Es Wird Nicht Nur Einen Geben

Standardisierung im Umfeld des Varianten- und Variabilitatsmanagements

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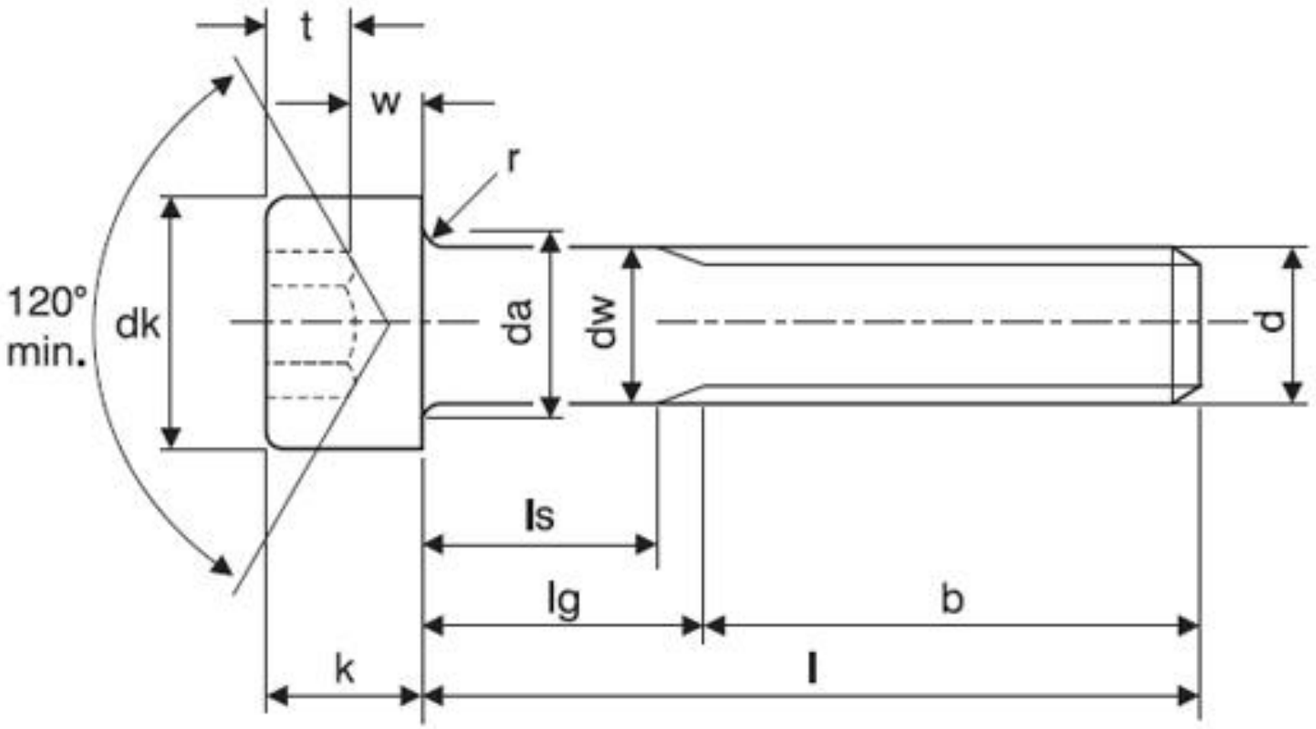
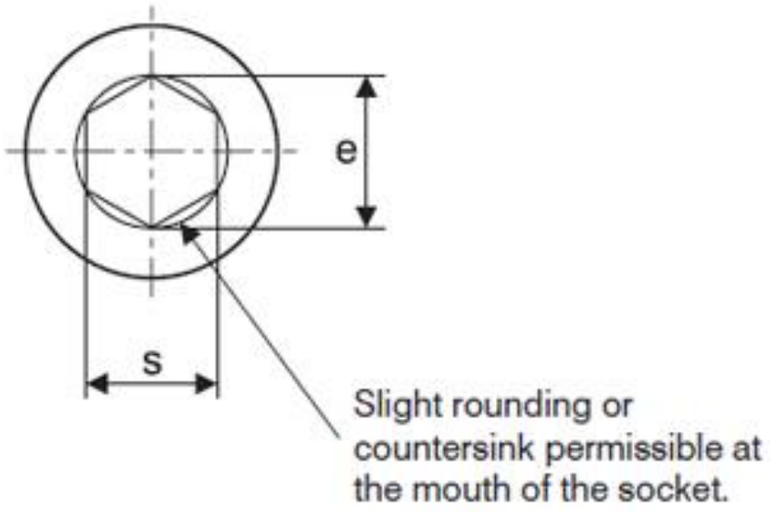
DIN 912 – (Almost) A Proper Standard for PLE





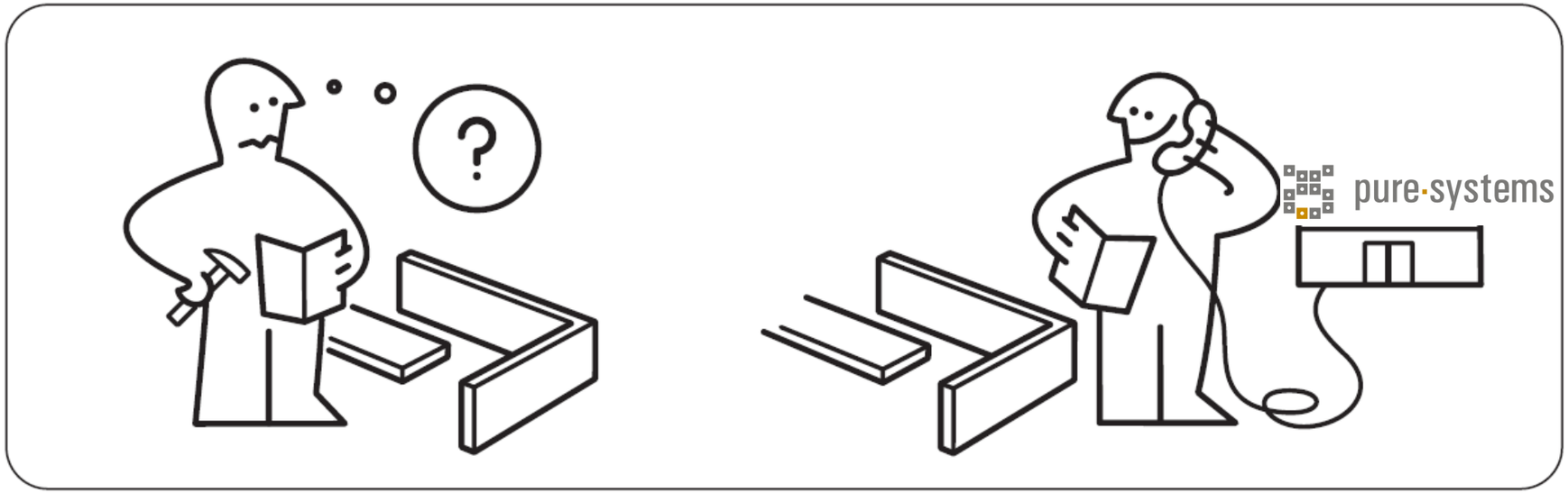
Concrete Metamodel | Domain Independent | Active | Focus PLE

My Background

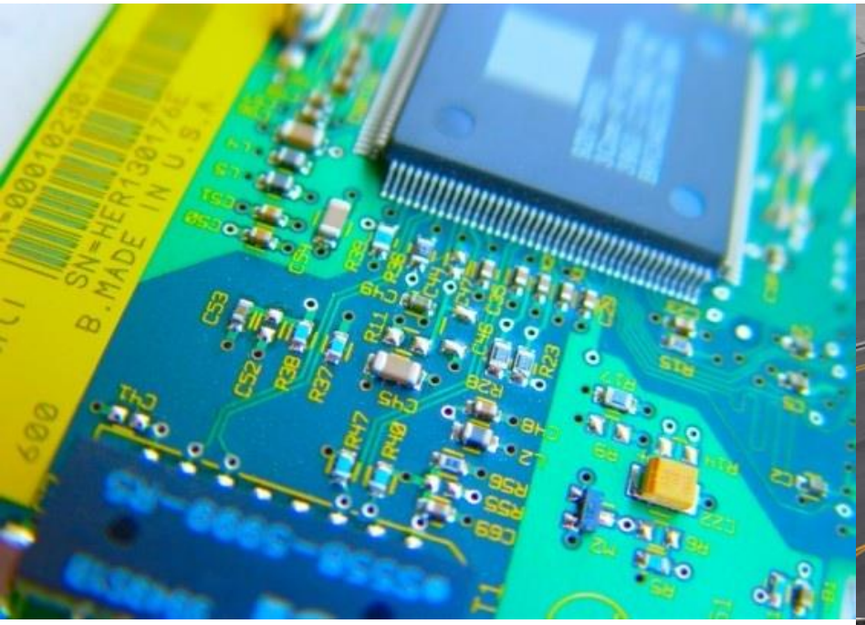
Variant Management Solution for Systems & Software Engineering

