BX4RE: Synchronizing Feature Models and Use Cases

Haiyan Zhao

Peking University

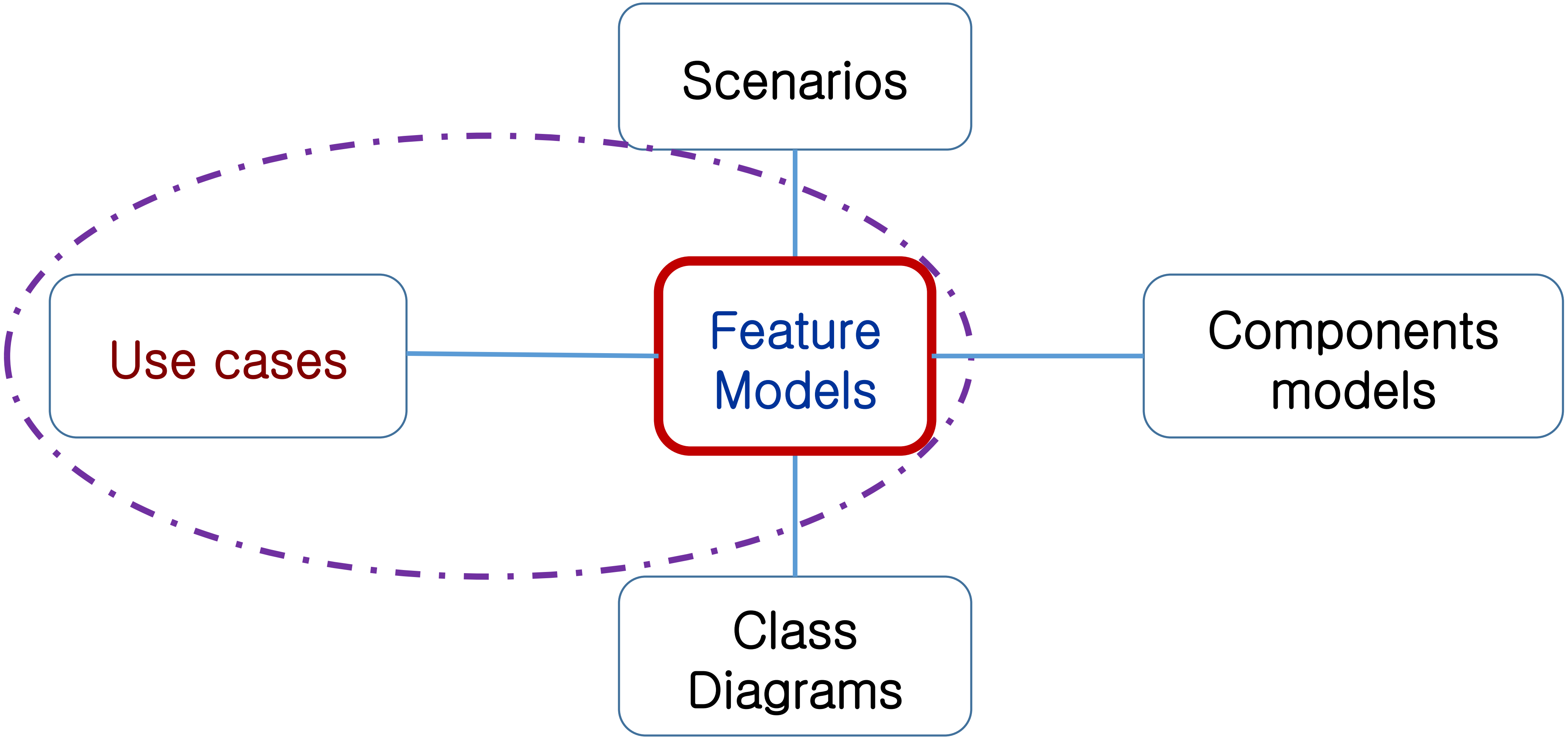
zhhy.sei@pku.edu.cn

Joint work with

Weize Zhao (PKU), Zhenjiang Hu (NII)

