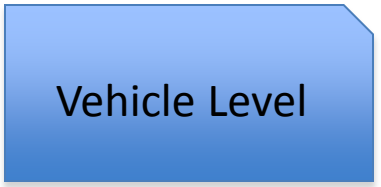
EAST-ADL Introduction

EAST-ADL Variability

Two Levels of Variability

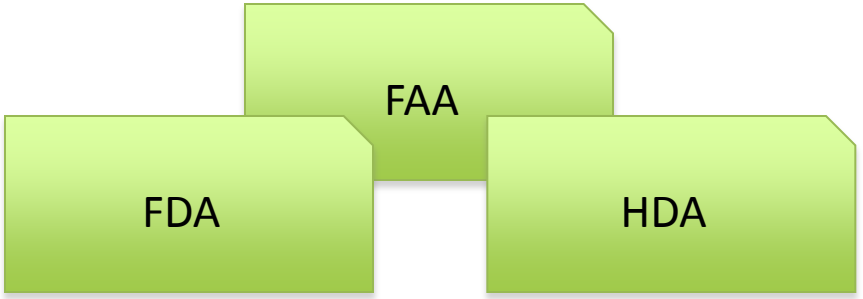
Variability on the **vehicle level**:

- Very abstract ; no design/implementation details.
- Distinction of customer vs. technical perspective.
- Modeling means: only Feature Modeling.

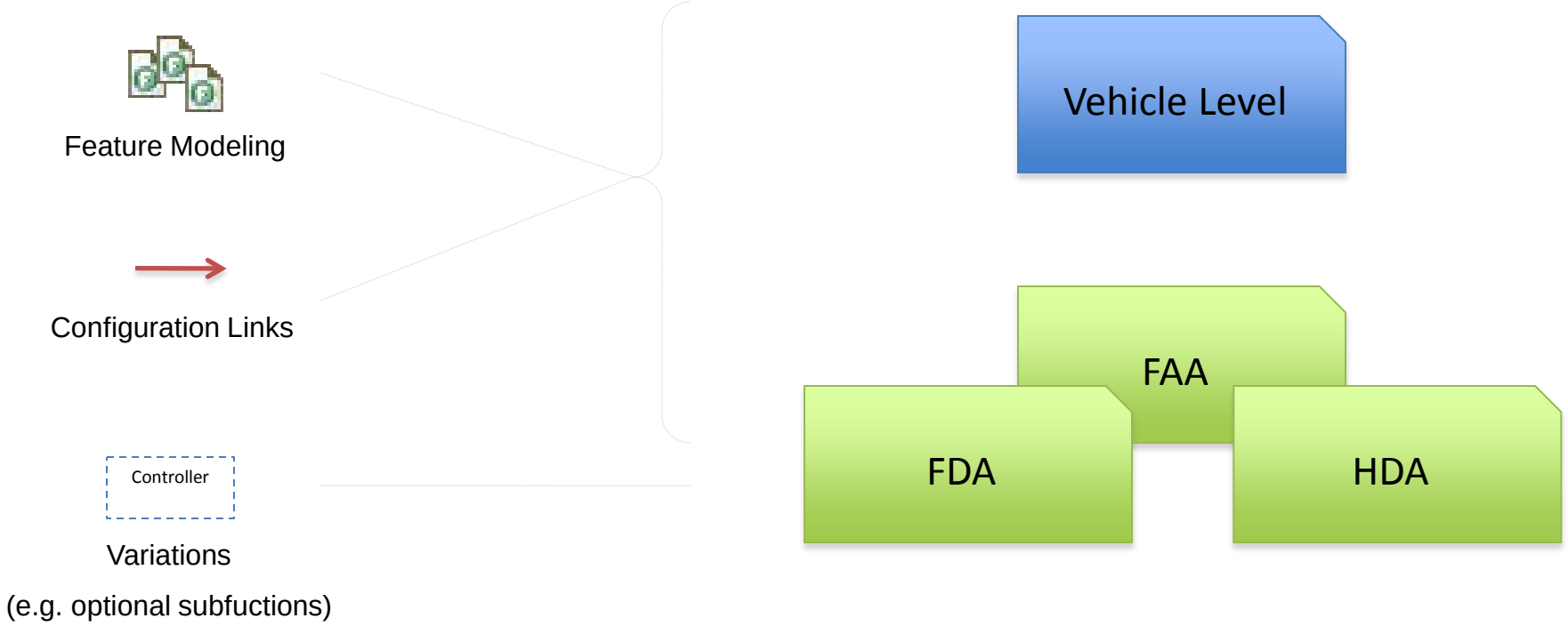


Variability on the **„artifact level“**:

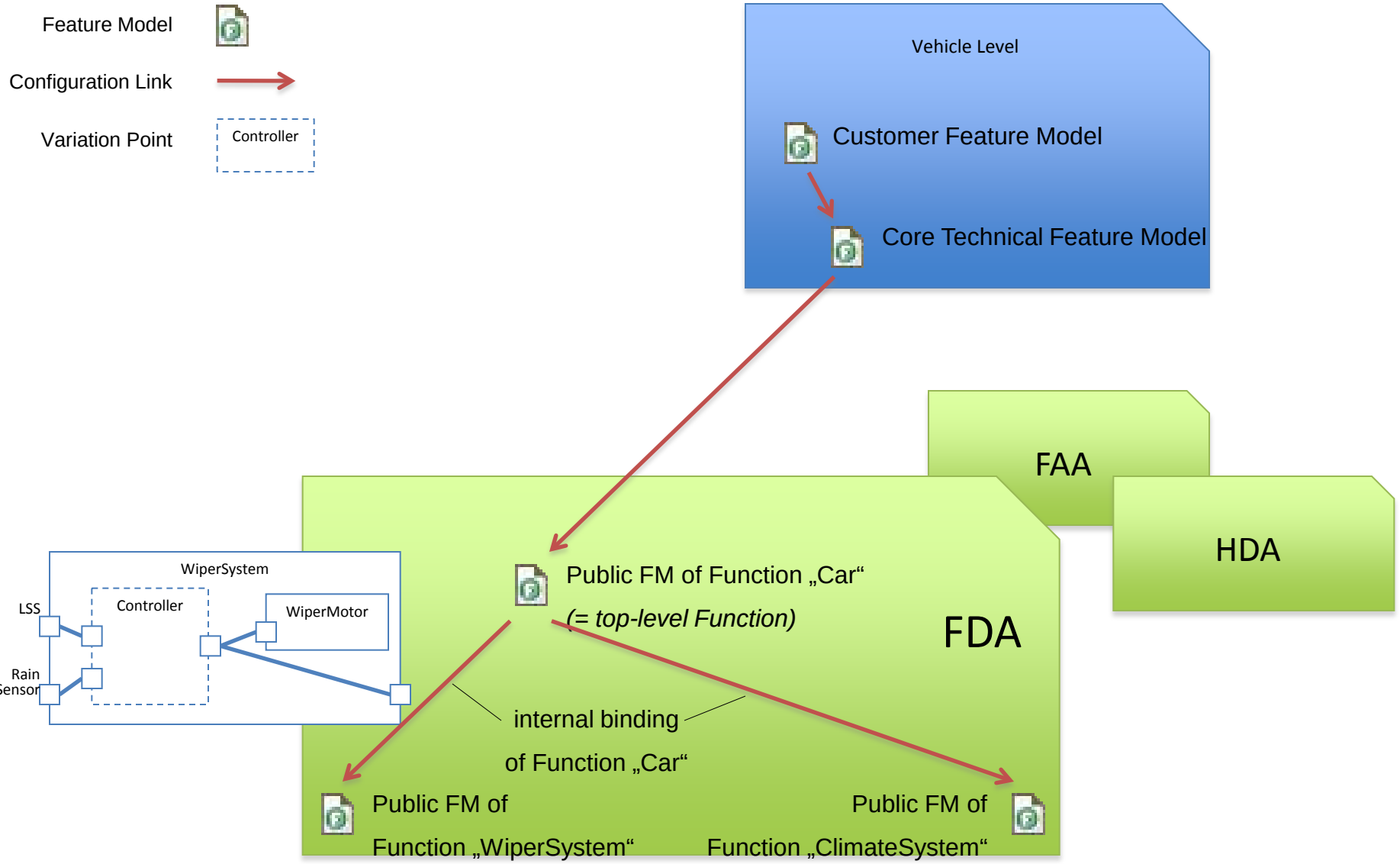
- Variability of the actual requirements, function types, etc.
- Only technical perspective.
- Modeling means: Feature Modeling + Variation Points inside FAA/FDA/...-Diagrams