pure::variants

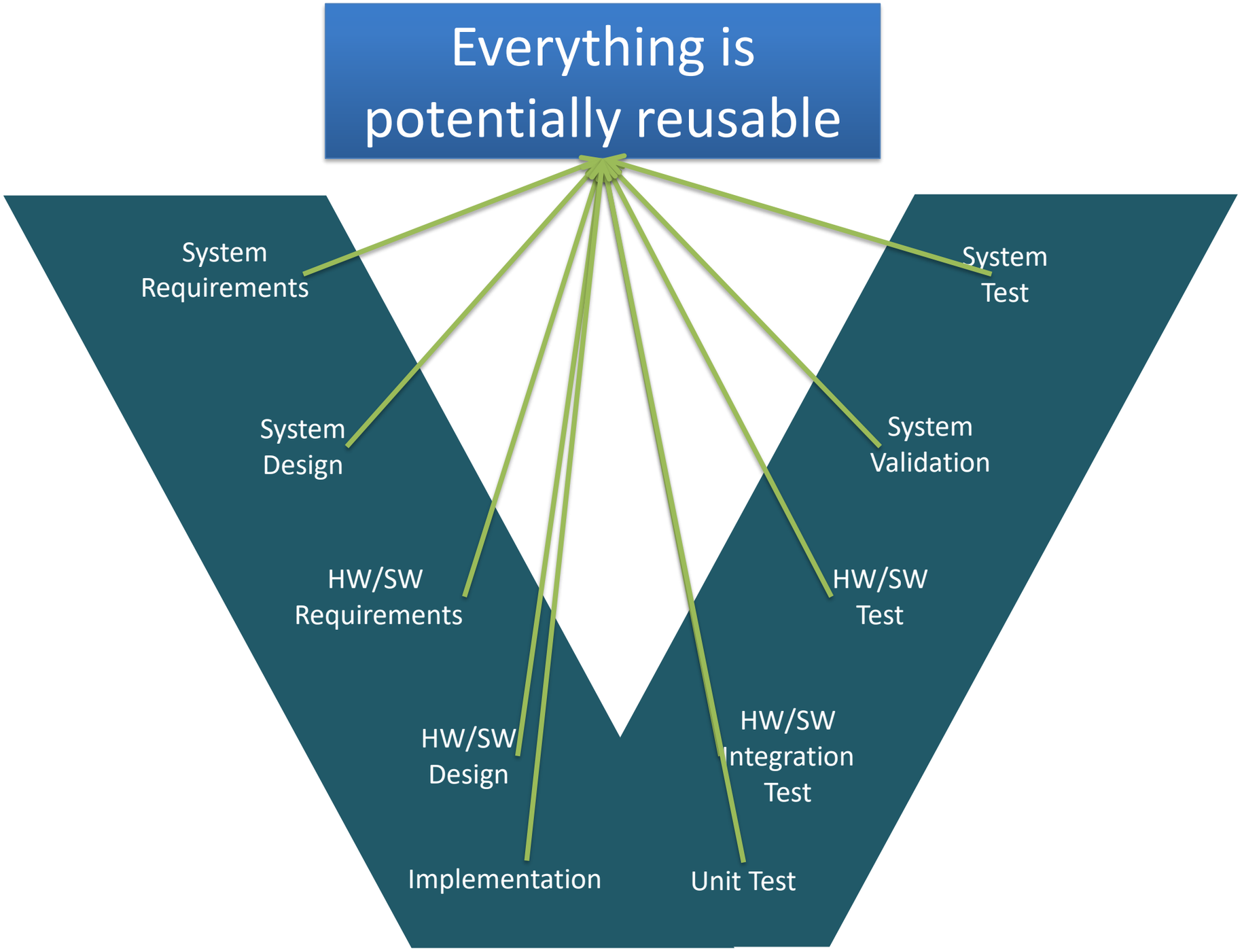
Product Line Engineering

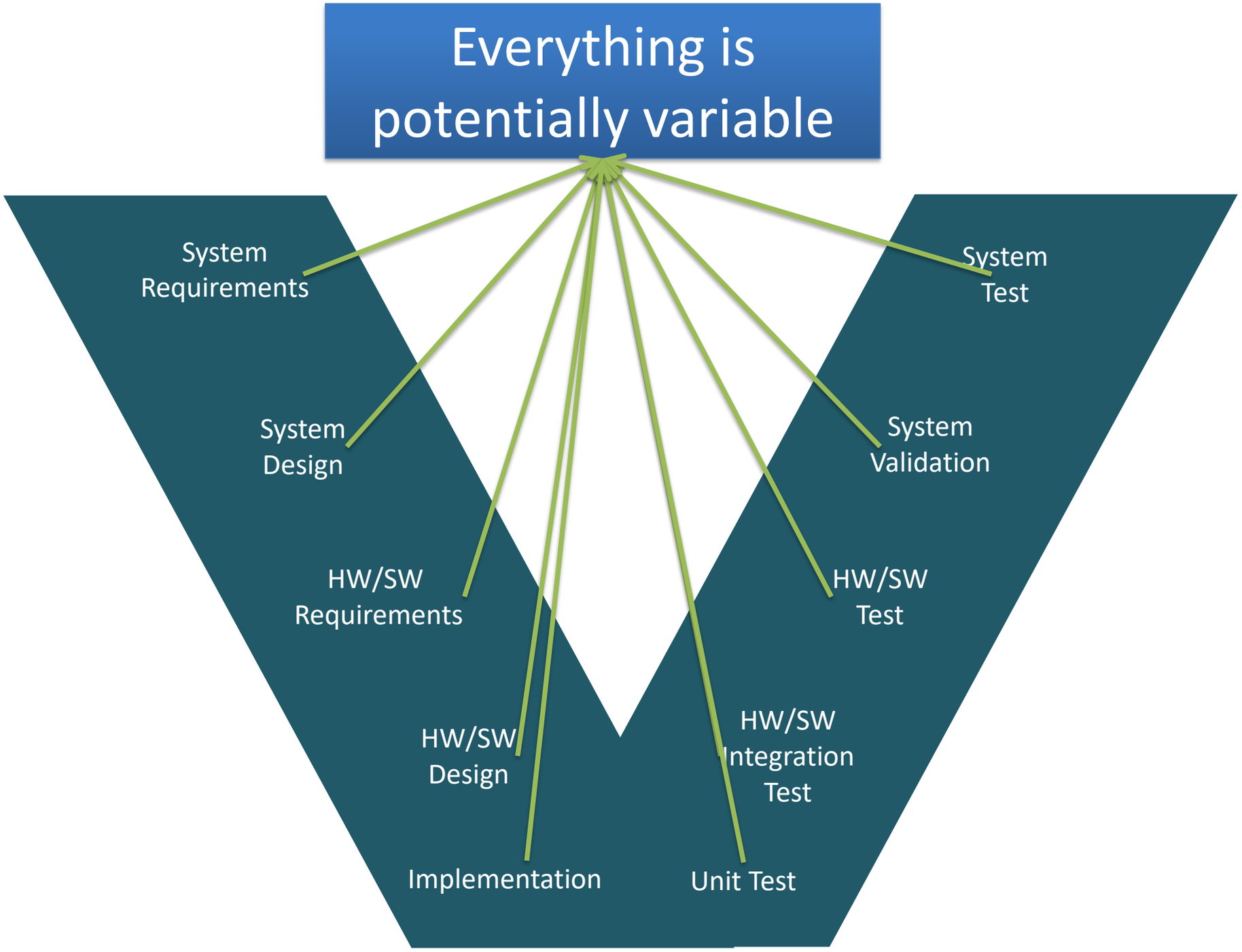


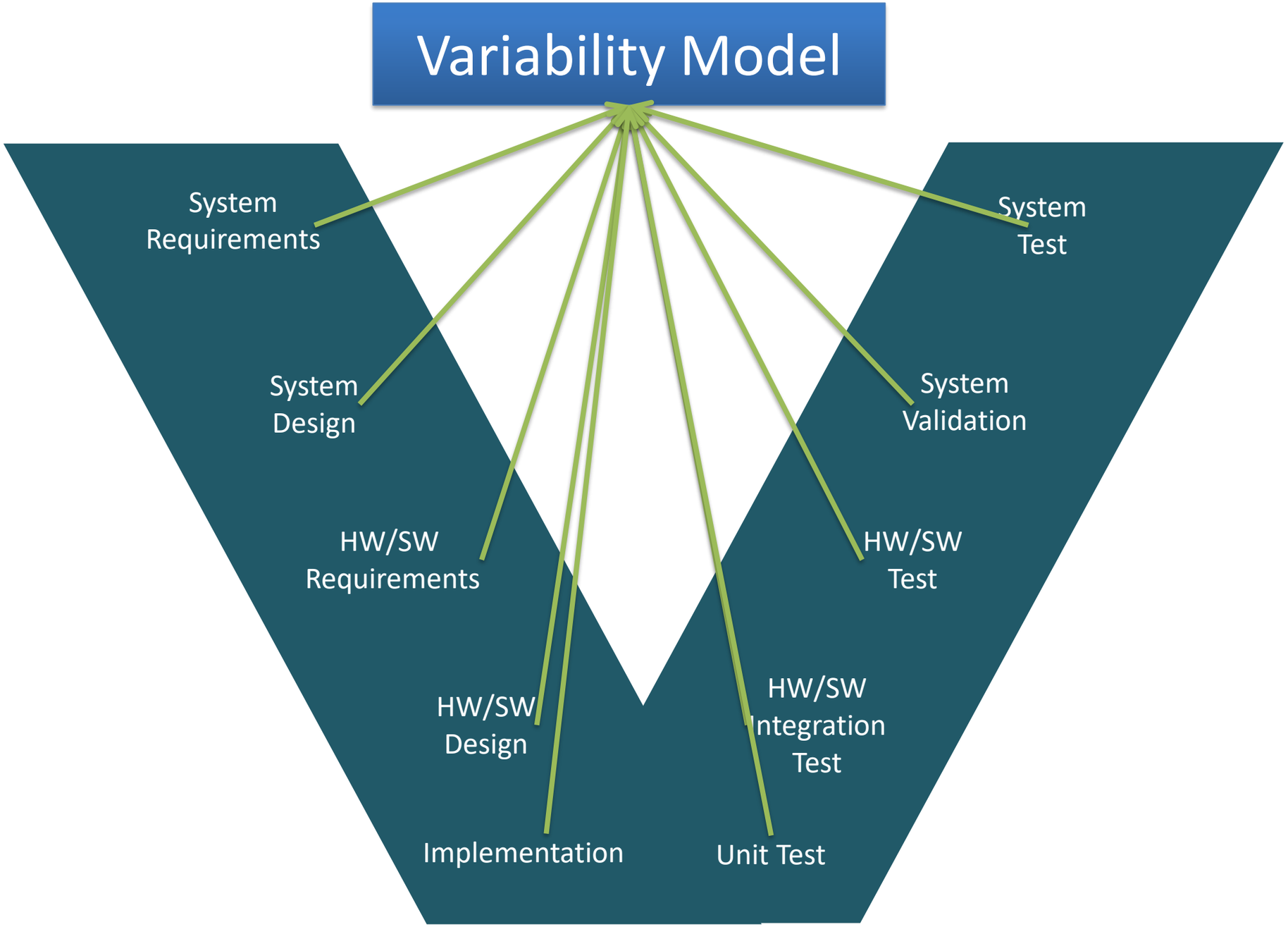
pure-systems‘ Customers Product Domains



Challenges Everywhere



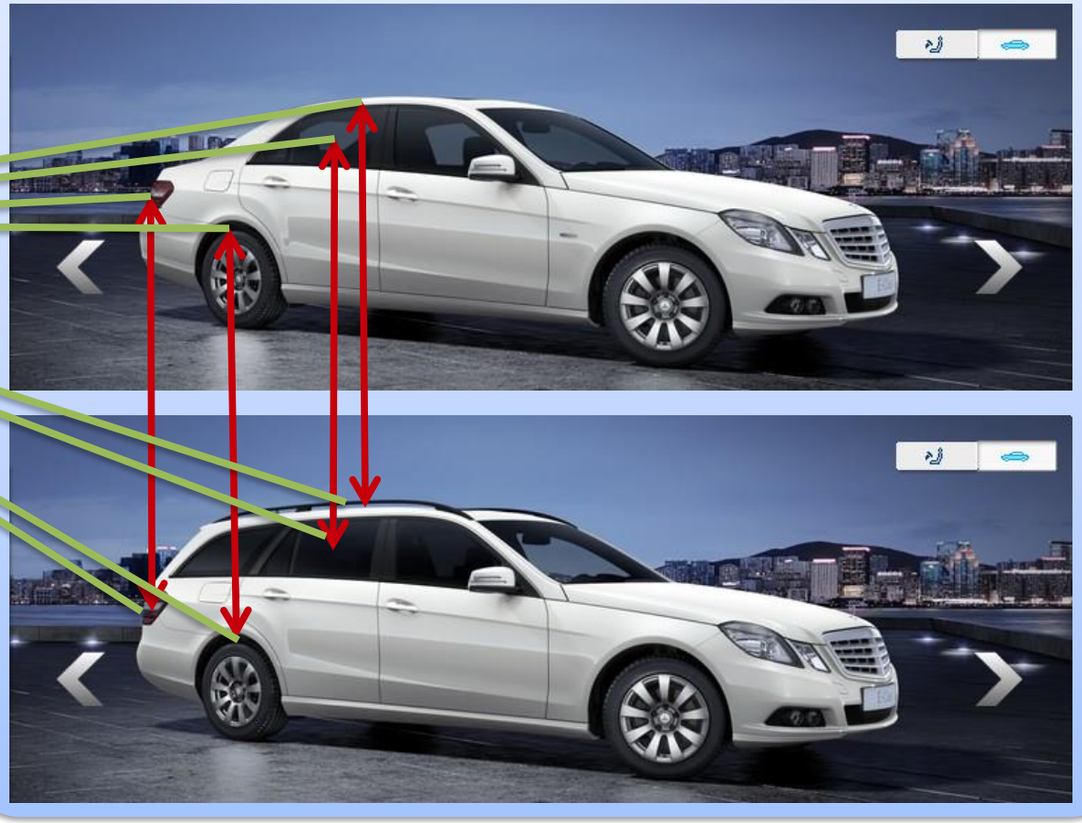


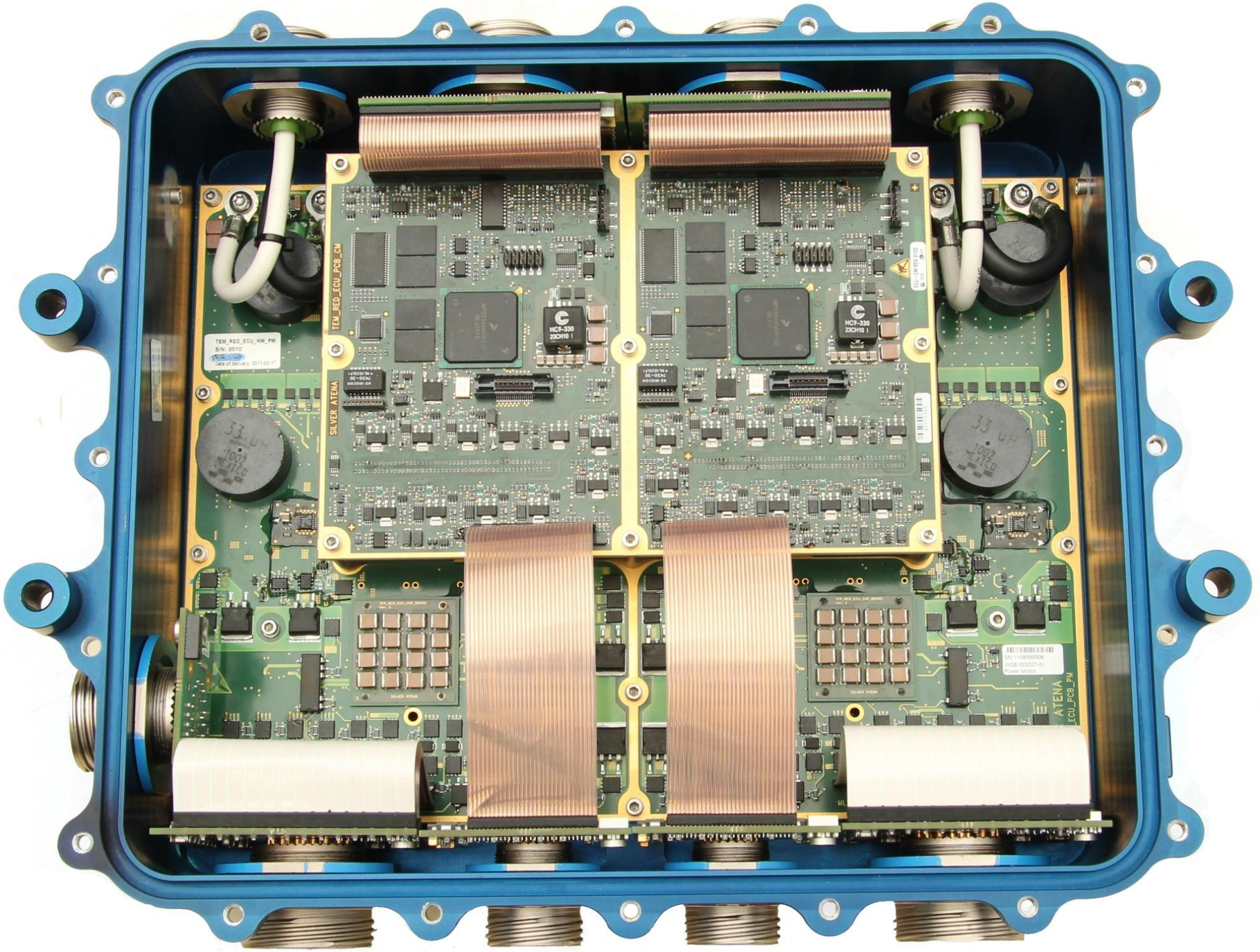


Variation Points

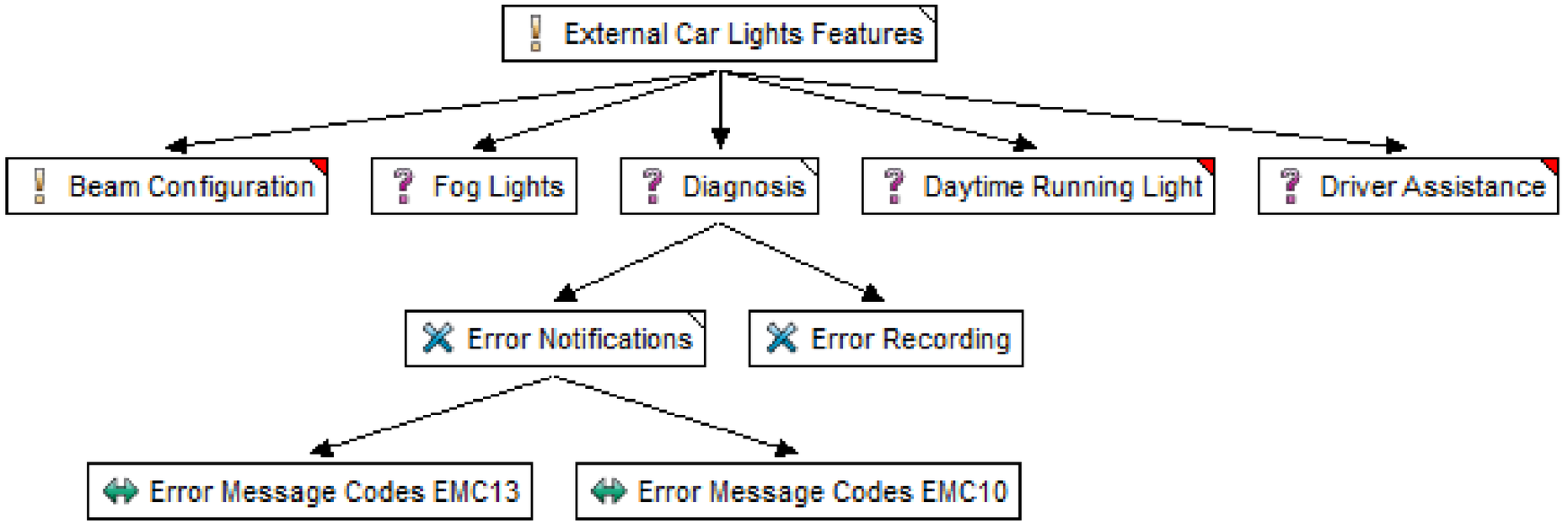
Problem Space

Solution Space



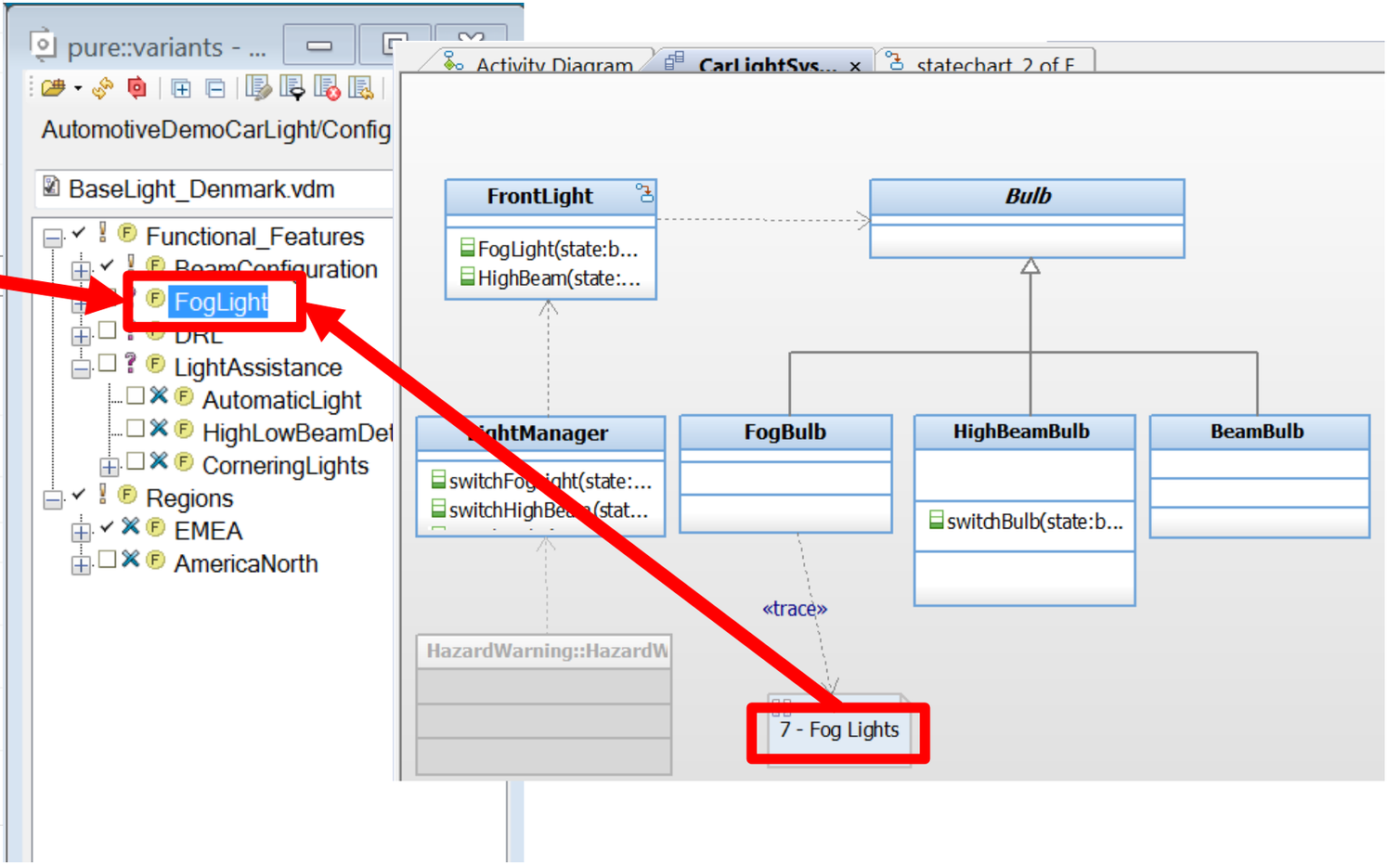


Feature Model [Partial View]

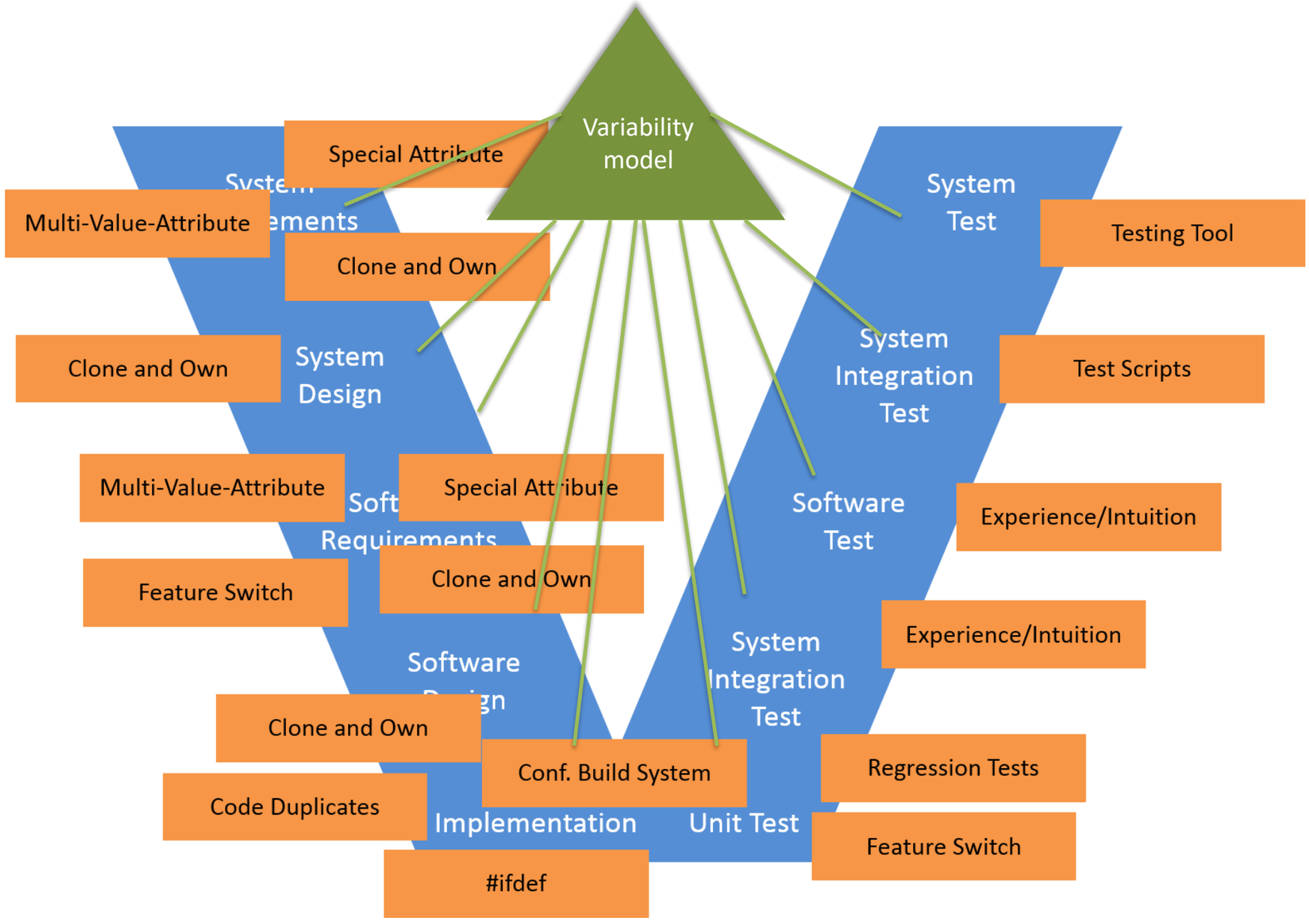


Connecting Variation Points With Feature Models

ID		pvRestriction
35	The high beam is dynamically adjusted if the wight is not balanced.	
6	**1.2 Low Beam**	
20	The beam pattern must conform to R98 — Headlamps equipped with gas-discharge light source	LowBeamXenon AND not(USA OR Canada)
19	The beam must confom to R112 — Headlamps emitting an asymmetrical passing beam and/or a driving beam and equipped with filament bulbs	LowBeamHalogen AND not(USA OR Canada)
7	**1.3 Fog Light**	FogLight
32	Front fog lamps have to provide a wide, bar-shaped beam of light with a sharp cutoff at the top, and are generally aimed and mounted low.	
34	They may be either white or selective yellow.	
2	**2 Assistance Systems**	LightAssistance
11	**2.1 Cornering Light**	CorneringLights
26	**2.1.1 Adaptive Forward Lighting**	AdaptiveForwardLighting
27	The adaptive forward lighting system is activated only when high or low beam is operating in full light mode.	
12	**2.1.2 Static Cornering Light**	CorneringStaticLights
13	The day running light on the side of the car is activated when the steering angle is above -/+15°, the vehicle is moving, and the vehicle speed is at least 10m/s	DRL



