

# UPDATES ON PV WITHIN THE IPE, SYSML V2 AND MORE



**Danilo Beuche**

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PTC



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Senior Director, Solutions Engineering

PTC

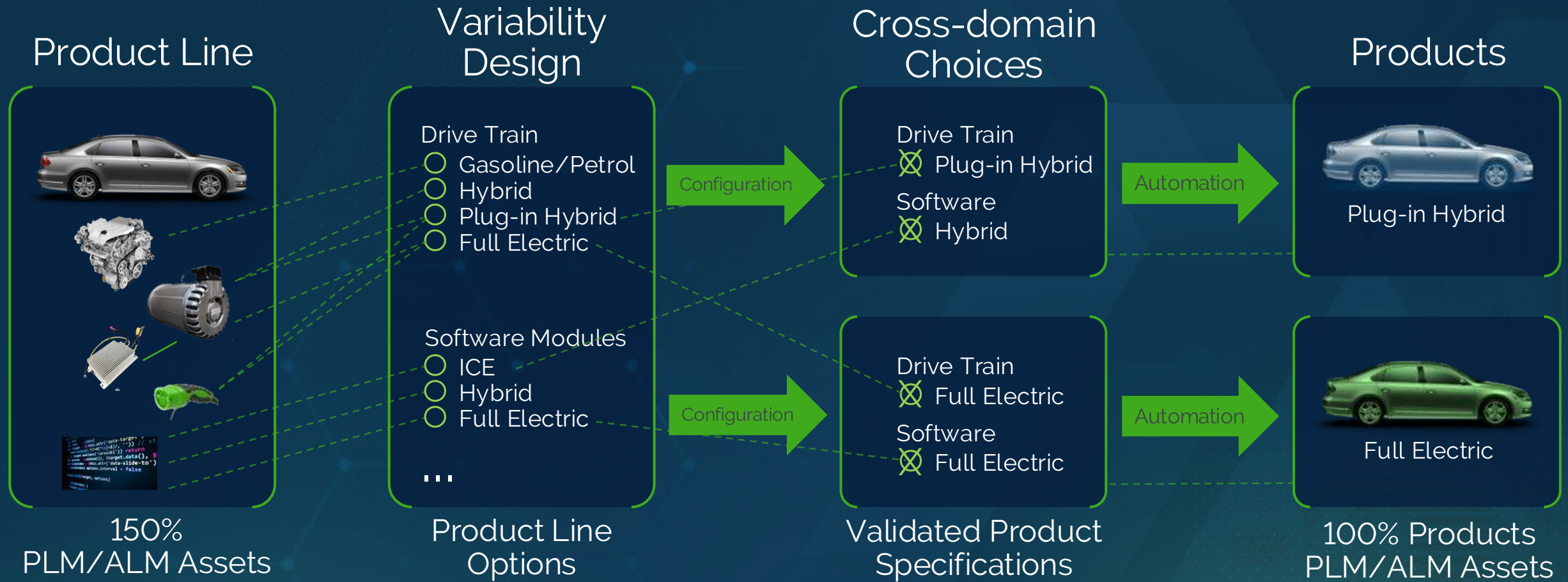


# **FOCUS AREA 1**

## **IPE – PLM & PLE**

# PLANNING CROSS-DOMAIN PRODUCT LINES

Product Line Engineering ... helping to Automate Reuse





**WHAT A DIFFERENCE A  
WORD MAKES...**

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# OUR SCENARIO: JUST A SMALL REQUIREMENTS CHANGE...

- The snowmobile supports manual start via pull crank and <sup>optionally</sup> electric start.

Filtered · Quick Filter · Differences

Model Elements	Level	INDY600	INDY600XT
[-] SnowmobileTechDesign			
[-] ! F SnowmobileTechDesign		✓	✓
[-] ! F ACCESSORIES	7	✓	✓
[-] ? F PASSENGER SEAT	7.4	✓	☐
↔ F NONE	7.4.3	☑	☐
[-] ! F STARTING TYPE	9	✓	✓
✕ F ELECTRIC	9.2	✗	✓
[-] SnowmobileSalesFeatures			
[-] ! F SnowmobileSalesFeatures		✓	✓
[-] ? F COLOR	1	✓	✓
↔ F BLU	1.2	✗	☑
↔ F RED	1.5	☑	✗
[-] ? F PACKAGE	2	✓	✓
↔ F INDY_	2.4	☑	✗
↔ F LXT	2.5	✗	☑
[-] InitialStream			



Snowmobile visual not rendered by Pure Variants

Basic Node - 0041455, HANDLEBAR SWITCHBOX MODULE, 1.2 (Design)

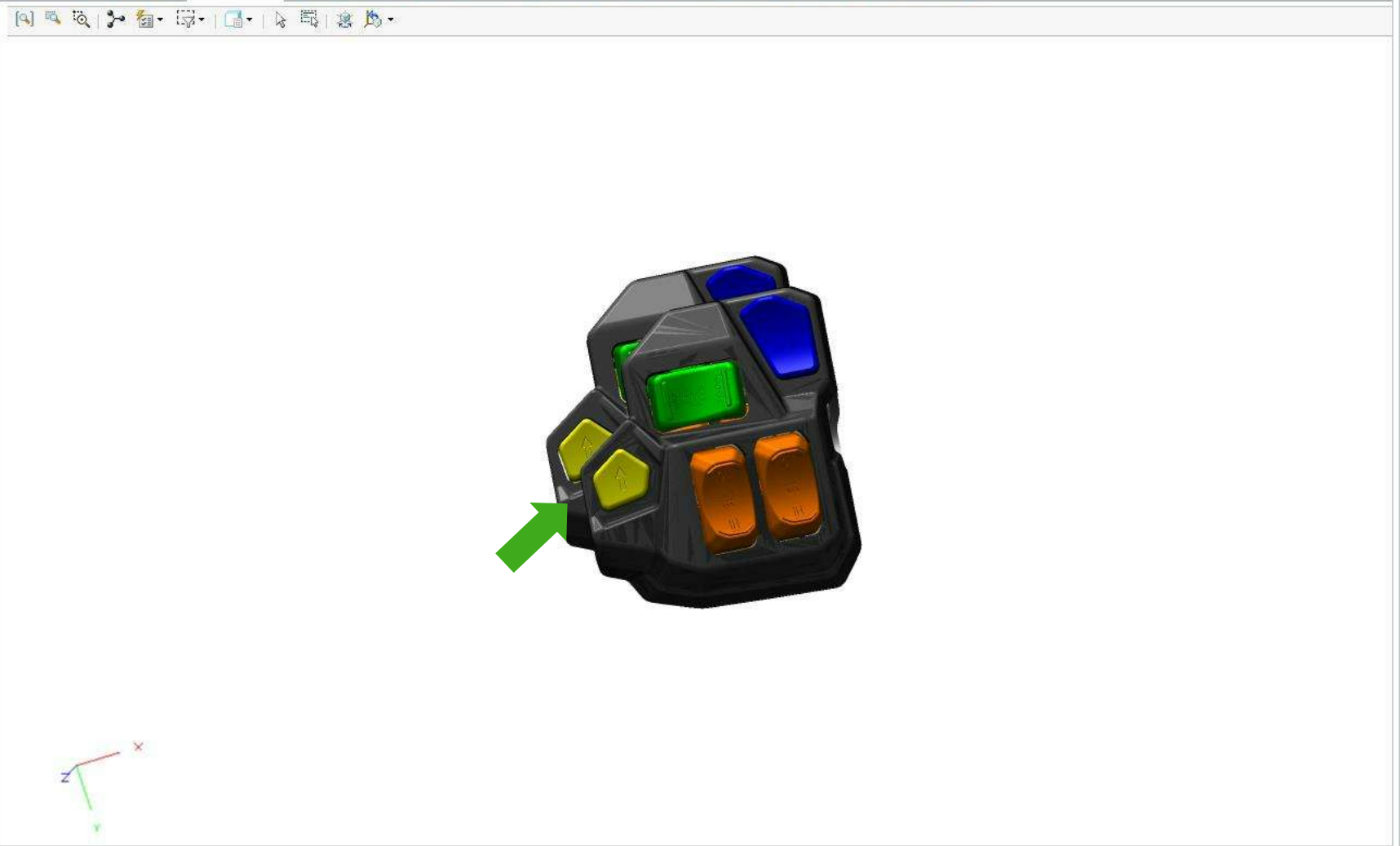
- Details
- Structure
- Related Objects
- Changes
- History
- Where Used
- AML/AVL
- Regulatory
- Effectivity
- FMEA
- New Tab 1

Editing: Insert Existing, Remove, Insert New, Edit  
Check Out/In: Check Out, Revise, Check In, My Checkouts  
Clipboard: Paste, Copy  
Viewing: Show, Hide, Views, Display  
New/Add To: New, Add to  
Filter: Current Filter, Path Filter, Edit Filter, Saved Filters  
Tools: Compare, Open in  
Service: Generate  
Reports: Reports, Export

