VARiability In safety-critical Embedded Systems

ARTEMIS-2011-1
Project Number: 295397

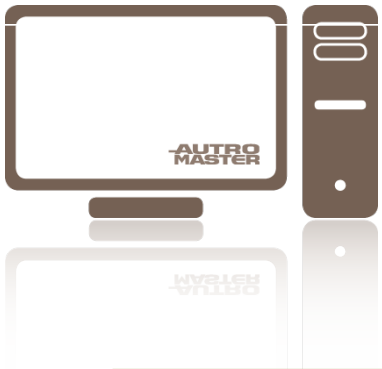
BVR – Better Variability Results

by Øystein Haugen (SINTEF) and Ommund Øgård (Autronica)

What do we mean by “variability”?

- Product Line variance
  - often variants of the same software base
- Cross-cutting variability
  - often variability is orthogonal to the software design
  - variability needs are discovered after the first software design
- The variability designer is not always the software designer
  - division of labor and of competences

The Autronica Product Family



AutroMaster

Top level graphical presentation system running on Linux PCs

0,1
Presentation
1..*

FireAlarmSystem

System consisting of embedded fire panels with logics and LCD menu system.

1 — 1..*

FieldEquipment

Smoke detectors, manual call points, sounders, IO units etc.

AutroSafe

High end networked Fire Alarm System for large demanding applications

Autroprime

Medium range standalone Fire Alarm System

SINTEF

AUTRONICA
United Technologies

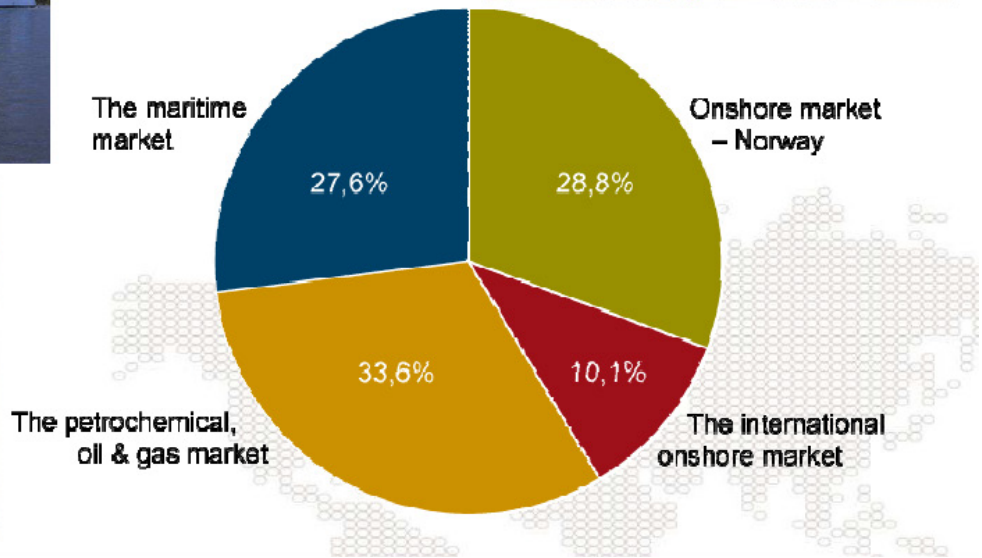
ARTEMIS

COMMON VARIABILITY LANGUAGE

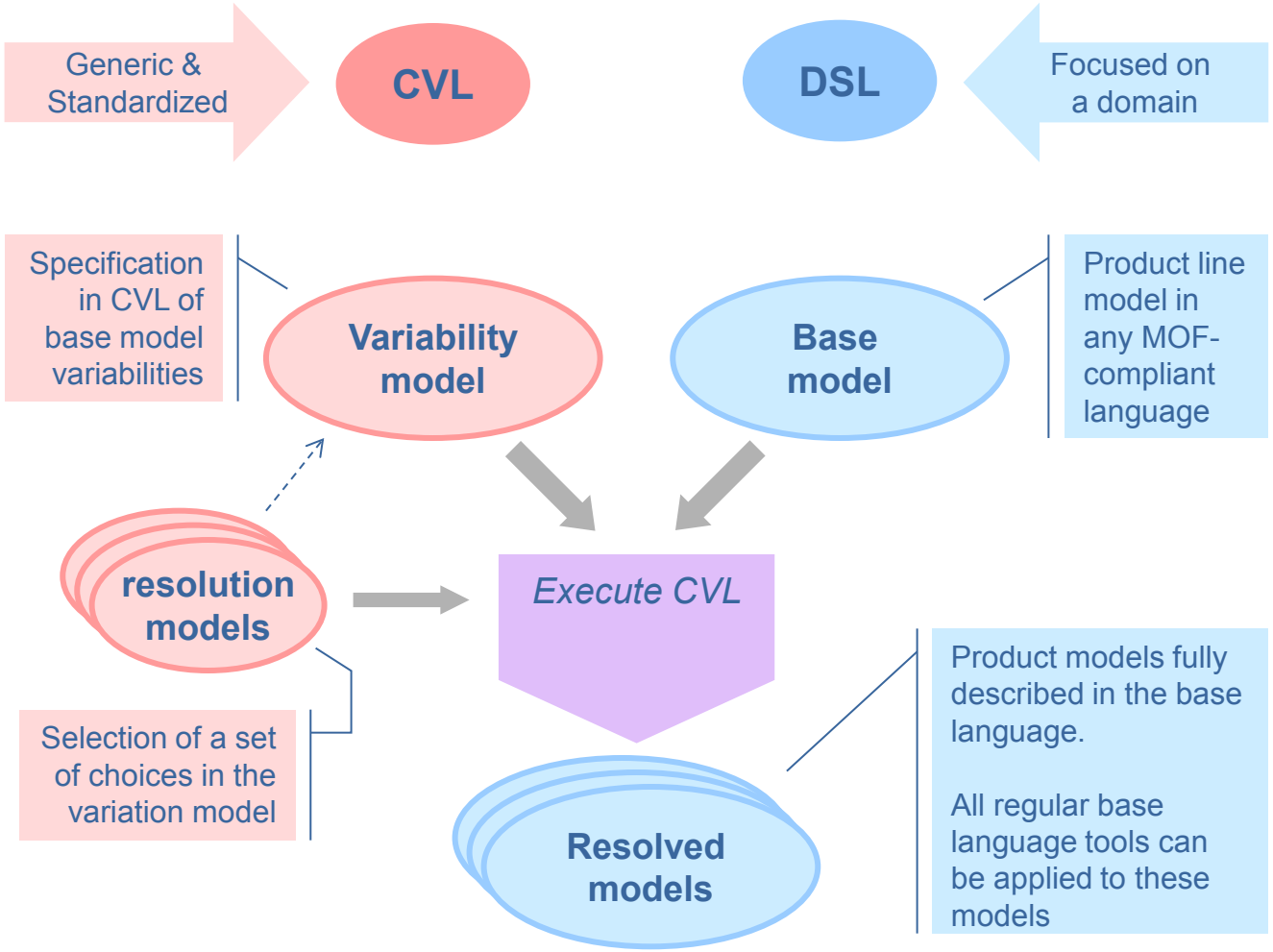
The Market Domains of Autronica

Autronica – turnover 2010

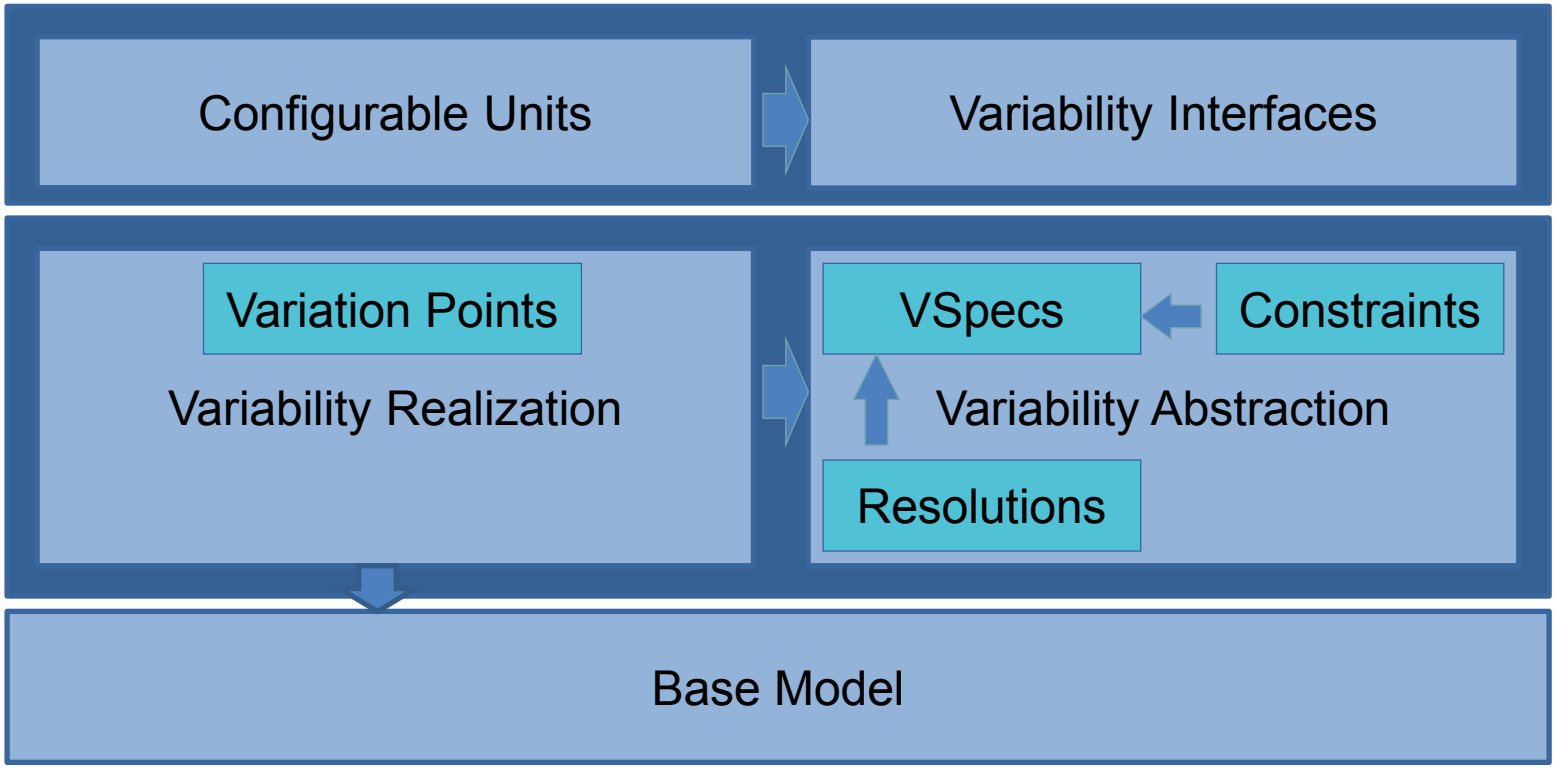
- Turnover 2010: NOK 760 mill



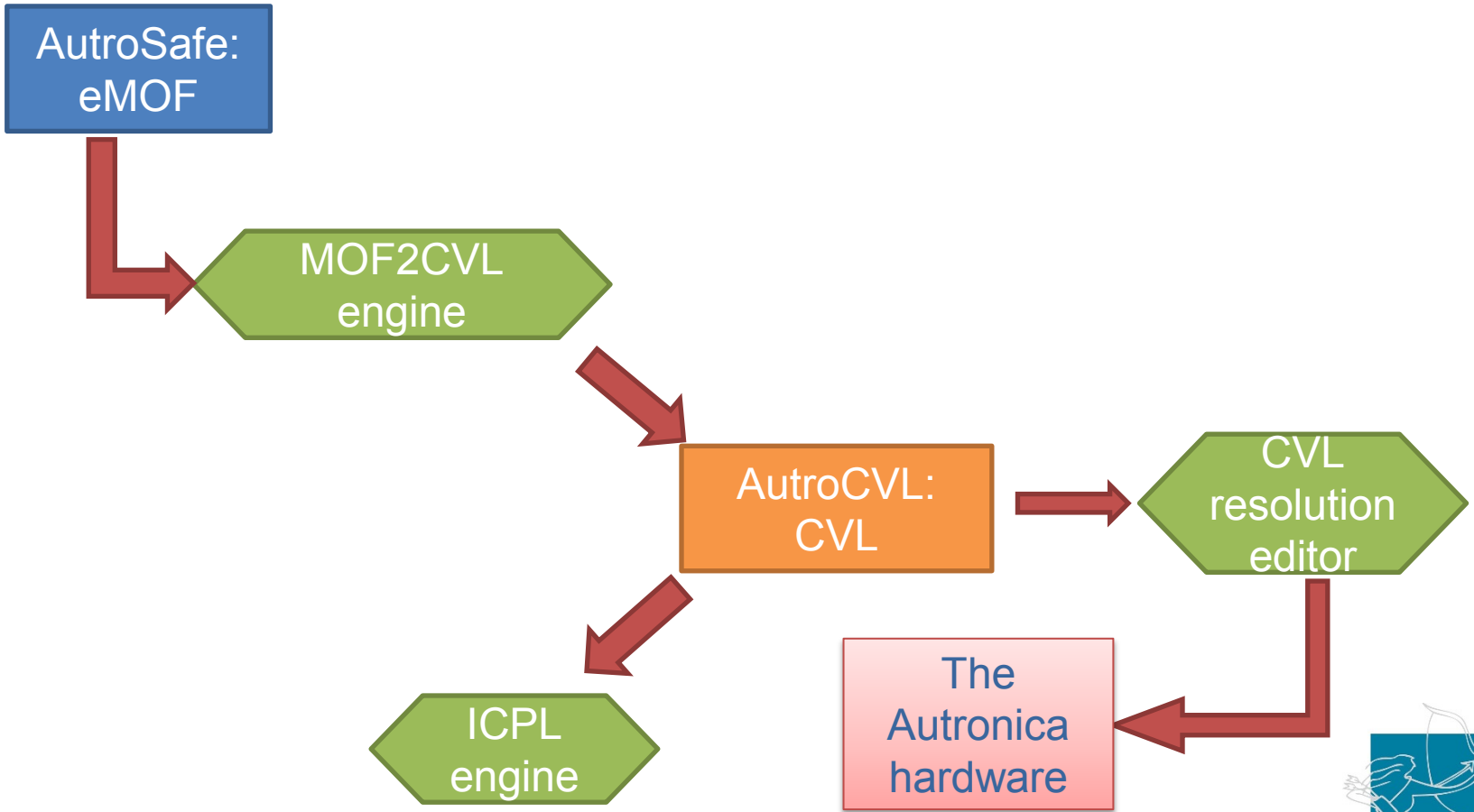
Common Variability Language (CVL)