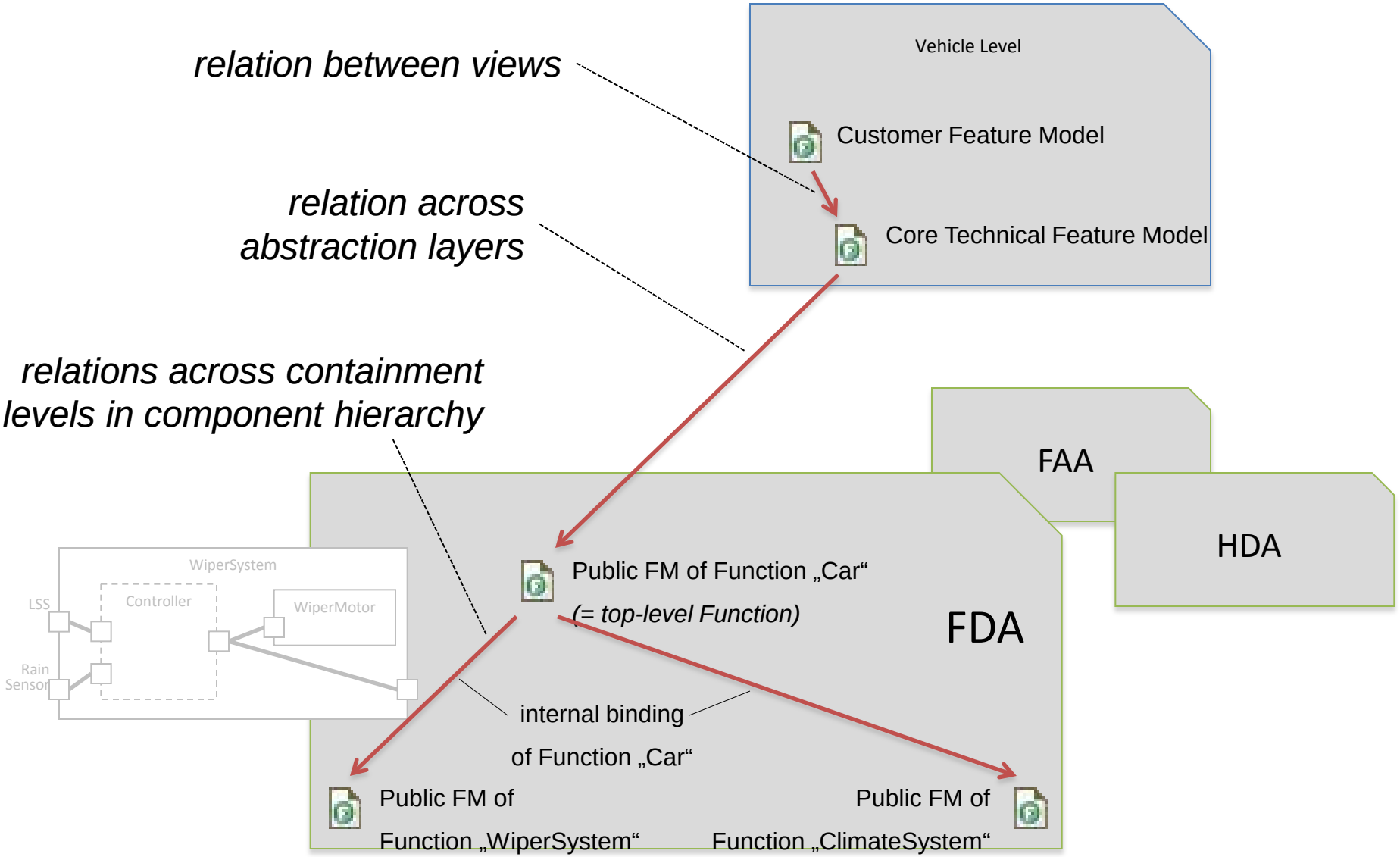
Concepts Used on These Levels



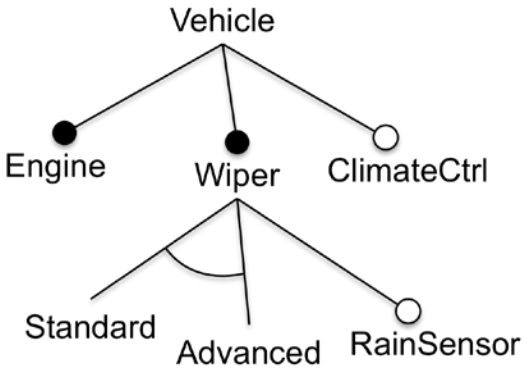
Relations between Feature Models



Relations between Feature Models



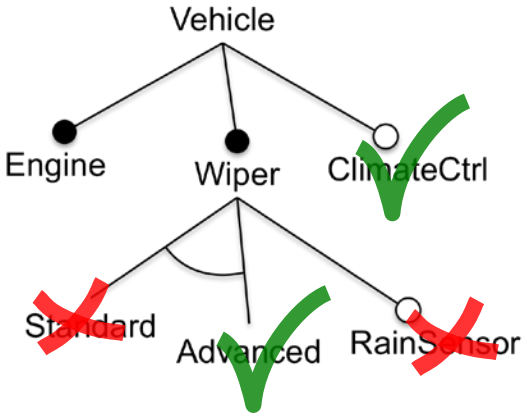
Feature Models



Feature Model

Cardinality-based feature models ...
(cf. Czarnecki et al.)

with some modifications
(e.g. 1+ root features per model)



Configuration (of a Feature Model)

