

PLE & Requirements

Managing Variability in System and SW Requirements

pure::variants - Variant Management & IBM tool

内容

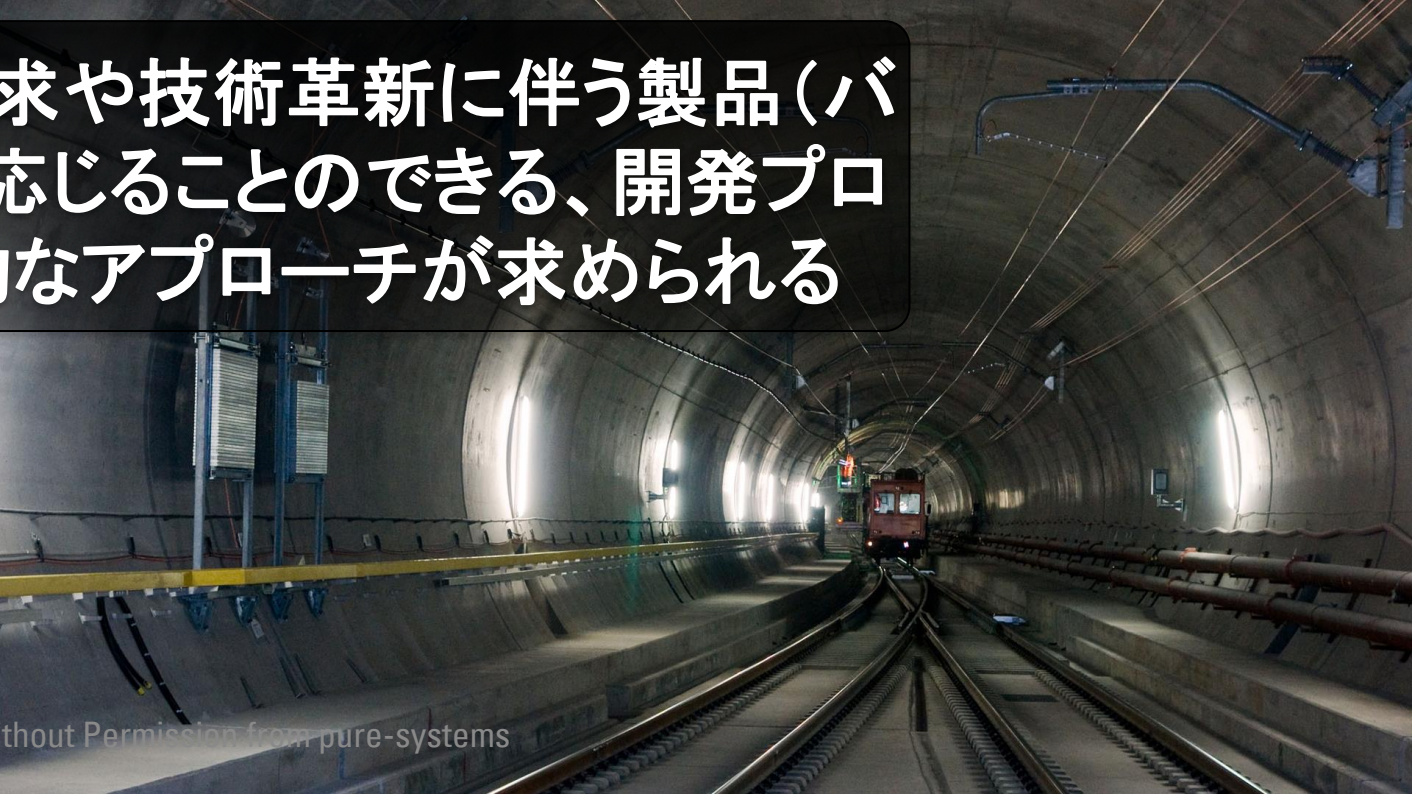
- プロダクトライン開発のバリエーション管理について
- バリエーション管理ツールの機能
- プロダクトライン開発の実践事例