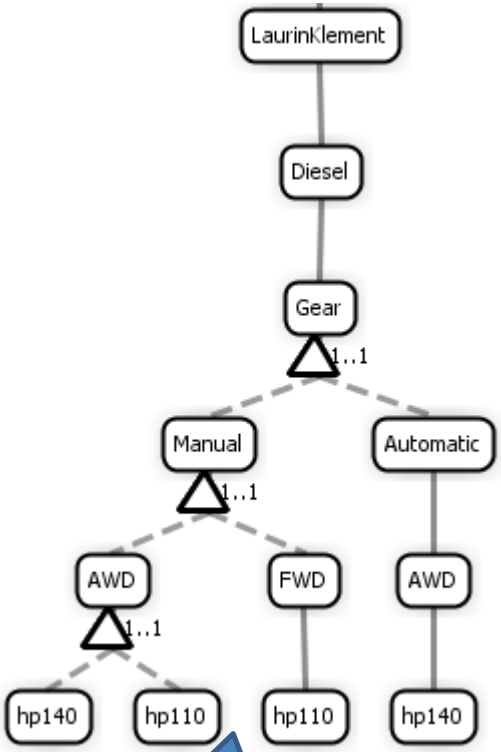
CVL Architecture



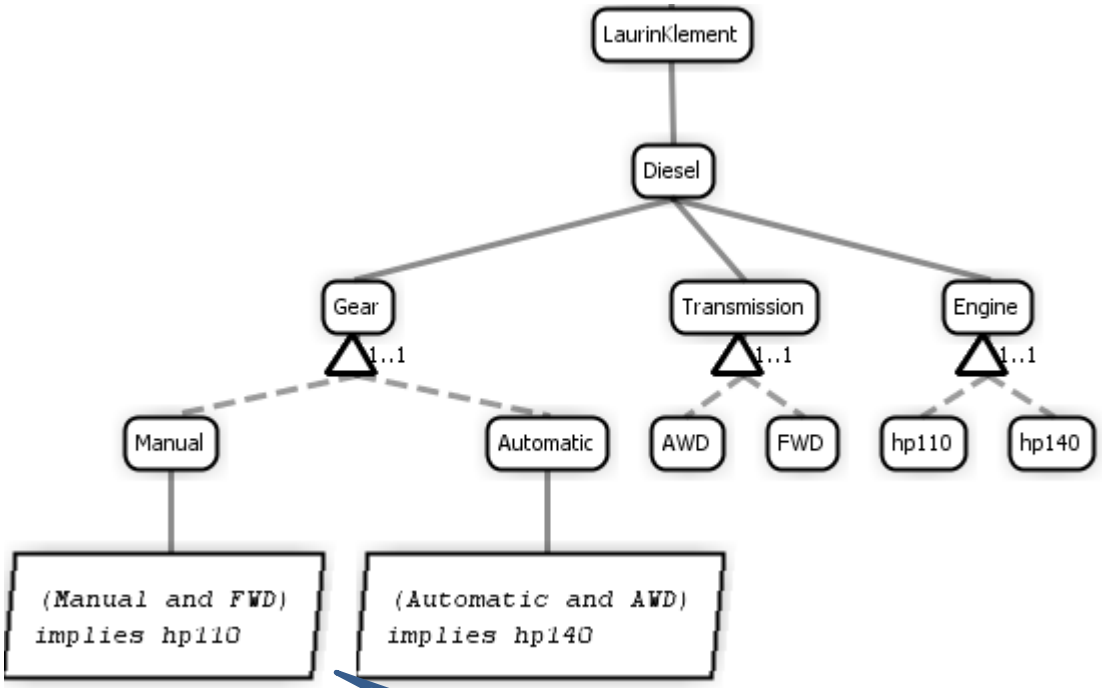
The MOF2CVL experiment



Introducing a simple car configuration



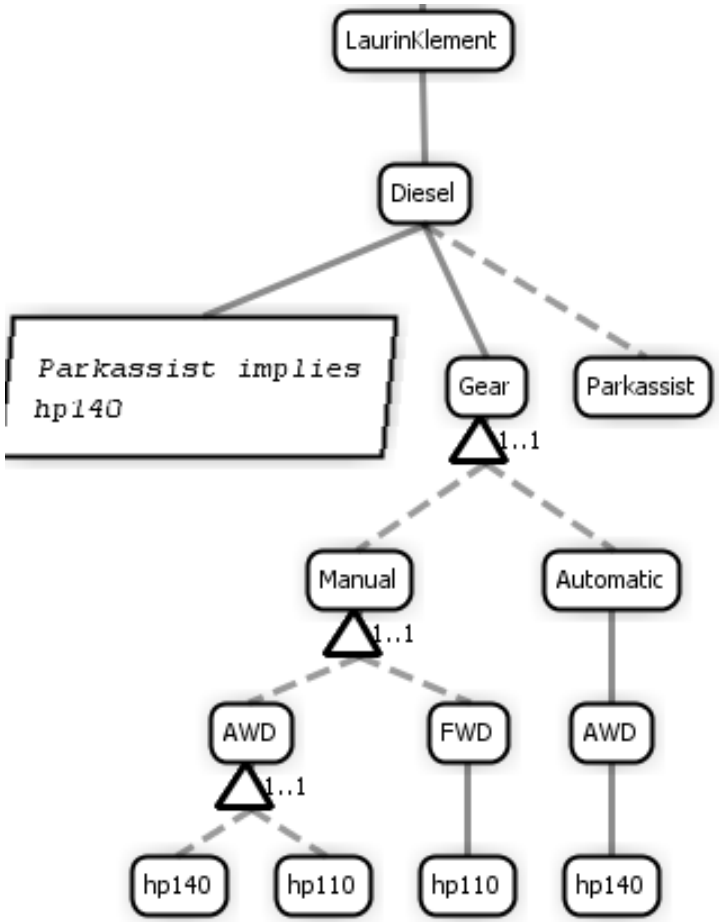
Duplicating choices – not legal CVL



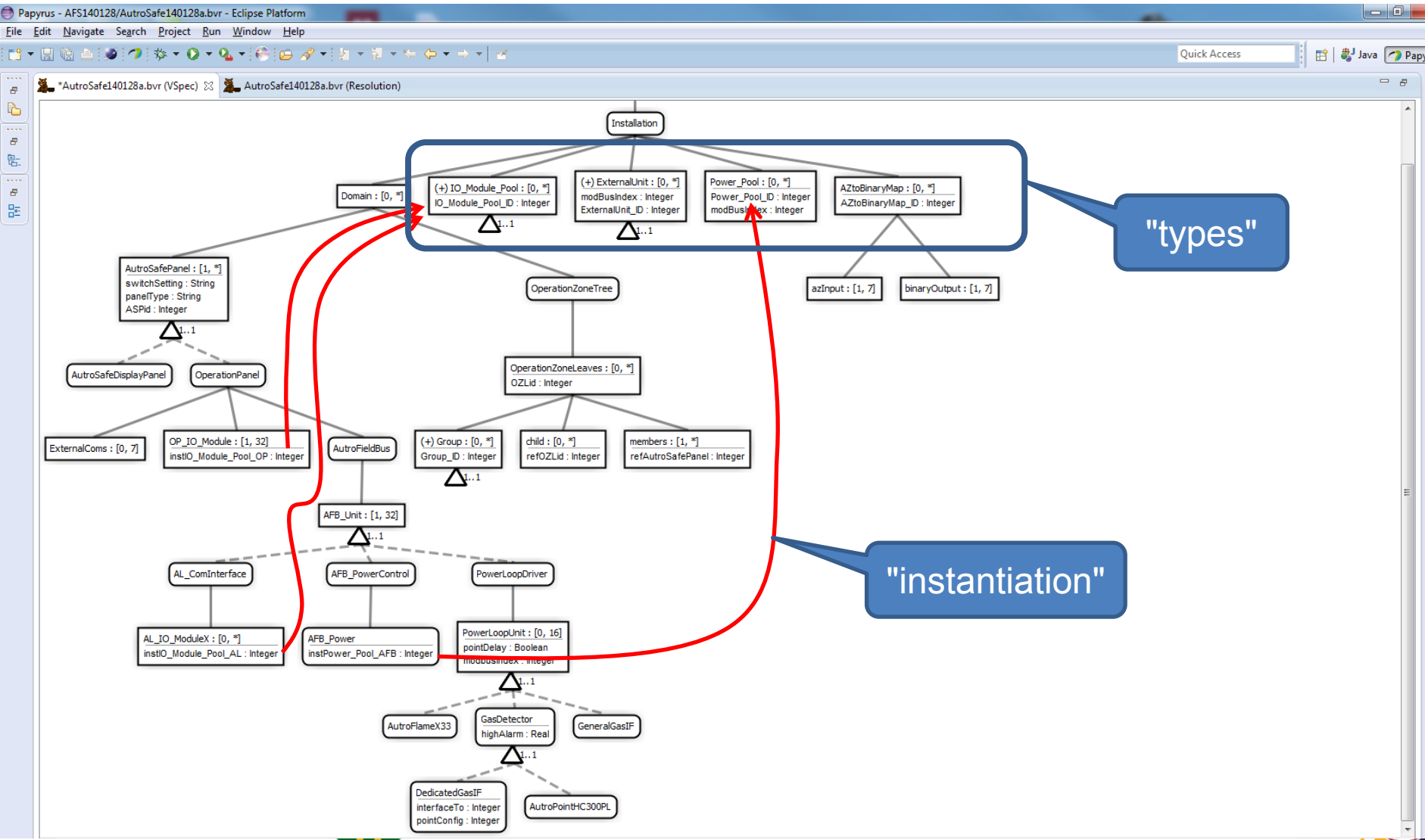
Unique choices, supplemented by constraints

Constraints are about targets

- *"Parkassist* **implies** *hp140*" means that either (Manual,AWD,hp140) or (Automatic,AWD,hp140) are valid
- Constraints are about "targets" and not about decisions
- Duplicated names on VSpecs indicate that they are decisions on the same target