Find in Structure: All, Advanced, Latest, Design, Working Saved filters

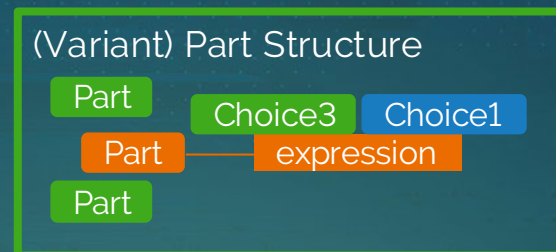
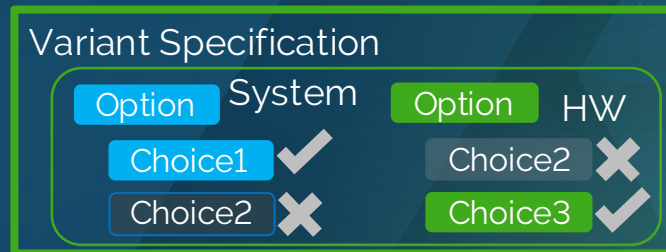
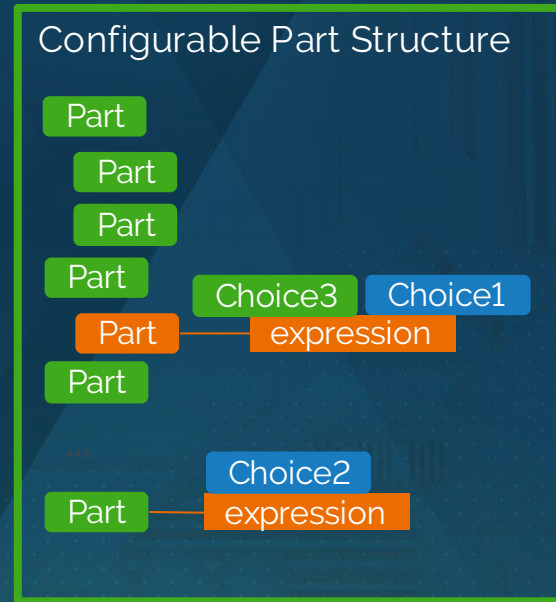
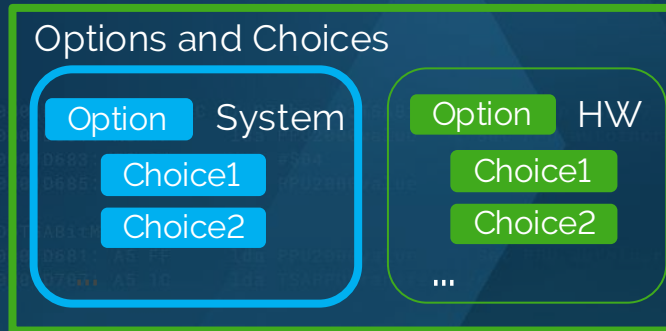
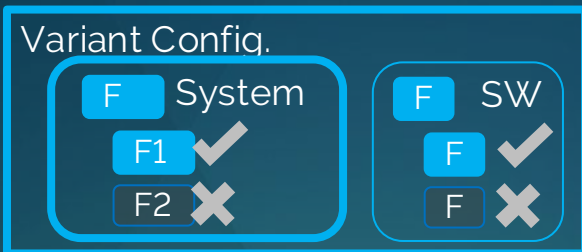
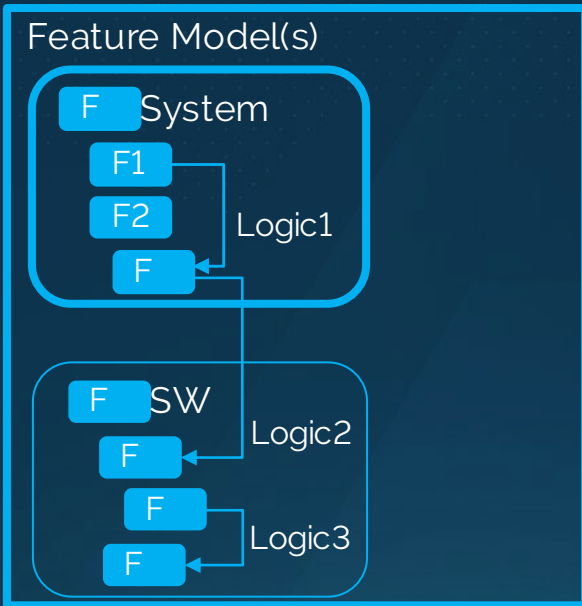
Identity	Change S
0041455, HANDLEBAR SWITCHBOX MODULE, 1.2 (Design)	i
0041452, HANDLEBAR_SWITCHBOX_SIMPLE, 1.3 (Design)	i
0041454, HANDLEBAR_SWITCHBOX_COMPLETE, 1.2 (Design)	i
0041458, HANDLEBAR_SWITCHBOX_COMPLETE_INDY, 1.2 (Design)	i

- Attributes
- Classification
- Visualization
- Traces
- Locators
- Uses
- Occurrences
- Effectivity
- Supersedes
- Documents
- Parameters
- Constraints



Search | Browse  
Navigator

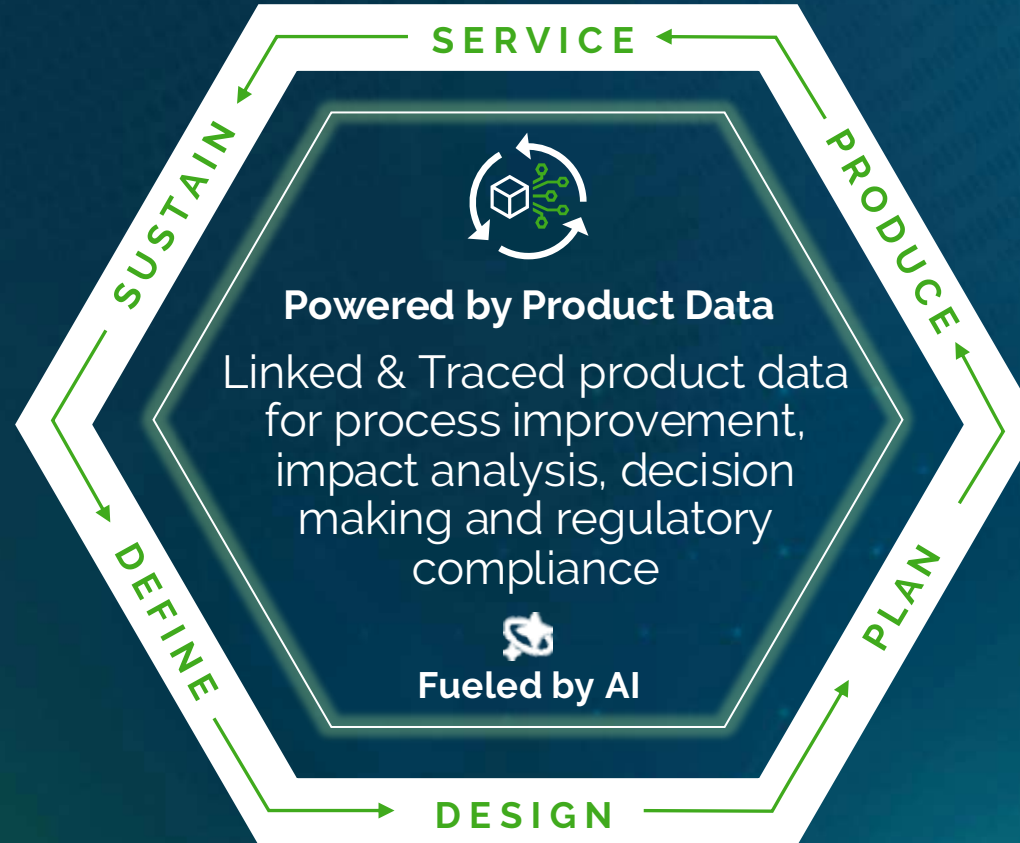
# VARIABILITY CONCEPTS –PURE VARIANTS TO WINDCHILL



# »» PTC's INTEGRATED PRODUCT ENGINEERING

## Orchestration

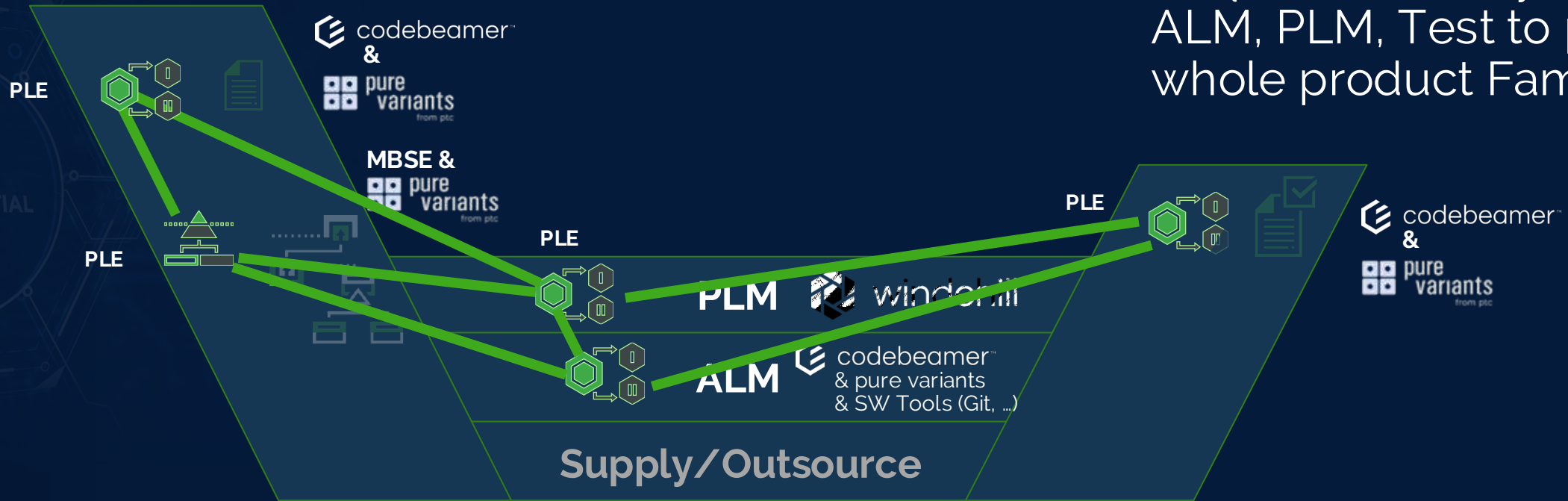
Stakeholder Requirements,  
System Architecture,  
Component & Interfaces,  
Product Families and Test  
Management to build the  
Right Product