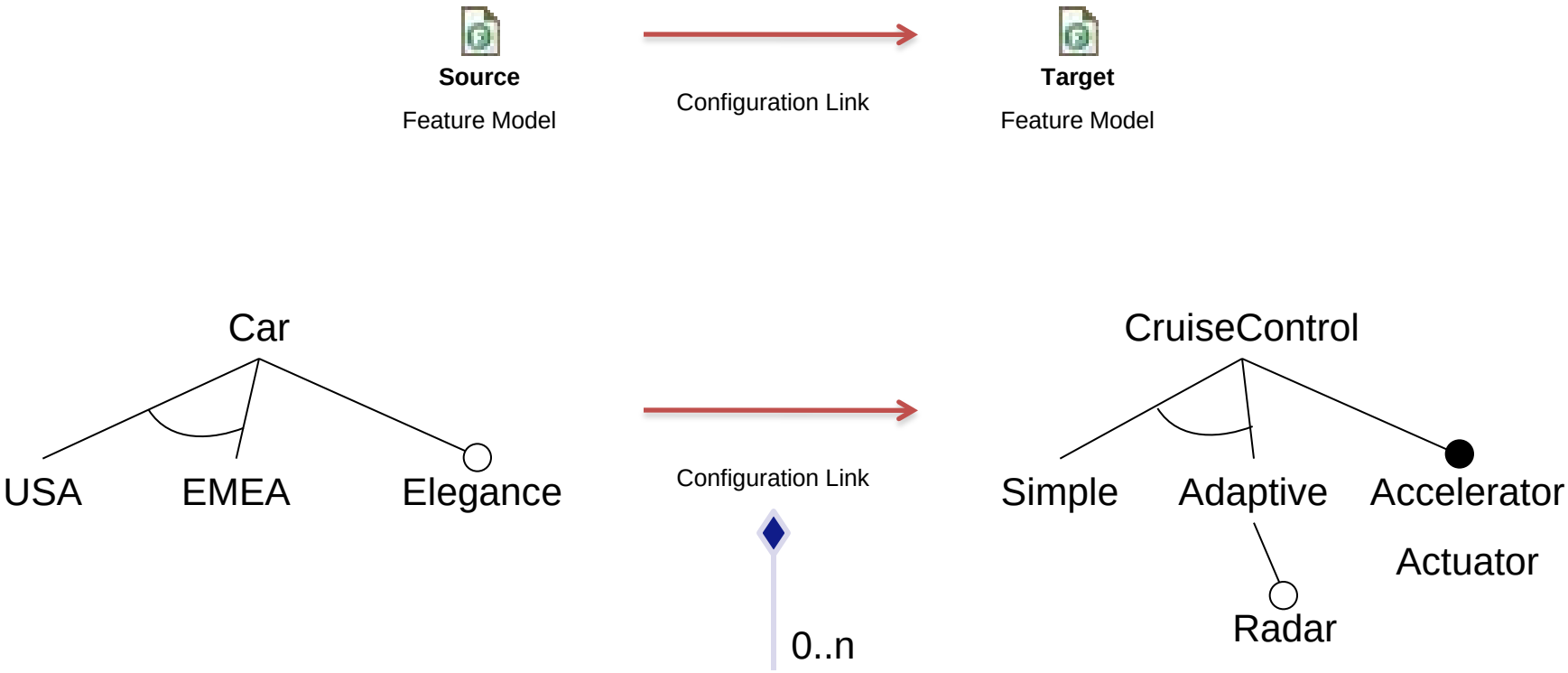
incl. support for ...

– parameterized features
(a.k.a. feature attributes)

– instances for cloned features

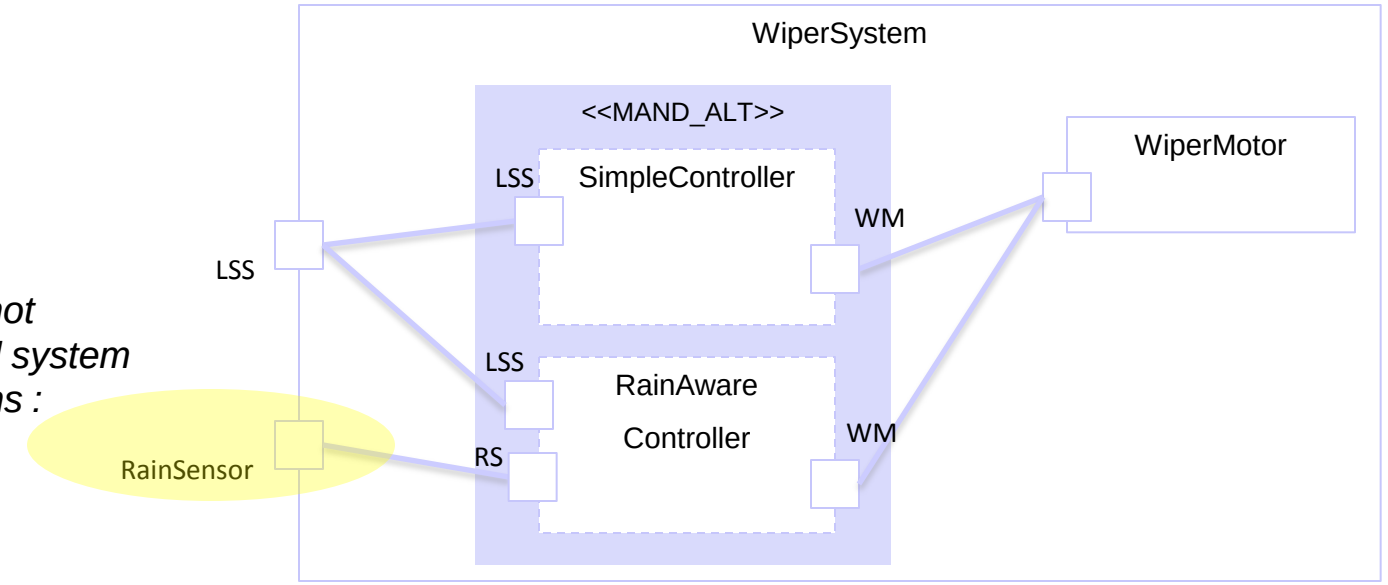
(subtrees of instances can be configured separately)