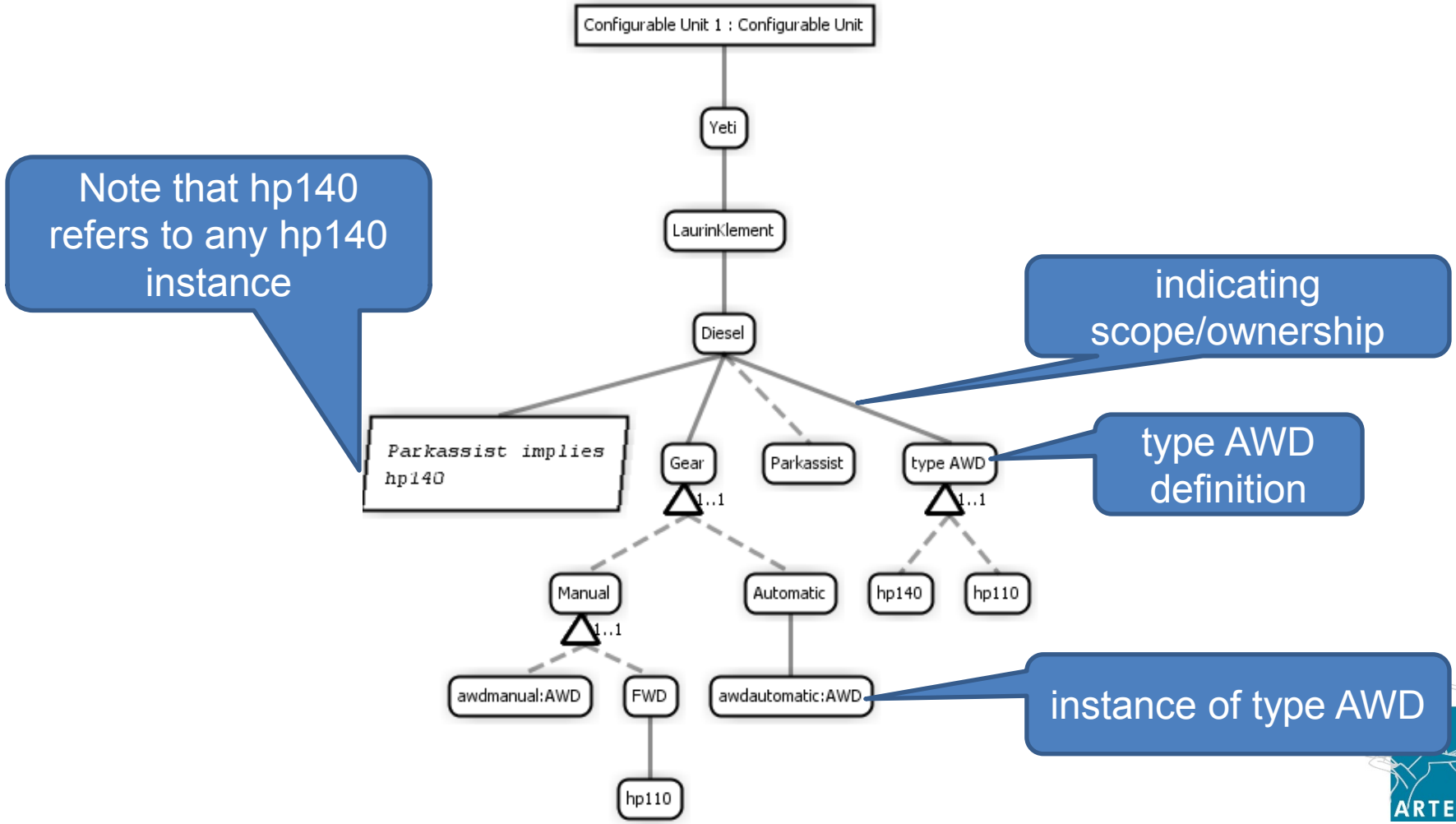
Autronica Variability model (Type/Inst.)