## Collaboration

Coordinated Lifecycles,  
Task and Change Collaboration  
across engineering domains,  
Supplier Collaboration & Virtual  
Co-simulation

PLE connected across Requirements, Systems, ALM, PLM, Test to plan whole product Families



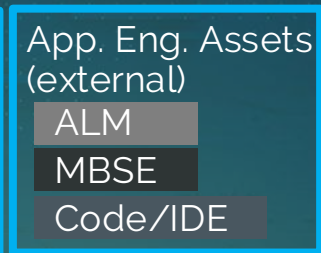
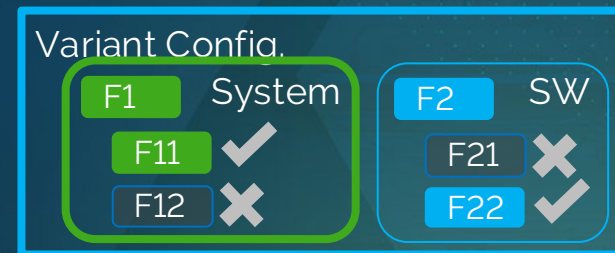
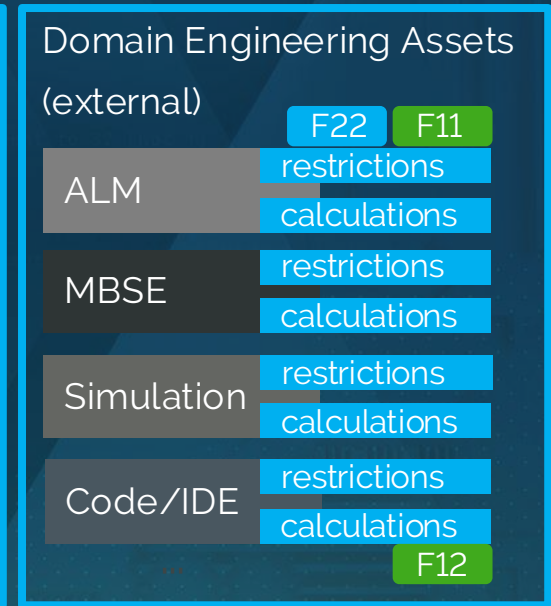
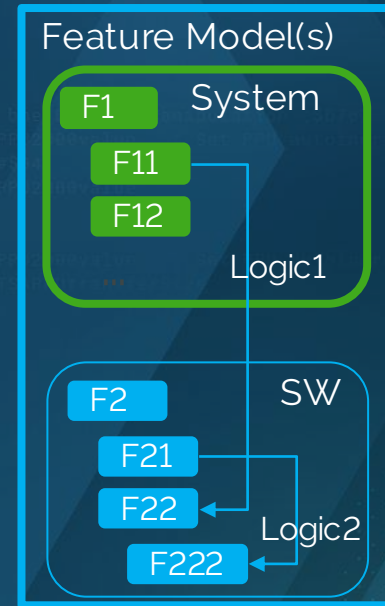
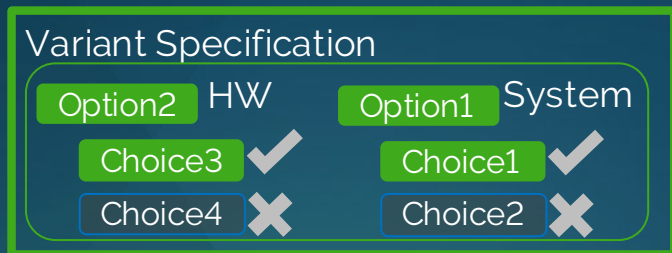
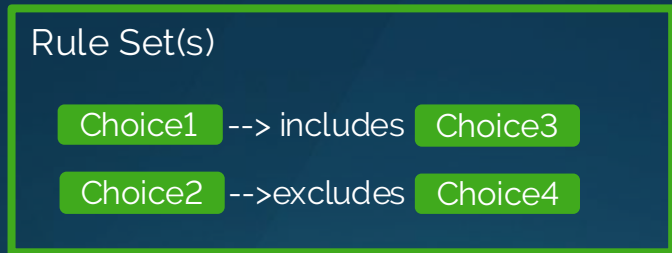
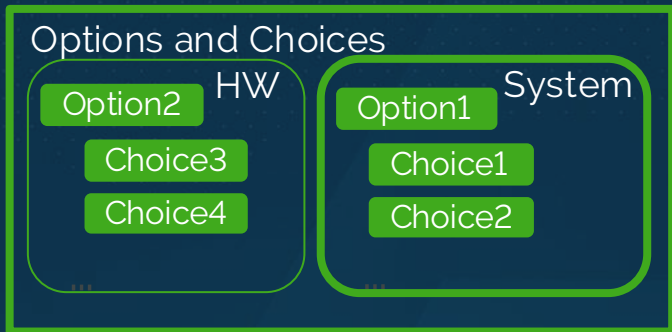
Collaborative whole product line engineering to build the right product for each customer, maximize reuse and minimize variation

# VARIABILITY CONCEPTS – WINDCHILL TO PURE VARIANTS



Expose Shared Options and Choices

Expose Shared Choice Selection



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# TL;DL

- Planned Release: Dec 2026
- Phase 1 of 3; From Collaborative PLE over Linked PLE to Integrated PLE
- Deep Dive // Your Thoughts; Join us in breakout group 1

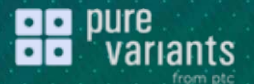


**FOCUS AREA 2**

**ALM – CB+ AND PV**

**Codebeamer** empowers companies to deliver **innovative, safe & secure** software-driven products with **speed and confidence**.

**MASTER COMPLEXITIES.  
INNOVATE FASTER.  
DELIVER RELIABLY.**



**Master Complexity & Compliance**

**Real-time Collaboration & Agility**

**Engineering Efficiency & Velocity**

Requirements Management

Risk Management

Test & Validation

Agile Engineering

Software Engineering

Release Mgt & CI/CD

AI Assistants & Agents

Configuration Management

Product Line Engineering



# CODEBEAMER+ AND PURE VARIANTS

- What is Codebeamer+?

- Codebeamer as a Service from PTC
- Cloud-hosted, SaaS-like experience
  - SLA, Backups, ...
  - PTC DevOps
  - PTC responsible for updates and upgrades
- Single-tenant flexibility (with guardrails)



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# CODEBEAMER+ AND PURE VARIANTS

What is it?

When will it be available?

Why not (Codebeamer//  
Pure Variants)+?

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# CODEBEAMER+ AND PURE VARIANTS

What is it?

When will it be available?

Why not (Codebeamer//  
Pure Variants)+?

**Codebeamer+ and Pure Variants** Codebeamer server components **deployed** and **operated by PTC**

**Pure Variants Enterprise** **deployed** and **operated by customer**

Fully supported by PTC from **CB+ 3.3 & PV 7.3** (June 26)

Conditions apply!

