

Product Derivation with Requirements Models

Group 3 - RE II - HS14

Agenda

- 1) How our topic fits
- 2) Template approach
- 3) ADORA approach
- 4) Comparison
- 5) Discussion

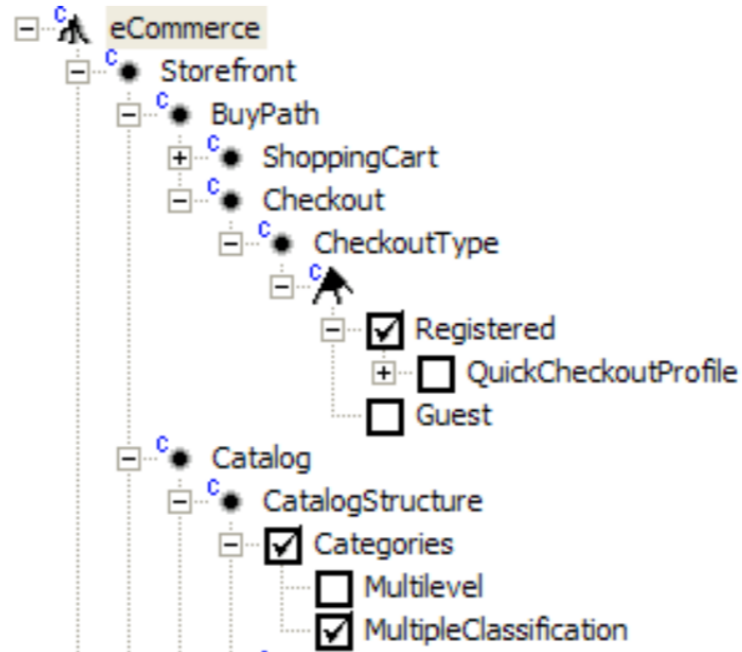
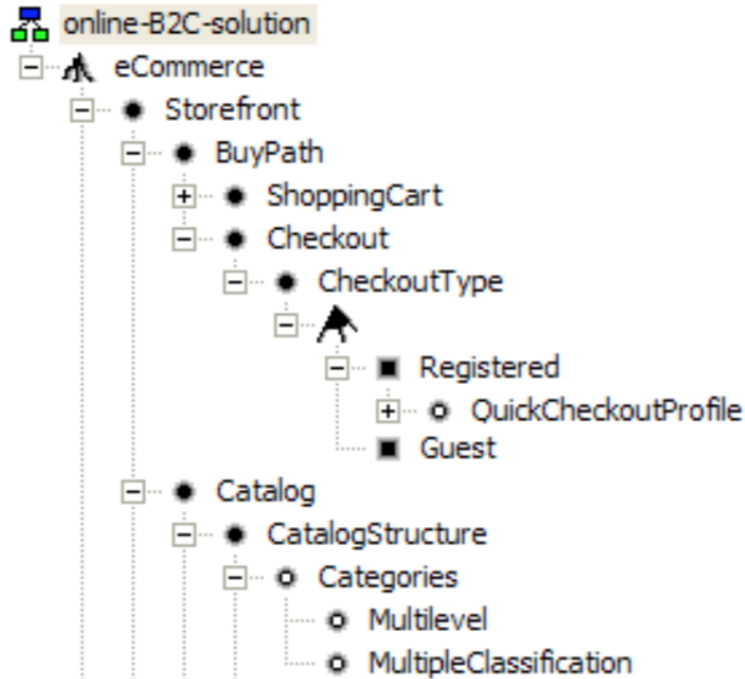
How our topic fits

- Representing common and variable features of the system in a product line
- Deriving products from a software product line