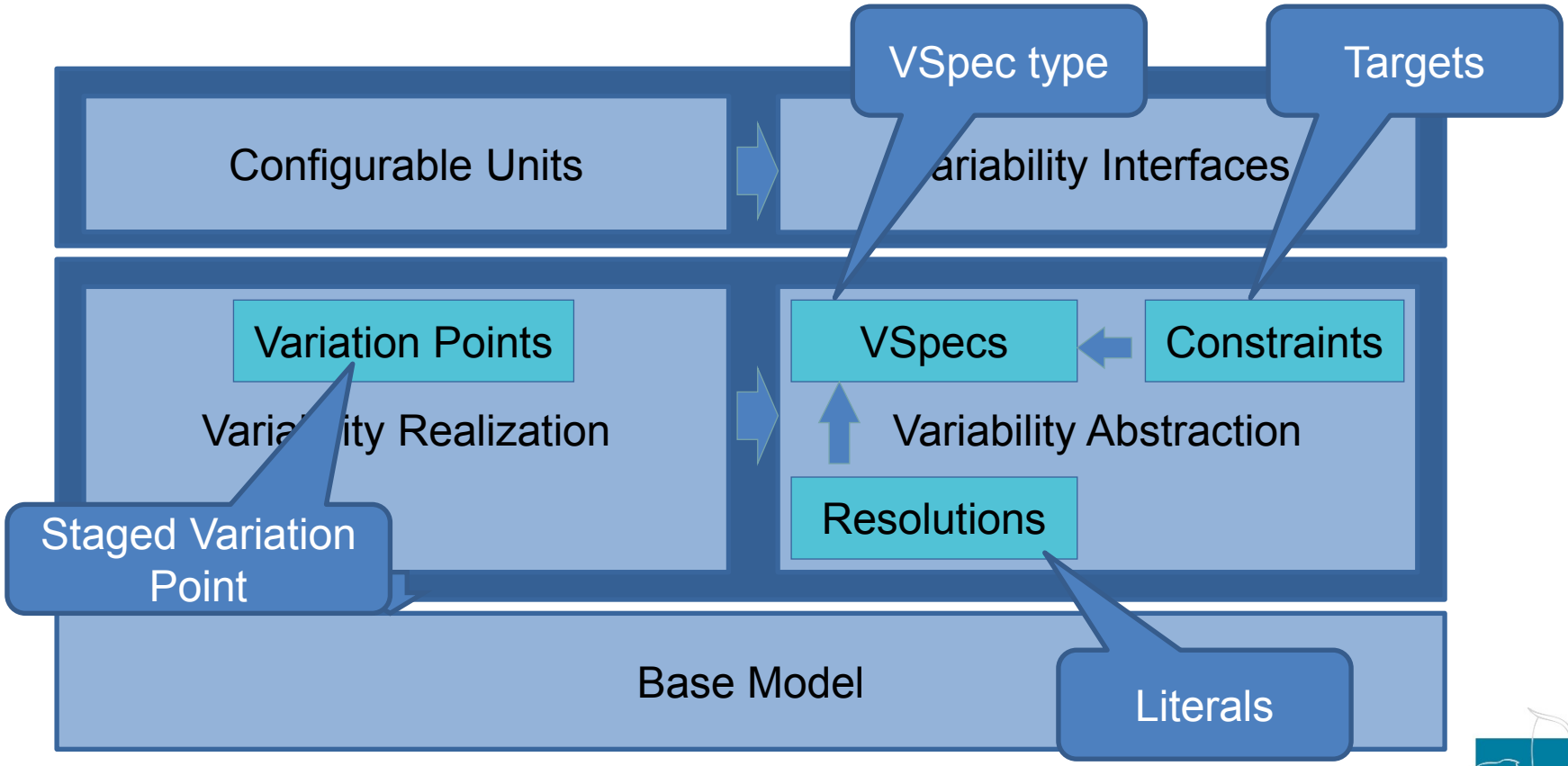
SINTEF AUTRONICA United Technologies

VARIABILITY LANGUAGE

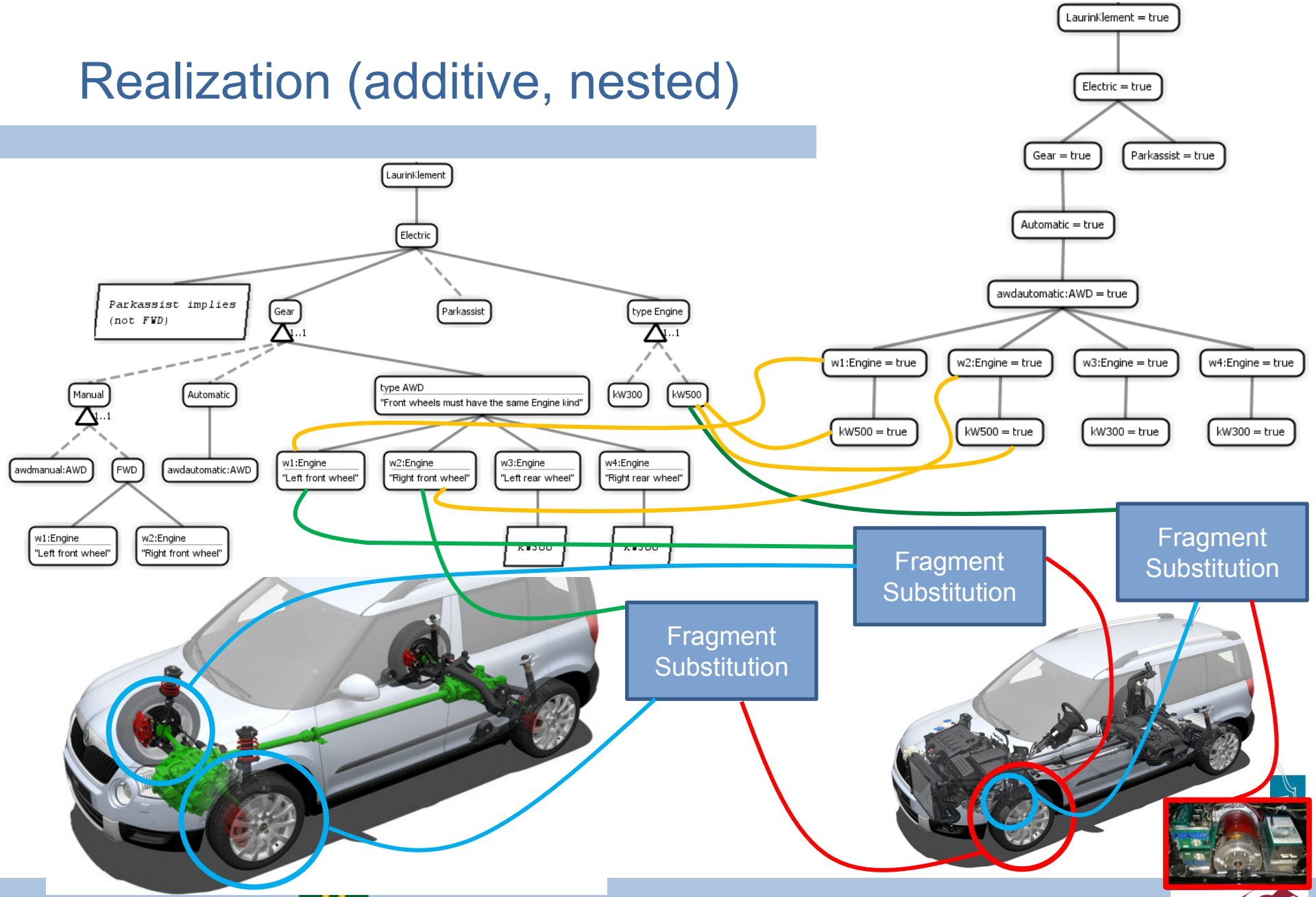
Introducing VSpec Type