Product Line Engineering (PLE) は、
再利用資産を運用する技術的な取り組み



継続的に変化する市場要求や技術革新に伴う製品（バリエーション）の進化に柔軟に応じることのできる、開発プロセスや手法を伴う全体的なアプローチが求められる



Product Line Engineering Variation Dimensions

製品間の違い
Technical Dimension

プロダクトライン開発の課題として同時に対応すべき2つのバリエーション(変化)がある

この例では、一番上のみ右ハンドルで、下の3つは同様に見えるが違いもある

ここでは製品間の違いのみ



Product Line Engineering Variation Dimensions

製品間の違い
Technical Dimension

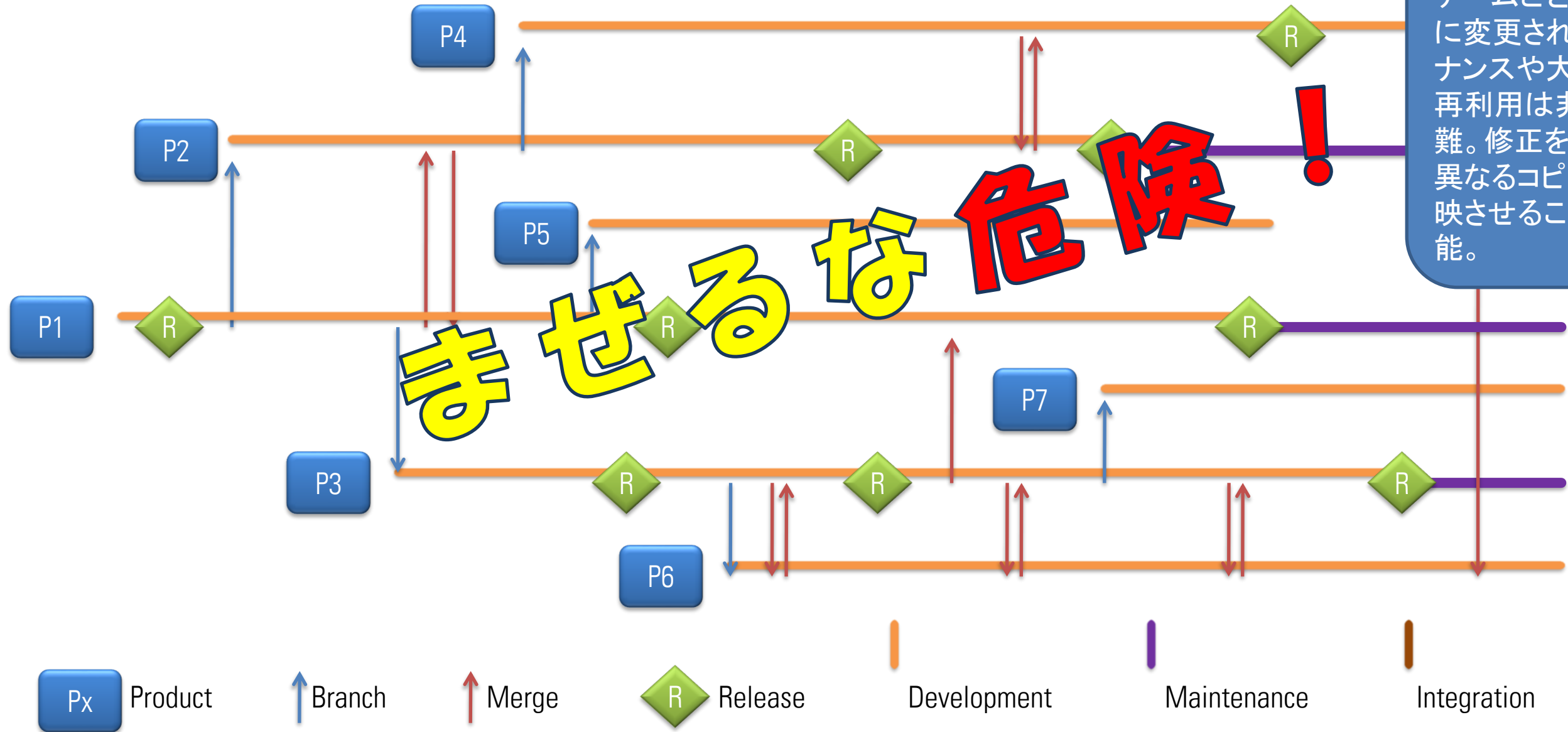
これら製品（バリエーション）は、継続的に変化する市場要求や技術革新を受けて進化する
備えはいるが、どうなるか予測はできない