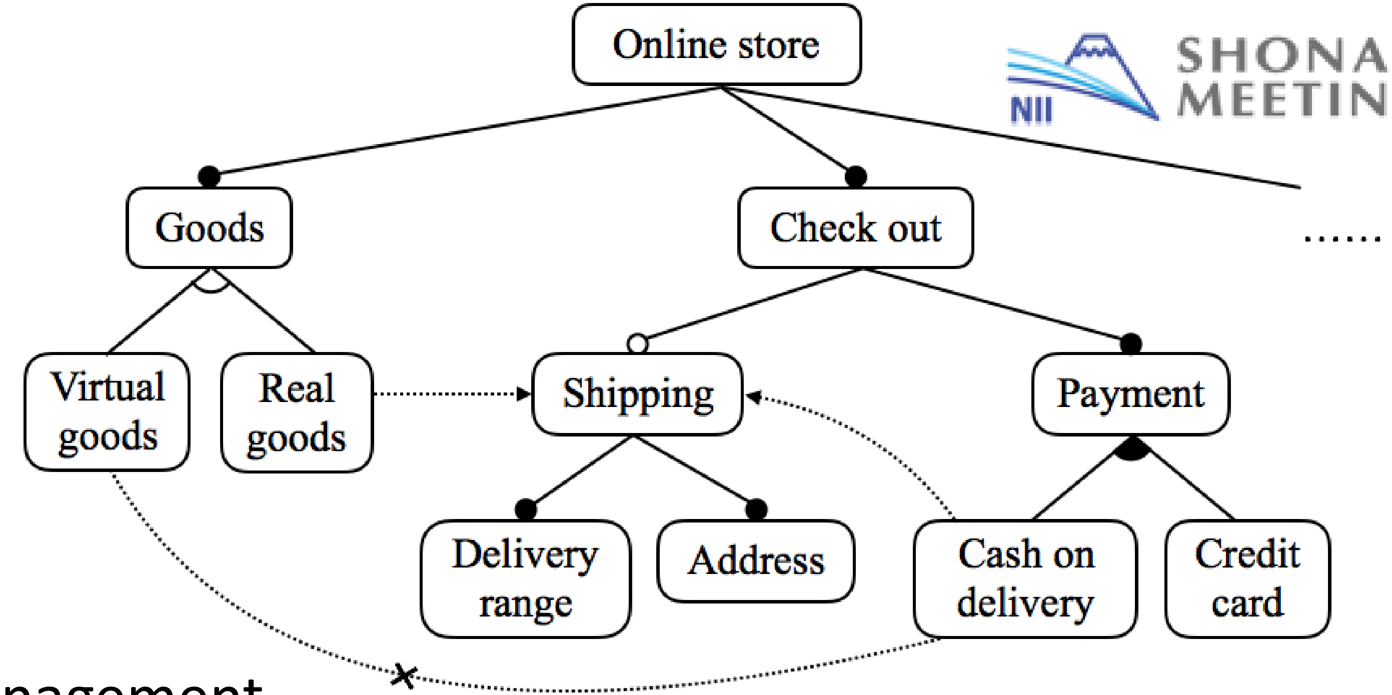
Shonan BX, 25-29 Sept. 2016

Feature Model Centric Approach to RE/SPL/SW Adaptation



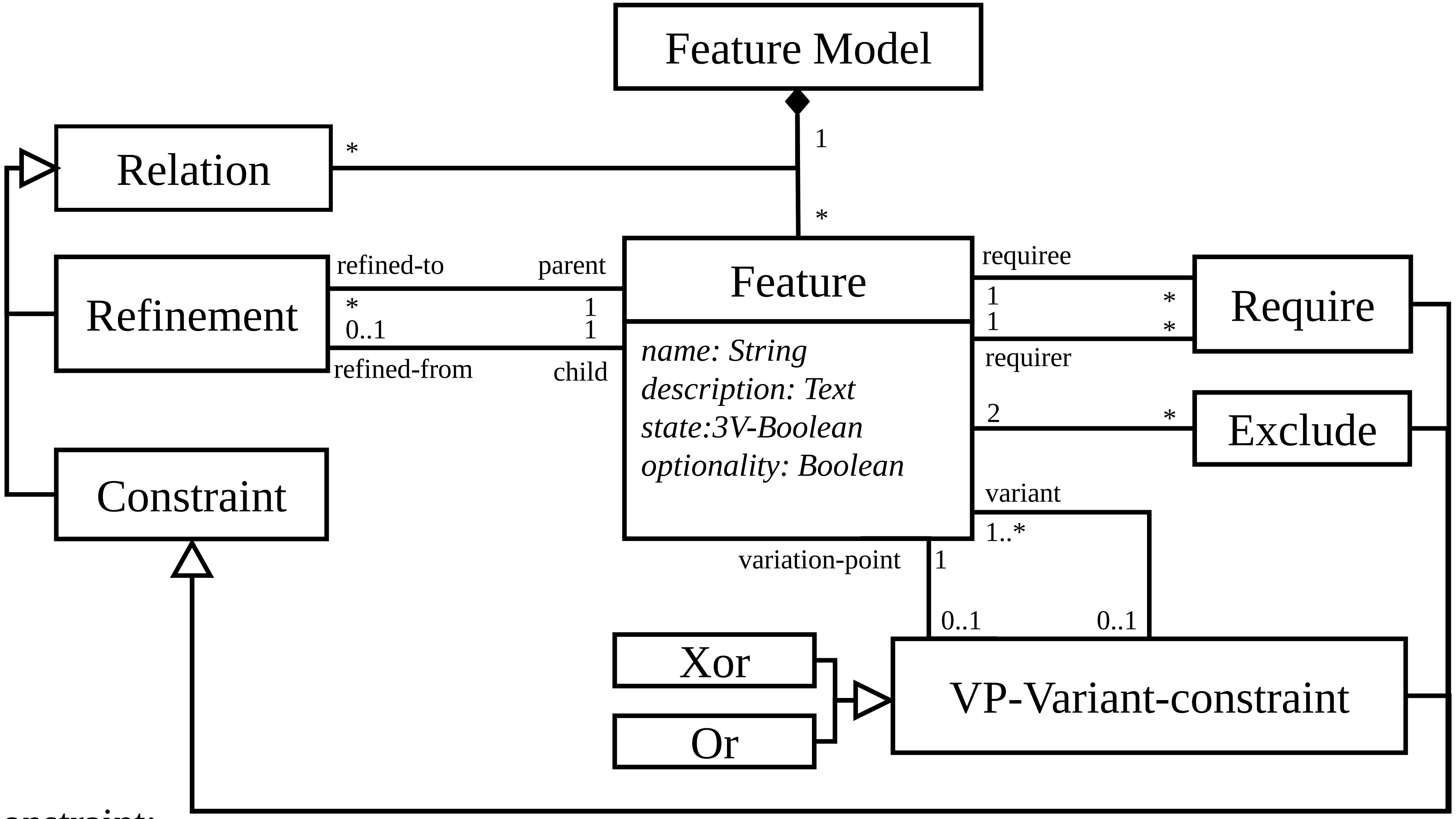
+ Traceability between feature models and other artifacts

Feature Model



- Fulfills the need of variability management
  - Commonality : Mandatory features
  - Variability : Optional features , Variant features
- Provides an efficient way to abstract from requirements
  - Group a set of related requirements in one feature
  - Narrow the gap between the end-user and the developer perspective of a software system

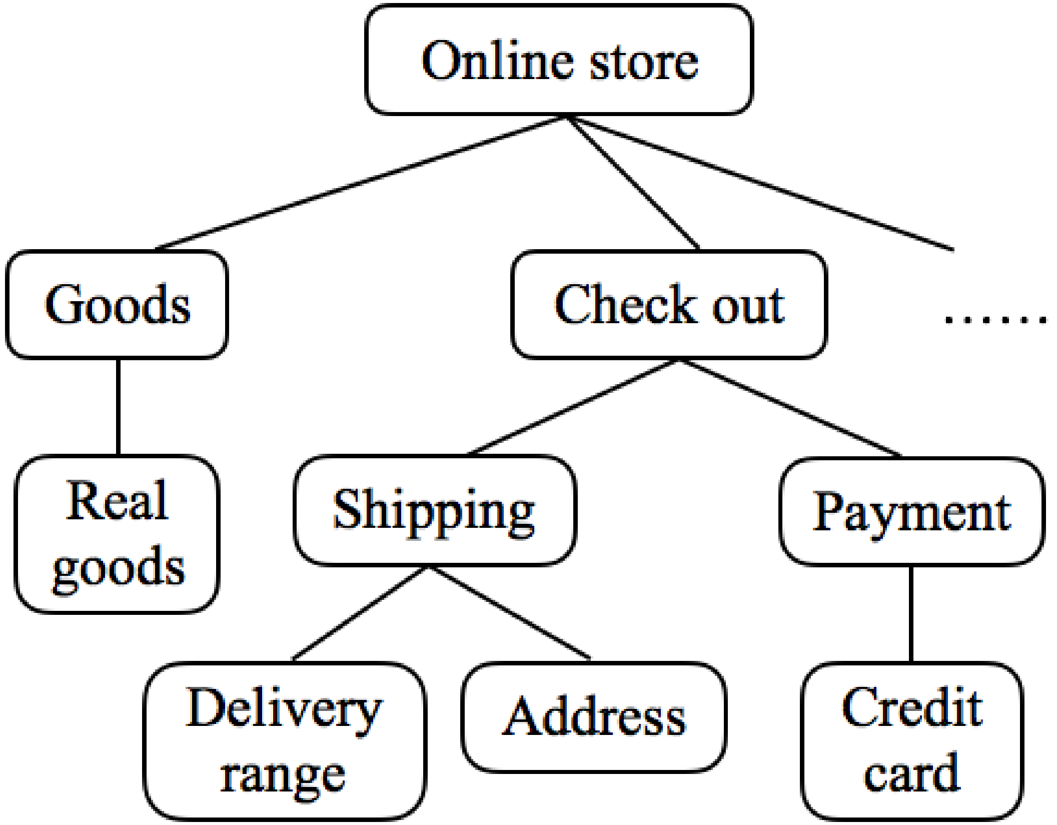
Meta-model of Feature Models



OCL constraint:
context c: VP-Variant-Constraint
inv: c.variant->forAll(refined-from.parent=c.variation-point)

Feature Model Configuration

- A set of features selected from the feature model, which describes a specific system (software), as well as satisfies the constraints imposed by the model

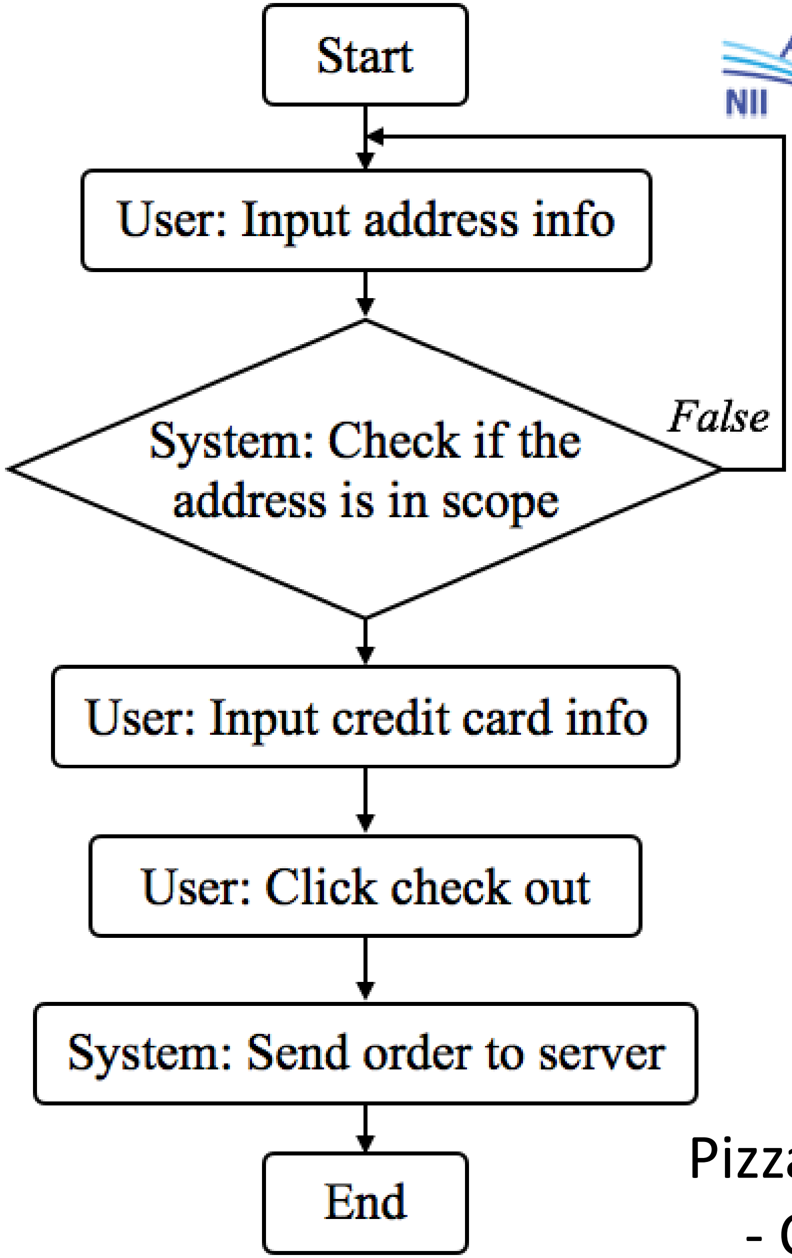


Online Pizza Store

Use Case

- Consists of a list of actions, typically defining the interactions between a role (actor) and a system to achieve a substantial goal