Challenge: Variability across the Lifecycle Assets



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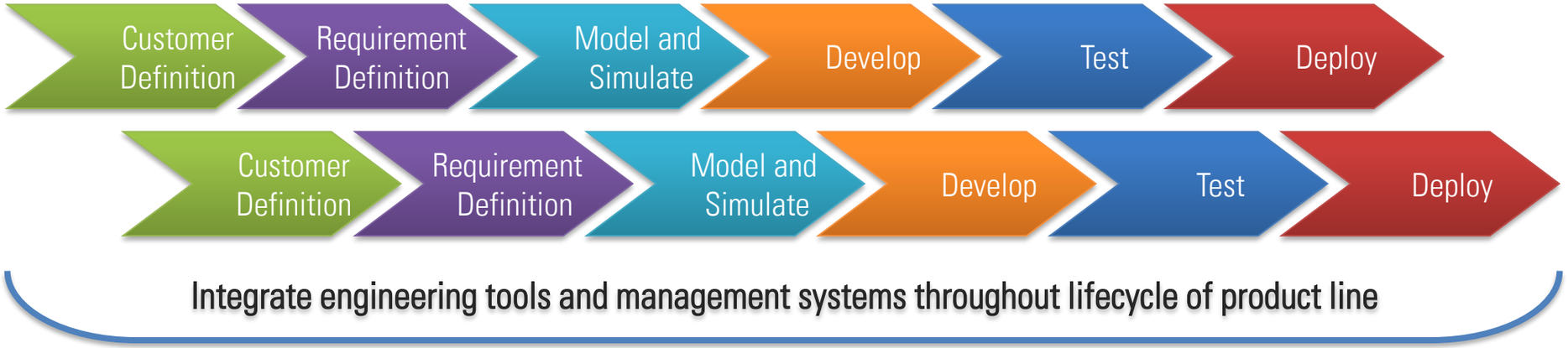


DOORS 9 | DOORS Next | Rhapsody Design Manager

Rhapsody | RTC | Rational Quality Manager | C/C++/Java

medini analyze | AUTOSAR | EMF | Enterprise Architect

PTC Integrity | AUTOSAR | … | IBM Jazz Global Configurations, Streams, Change Sets

Standards To Rescue Us

PLE Standard / Standards with PLE Elements

ISO 2655x

ISO 26580

AUTOSAR

SysML V2

EAST ADL

Common Variability Language

STEP AP242

Variability Exchange Language

Concrete Metamodel

AUTOSAR

SysML V2

EAST ADL

Common Variability Language

Variability Exchange Language

STEP AP242

Domain Independent

ISO 2655x

ISO 26580

SysML V2

Common Variability Language

Variability Exchange Language

Focus PLE

ISO 2655x

ISO 26580

AUTOSAR

SysML V2

EAST ADL

Common Variability Language

Variability Exchange Language

Active

ISO 2655x

AUTOSAR

EAST ADL

STEP AP242

Concrete Metamodel

Domain Independent

Focus PLE

Active

Standards – A “Deeper” Look

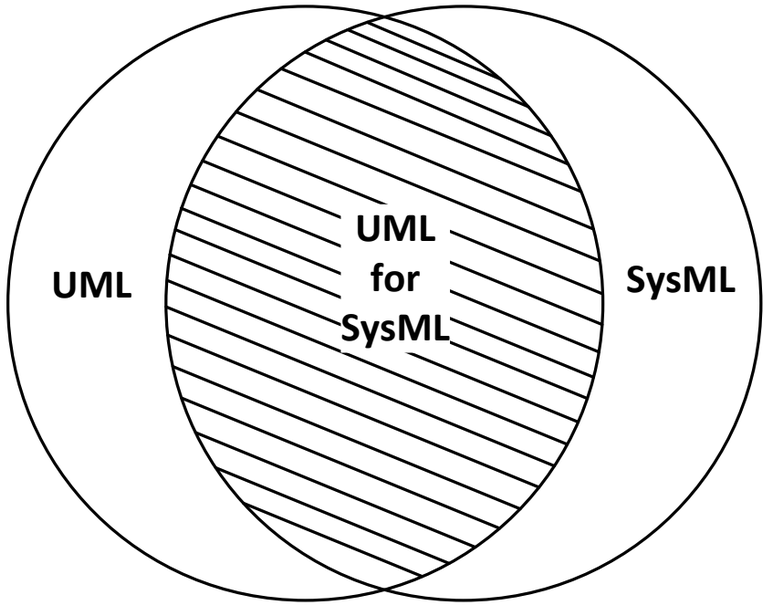
SysML V2 Overview

Tim Weilkiens

OMG Systems Modeling Language (OMG SysML™)

SysML is designed to provide simple but powerful constructs for modeling a wide range of systems engineering problems. It is particularly effective in specifying requirements, structure, behavior, allocations, and constraints on system properties to support engineering analysis.

(OMG SysML™ Specification)



SysML does not explicitly support the modeling of variants.

VAMOS Domain Knowledge Model

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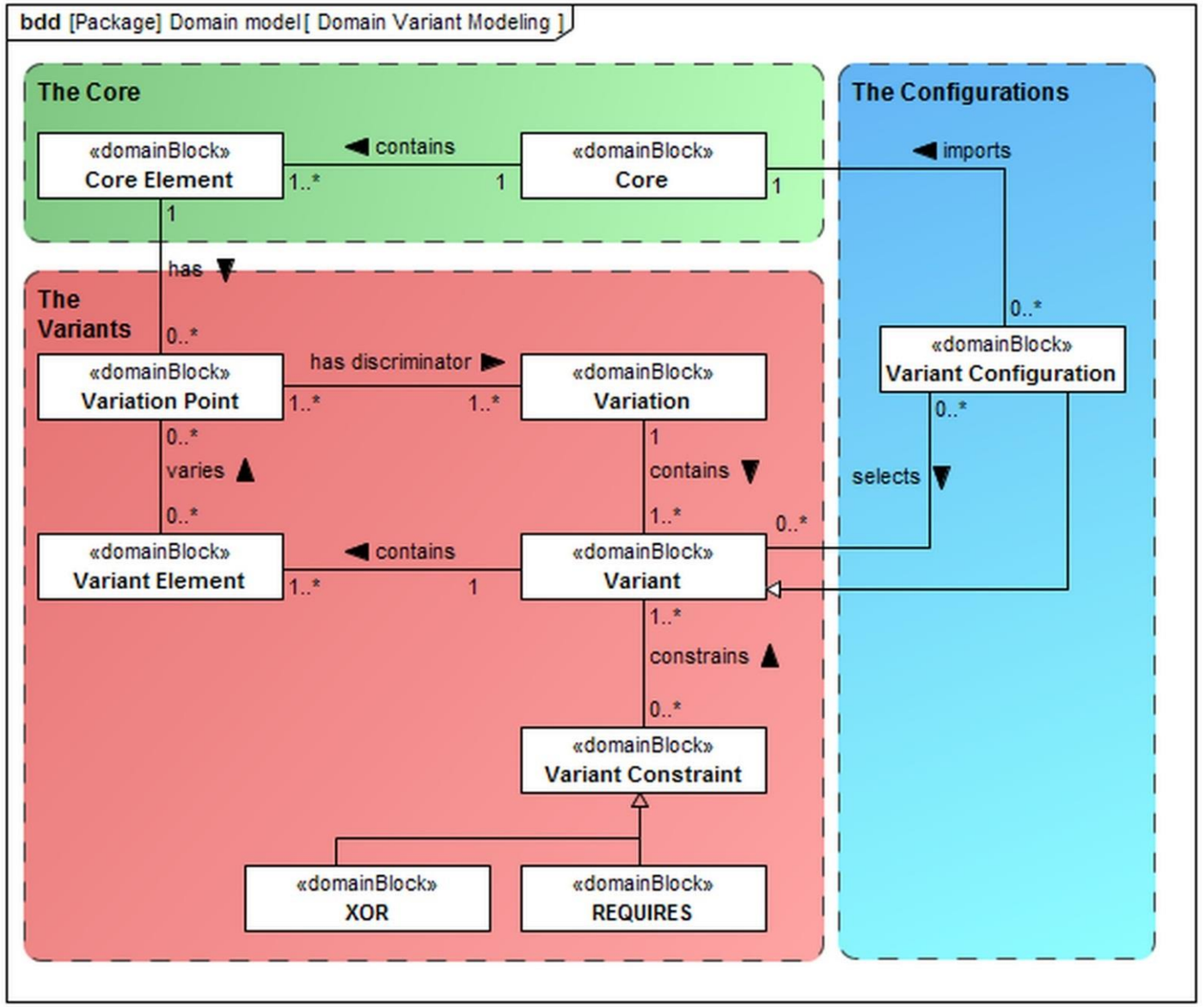

Variant Modeling with SysML (VaMoS)

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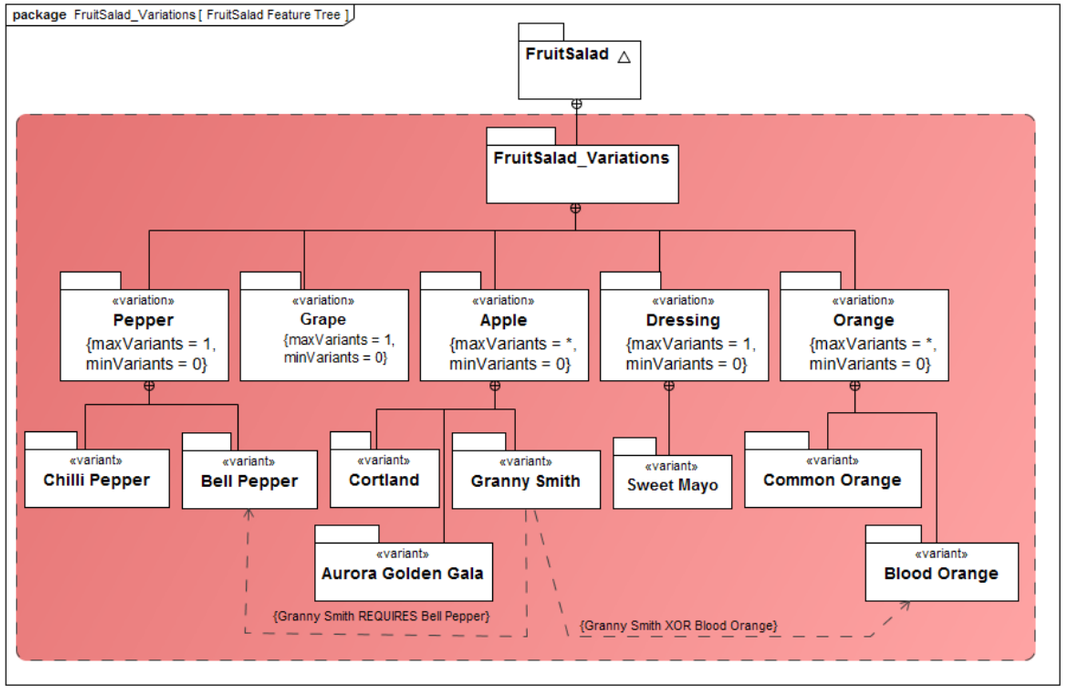
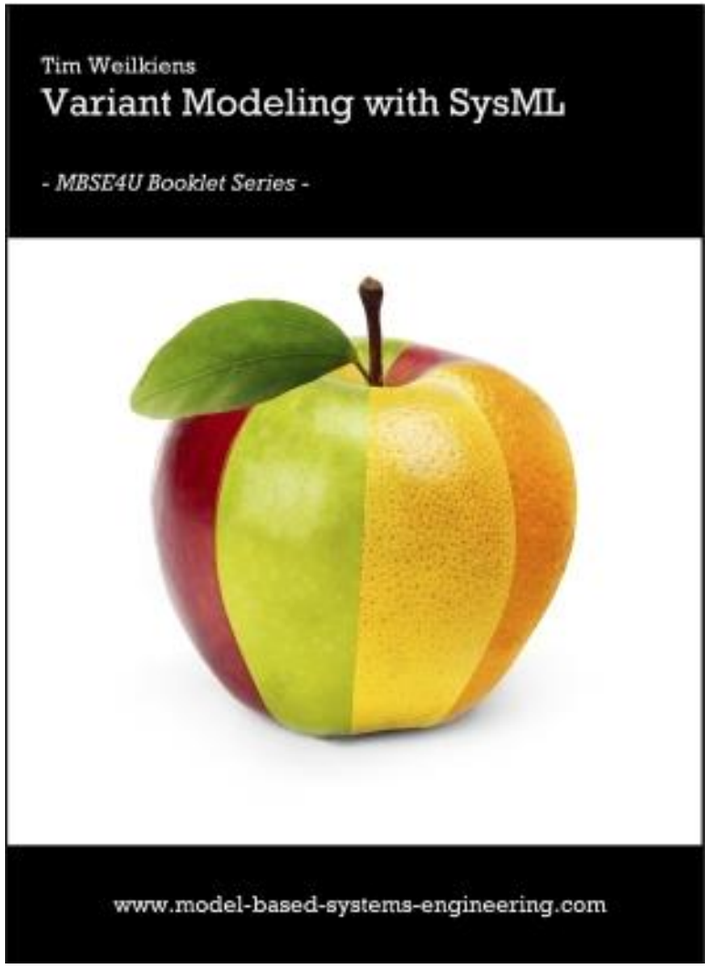
VAMOS Objectives