同時進行で発生するバリエーション（製品間の違い）とバージョンの両方の管理が必要

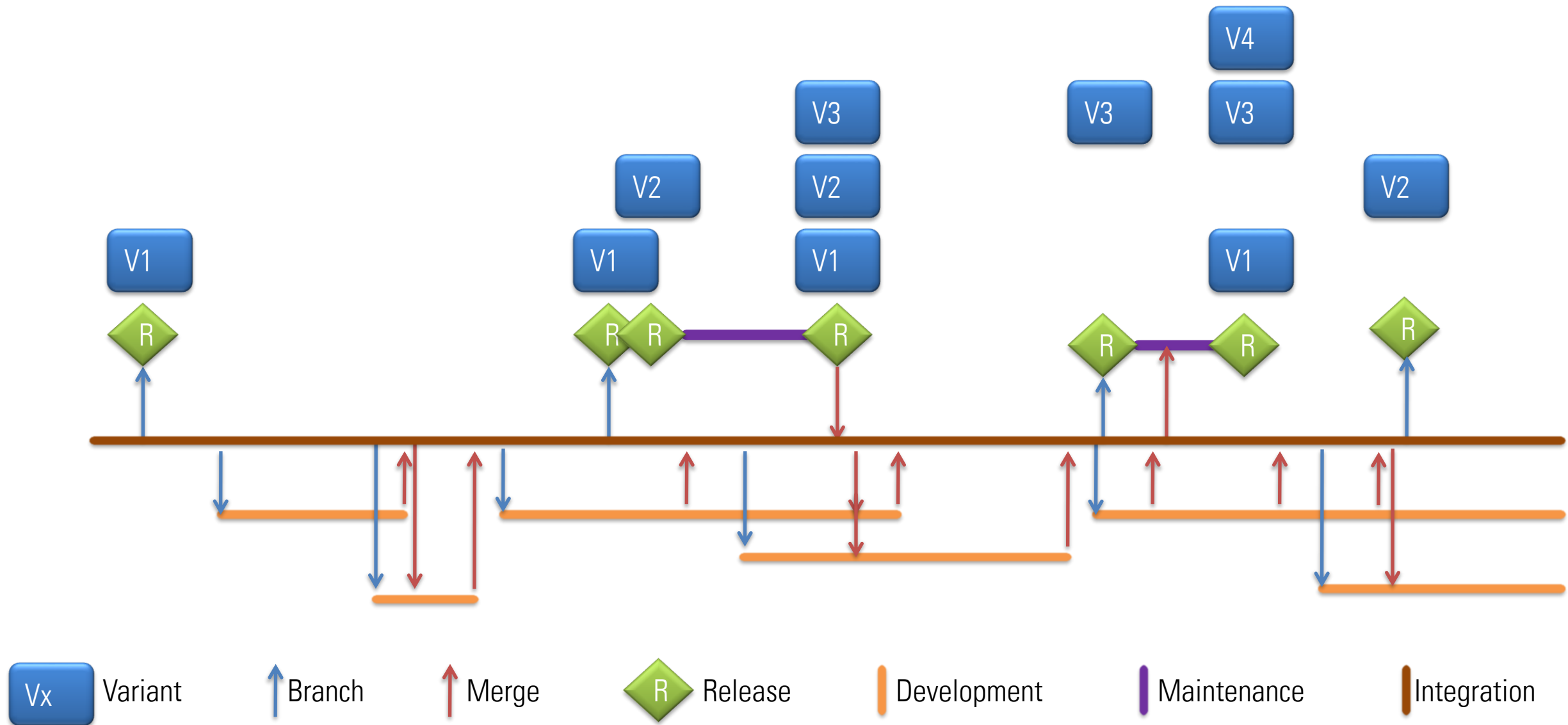


バージョン
Time Dimension

バージョン管理とバリエーション管理を混同すると、



共通資産は異なるチームごとに勝手に変更され、メンテナンスや大規模な再利用は非常に困難。