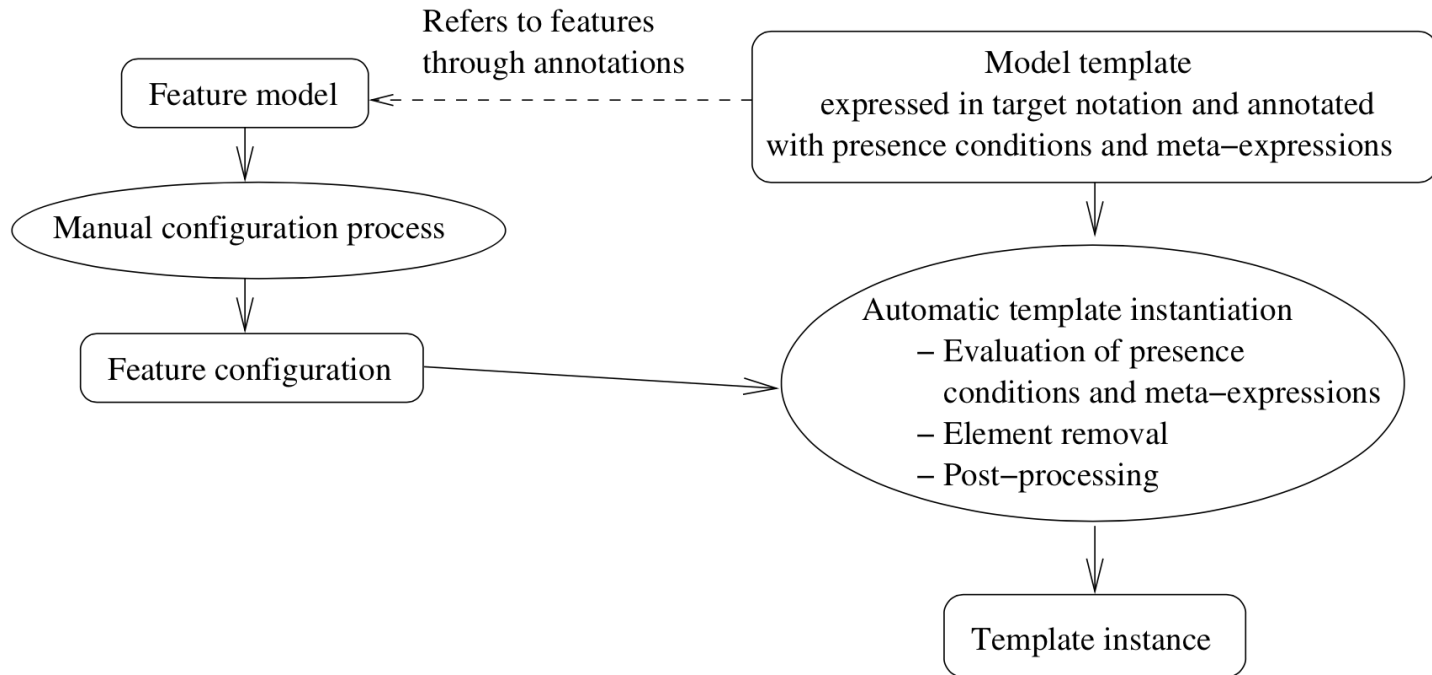
Template approach



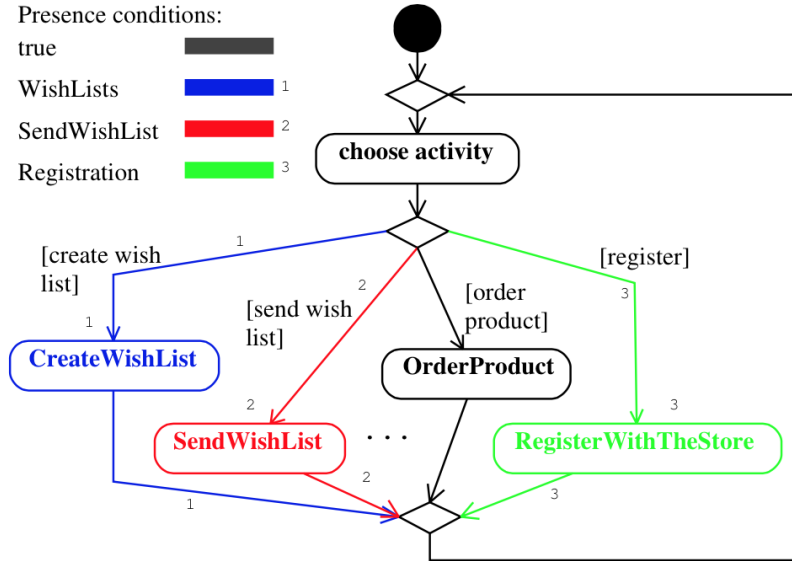
Template approach