- Easy to communicate with stakeholders/end-users

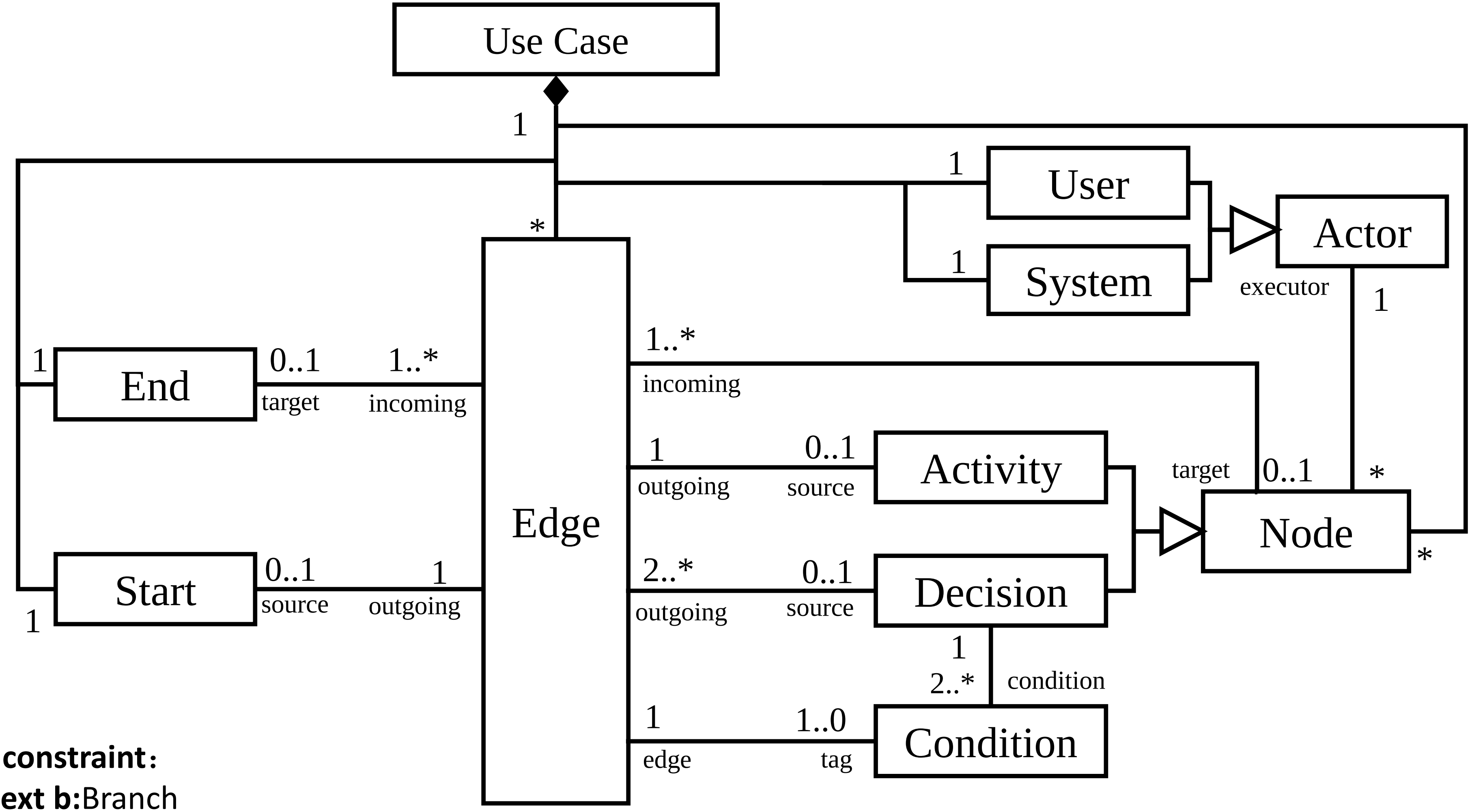


Start
User: Input address info
System: Check if the address is in scope
False
User: Input credit card info
User: Click check out
System: Send order to server
End

Pizza Online Store

- Check Out

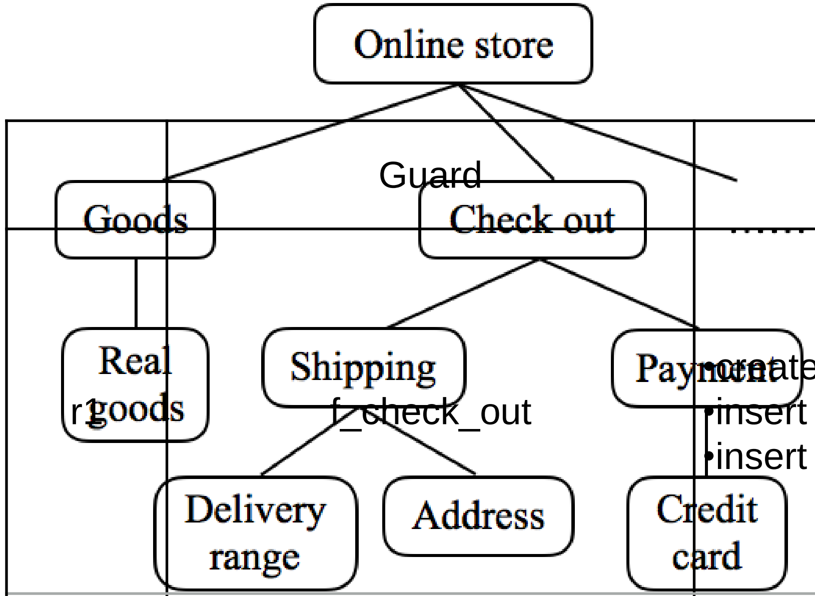
Meta-model of Use Cases

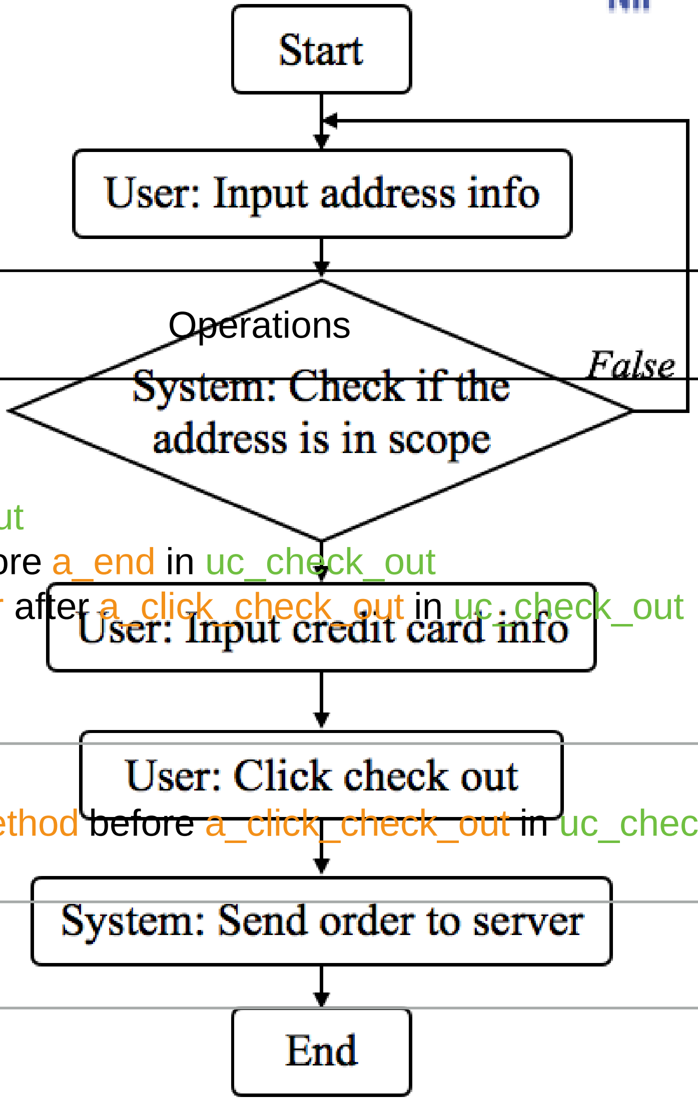


OCL constraint：
context b: Branch
inv: b.outgoing->forAll (e : Edge | e.tag->size()=1 **and** b.condition->includes(e.tag)) **and**
b.condition->forAll (c : Condition | c.edge->size()=1 **and** b.outgoing->includes(c.edge))