修正を全ての異なるコピーに反映させることは不可能。



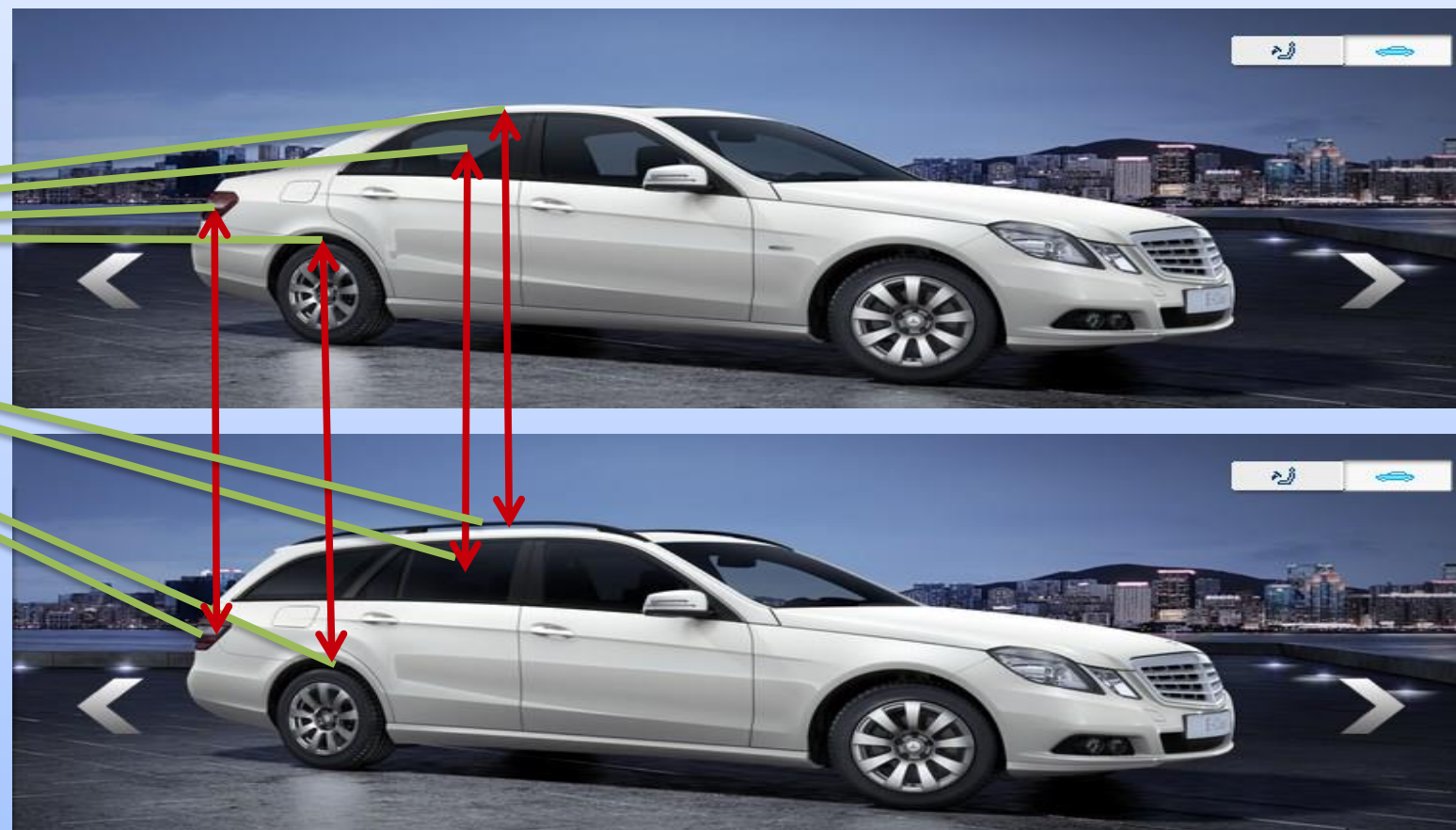
バージョン管理に適正なバリエーション管理ツールを統合することで
プロダクトラインの持続的な進化と保守を支援して体系的な再利用を実現できる