Configuration Links



„Use Radar in USA.“

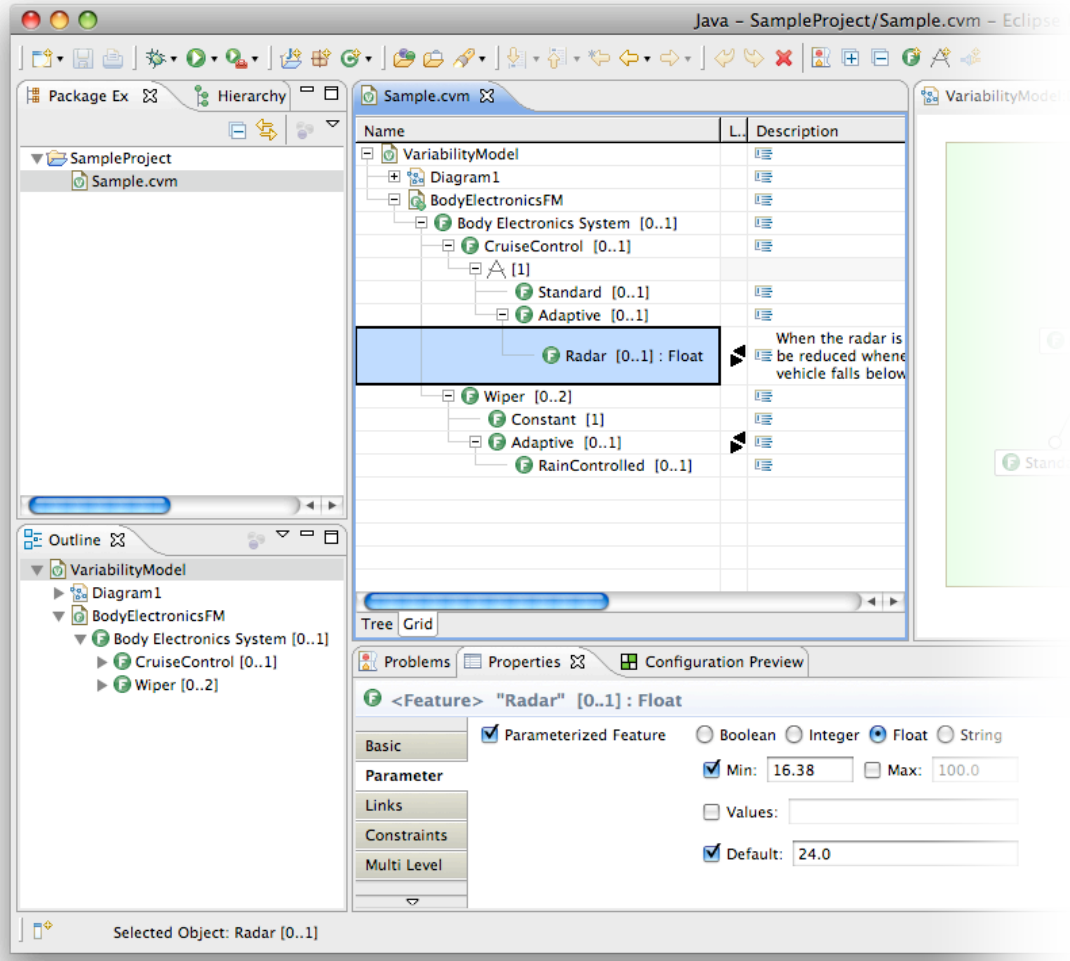
Variation Definition

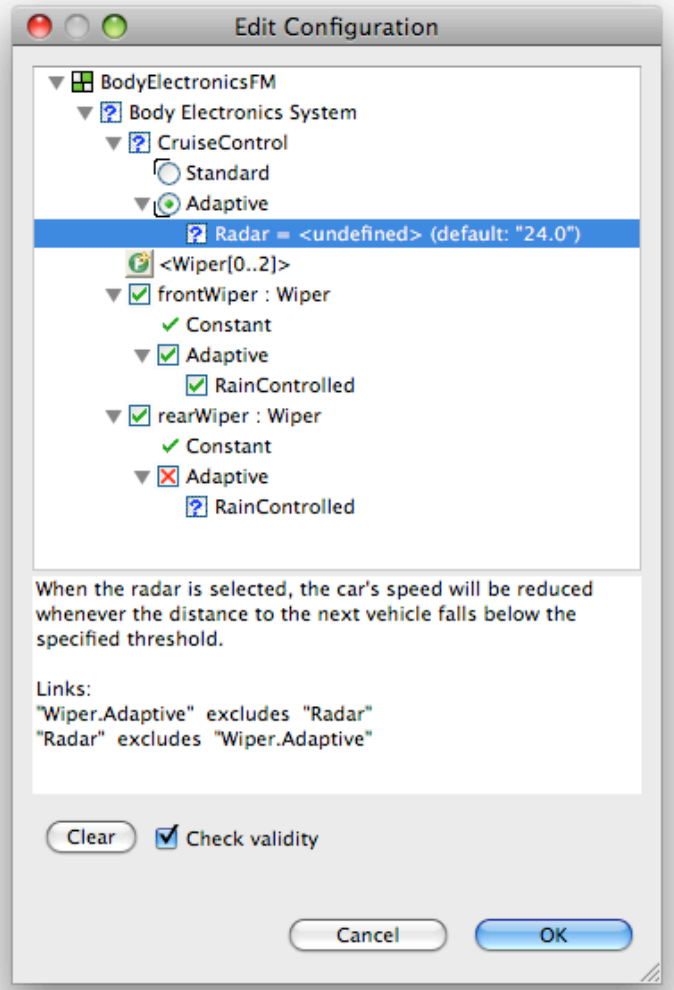


This port is not present in all system configurations :

Technical realization does not require explicit variation points.