TDL4UC: X-rules

	Guard	Operations
r1	f_check_out	•create use case uc_check_out •insert a_click_check_out before a_end in uc_check_out •insert a_send_order_to sever after a_click_check_out in uc_check_out
r2	f_payment	•insert b_pick_a_payment_method before a_click_check_out in uc_check_out
…	…	…

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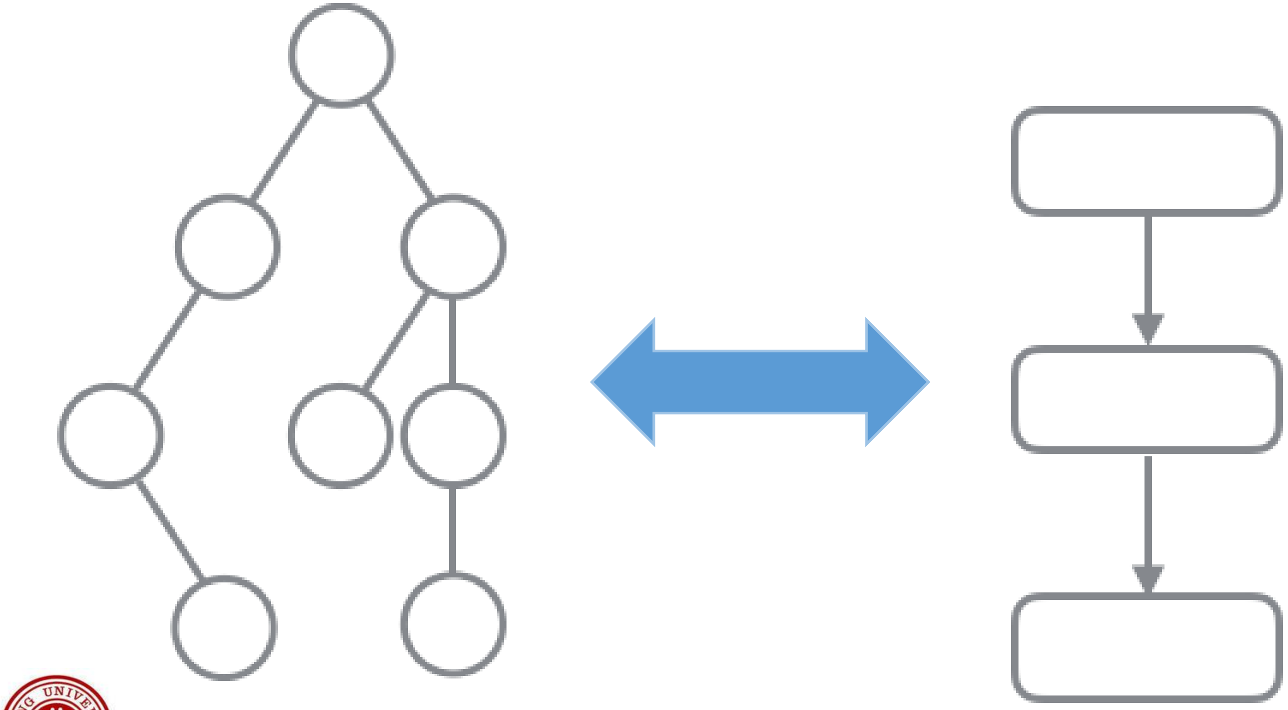
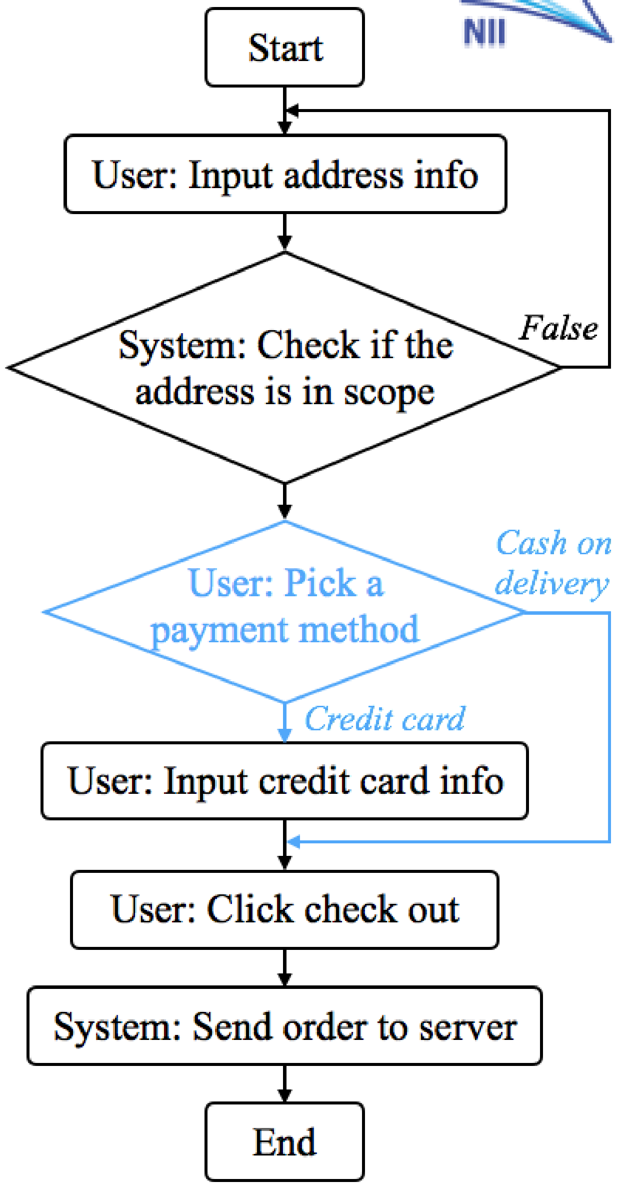
End

Synchronization UC with FMC

Need to propagate the modification in use case to feature model configuration, and may further to feature model itself