バリエーションポイント

問題空間



解決空間



問題空間上のバリエーションポイントは、解決空間上のテクニカルなそれと結びつき、バリエーションの複雑さを軽減してバリエーションの決定項目を削減できる

Variant Management Solution for Systems & Software Engineering



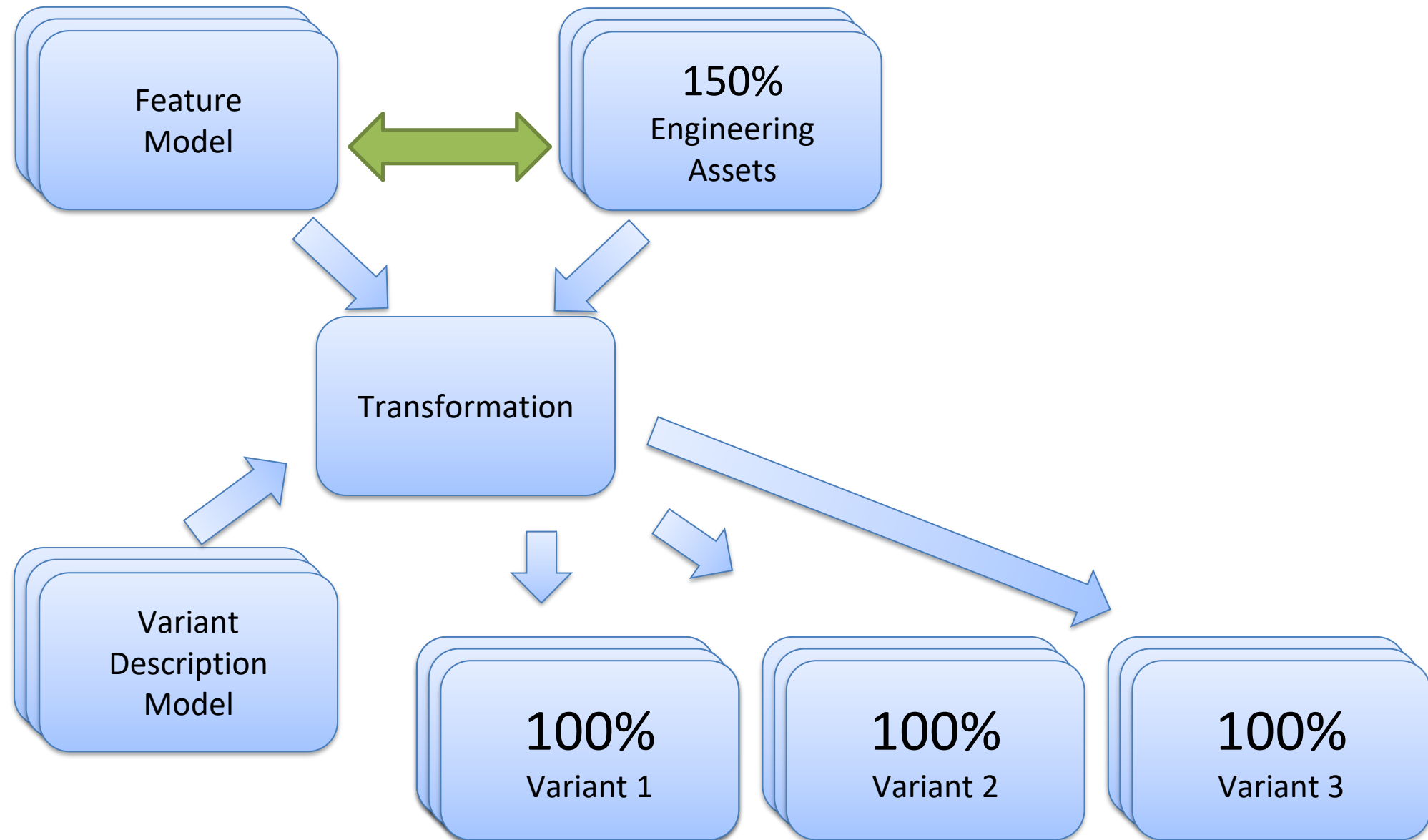
PLEの戦略＝関心事の分離

ドメインエンジニアリング