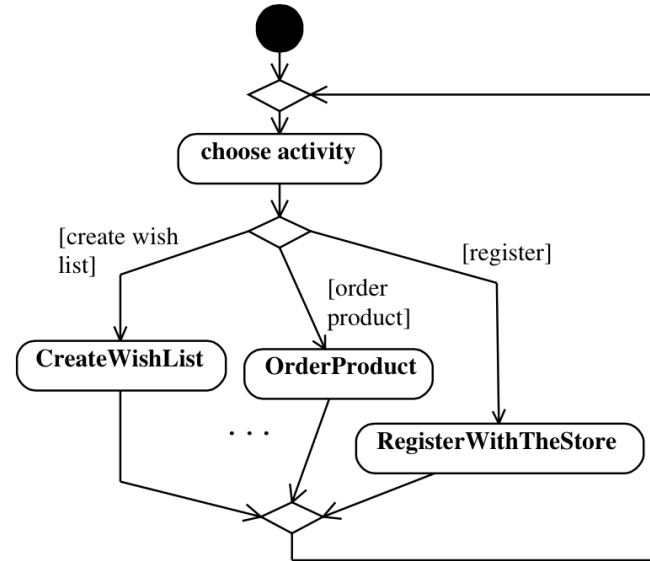
Template approach



Template approach



(a) Storefront template



(b) Storefront instance

Template approach