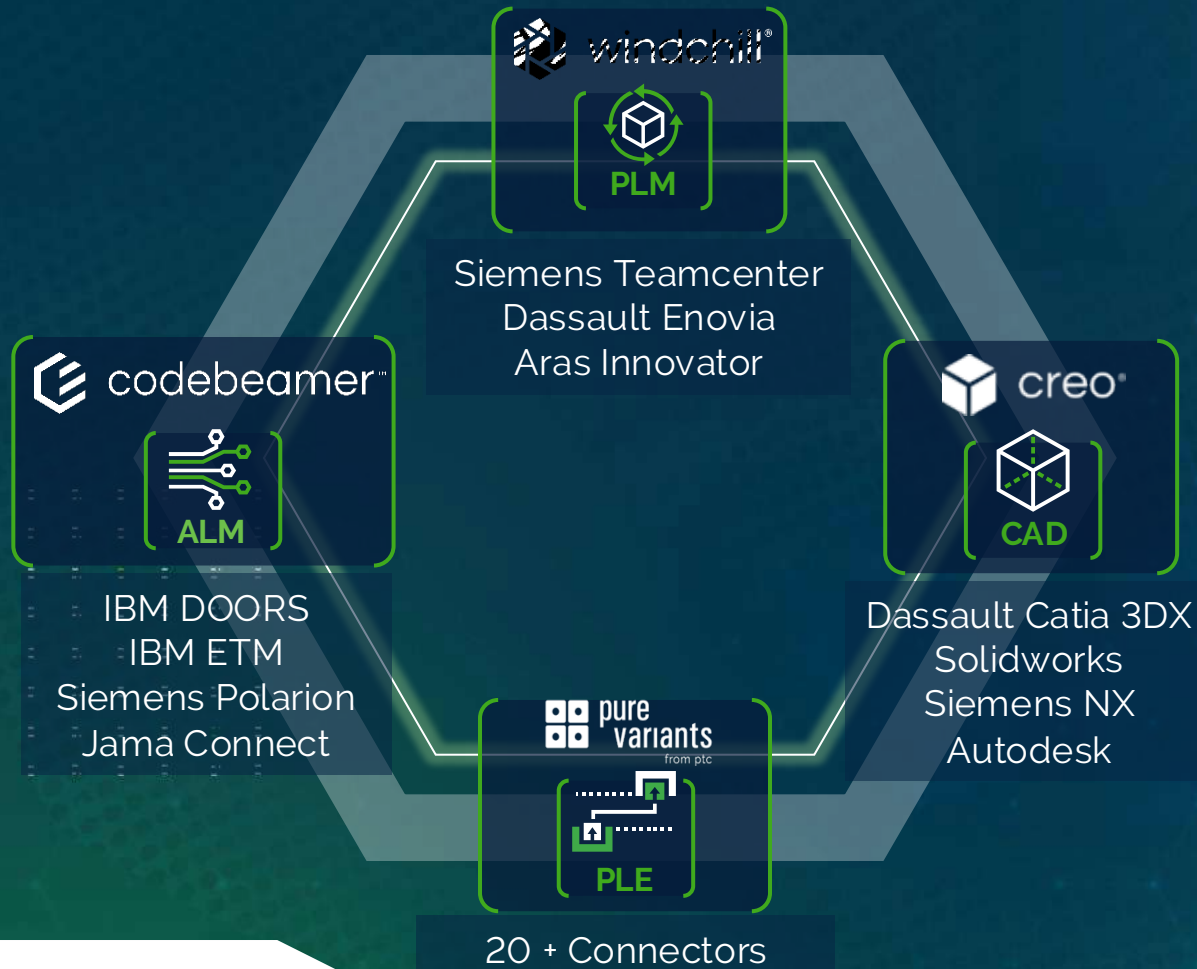
Most **Pure Variants Connectors for 3<sup>rd</sup> party tools** are still desktop-bound and **require the PureVariants Desktop Client** to be deployed



# **FOCUS AREA 3**

## **OPENNESS**

# OPEN IPE



Standards-based  
e.g. OSLC

Open to Partnering  
with Competitors

End-to-end Integration

Your Open Engineering System Environment - Connecting PTC & 3<sup>rd</sup> Party Products

# OPENNESS TO SUPPORT YOUR ECOSYSTEM

Which 3<sup>rd</sup> party integrations did we retire in the last 36 months? Please point them on the image



# OPENNESS TO SUPPORT YOUR ECOSYSTEM

- What about continued support for competing ALM solutions?

- market and customer relevance
- continued availability and access to API and licenses
- business value for PTC and/or partner ecosystem interest



- What about new 3<sup>rd</sup> party integrations?

- So glad you asked...

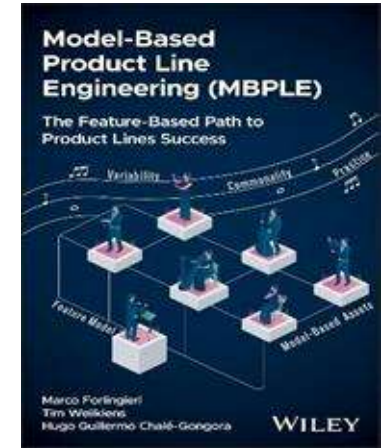
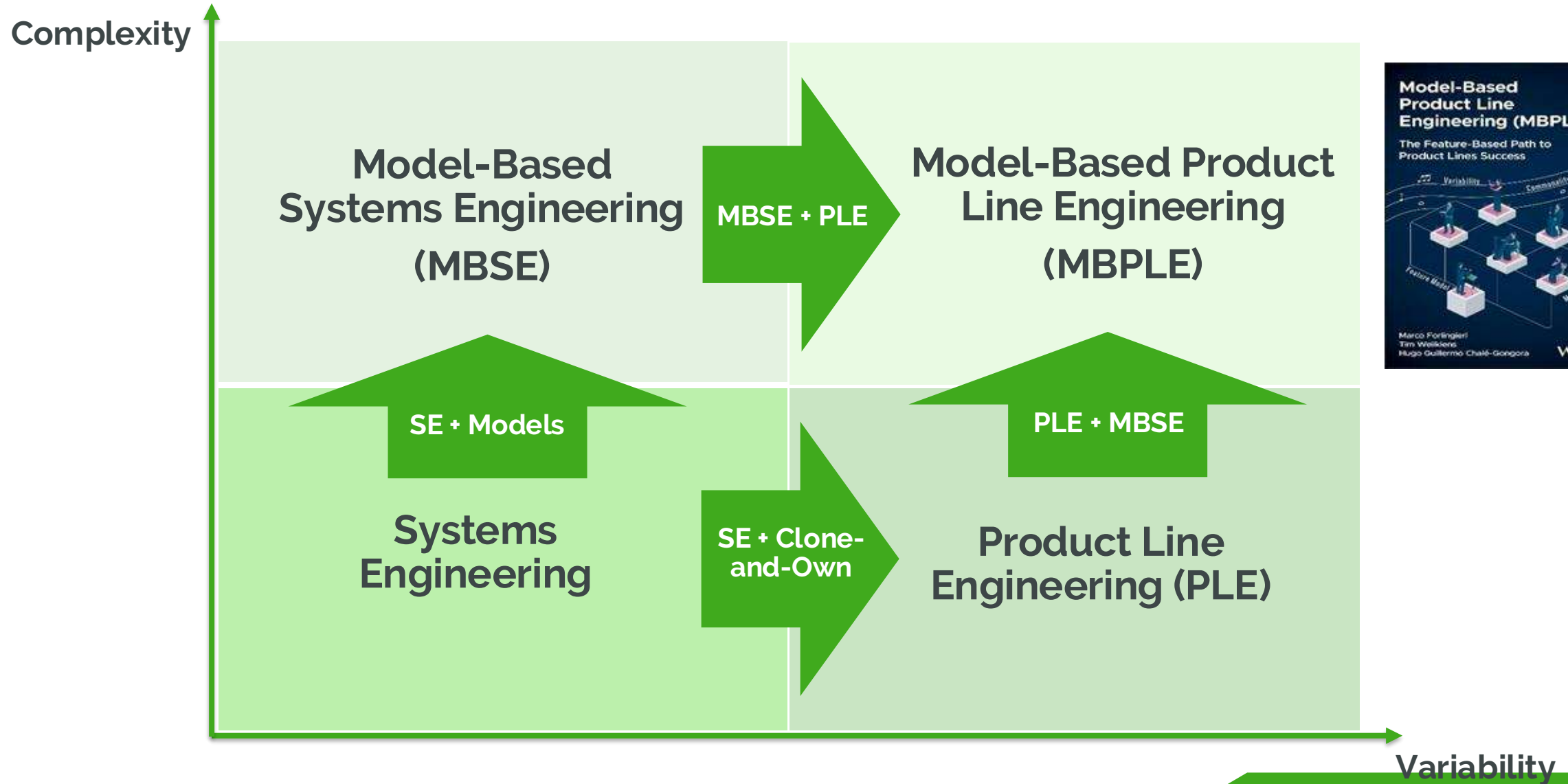




**FOCUS AREA 4**

**MBPLE – PV & SYSML V2**

# TOWARDS MODEL-BASED PRODUCT LINE ENGINEERING 2.0



The image displays the CATIA Magic software interface. The main window shows a detailed powertrain system diagram with components such as Diesel Combustion Engine, Gas Combustion Engine, Belt Starter Generator, Inverter HV, VCU, Electric Motor, HV Battery, Brake Energy Recovery, DC/DC Converter, and 12V Battery. The diagram is color-coded: red for combustion engines, yellow for generators and inverters, green for electric components, and orange for batteries. A green line highlights a path from the DC/DC Converter to the VCU and then to the HV Battery.

On the right side, the 'pure:variants' tree is visible, showing a hierarchical structure for 'Full Vehicle integration/FullVehicleVariants'. The 'Battery\_Electric\_Vehicle' folder is expanded, showing various vehicle configurations. The 'EU' region is selected, and the 'EU' variant is active. Other variants include 'China', 'Japan', 'South Korea', 'EMEA', 'North America', 'Canada', 'Mexico', and 'USA'. The 'ADAS\_System' folder is also expanded, showing 'Park Assistance', 'Perpendicular Parking', and 'Parallel Parking'.