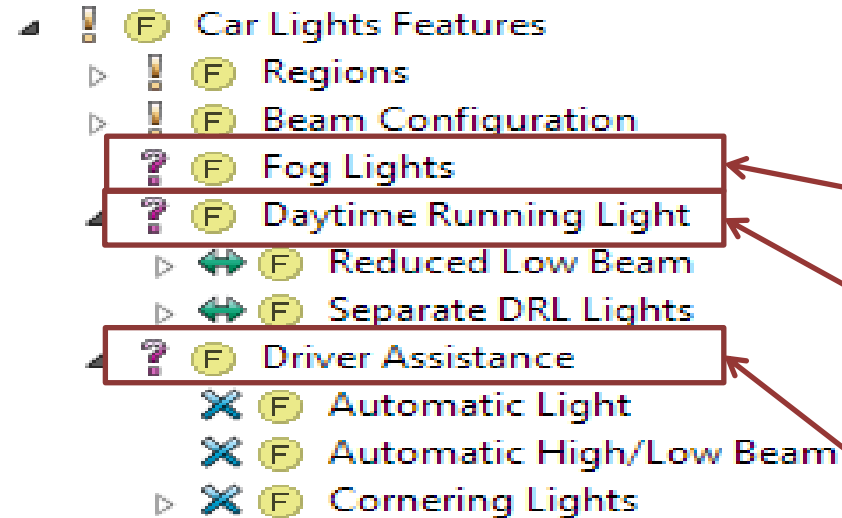


アプリケーションエンジニアリング

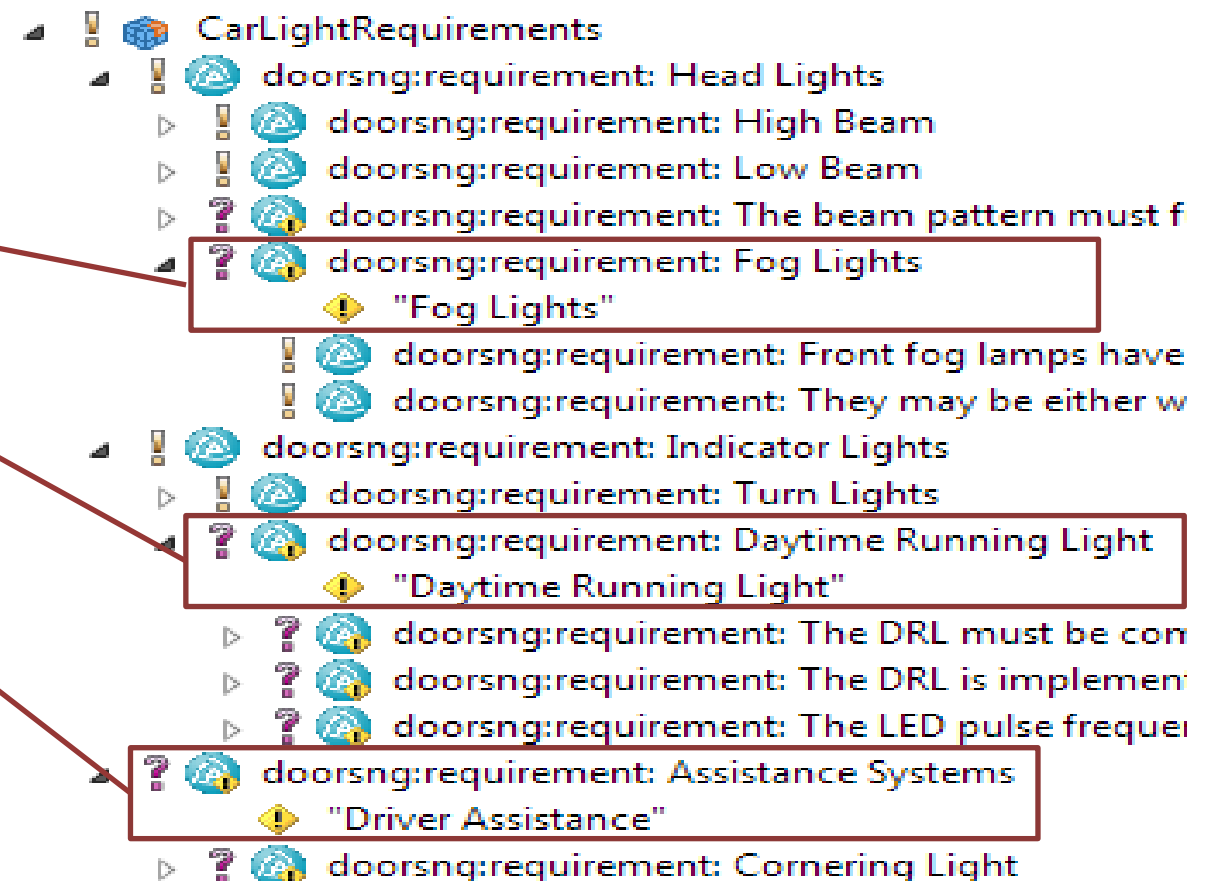
Feature Model-based Variant Management



Feature Models



Family Models

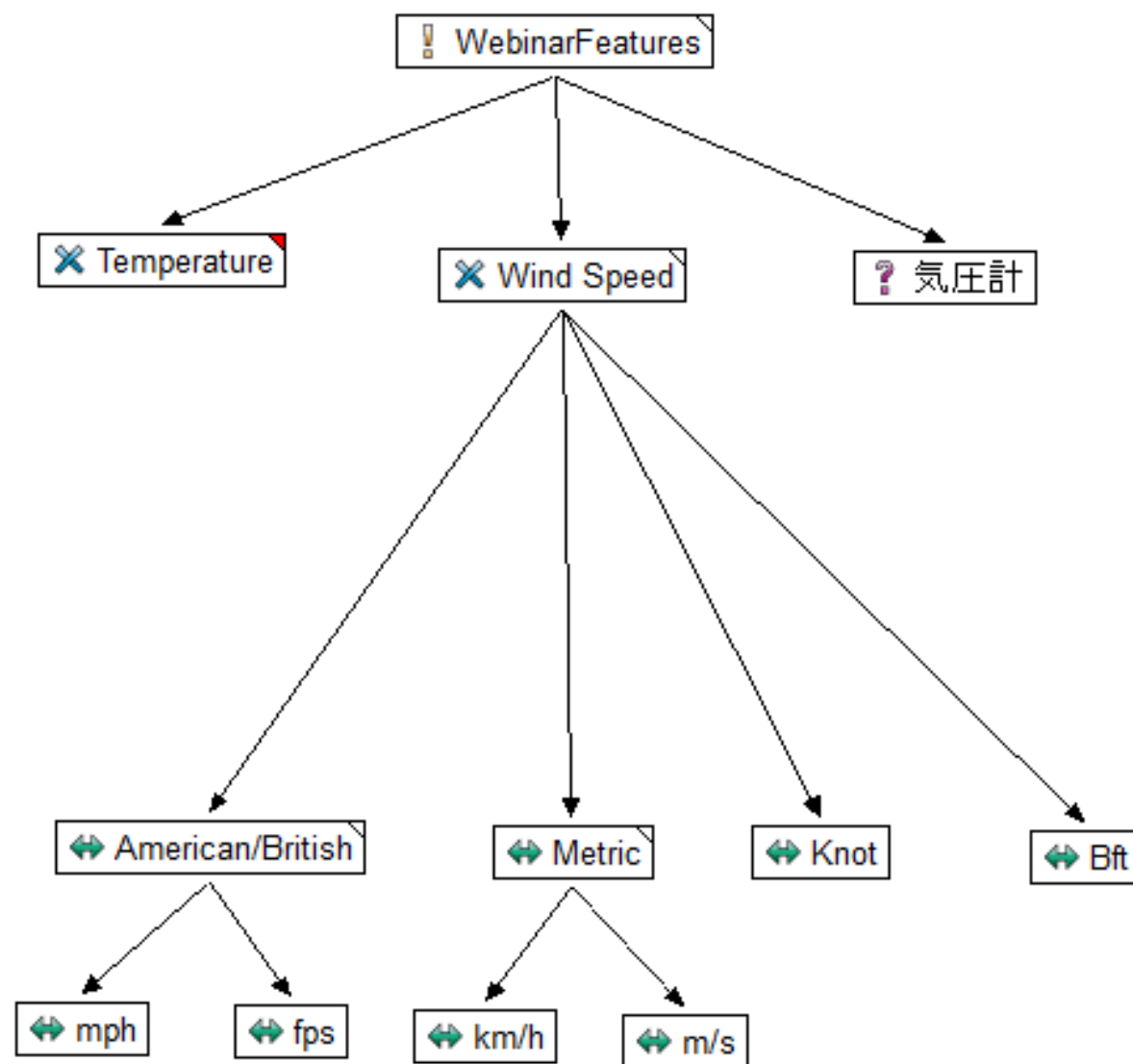


問題空間上の各フィーチャに解決空間内の