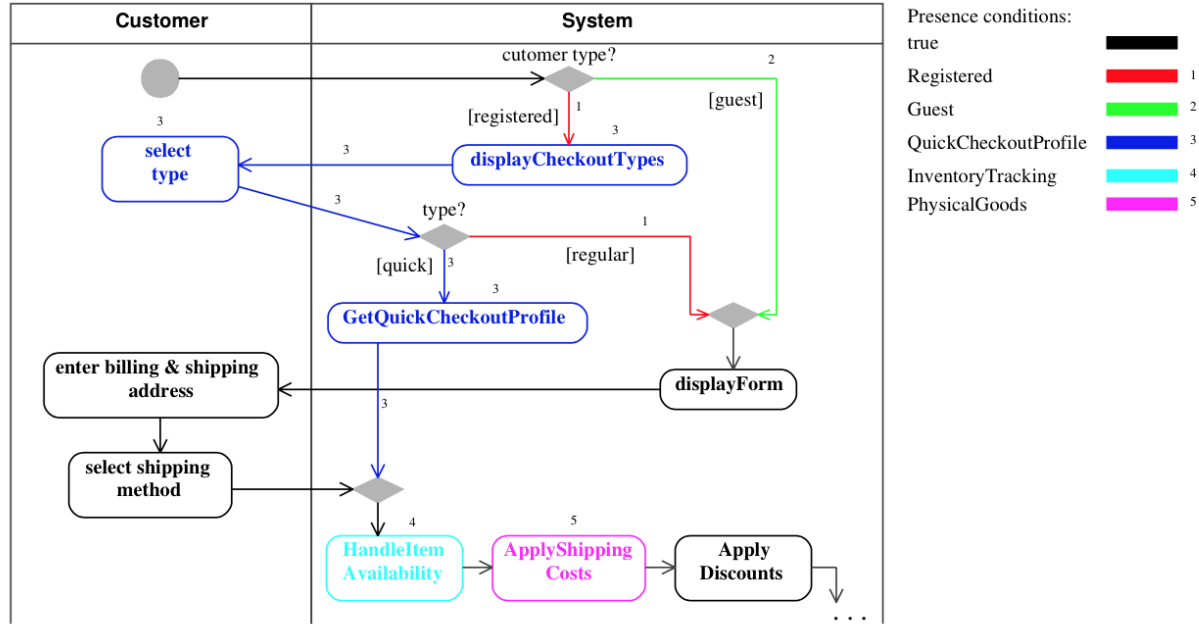
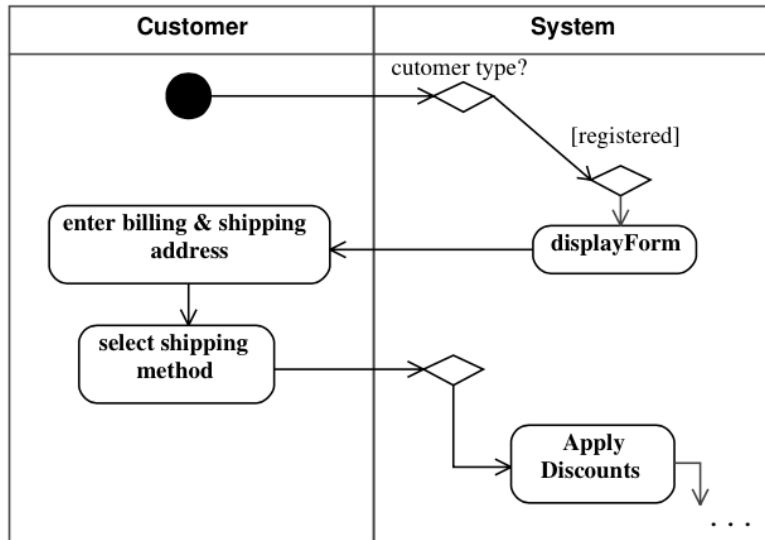
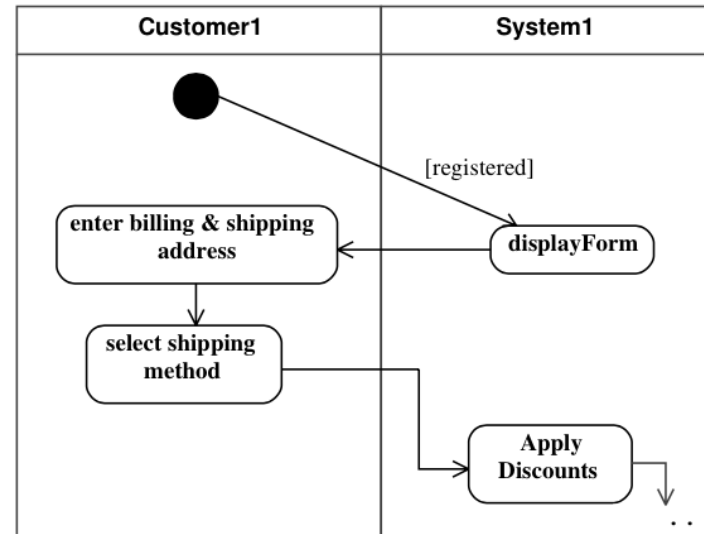