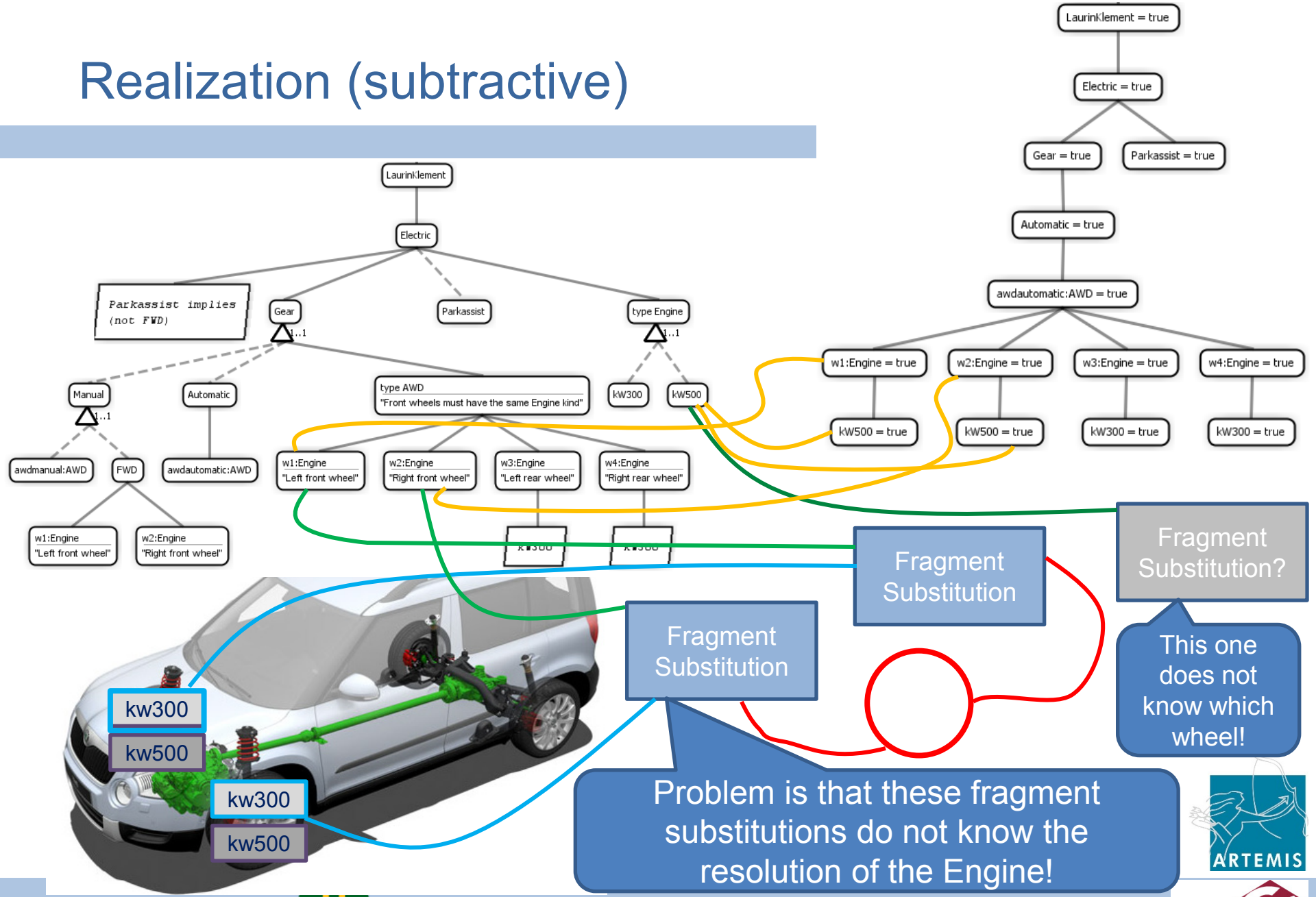
Cascading effects of VSpec Type



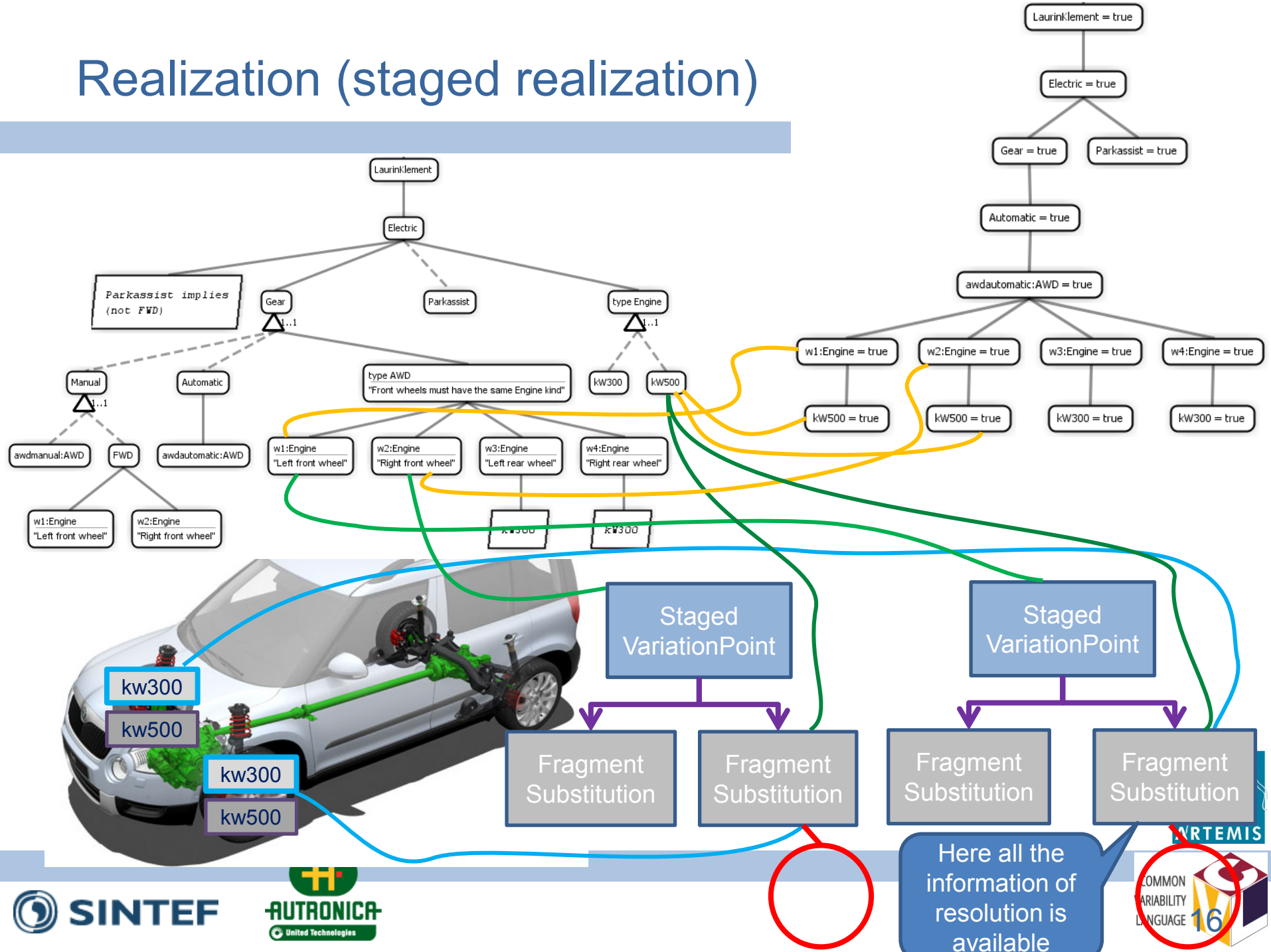
Realization (additive, nested)



Realization (subtractive)