Start

User: Input address info

System: Check if the address is in scope

False

User: Pick a payment method

Cash on delivery

Credit card

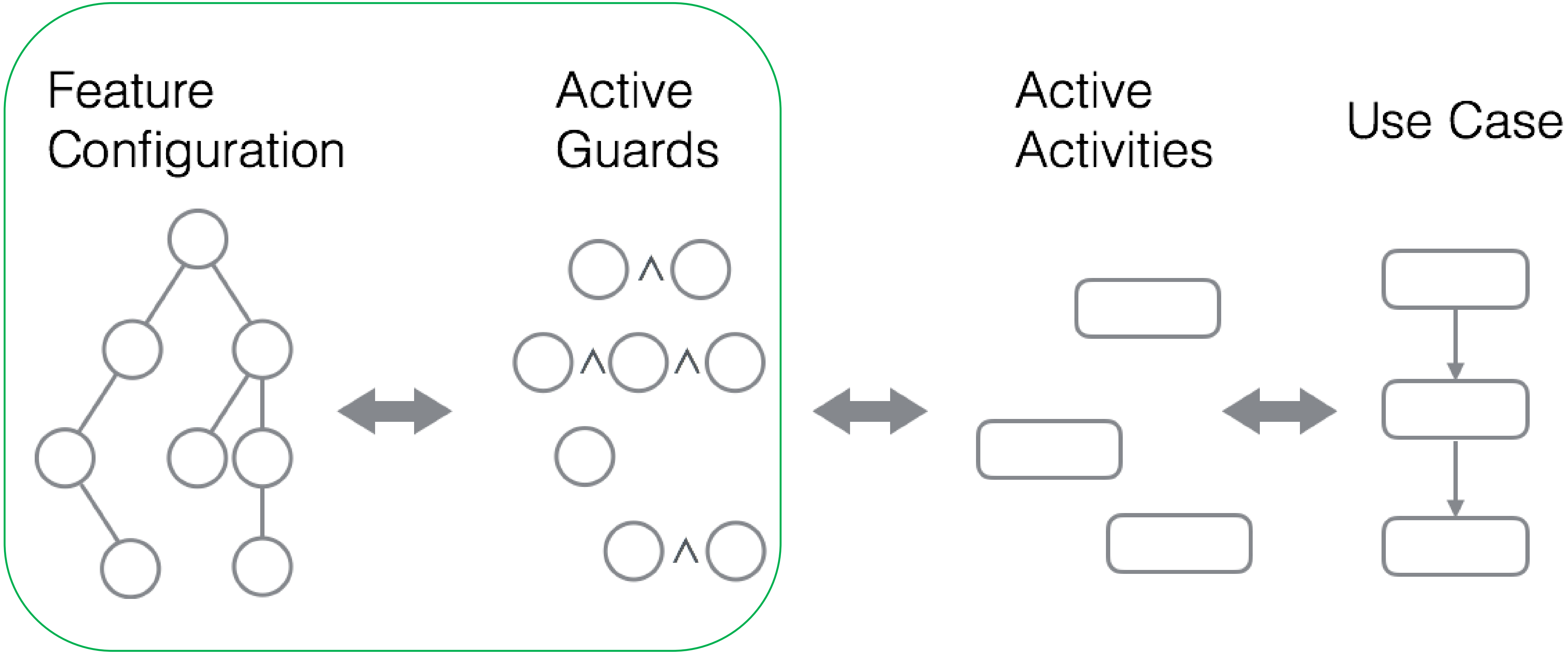
User: Input credit card info

User: Click check out

System: Send order to server

End

X-rules vs UC & FMC



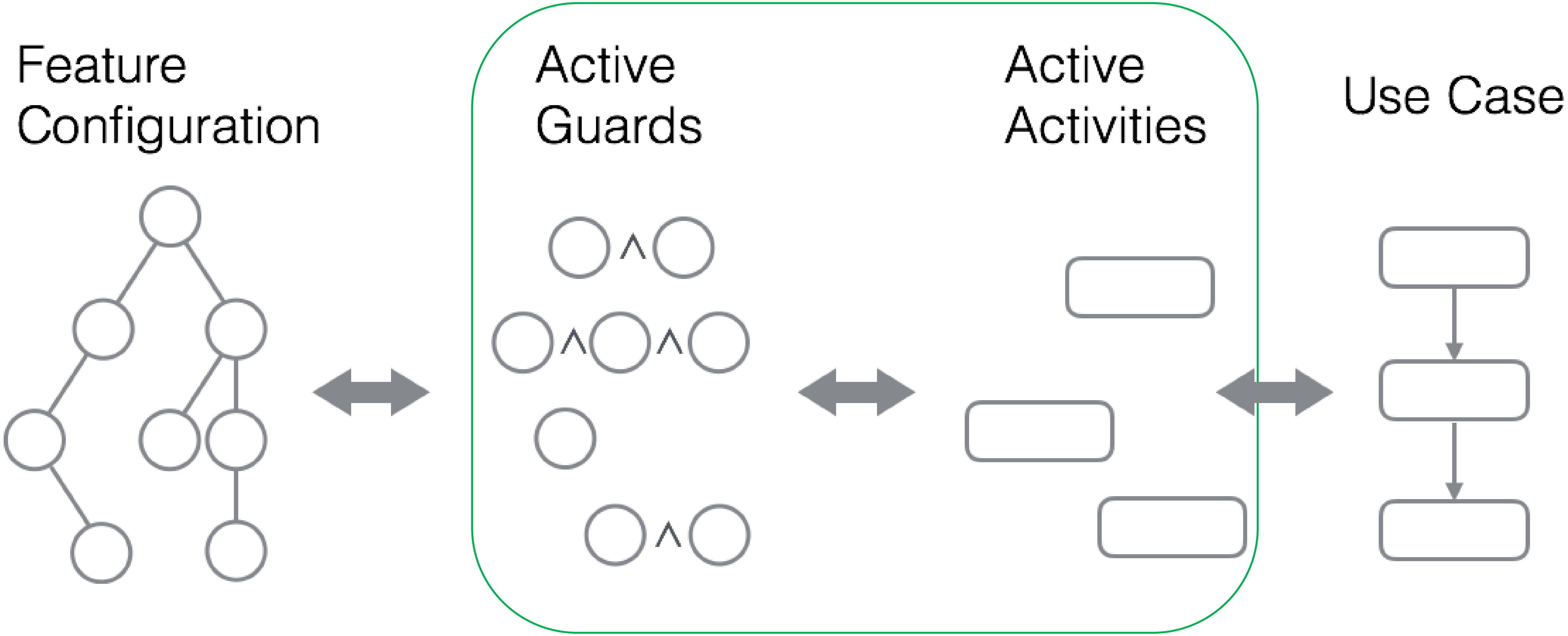
Feature Configuration

Active Guards

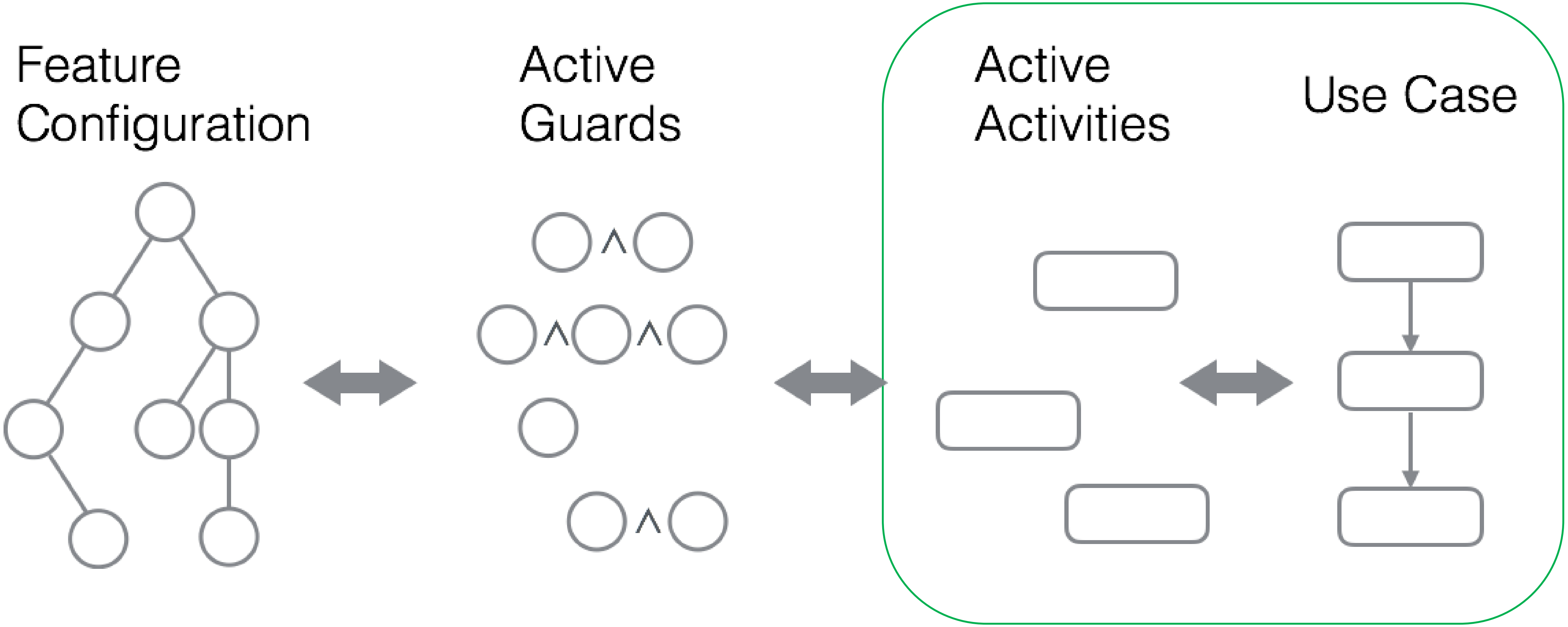
Active Activities

Use Case

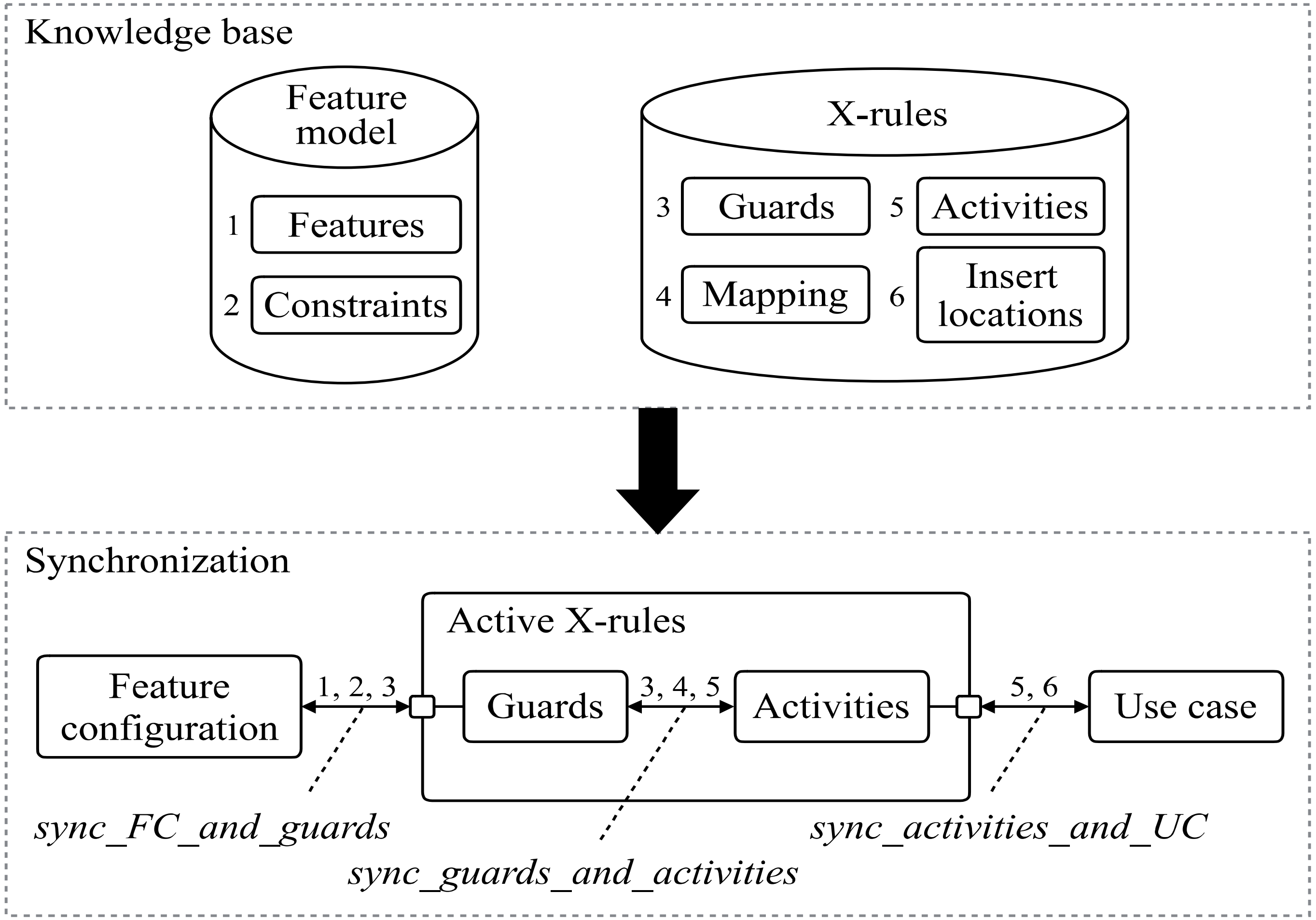