バリエーションポイントを紐付ける

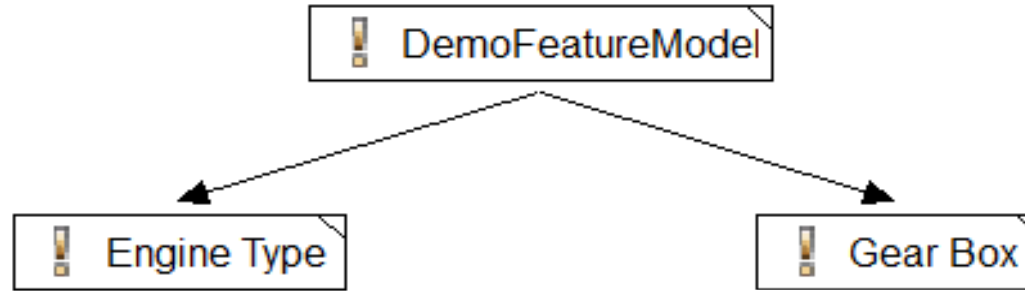
フィーチャモデル: ツリー構造とグラフ表示

*WebinarFeatures.xfm

- WebinarFeatures
 - Temperature
 - Wind Speed
 - Metric
 - km/h
 - m/s
 - American/British
 - mph
 - fps
 - Knot
 - Bft
 - 気圧計