# VARIANT MODEL DRIVES SYSTEM CONFIGURATION

*Pure Variants in Catia Magic enables consistent reuse*



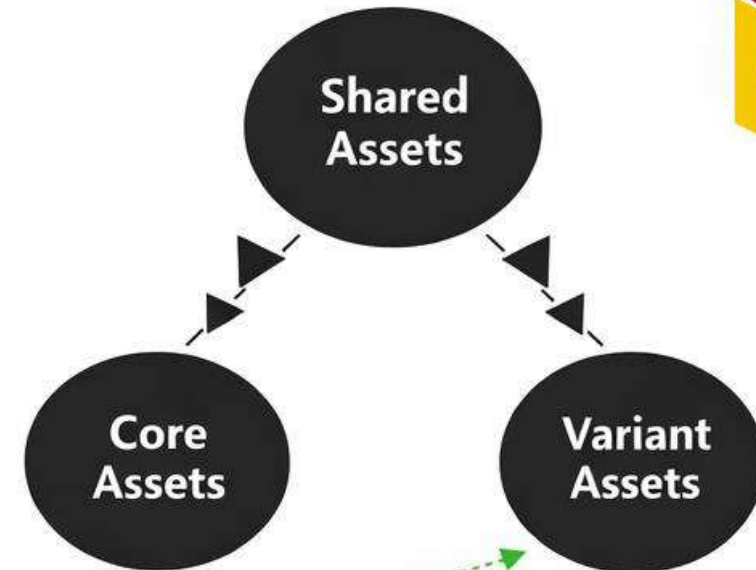
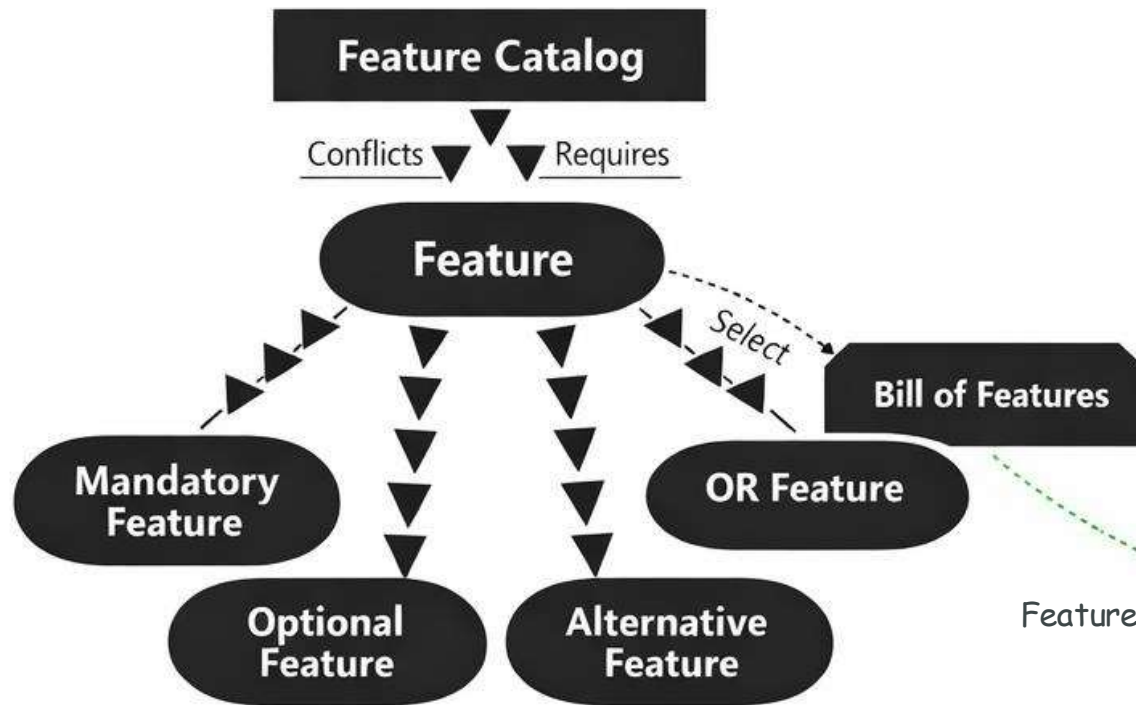
# PLE IN SYSML V2

## Simplified Information Model

ISO/IEC 26580:21

### Set of Product Line Features

### Set of Product Line Shared Assets



Feature Restriction

# PLE IN SYSML V2

## Simplified Information Model

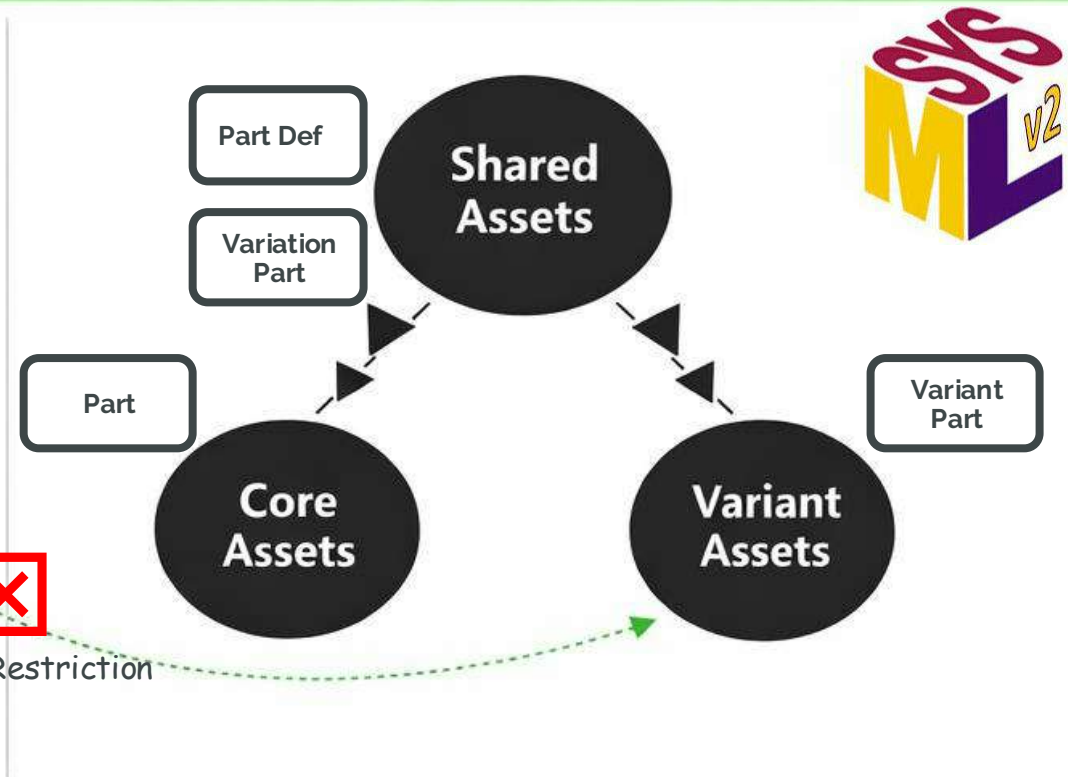
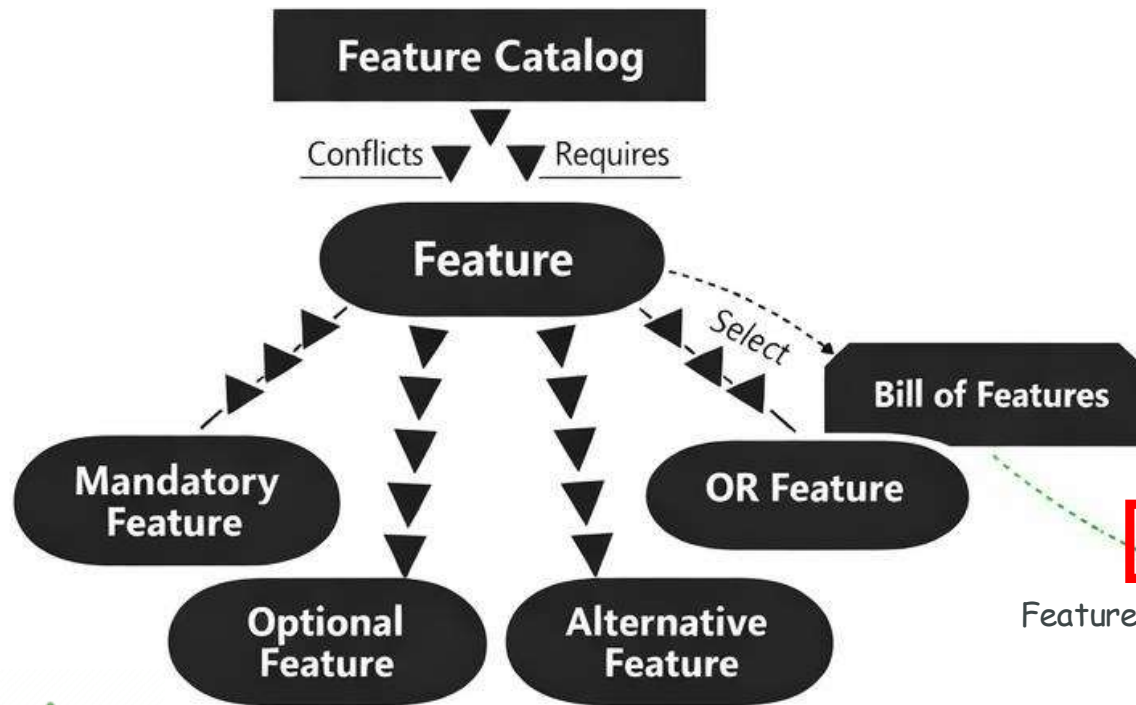