Fig. 7. Checkout Items diagram template

Template approach



(a) Checkout instance after region removal



(b) Checkout instance after simplification

Template approach

Presence conditions:

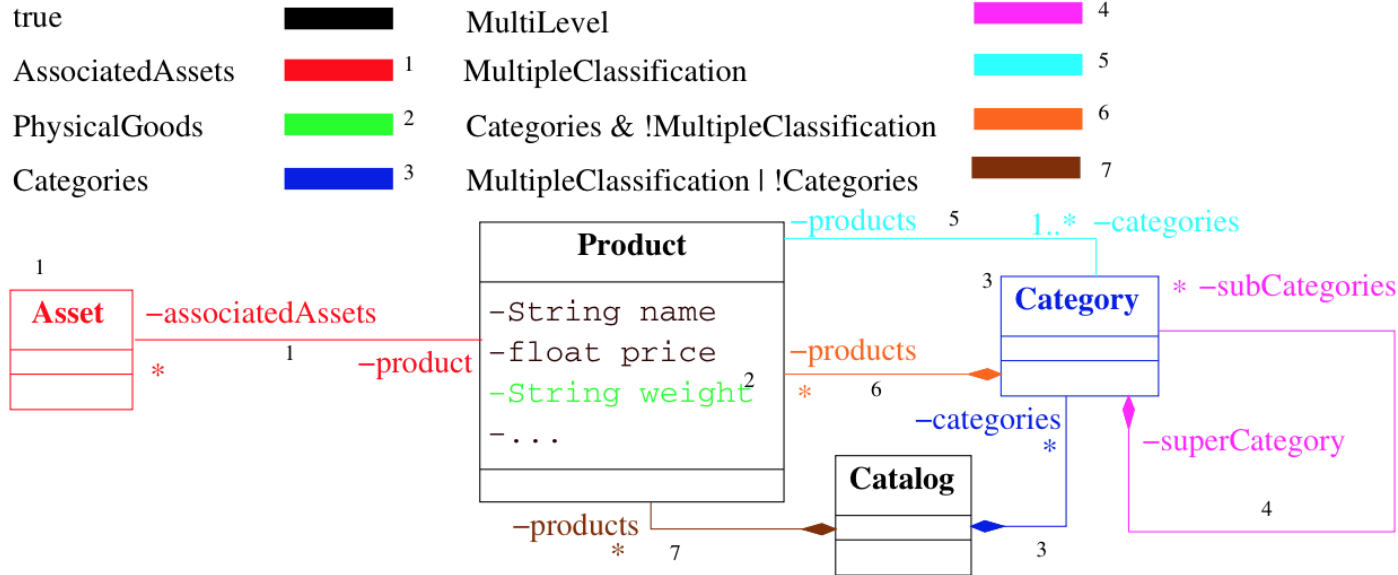
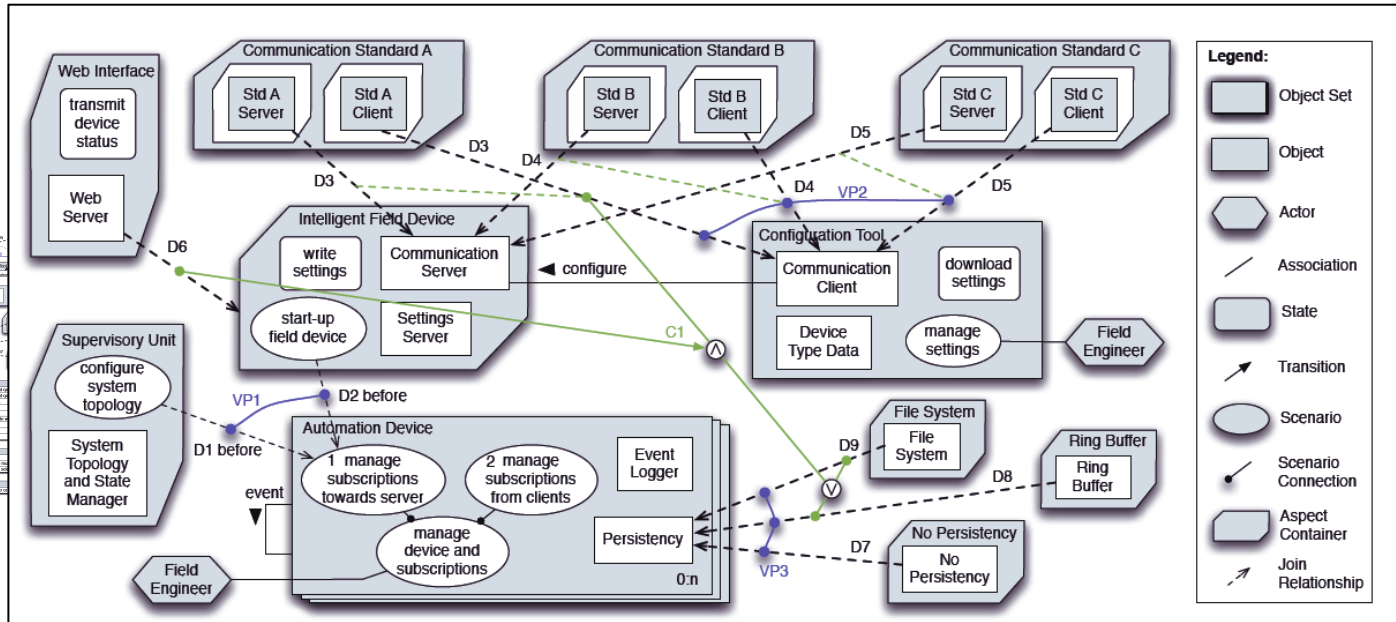


Fig. 5. Example of annotated class diagram

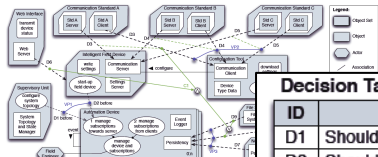
ADORA elements

Graphical visualisation of all relationships and dependencies



ADORA elements

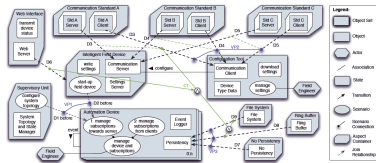
Decision table list all potential decisions, provide background information, impact on variability and constraints and current status