In simple cases, optional FunctionPrototypes and VariationGroups can be used directly to achieve same result.


Java – SampleProject/Sample.cvm – Eclipse
Package Ex
Hierarchy
SampleProject
Sample.cvm
Sample.cvm
Name
L..
Description
VariabilityModel
Diagram1
BodyElectronicsFM
Body Electronics System [0..1]
CruiseControl [0..1]
[1]
Standard [0..1]
Adaptive [0..1]
Radar [0..1] : Float
When the radar is
be reduced whene
vehicle falls below
Wiper [0..2]
Constant [1]
Adaptive [0..1]
RainControlled [0..1]
Tree
Grid
Outline
VariabilityModel
Diagram1
BodyElectronicsFM
Body Electronics System [0..1]
CruiseControl [0..1]
Wiper [0..2]
Problems
Properties
Configuration Preview
<Feature> "Radar" [0..1] : Float
Basic
Parameter
Links
Constraints
Multi Level
Parameterized Feature
Boolean
Integer
Float
String
Min: 16.38
Max: 100.0
Values:
Default: 24.0
Selected Object: Radar [0..1]

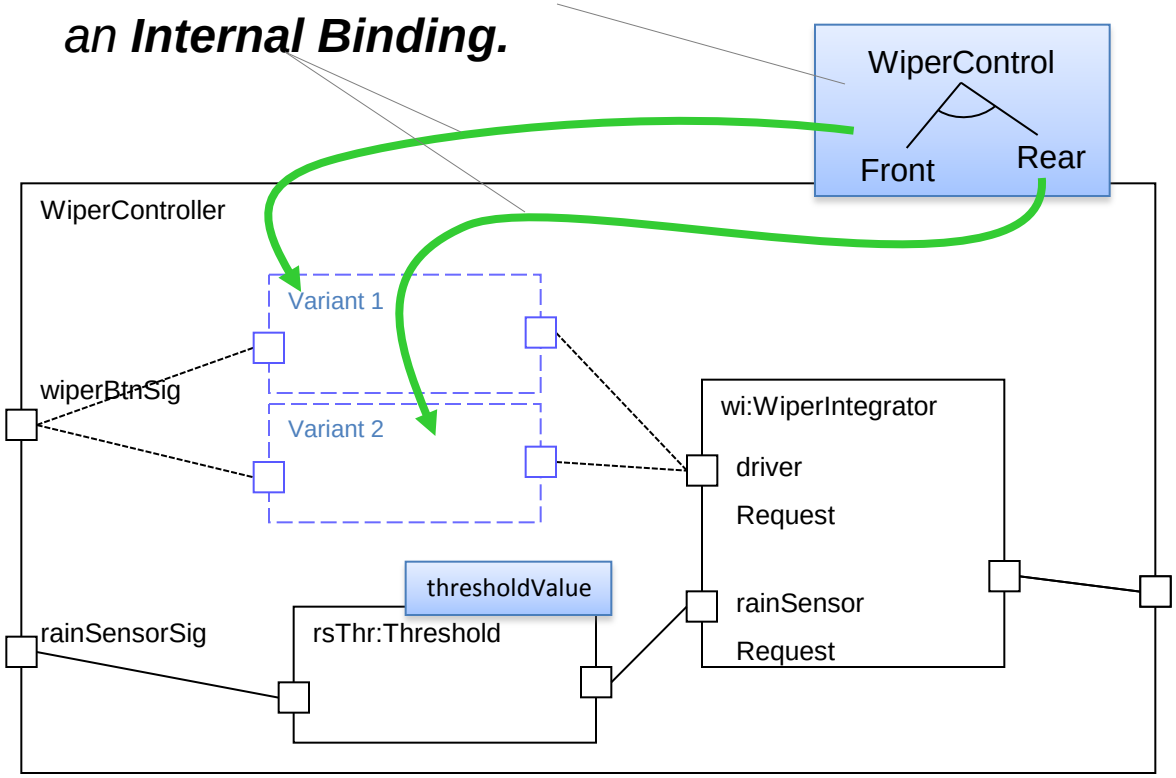

Edit Configuration
BodyElectronicsFM
Body Electronics System
CruiseControl
Standard
Adaptive
Radar = <undefined> (default: "24.0")
<Wiper[0..2]>
frontWiper : Wiper
Constant
Adaptive
RainControlled
rearWiper : Wiper
Constant
Adaptive
RainControlled
When the radar is selected, the car's speed will be reduced whenever the distance to the next vehicle falls below the specified threshold.
Links:
"Wiper.Adaptive" excludes "Radar"
"Radar" excludes "Wiper.Adaptive"
Clear
Check validity
Cancel
OK

Compositional Variability

FunctionTypes have ...