Not covered in SysML v2

SysML v2

Set of Product Line Features 

Set of Product Line Shared Assets

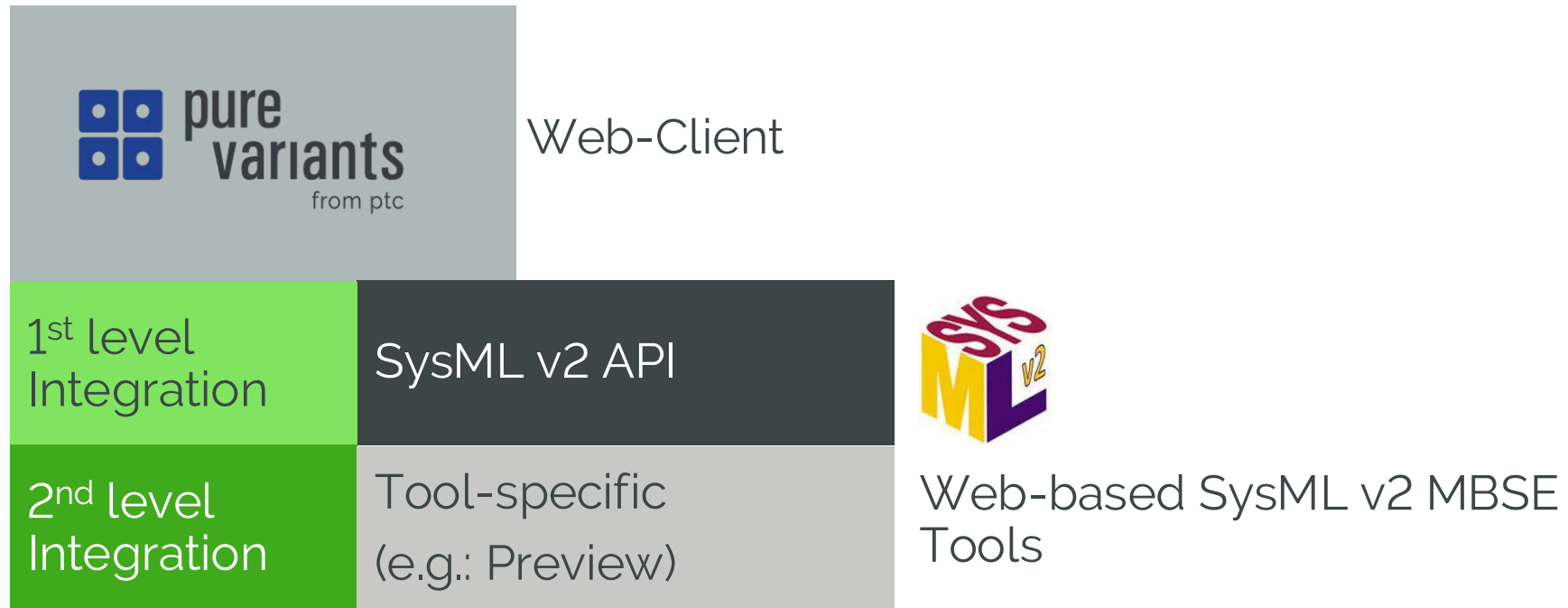


### Key Challenge

How to connect the SysML v2 "variant part" with a Feature?

# PLE IN SYSML V2

## Way forward – In development with third party MBSE: Rhapsody SE



### Step 1

Use the SYSML v2 API & Services to build 1<sup>st</sup> level as priority!

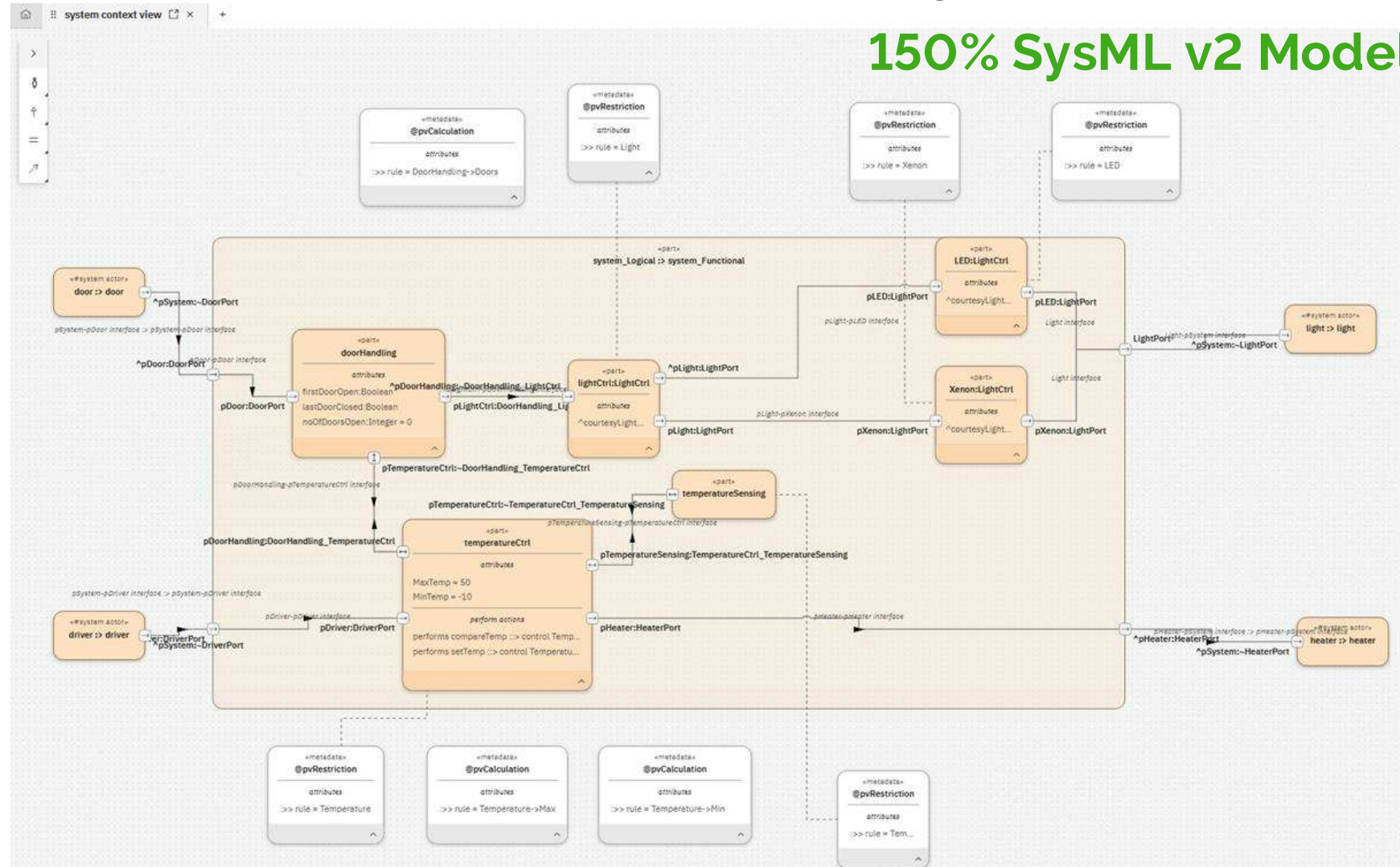
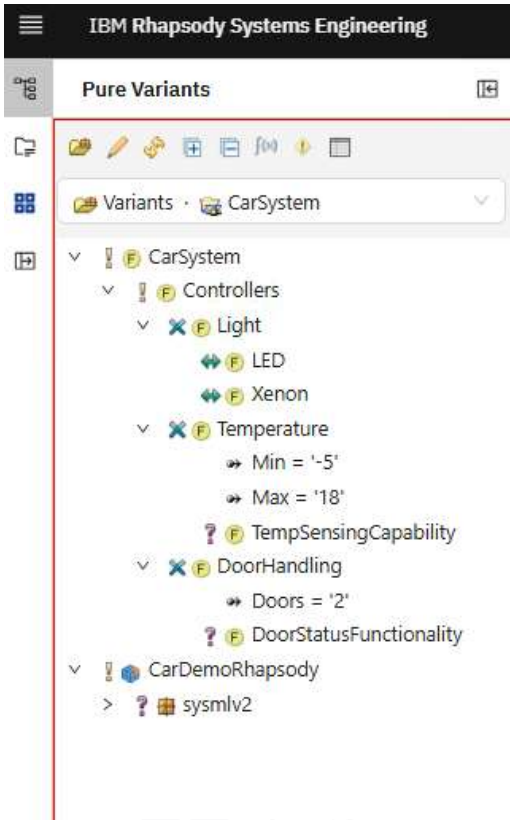
### Step 2

Refine the integration based on the specific MBSE Tool on 2nd level integration.