Decision Table						
ID	Description / Derivation Question	Design Rationale	Constraints	IfTrue	IfFalse	Decision
D1	Should the automation device be a supervisory unit?	The automation device platform is used for cost and quality reasons.	VP1	¬D2	D2	undecided
D2	Should the automation device be an intelligent field device?	The automation device platform is used for cost and quality reasons.	VP1	¬D1	D1 ¬D6	undecided
D3	Should the intelligent field device support communic. std. A?	Standard A is the newest and most performant one.	VP2, C1		¬D6	undecided
D4	Should the intelligent field device support communic. std. B?	Is a must in some countries.	VP2			undecided
D5	Should the intelligent field device support communic. std. C?	C is still required by many legacy systems.	VP2			undecided
D6	Should the intelligent field device a web interface?	The web interface allows access over the world wide web.	C1	D3 ¬D7		undecided
D7	Is there no memory in the automation device?	Might be interesting for non-critical systems.	VP3	¬D6 ¬D8 ¬D9		undecided
D8	Is there a ring buffer in the automation device?	Ring buffers are cheap to implement and fast.	VP3, C1	¬D7 ¬D9		undecided
D9	Is there a file system in the automation device?	File system offer huge amounts of storage space.	VP3, C1	¬D7 ¬D8		undecided

ADORA elements

Variation table defining variability of the product line

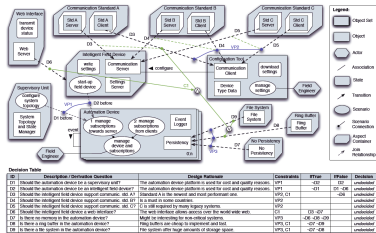


Decision Table	Description / Rationale	Decision	minCard	maxCard	Decisions Involved
D1	Should the automation device be a supervisory unit?	Yes	1	1	D1, D2
D2	Should the automation device be an intelligent field device?	No	1	1	D1, D2
D3	Should the communication standard be standard A?	Yes	1	3	D3, D4, D5
D4	Should the communication standard be standard B?	No	1	3	D3, D4, D5
D5	Should the communication standard be standard C?	Yes	1	3	D3, D4, D5
D6	Should the persistence be no persistency?	Yes	1	1	D6, D7, D8, D9
D7	Should the persistence be a ring buffer?	No	1	1	D6, D7, D8, D9
D8	Should the persistence be a file system?	Yes	1	1	D6, D7, D8, D9

Variation Points Table					
ID	Description / Rationale	minCard	maxCard	Decisions Involved	
VP1	An automation device always can be either a supervisory unit or an intelligent field device.	1	1	D1, D2	
VP2	There are three different communication standards to configure a field device: standard A, B, and C. At least one must be chosen.	1	3	D3, D4, D5	
VP3	There exist three different persistency types: no persistency, a ring buffer, or a file system. One of these must be selected.	1	1	D7, D8, D9	

ADORA elements

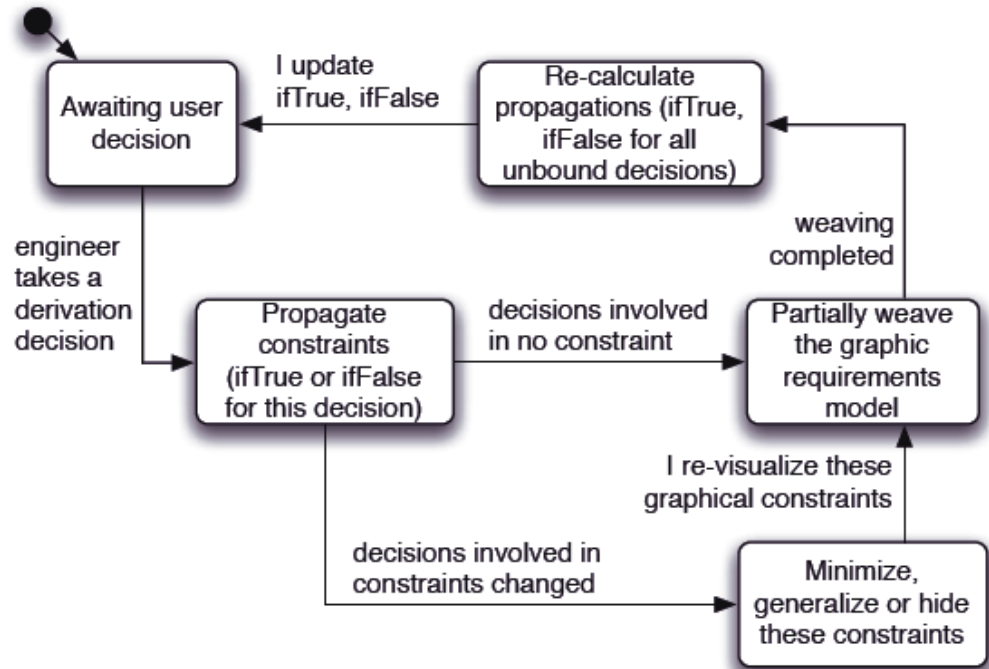
Constraint table defining dependencies within the product line