- Covers common variant concepts
- Tool independent
- 100% SysML conform (= valid SysML model)





http://www.mbse4u.com/vamos/

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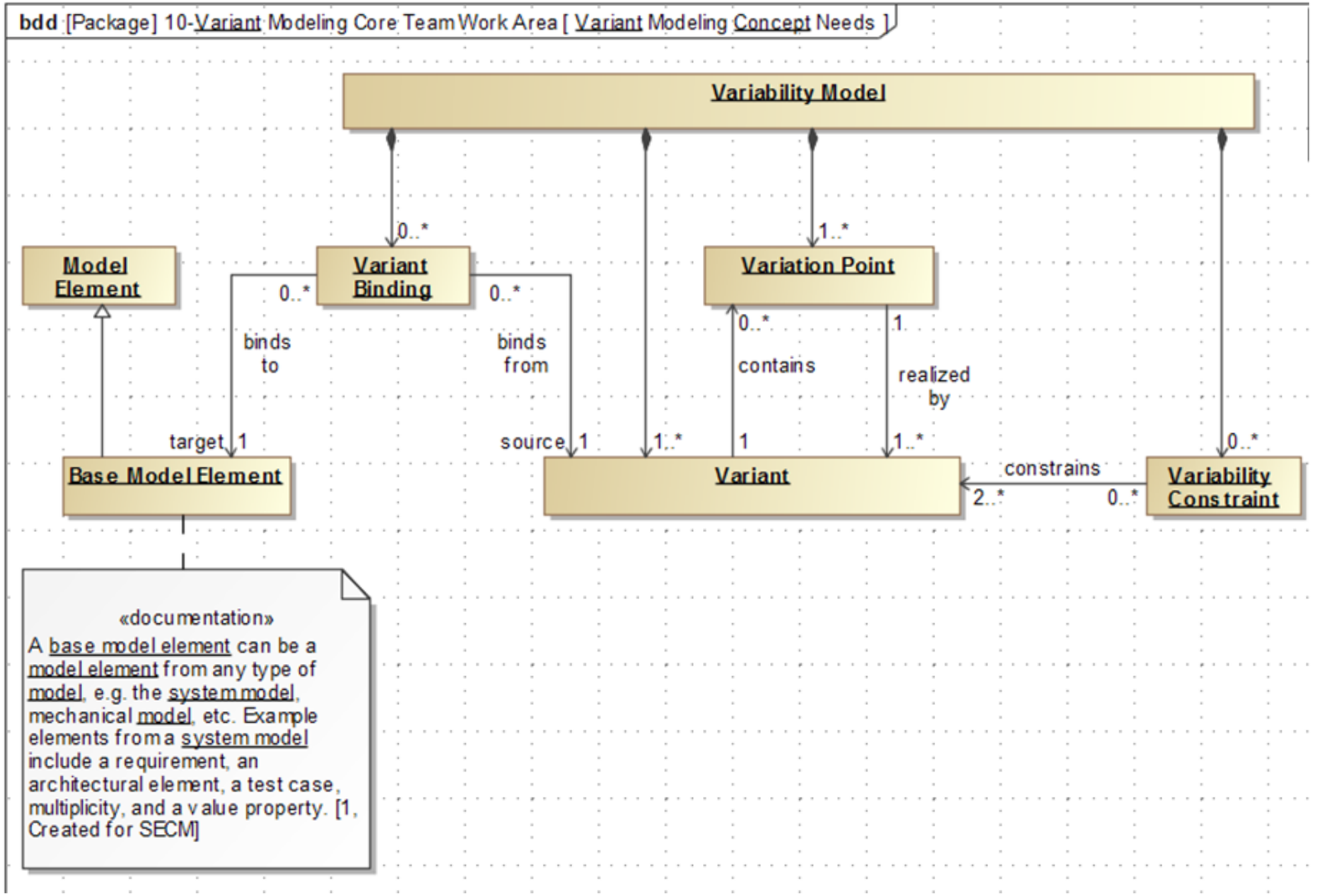
OMG SYSTEMS MODELING LANGUAGE™

v2

Variant Modeling with SysML v2



Variant Modeling with SysML v2: Definitions

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#	Name	Documentation	Owner
1	Base Model Element	A base model element can be a model element from any type of model, e.g. the system model, mechanical model, etc. Example elements from a system model include a requirement, an architectural element, a test case, multiplicity, and a value property. [1, Created for SECM]	Variants
2	Variability Constraint	A variability constraint constrains the combination of variants. [1, Created for SECM]	Variants
3	Variability Model	A model that captures the desired variabilities and constraints for a set of system configurations. [1, Created for SECM]	Variants
4	Variant	A variant (or option) represents a choice that realizes a particular variation point (or feature). A variant can include additional variation points. [1, Created for SECM]	Variants
5	Variant Binding	A variant binding binds a base model element to a variant [1, Created for SECM]	Variants
6	Variation Point	A variation point represents a characteristic (or feature) that can vary from one entity to another. [1, Created for SECM]	Variants

Variant Modeling with SysML v2: RFP Requirements

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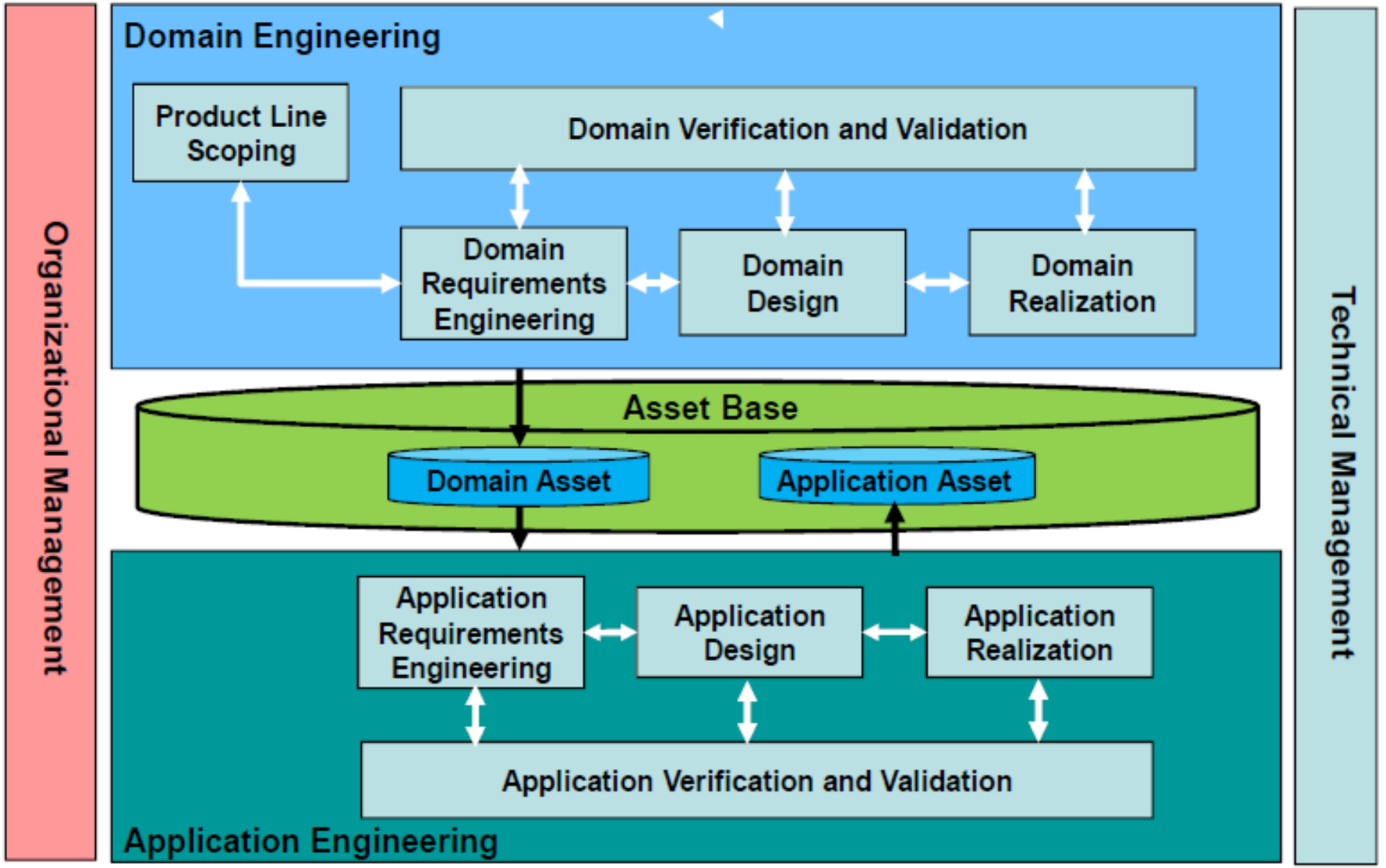
SysML2 shall provide the capability to model a set of entities (e.g., systems, components) sharing common and variable model elements, and which include the following concepts.