# PLE IN SYSML V2

## Way forward – In development with third party MBSE: Rhapsody SE

150% SysML v2 Model



# PLE IN SYSML V2

## Way forward – In development with third party MBSE: Rhapsody SE

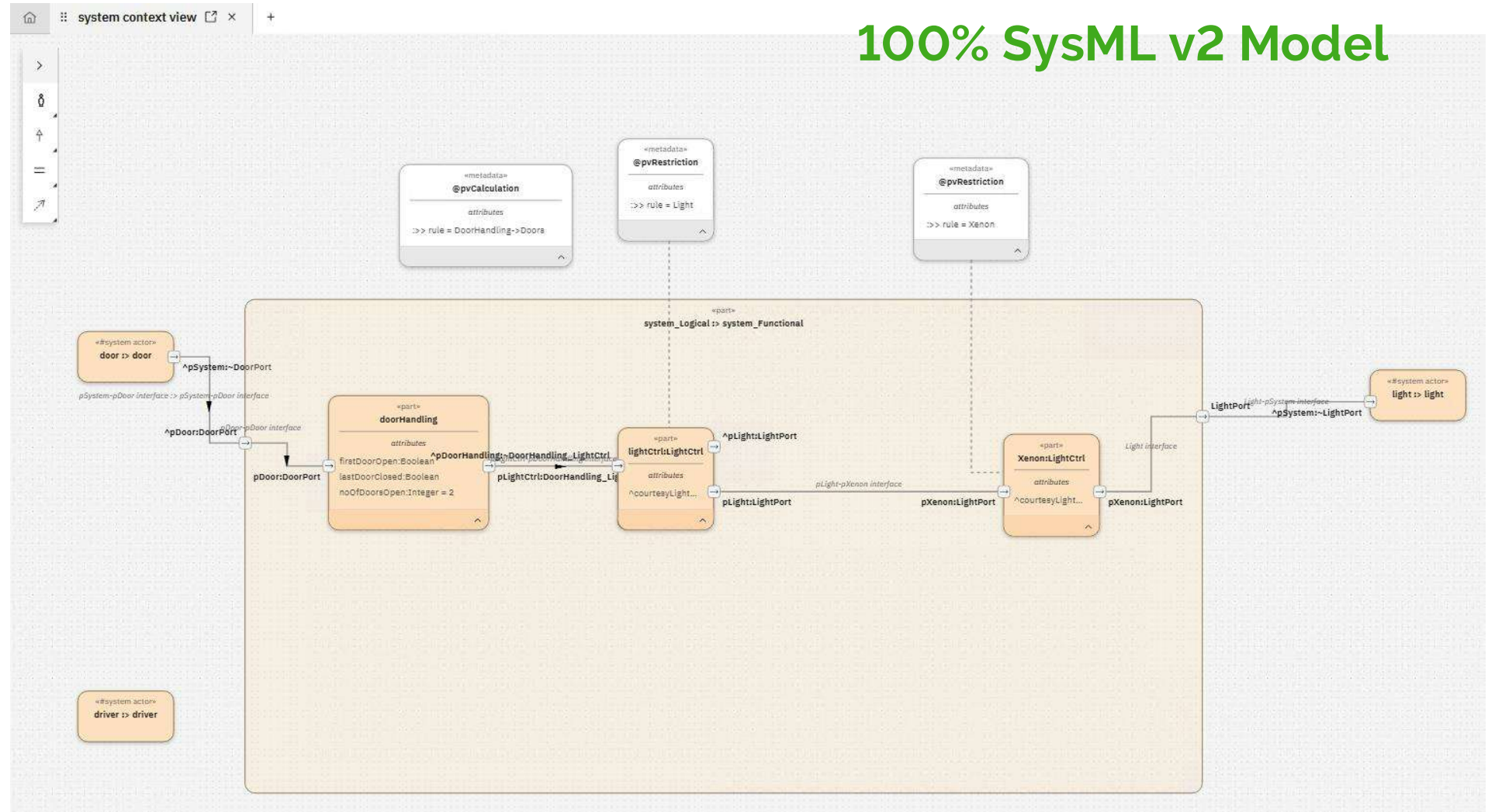
### 100% SysML v2 Model

IBM Rhapsody Systems Engineering

Pure Variants

Basic

- CarSystem
  - Controllers
    - Light
      - LED
      - Xenon
    - Temperature
      - Min = '-5'
      - Max = '18'
      - TempSensingCapability
    - DoorHandling
      - Doors = '2'
    - DoorStatusFunctionality
- CarDemoRhapsody
  - sysmlv2





The **Optional Variation** will be part of SysML v2.1 future release



## Feature - SysML V2 Model Element Restriction

We can agree that the Feature model is independent of SysML V2, however it would be beneficial to have a standard way to restrict SysML V2 models with external models like the Feature Model. With this first SysML V2 release, we will have to develop our own solution, but it would be great for a second revision and release to include a standard way to restrict features with SysML V2 model.



## Constraints Overlap

In SysML V2 we can define constraints between <<variant>> parts to be able to configure the SysML V2 model and select only the <<variant>> parts needed. Those constraints may overlap with the constraints defined already in the Feature Catalog. How to deal with it? If the SysML V2 can read the Feature Catalog through API, the constraints on SysML V2 could be created automatically based on the Feature Catalog's constraints.



## Optional Variation (not implemented in the current spec)

In commercial practice, the majority of variation points are of the optional form SysML v2 Variation Points with Variants cannot emulate Optional Variation Points

# CHALLENGES

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# TL;DL

- Planned Release: Dec 2026
- Step 1 and Step 2 with Rhapsody SE
- Deep Dive // Your Thoughts; Join us in breakout group 2



**FOCUS AREA 5**  
**COMMUNITY – INCOSE &**  
**OMG**

# PTC Gold Sponsor at IS2025



**Thank you  
to our IS 2025  
Gold Sponsor**

**OTTAWA, CANADA  
26 - 31 JULY 2025**



## OMG Involvement

Actively involved  
in **OMG** for the  
**SysML v2**  
standard  
development and  
Improvement of  
Variant Notation

# PLE COMMUNITY

# Awards in IS2025 & IW2026

## Best Paper Award in Ottawa



## From 340 to nearly 1000 PLE WG members

### Outreach

Recipient Group: Product Line Engineering Working Group

Recipients: Marco Forlingieri, Chair; Rowland Darbin, Co-Chair

*For outstanding dedication to advancing PLE standards and fostering global collaboration across the automotive, medtech, and electronics industries.*

# Global INCOSE PLE Webinars

**INCOSE WEBINAR 186**

**PRESENTERS**

- SANDY FRIEDENTHAL
- DR. CHARLES KRUEGER

DATE: Wednesday 19 November 2025

TIME: 11:00AM-12:00PM EST (16:00-17:00 UTC)

TOPIC: SysML v2 for Product Line Engineering

**REGISTER**

SUPPORTED BY: Caltech, WEBER STATE UNIVERSITY

**INCOSE WEBINAR 187**

**PRESENTERS**

- Marco Forlingieri
- Tim Weikiens
- Hugo Guillermo Chale Gongora

DATE: Thursday 11 December 2025

TIME: 11:00AM-12:00PM EST (16:00-17:00 UTC)

TOPIC: MBPLE: The Feature-Based Path to Product Lines Success

**REGISTER**

SUPPORTED BY: Caltech, WEBER STATE UNIVERSITY

## Gold Sponsor in Yokohama at the IS2026



4/4 papers accepted

1 panel

1 full-day tutorial

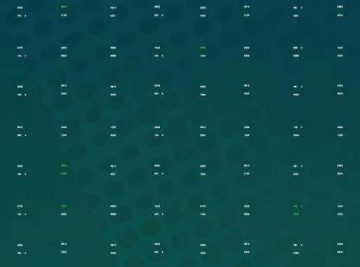
# PLE COMMUNITY



**FOCUS AREA 6**  
**GLOBAL PRESENCE –**  
**LOCAL EXPERTS**

In 2026 PTC is expanding its global expertise with focus on PLE and Pure Variants in North America!

Let us know if you know any PLE expert!