ID	Description / Rationale	Antecedent	Operator	Consequent
C1	A web interface always requires the communication standard A and a local persistency installed (either ring buffer or FS).	D6	$\Rightarrow$	D3 and (D8 or D9)

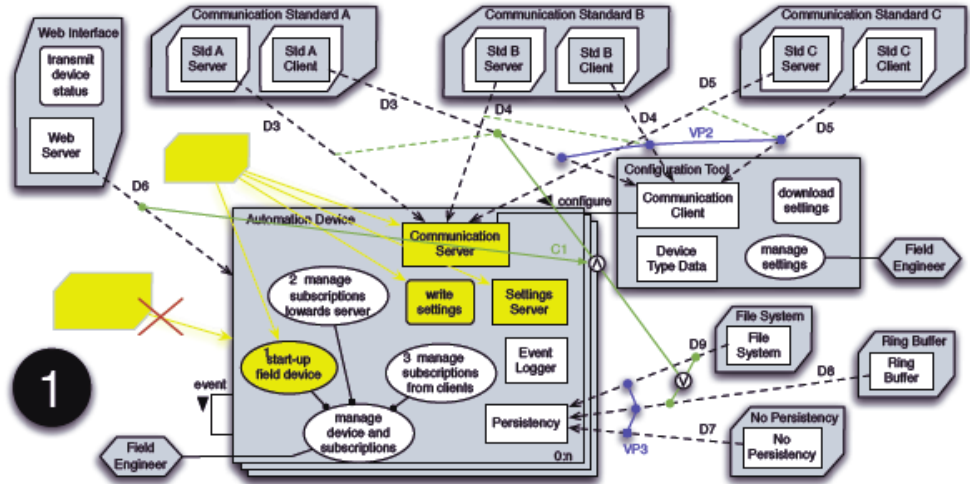
ADORA procedure

- Incremental update of all visualisation, variability and constraints with each decision
- Repetition until all decisions are made



ADORA example

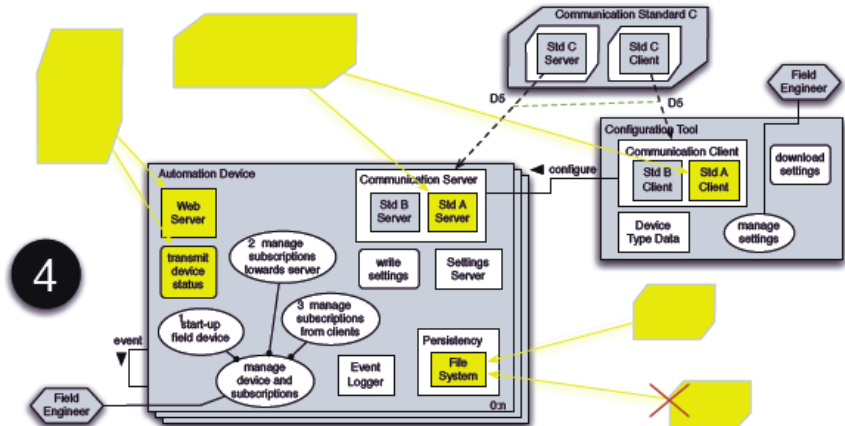
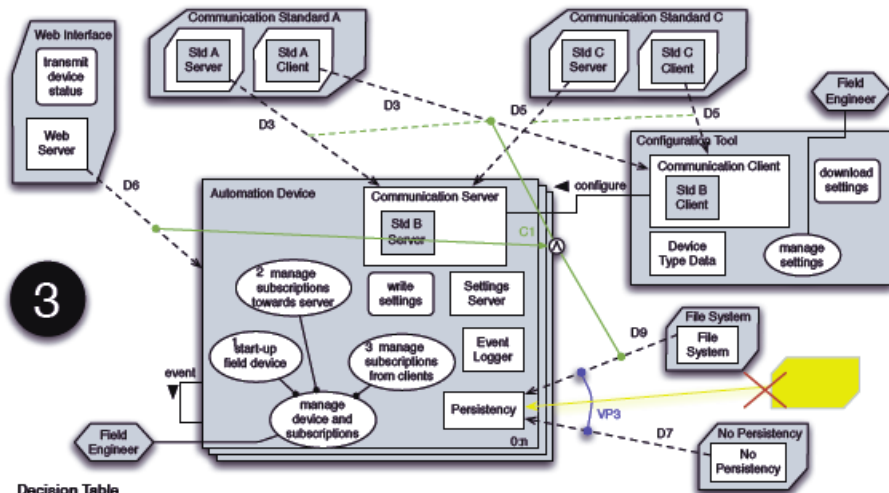
Visualisation with remaining variability updated after first decision



