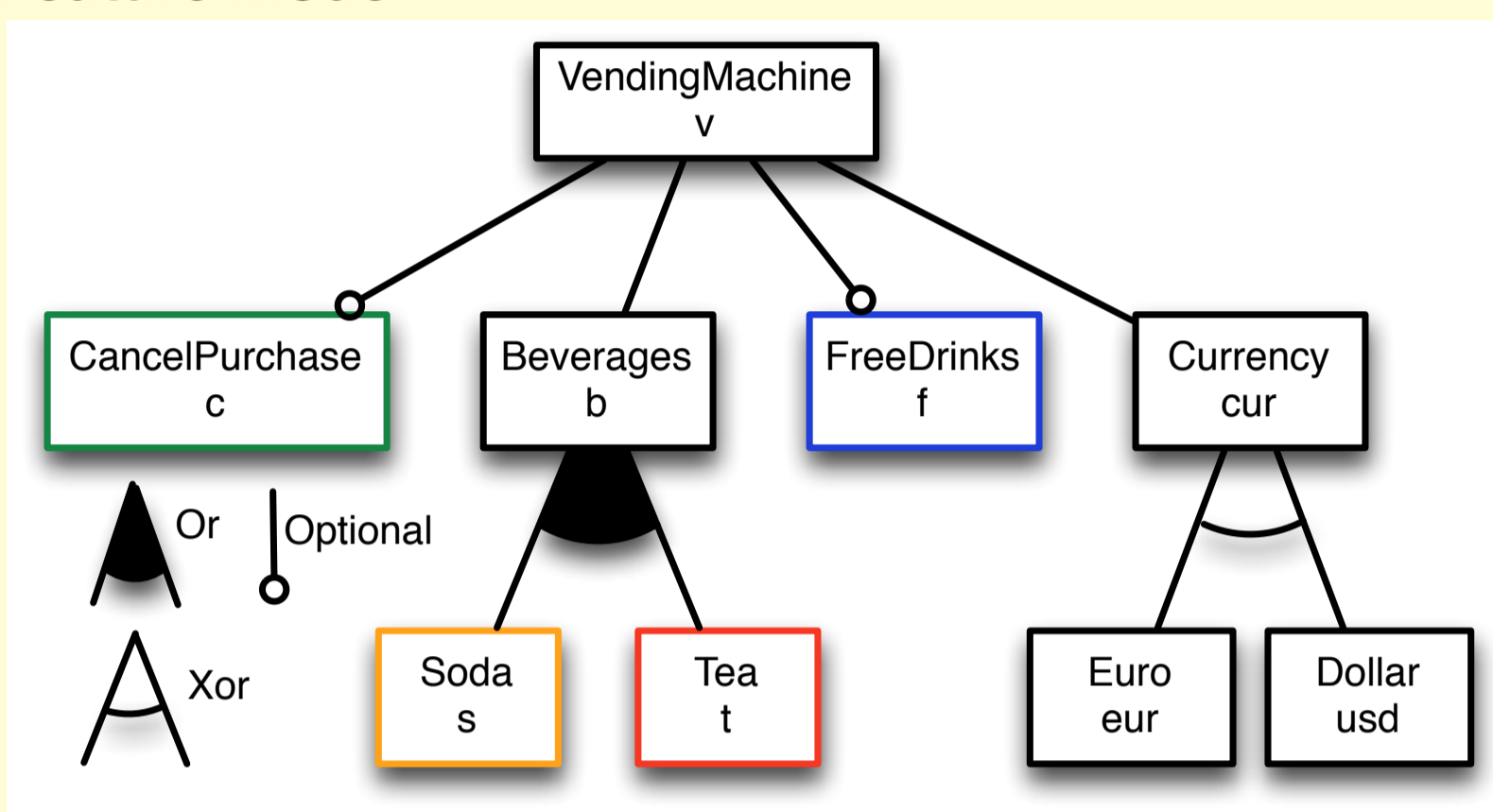
## Approach Overview



## Modelling

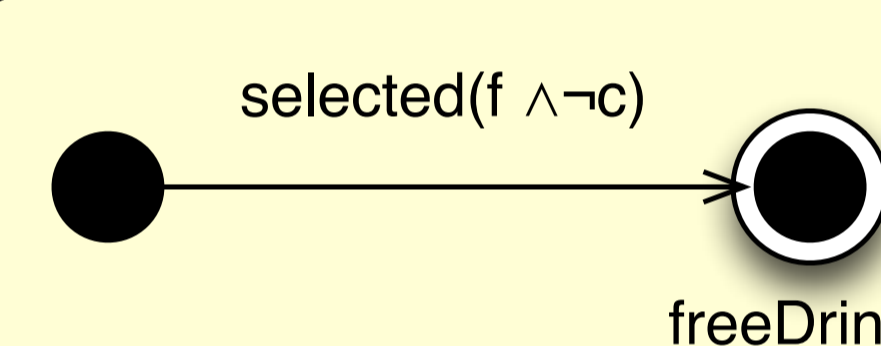
### SPL Model

#### Feature model

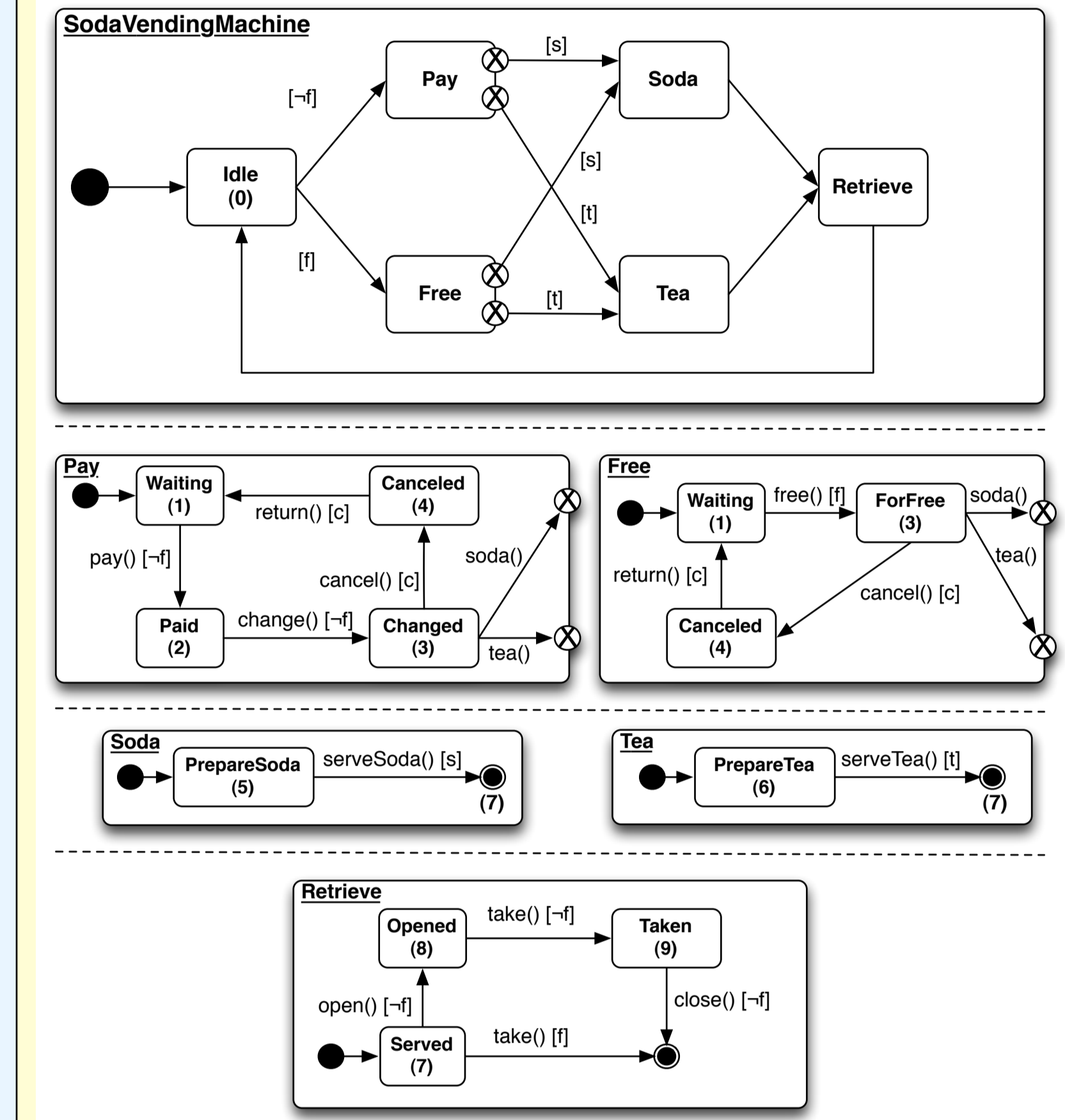


### QA Model

#### Coverage Criteria



### SDVA model



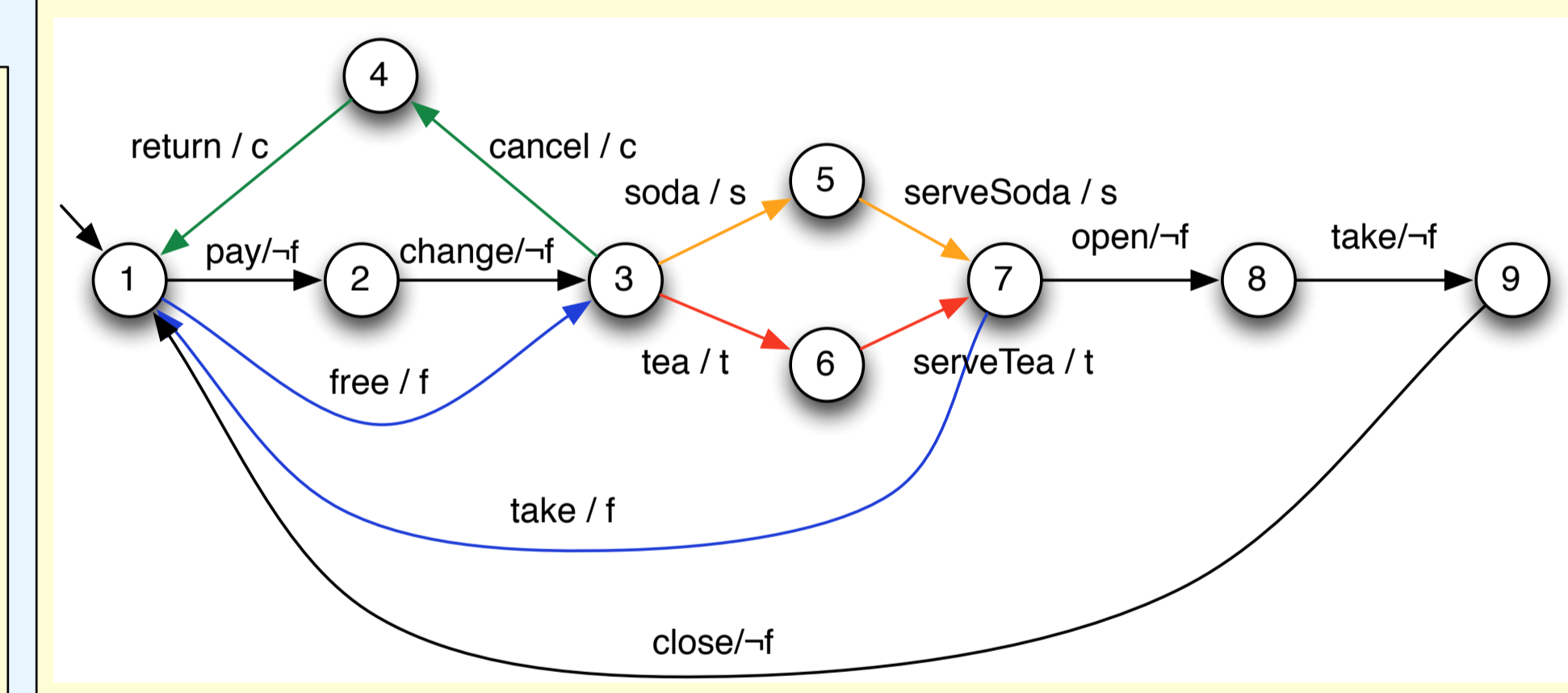
### 1. Flattening

#### Feature Model (TVL) [3]

```

root VendingMachine
group allof {
  opt CancelPurchase,
  Beverage group SomeOf{Soda,Tea},
  opt FreeDrinks,
  Currency group oneOf{Euro,Dollar}
}
  
```

#### FTS Model



## Design & Validation

### 2. Product Selection:

Selection of relevant test-cases and/or products using:

- Test Coverage algorithms
- Model Checking techniques [1]

### 3. Product Validation:

- SPL-oriented: seeks exhaustiveness at SPL level using refined FTS
- Product-oriented: relies on the QA product manager's knowledge for in-depth validation

## Ongoing and future work

- Define State Diagram Variability Analysis (SDVA)
- Define coverage criteria language
- Define and implement appropriate flattening algorithm
- Propose test reduction and generation techniques
- Validate the human focus through specific case studies

## Bibliography

- [1] Classen, A.; Modelling and Model Checking Variability-Intensive Systems; *Phd Thesis (FUNDP)*, 2011
- [2] Utting, M. & Legeard, B.; Practical model-based testing: a tools approach; *Morgan Kaufmann*, 2007
- [3] Classen, A.; Boucher, Q. & Heymans, P.; A Text-based Approach to Feature Modelling: Syntax and Semantics of TVL; *Science of Computer Programming, Special Issue on Software Evolution, Adaptability and Variability*, 2011, 76, 1130-1143
- [4] Oster, S.; Wöbbeke, A.; Engels, G. & Schürr, A.; Zander, J.; Schieferdecker, I. & Mosterman, P. J. (Eds.); Model-Based Software Product Lines Testing Survey; *Model-Based Testing for Embedded Systems, CRC Press*, 2011, 688

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