- variation point
- variant
- variability constraint
- variant binding

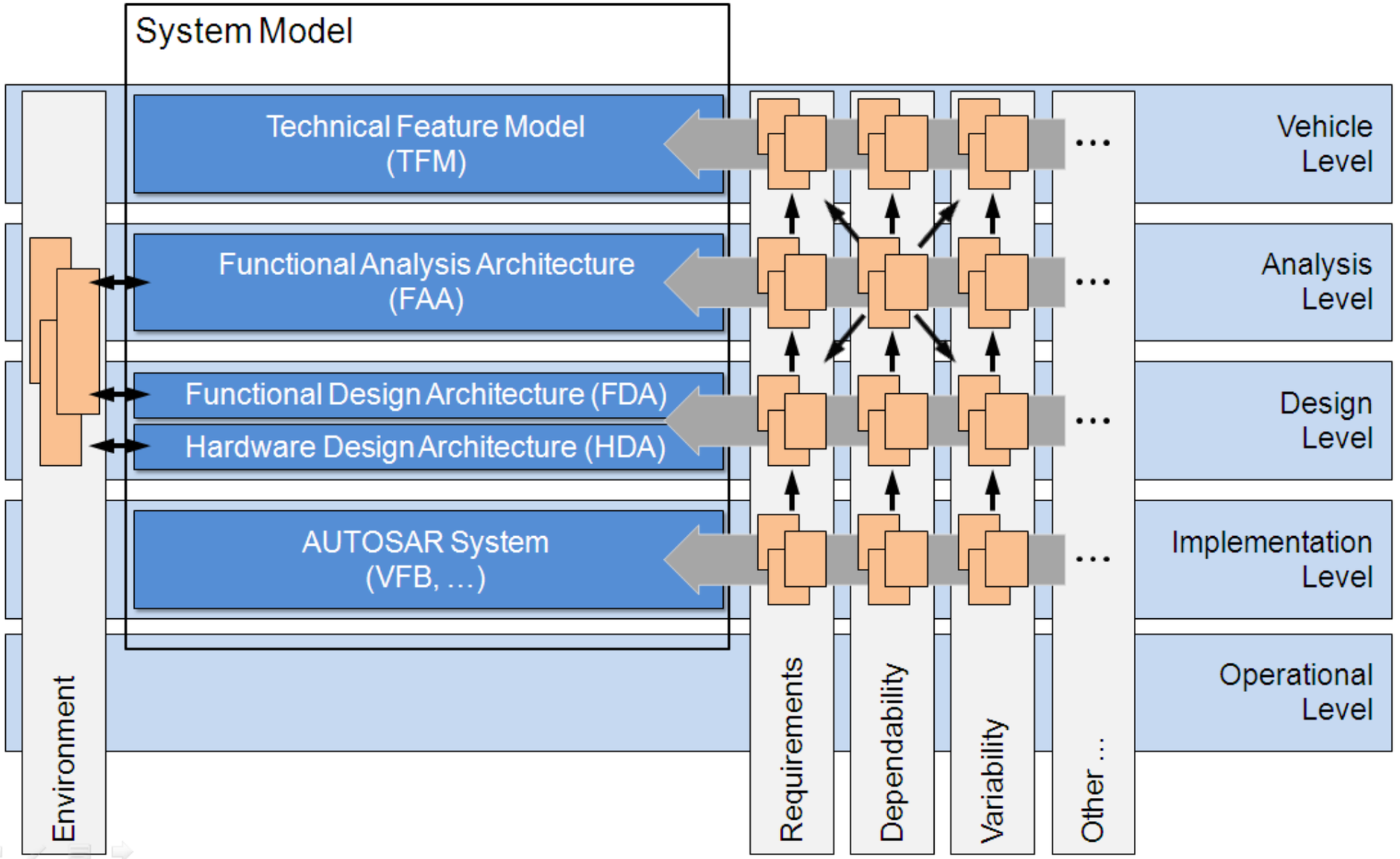
SysML2 shall provide modeling notation to represent the variability concepts.

#	Id	Name	Text	SysML1.X	Status
1	VAR 1	Variability Concepts	SysML2 shall provide the capability to model a set of entities (e.g., systems, components) sharing common and variable model elements, and which include the following concepts. • variation point • variant • variability constraint • variant binding	No	Proposed
2	VAR 2	Variability Notation	SysML2 shall provide modeling notation to represent the variability concepts.	No	Proposed

ISO 26550:2015 Software and systems engineering — Reference model for product line engineering and management

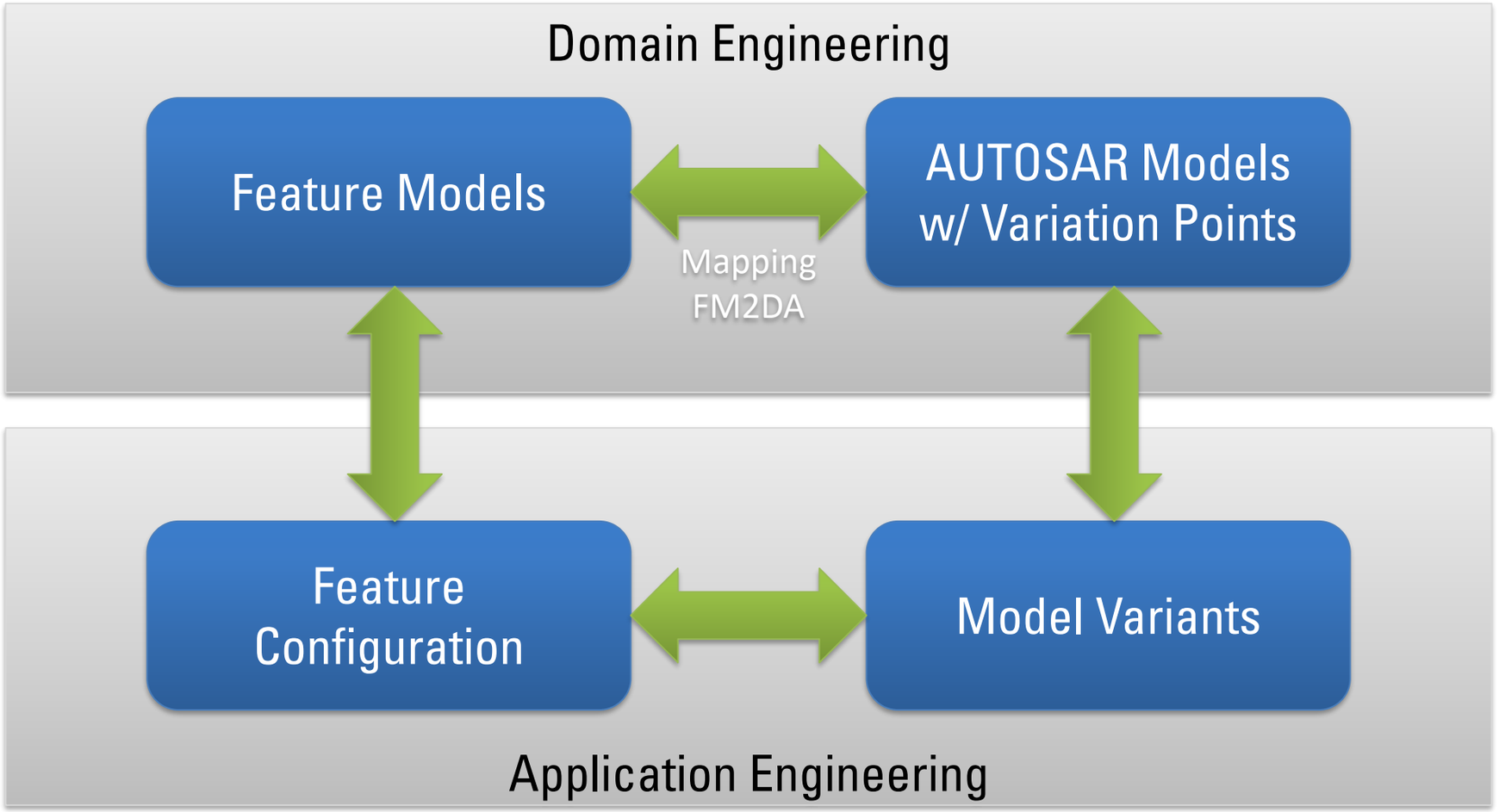


EAST ADL Overview

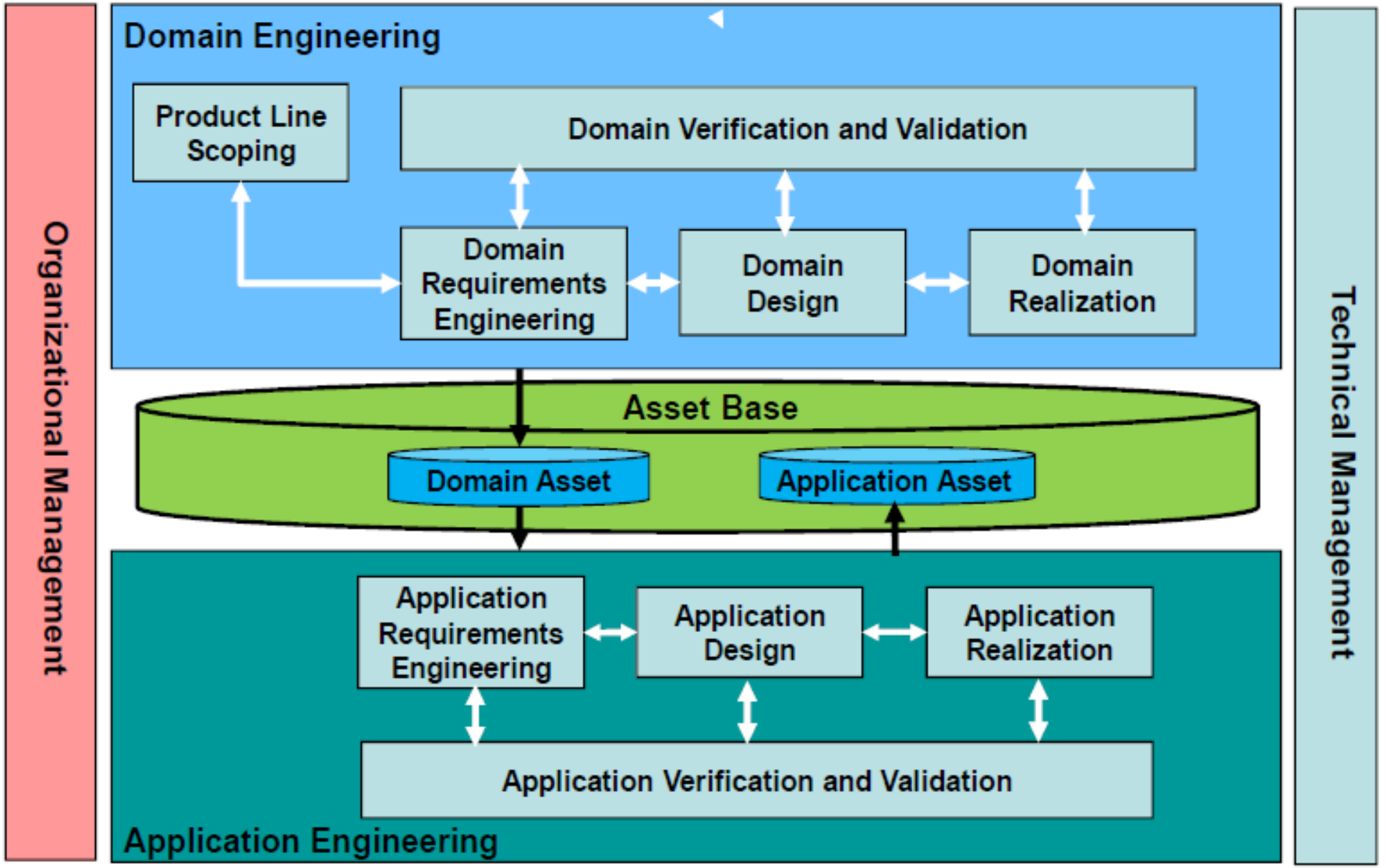


Source: http://www.east-adl.info/Specification.html

AUTOSAR Variability Overview



ISO 26580 Methods and Tools for the Feature-based Approach to Systems and Software Product Line Engineering