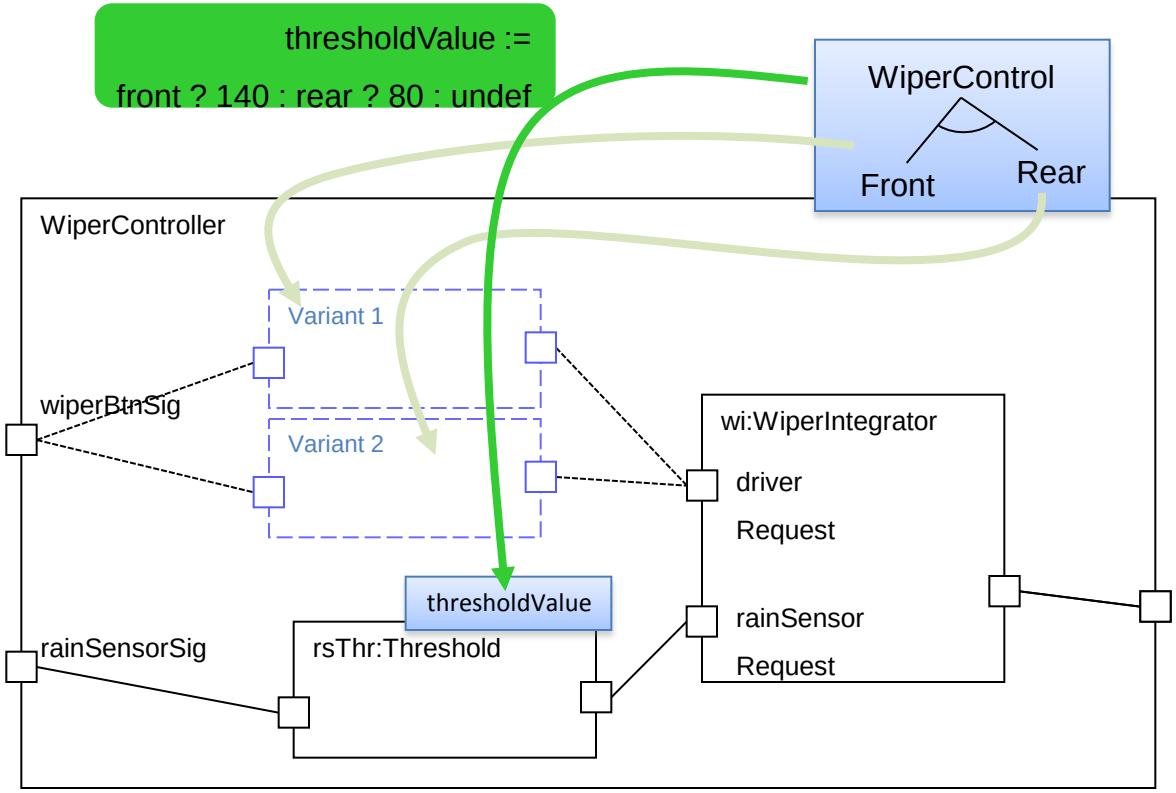
*a **Public Feature Model**,*

*an **Internal Binding.***



Compositional Variability

The Internal Binding can be more complex ...



Compositional Variability

- Note:
  - deriving lower level configurations

1 configuration of FM of containing component → N configurations of FMs of contained components

  - binding is part of definition of containing component
  - binding is internal / private
  - ⇒ information hiding for binding variability of lower-level components

„Configuration Hiding“

(cf. Reiser, Tavakoli, Weber HICSS-42 2009)

Compositional Variability

Syntax & semantics of configuration decisions ...

Defined by Variability Specification Language (VSL).