X-rules vs UC & FMC



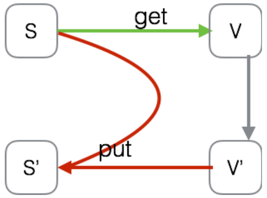
X-rules vs UC & FMC

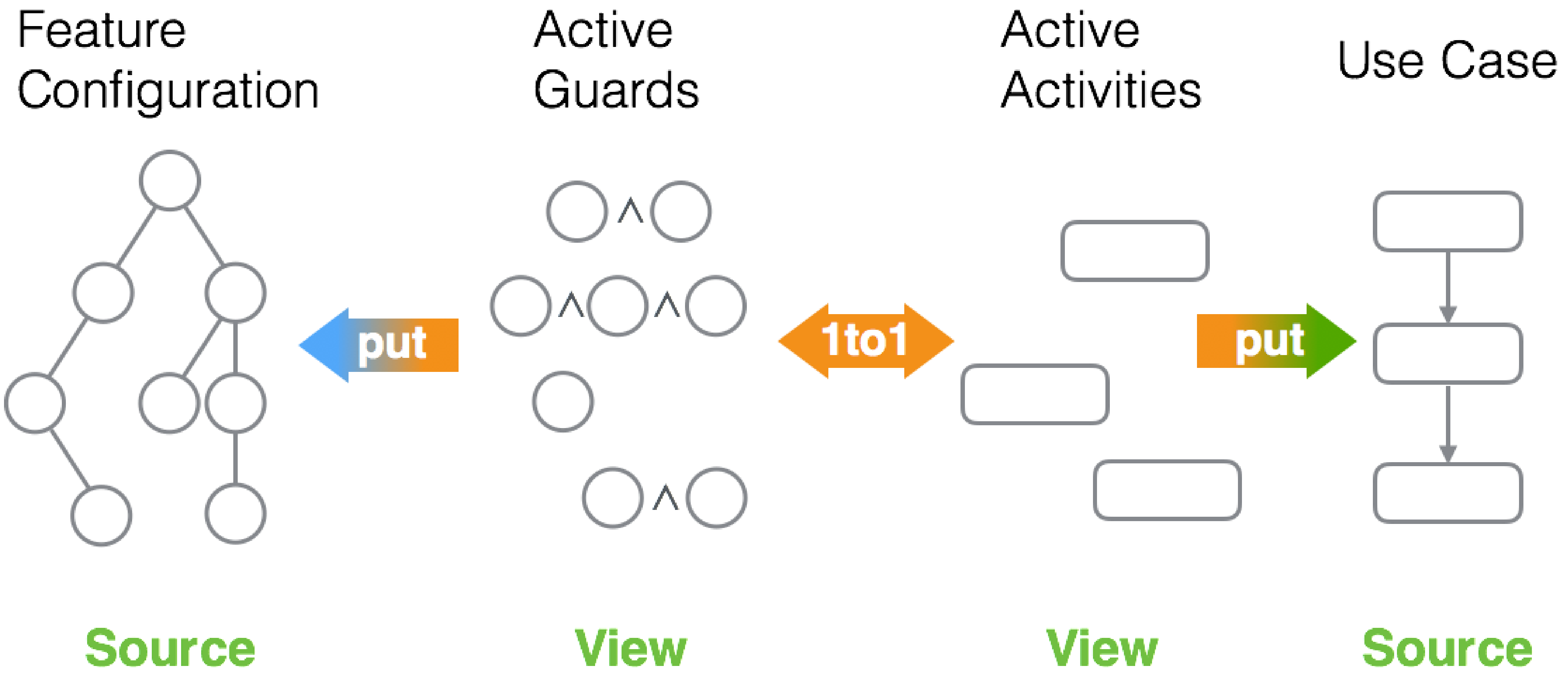


Synchronization Framework



Synchronization Using BiGUL





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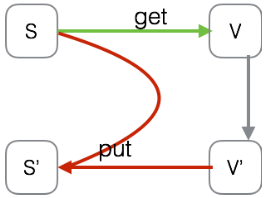
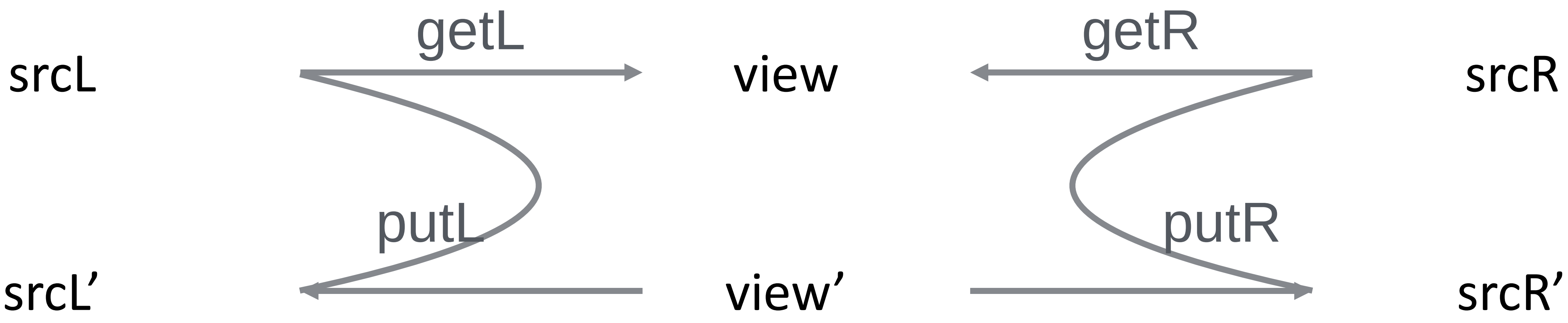



srcL

getL

view

getR

srcR

putL

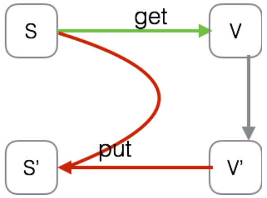
putR

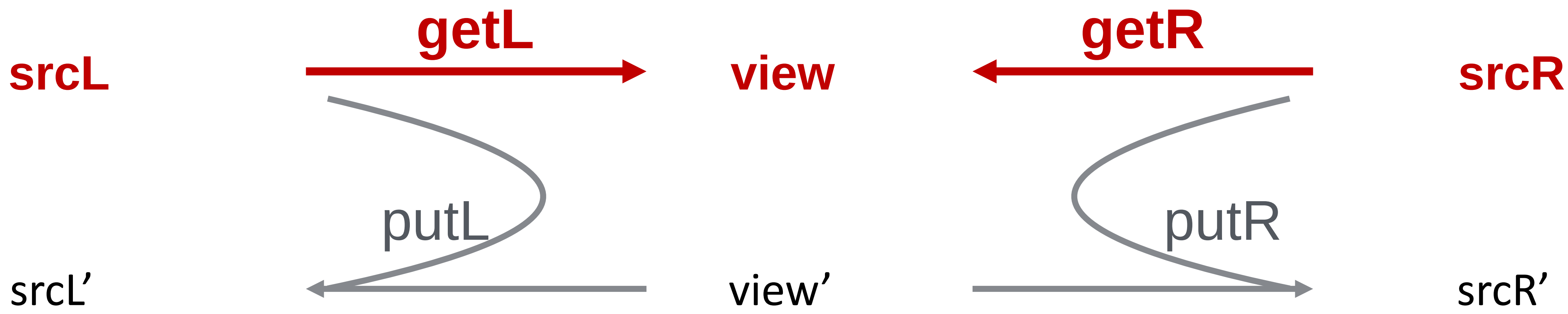
srcL’

view’

srcR’