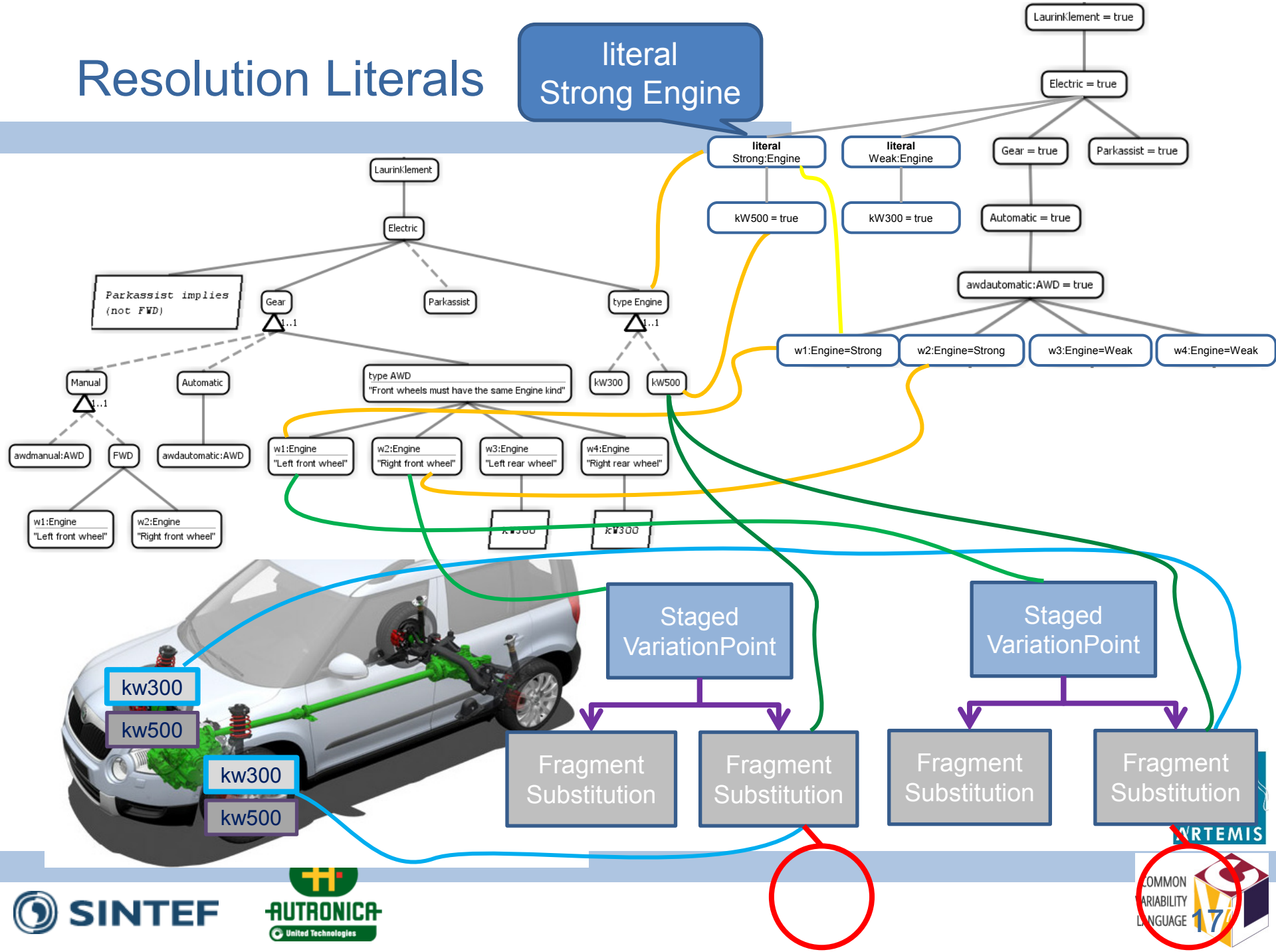


Realization (staged realization)



Resolution Literals

literal
Strong Engine



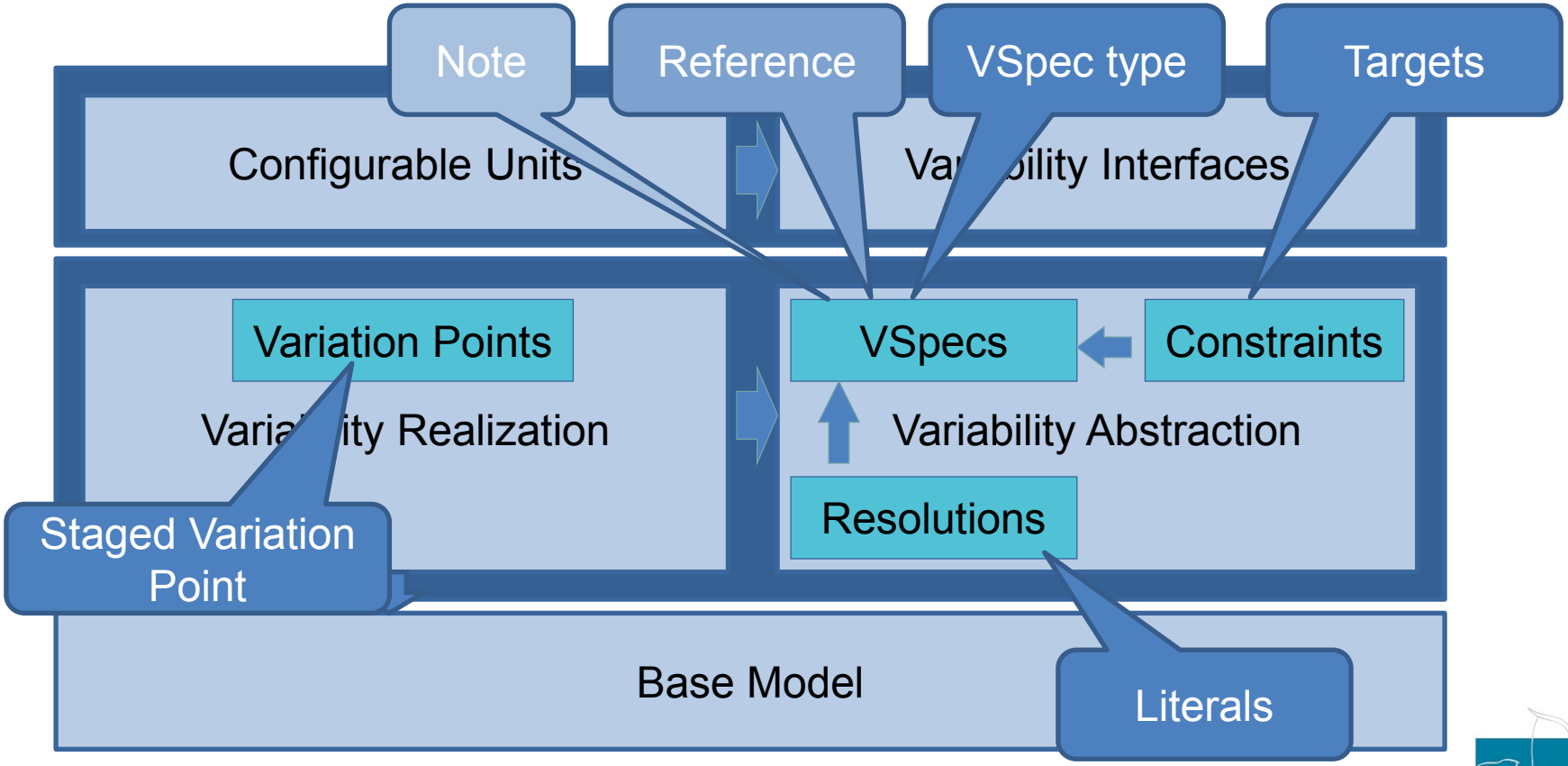
SINTEF

AUTRONICA
United Technologies

ARTEMIS

COMMON VARIABILITY LANGUAGE

New in BVR


Note
Reference
VSpec type
Targets
Configurable Units
Variability Interfaces
Variation Points
VSpecs
Constraints
Variability Realization
Variability Abstraction
Resolutions
Staged Variation Point
Base Model
Literals