**Automotive Solutions**  
New Role: PLE Expert - Automotive Focus

**Federal Defense & Aerospace**  
New Role: PLE Senior Expert - Defense & Aerospace Focus

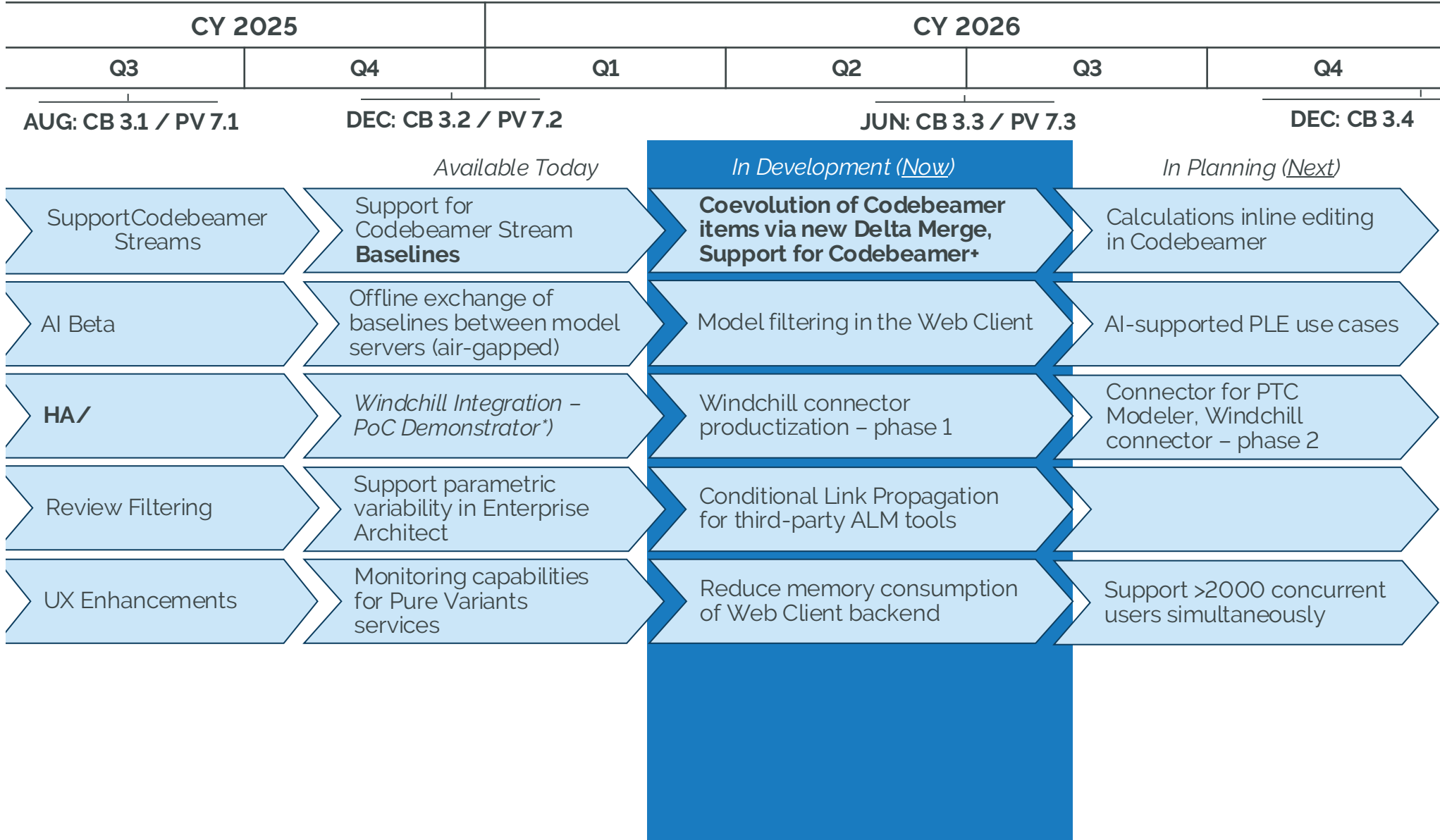
- Advanced Vehicle Systems
- EV & Autonomous Technologies
- Defense Systems & Aerospace
- Military & Space Programs

# PLE GLOBAL PRESENCE



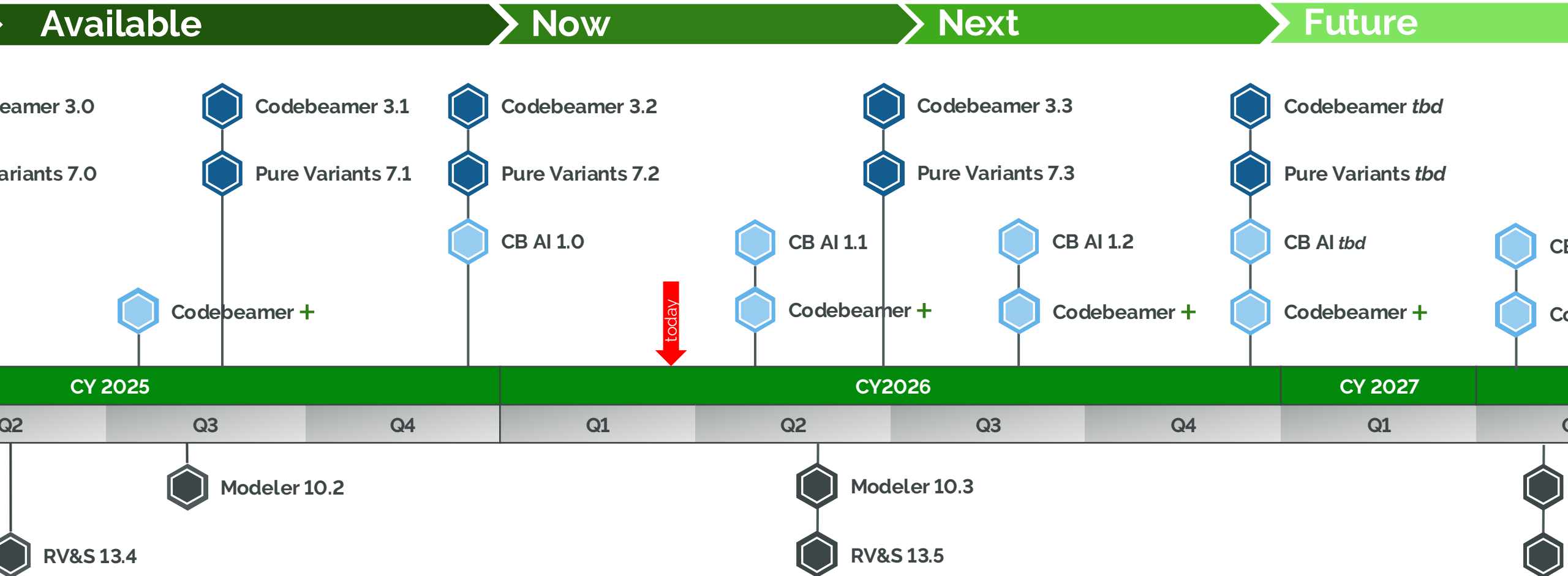
# FINAL BITS

# ROADMAP HIGHLIGHTS (MAR 2026)

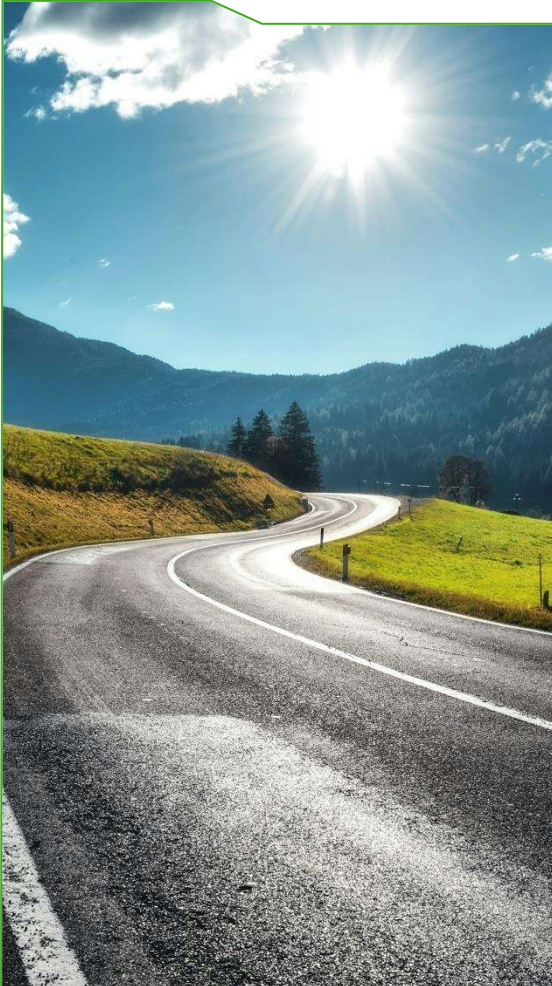


# ALM RELEASE PLAN (JAN 2026)

1. Codebeamer & Pure Variants release at the same time every 6 months.
2. Codebeamer+ and AI are available for different Codebeamer versions.
3. RV&S and Modeler shift to an annual release cycle.
4. 'Now'-stage is planned; 'Next' & 'Future' stages are subject to change!



# ALM INVESTMENT AREAS



**Integrated Product Engineering (IPE):** Cross-functional integrations for traceability, change processes, holistic configuration management, and product line engineering (PLE).



**Codebeamer AI:** Build high-value AI Agents to help customers maximize Requirements Quality, Test Case coverage, Traceability, and Reuse.



**Configuration Management with integrated PLE:** Product Line Engineering based on scalable configuration management supports reuse and variability.



**Industry Solutions with Market Leading Features:** Best-in-class features and industry best practice-driven solutions with tool qualification and certifications



**Improved UX:** Streamline user interaction, harmonize with PTC Design, modernize UI technology, make working with Codebeamer a delightful experience.



**Enterprise Application Infrastructure, Quality, and SaaS:** Meet customer scalability and performance needs, increase product quality, and optimize Codebeamer+



This slide contains forward looking information that is subject to change at any time at PTC's sole discretion and without notice.