Synchronization Using BiGUL





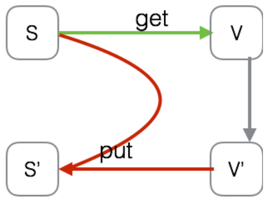
srcL getL view getR srcR

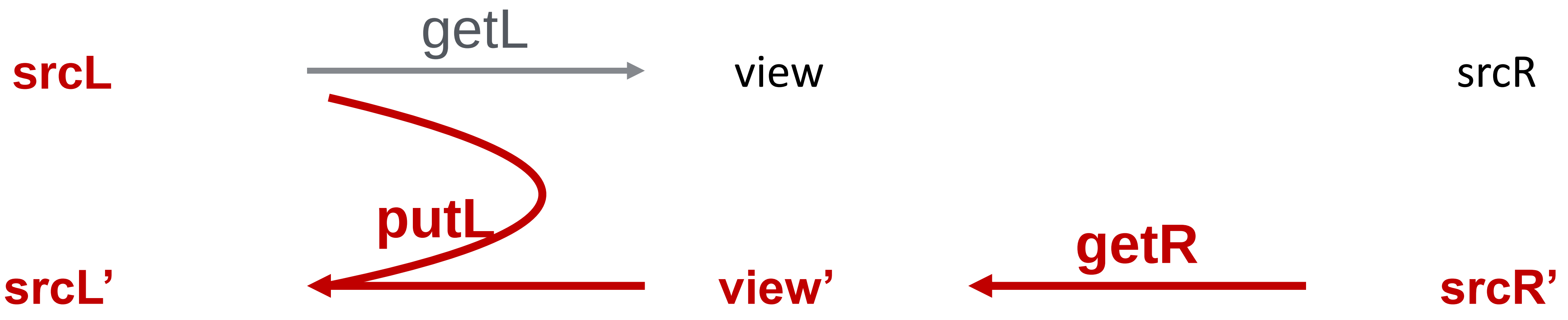
putL putR

srcL’ view’ srcR’

Consistency: srcL~srcR $\overset{\text{def}}{=}$ **getL srcL = getR srcR**

Synchronization Using BiGUL

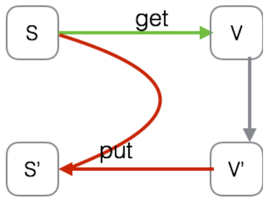


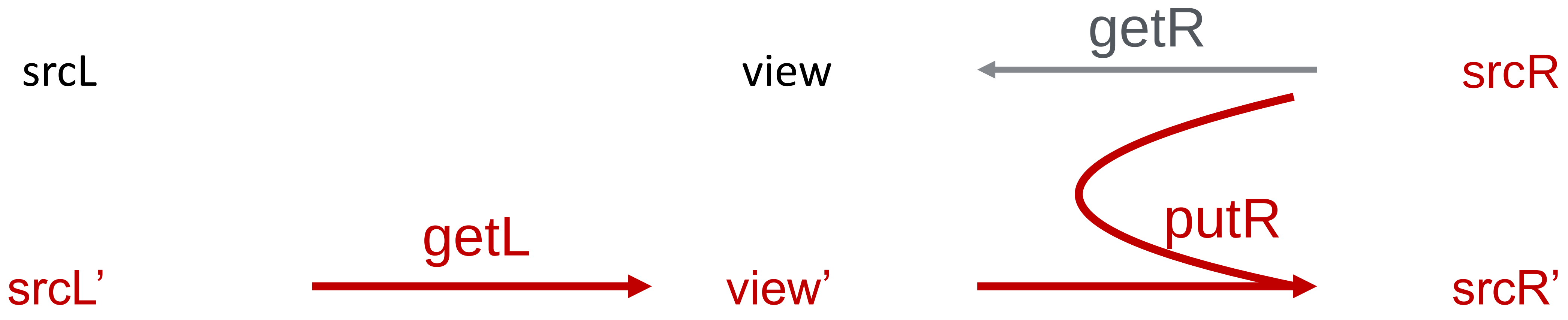


Consistency: srcL~srcR $\overset{\text{def}}{=}$ **getL srcL = getR srcR**

# 1: putR2L srcL srcR’= putL (srcL (getR srcR))

Synchronization Using BiGUL





srcL view getR srcR

putR

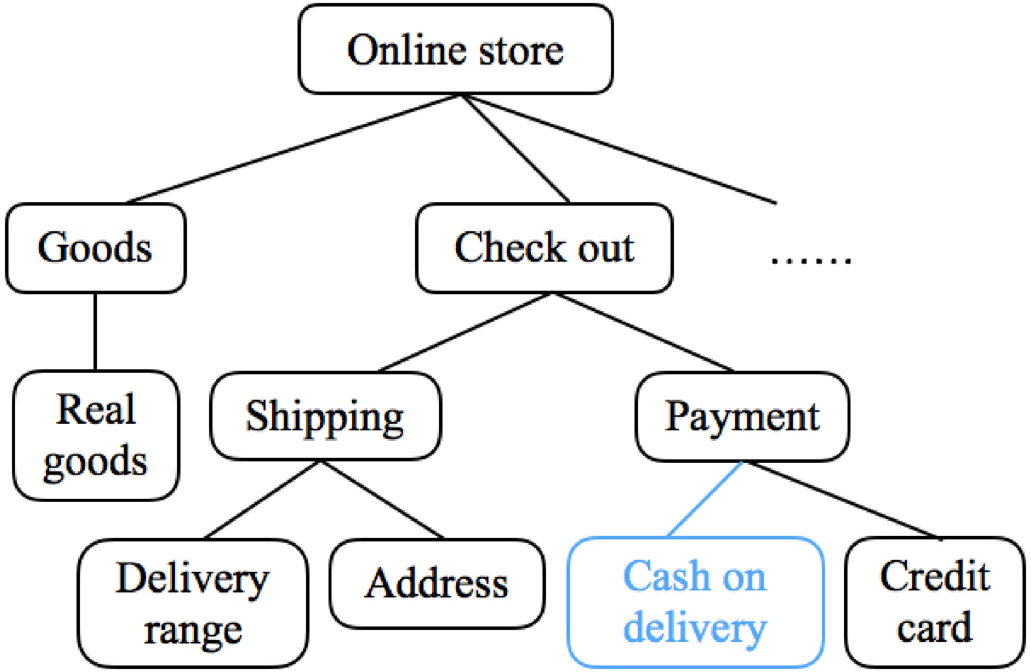
srcL' getL view' srcR'

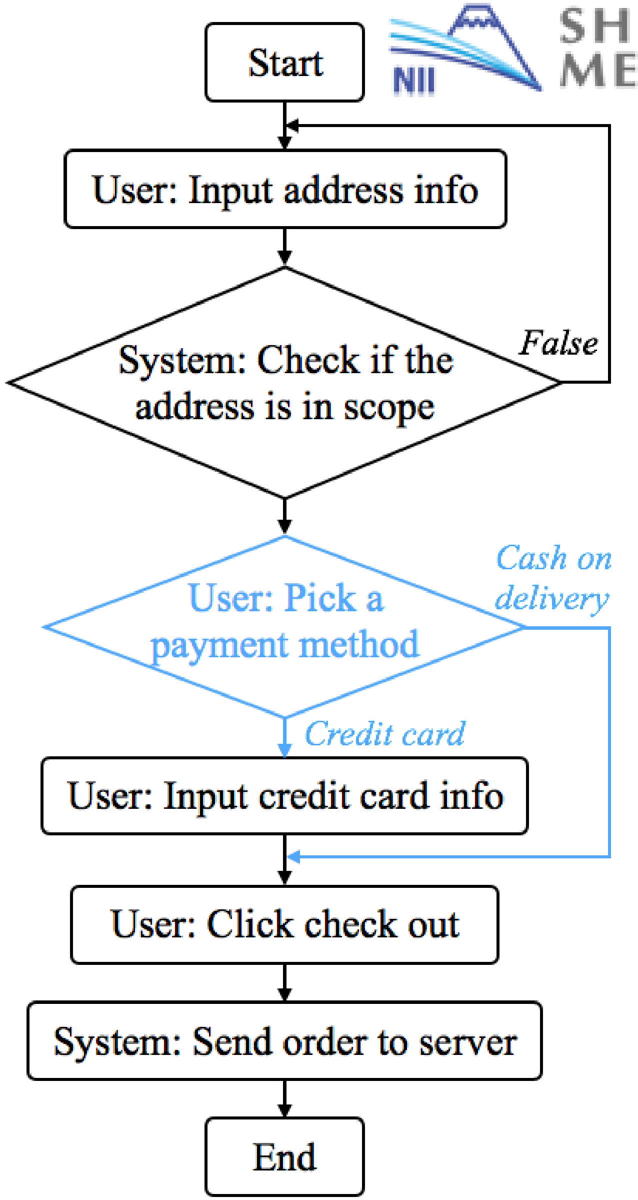
Consistency: srcL~srcR $\overset{def}{=}$ getL srcL = getR srcR