Decision Table

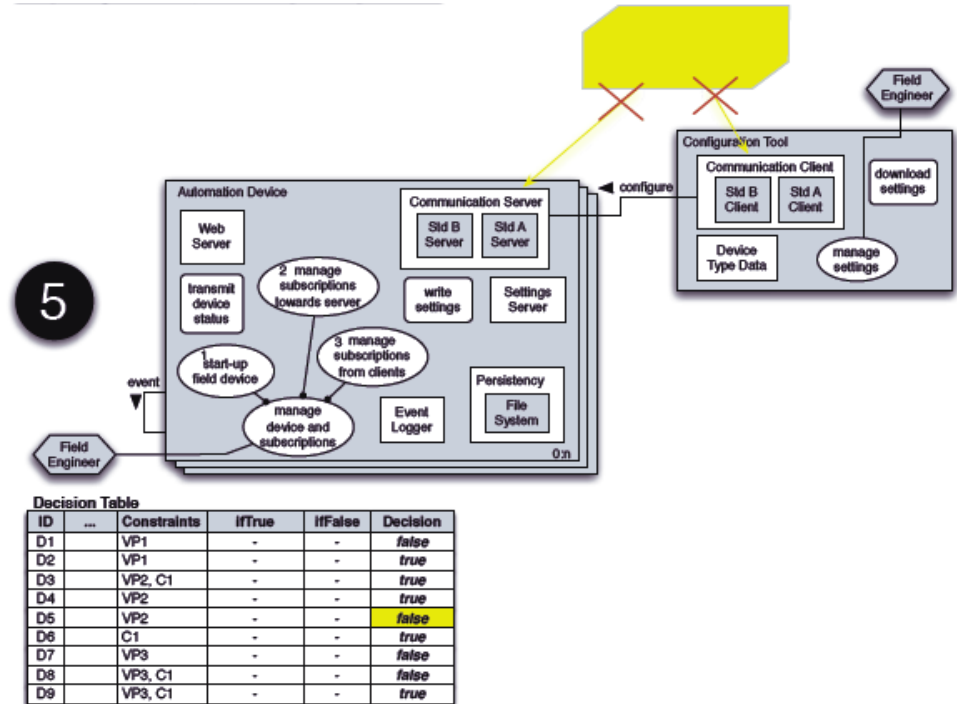
ID	...	Constraints	ifTrue	ifFalse	Decision
D1		VP1	-	-	false
D2		VP1	-	-	true
D3		VP2, C1		~D6	undecided
D4		VP2			undecided
D6		VP2			undecided
D6		C1	D3 ~D7		undecided
D7		VP3	~D6 ~D8 ~D9		undecided
D8		VP3, C1	~D7 ~D9		undecided
D9		VP3, C1	~D7 ~D8		undecided

ADORA example



ADORA example

Last decision defines
final product
configuration derived
from product line



Summary

- Template Approach:
 - Integration of already existing information (e. g. UML models)
 - not limited to requirements engineering
 - no special language or tools needed
- ADORA Approach:
 - less context switches
 - easy constraint handling
 - decision traceability and possibility to revert

Discussion

- How to avoid clashes and dead ends?
- How to deal with requirements beyond product line variability?