Example 1:

```
be#CruiseControl.Adaptive[+]
```

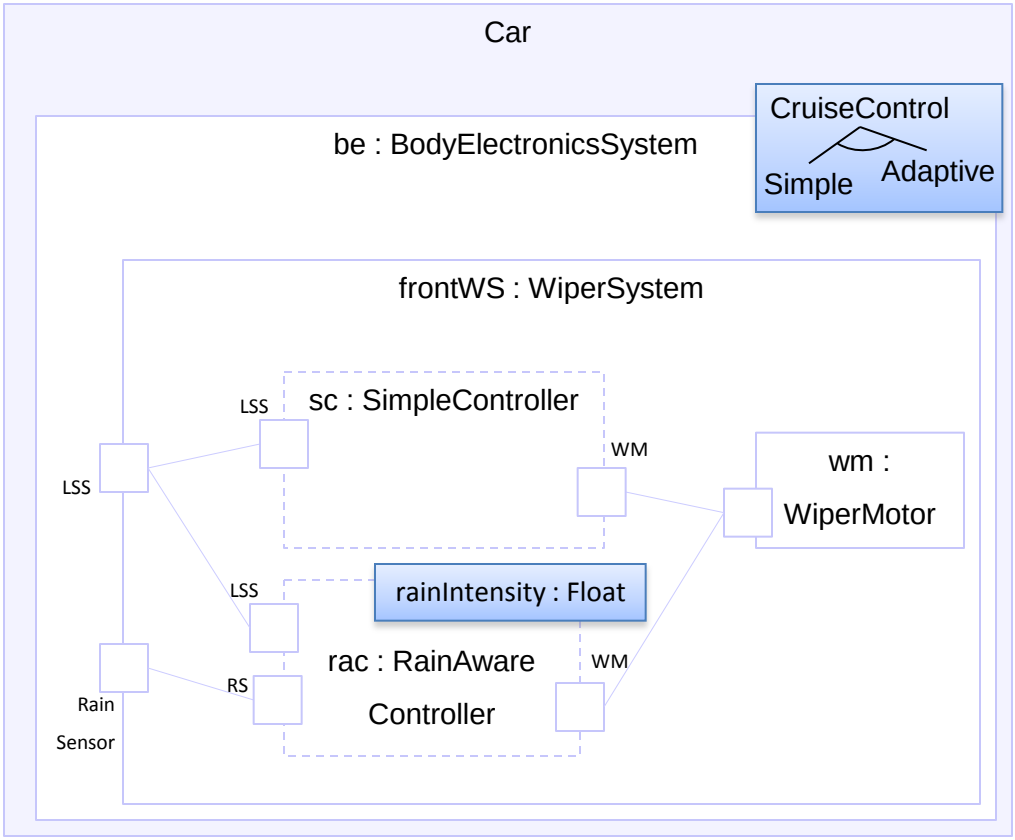
Example 2:

```
be.frontWS.sc[+]
```

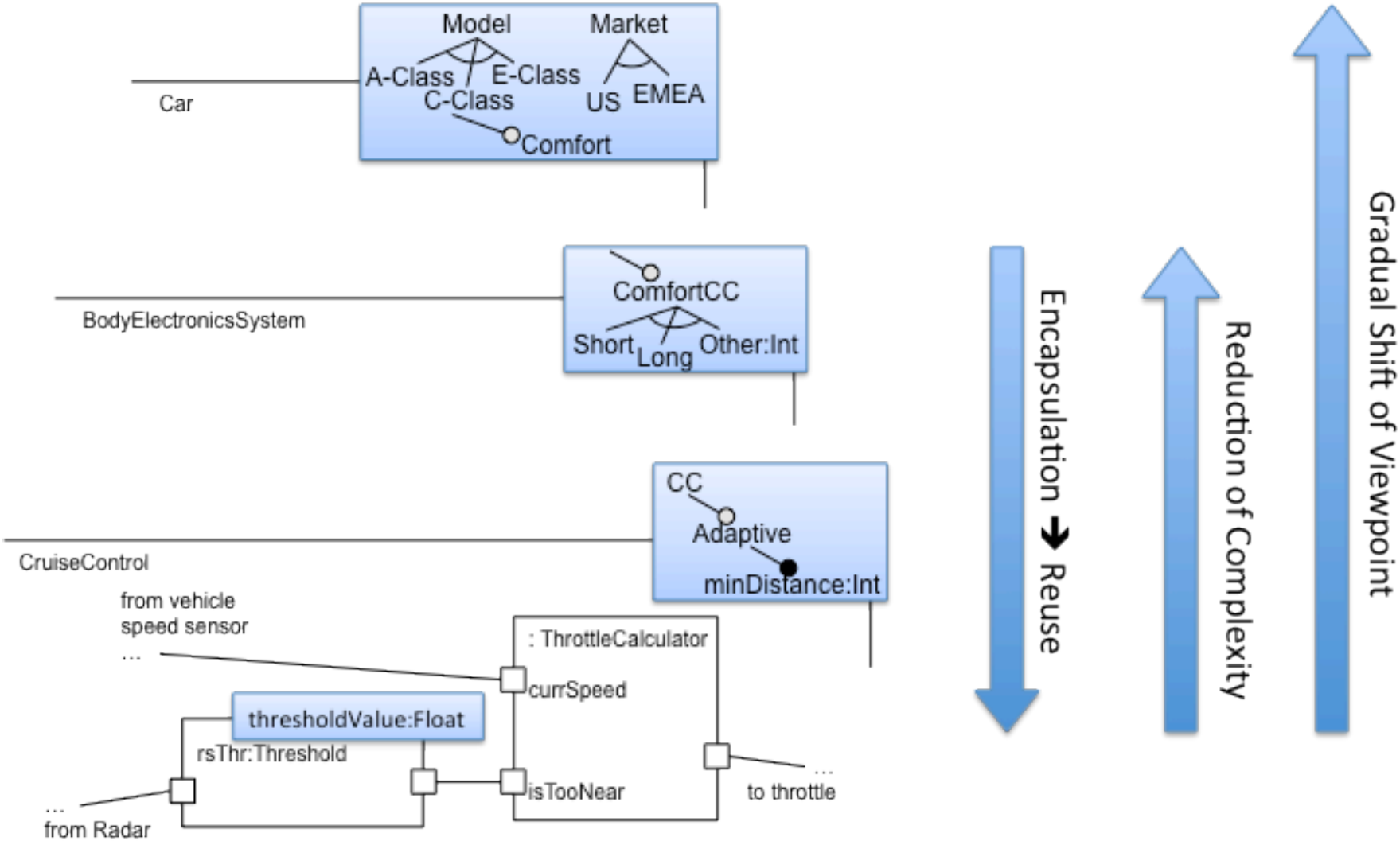
Example 3:

```
be.frontWS.rac[+]

be.frontWS.rac#rainIntesity=0.83
```



Benefits of Compositional Variability



Summary: EAST-ADL Variability

Supports:

- multiple viewpoints (e.g. technical vs. end-customer)
- different abstraction levels

- containment hierarchies – *„compositional variability management“*
- complete-system configuration

- reuse ← *„configuration hiding“*
- integration within a larger context
  - cooperative active safety systems
  - manufacturer/supplier scenario