#1: putR2L srcL srcR'= putL (srcL (getR srcR'))

#2: putL2R srcR srcL' = putR (srcR (getL srcL'))

Synchronization Using BiGUL

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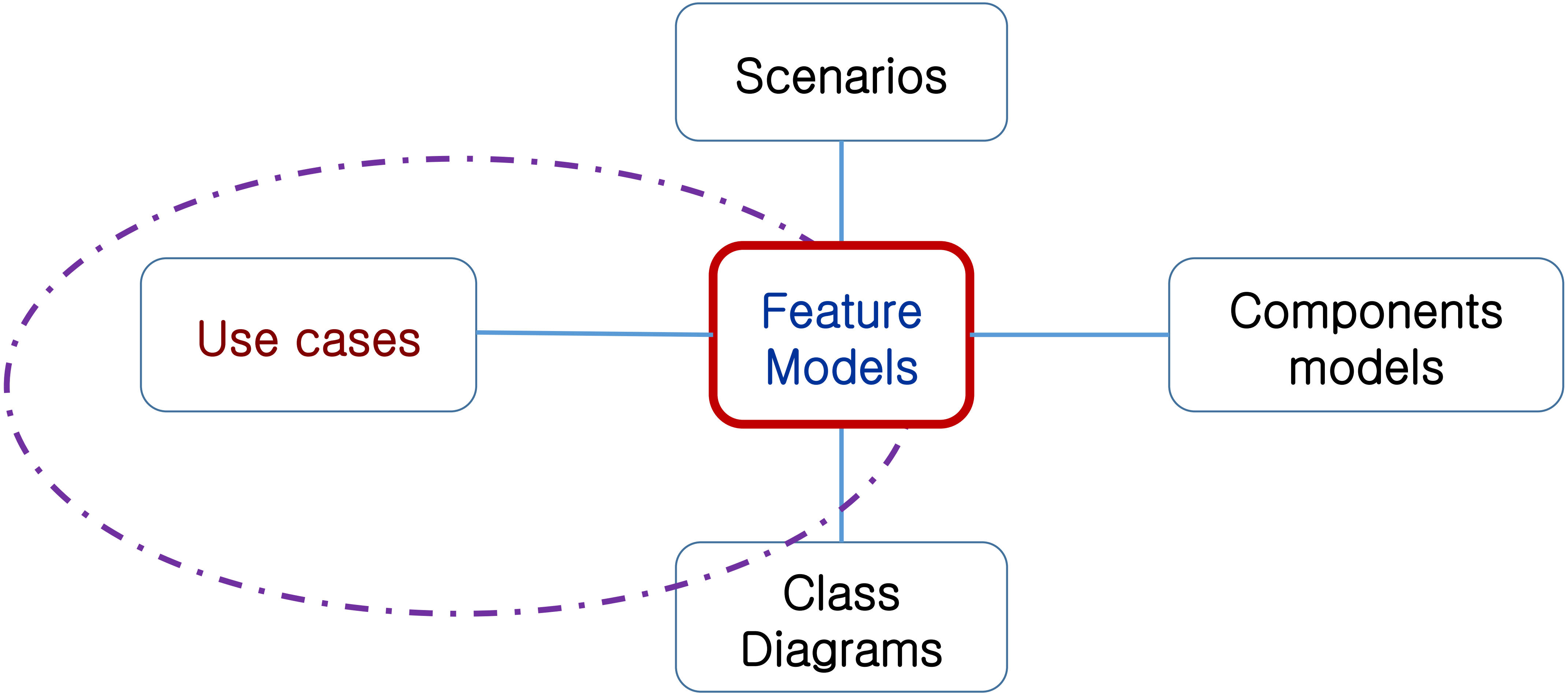
Feature model centric approach to RE/SPL/SW Adaptation



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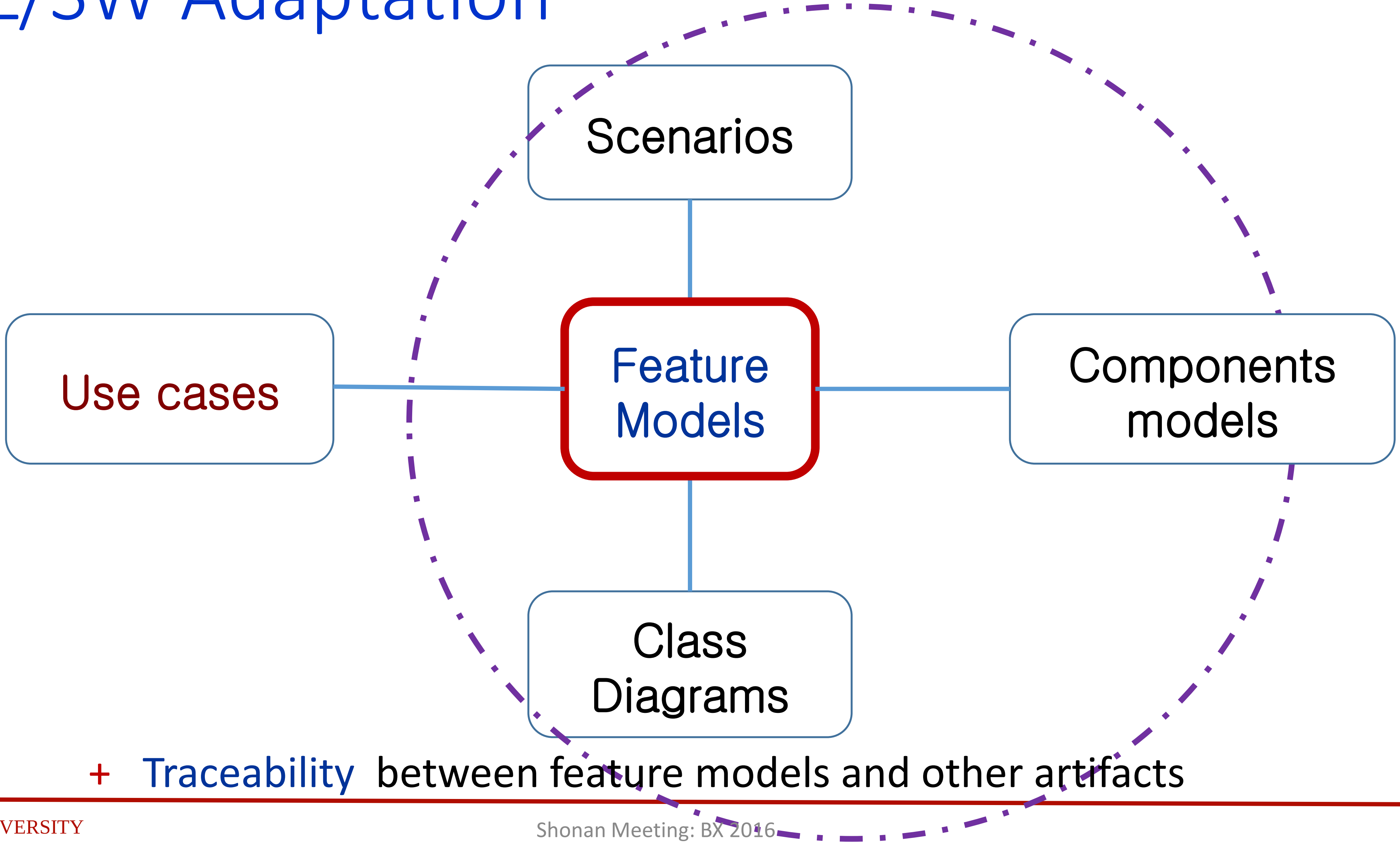

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Conclusion

- A small step : FMC & UC
  - Modification to UC is limited
  - Evolution of feature model / X-rule

- Behavioral models vs Structural models
  - Ordered list / set

- Collective models merging/synchronization

THANKS!