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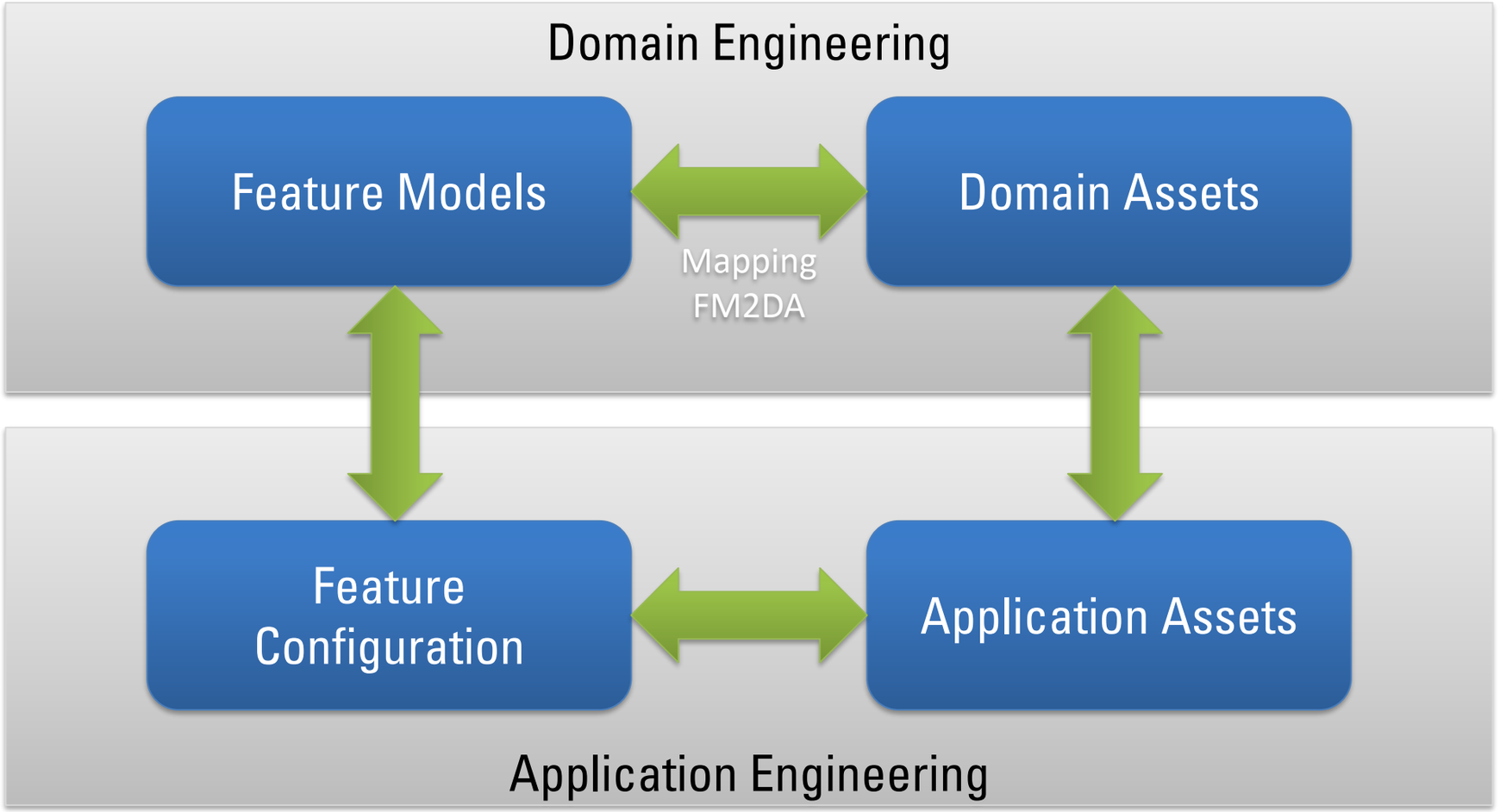
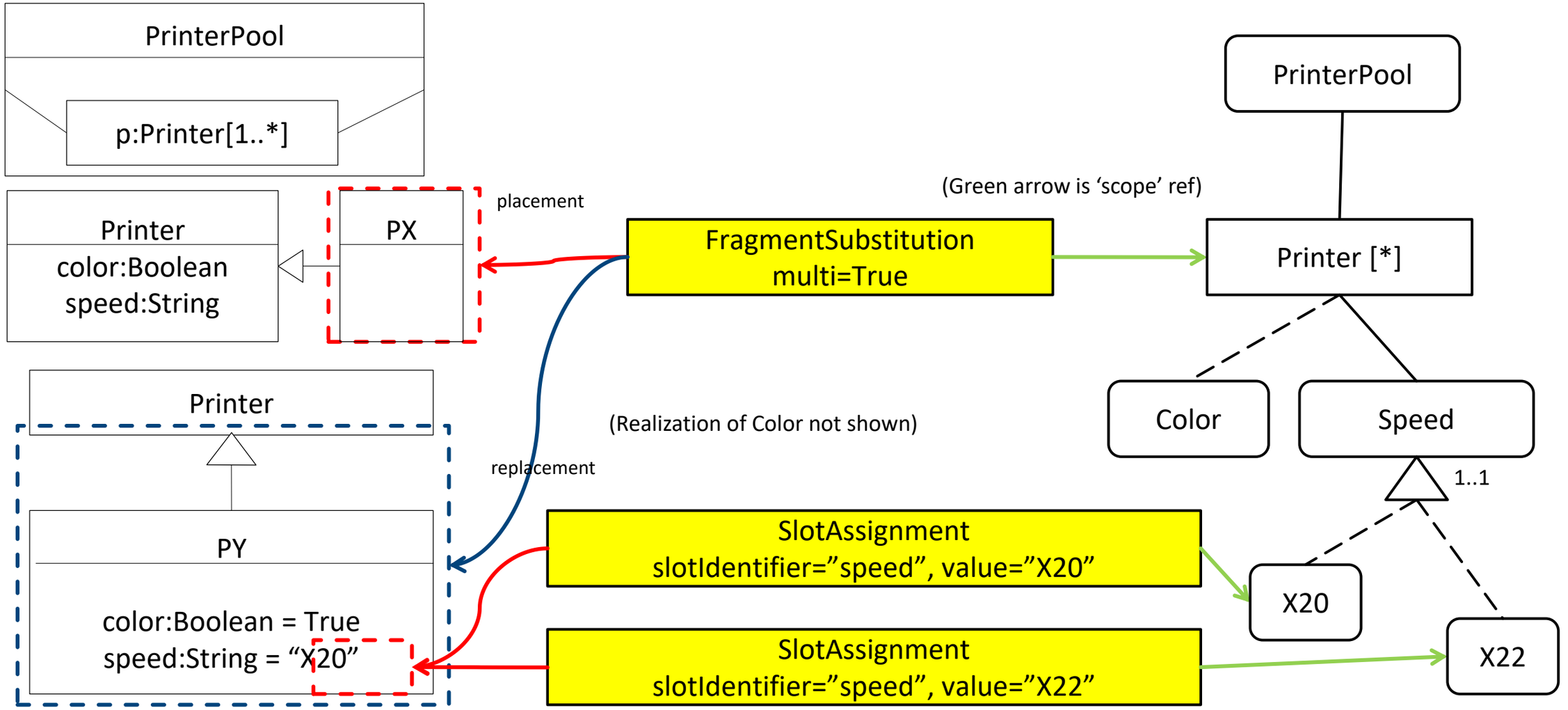
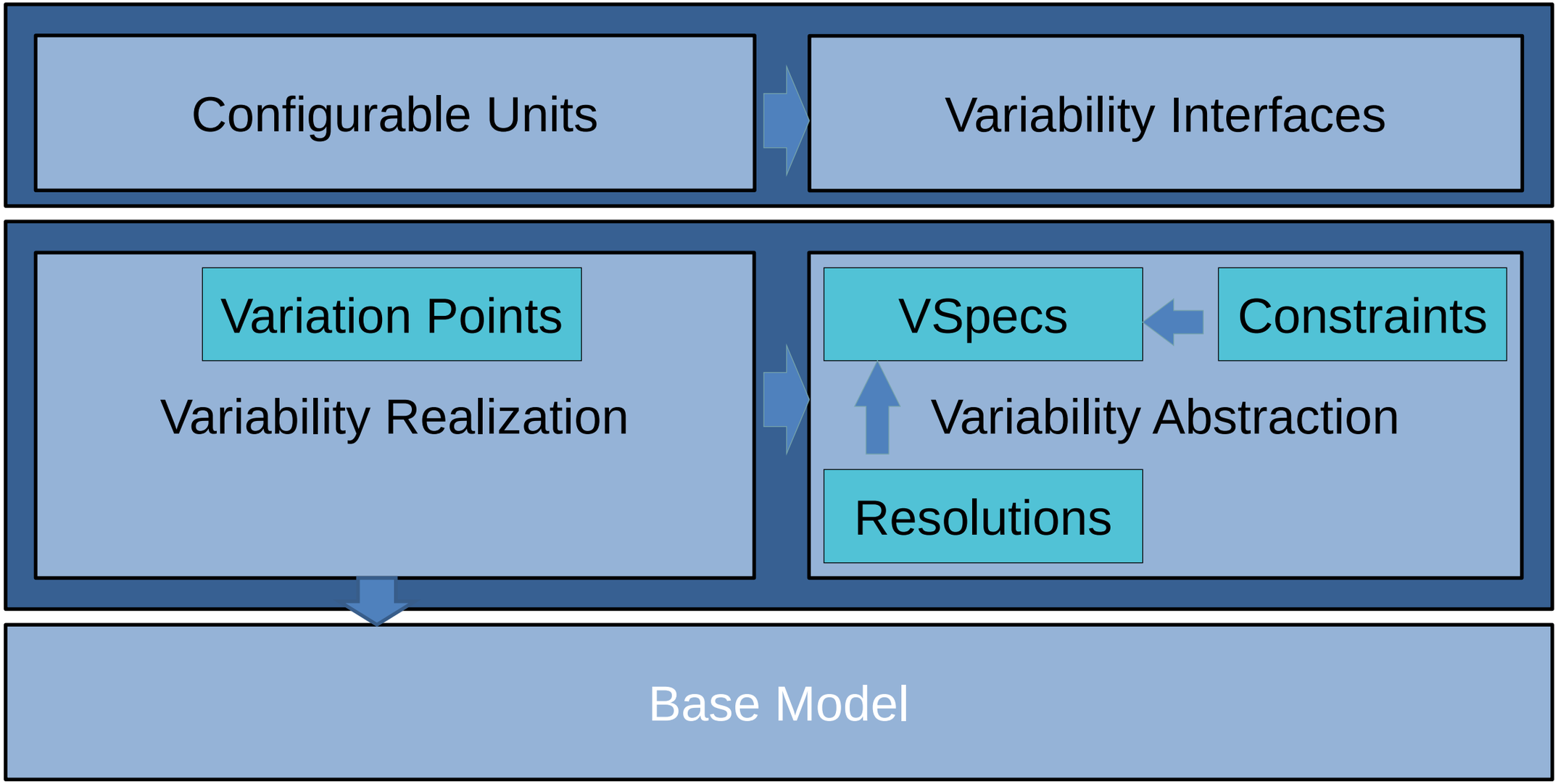


CVL - Common Variability Language

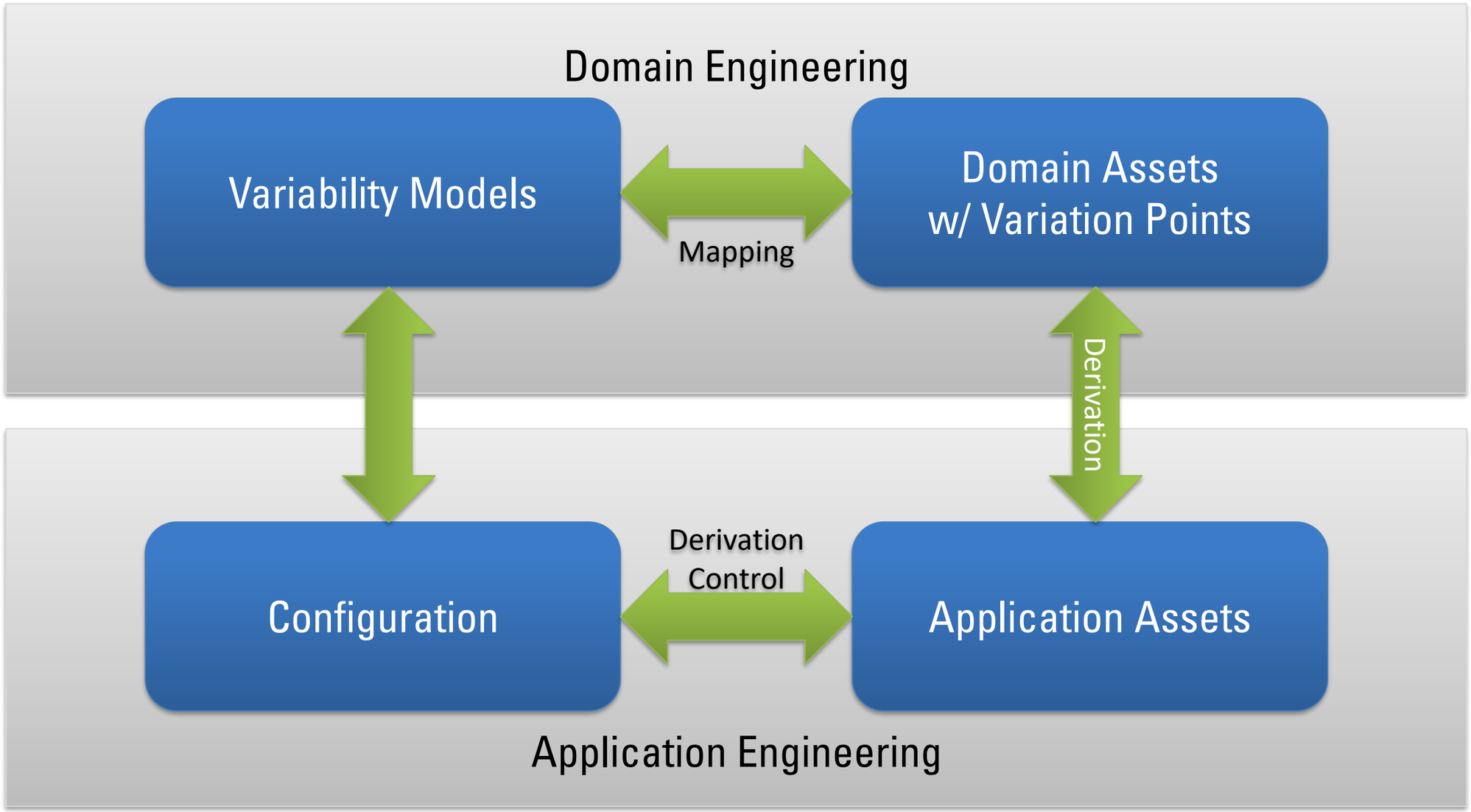
CVL Example



CVL Overview



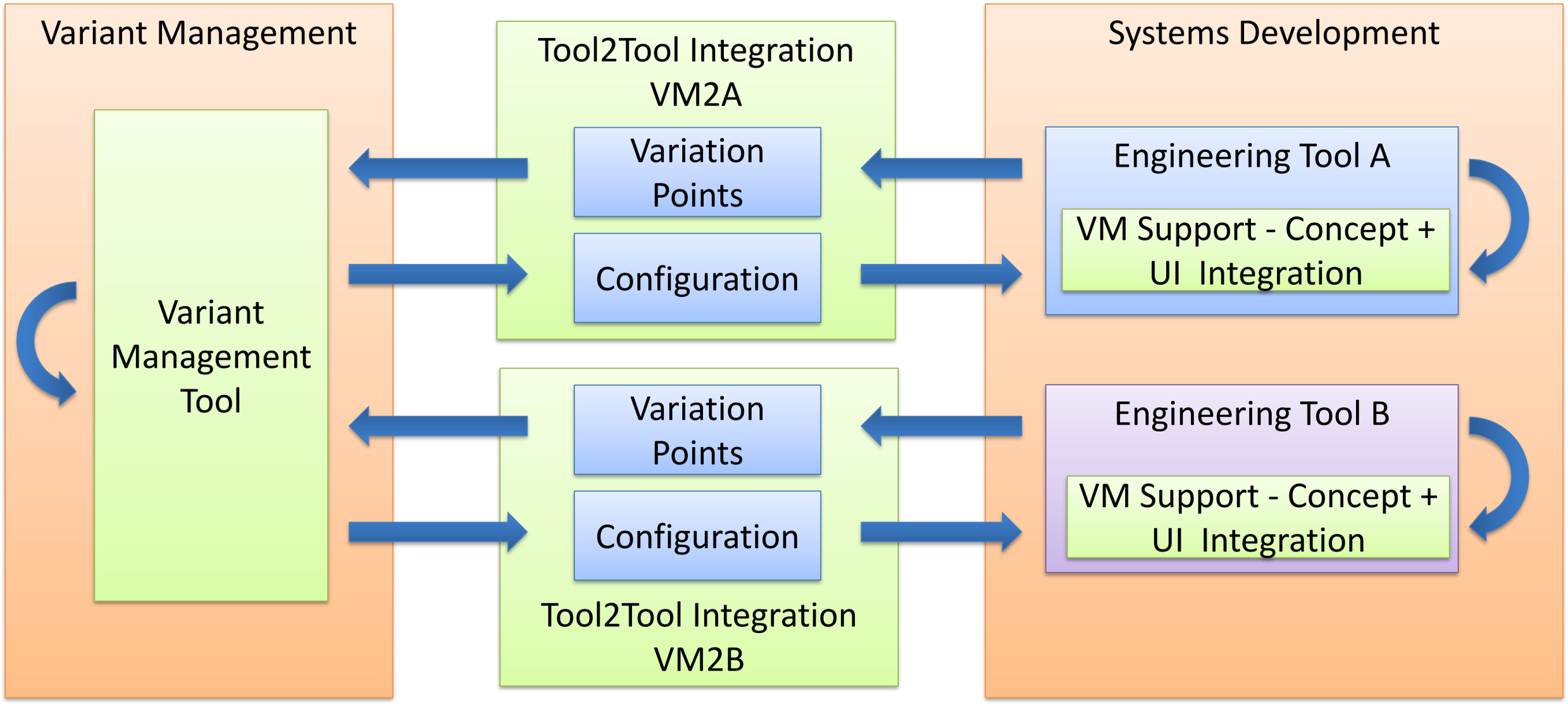
The Essence



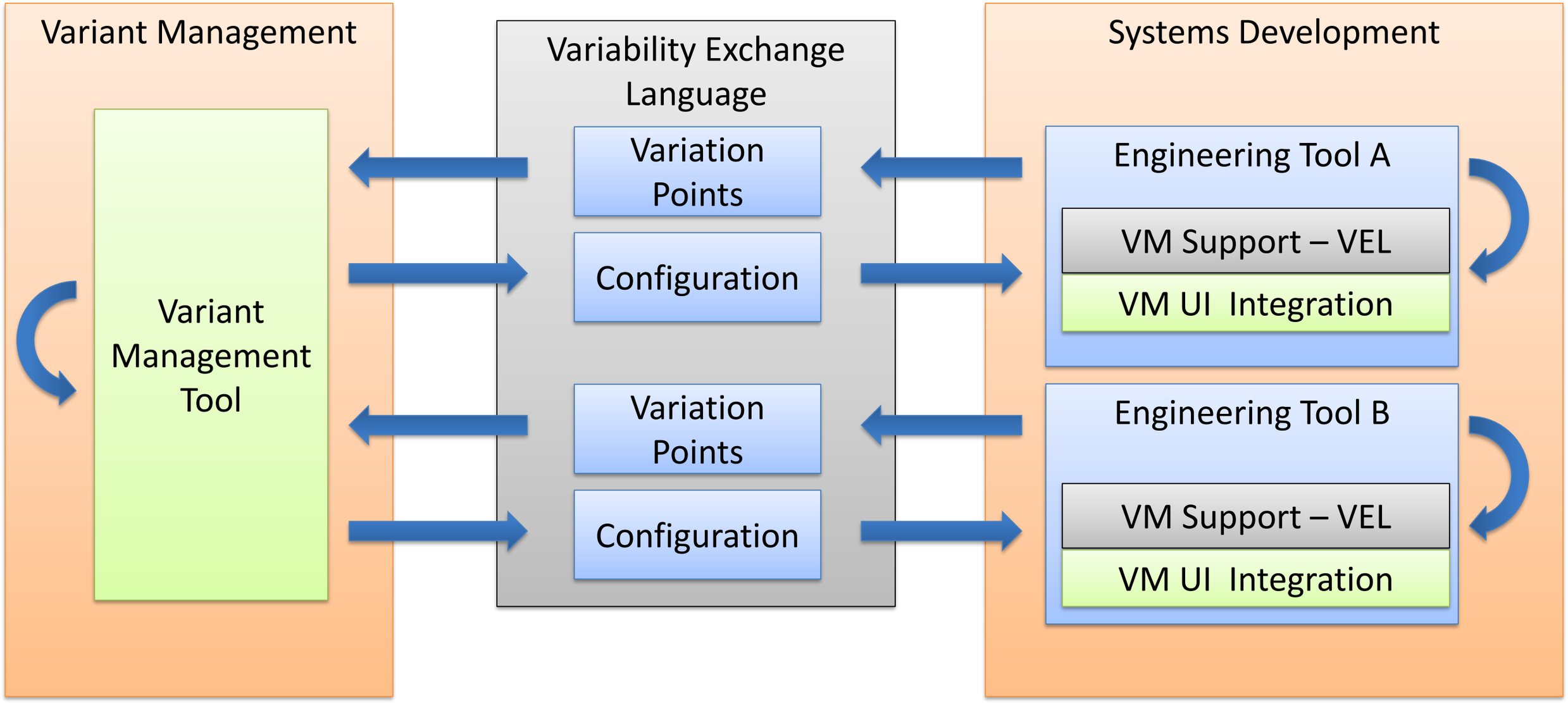
VEL - Variability Exchange Language

http://www.variability-exchange-language.org/

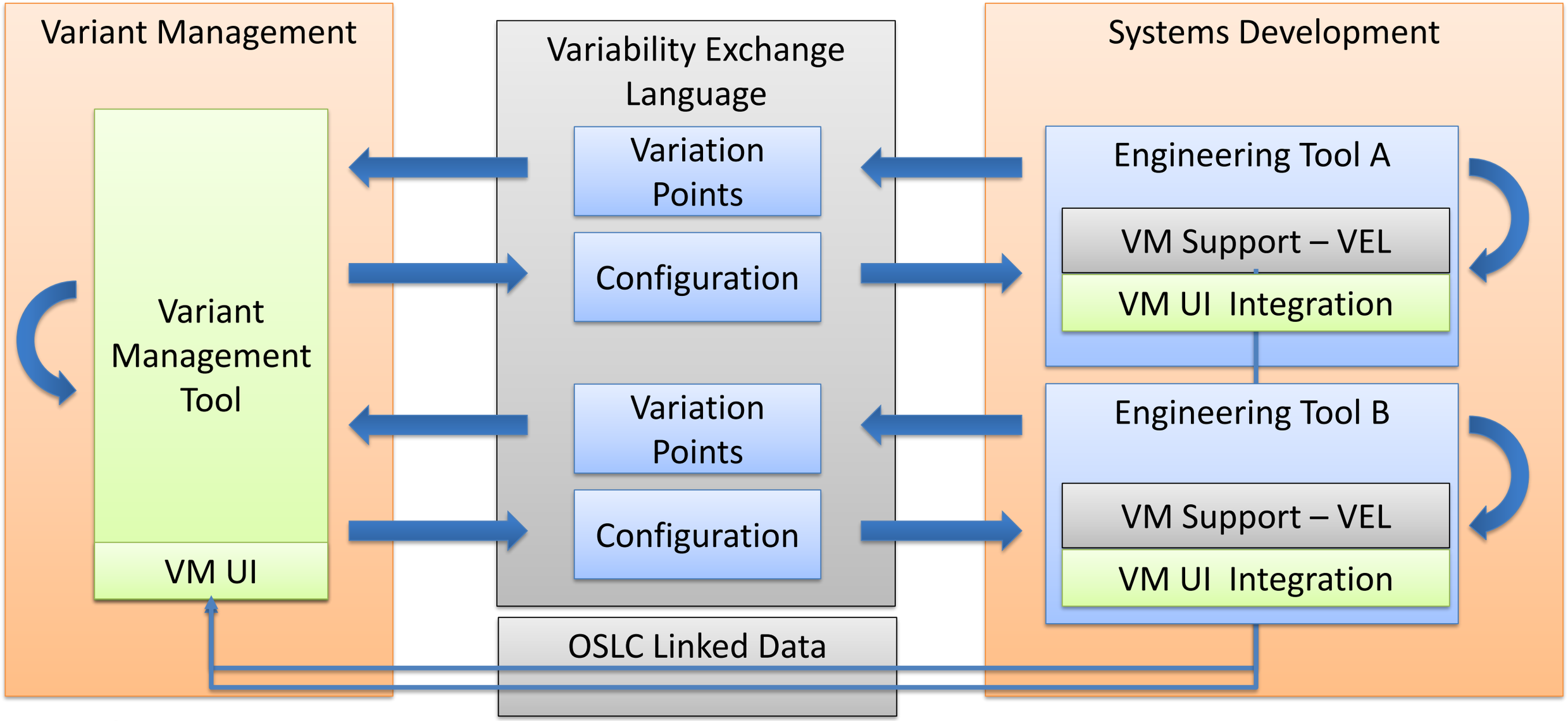
VM Integration Today



VM Integration in The Future



VM Integration in The Future



The Final Words

	STEP AP 242***	VEL	Feature Modelle**	OVM
Produktfamilie / Produktlinie	Product Concept (Portfolio)	-	Feature Model	OVM
(kundenwahrnehmbares) Merkmal	Specification Category	Variation Point	Feature	Variation Point*
Ausprägung	Specification	Choice	Feature	Variant*
		Value		
Berechnungsmechanismus	-	Calculation	-	-
Boolscher Ausdruck	Condition	Constraint	Constraint	(OCL)
Kombinatorikregel	Specification Inclusion	Constraint	Constraint	Relation (OCL)
			Feature Hierarchy	
Produktstruktur / Produktgliederung	Breakdown	-	Not Specified	Not Specified
Positionsvariante mit Auswahlregel	Alternative Solution & Conditional Configuration	-	Asset Constraints / Mapping	
Technische Lösung	Part		Asset	Model Element
(Produkt-) Konfiguration	Configuration	Configuration	Configuration	Configuration

*) gemäß ISO 26550 **) gemäß ISO 26580 **) ISO 10303-242

Ergebnis: GfSE Workshop 2017, Thema: PLE und PLM
Umsetzung: Christian Muggeo, VPE

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