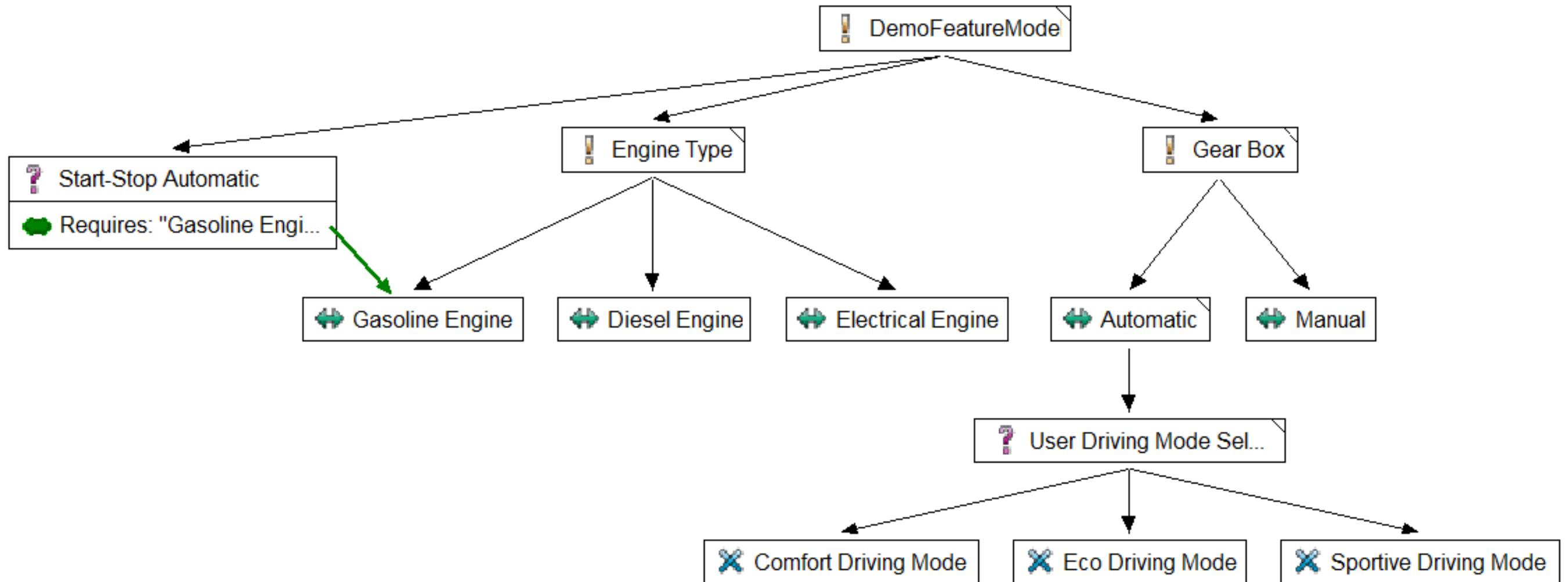


Feature Model（自動車の例）



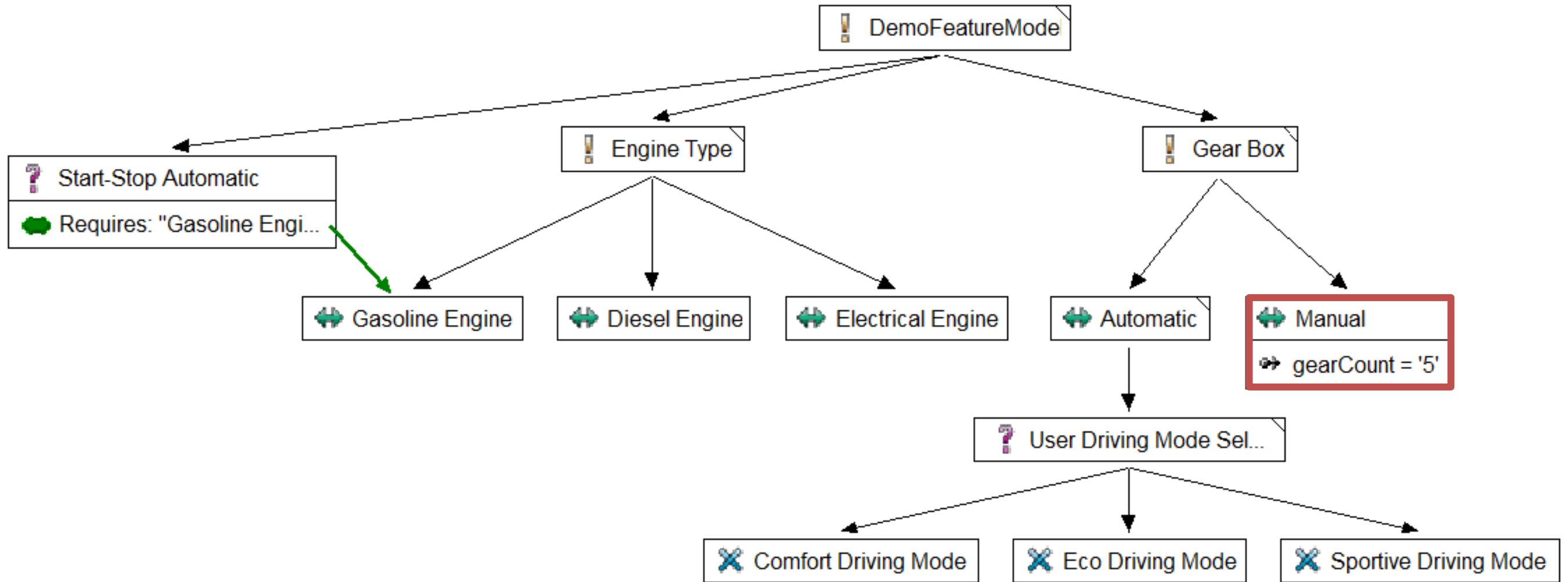
タイプ :  = Mandatory (必須)  = Optional (選択自由)  = Alternative (どれか一つ)  = Or (少なくとも一つ)

Feature Model - Dependencies



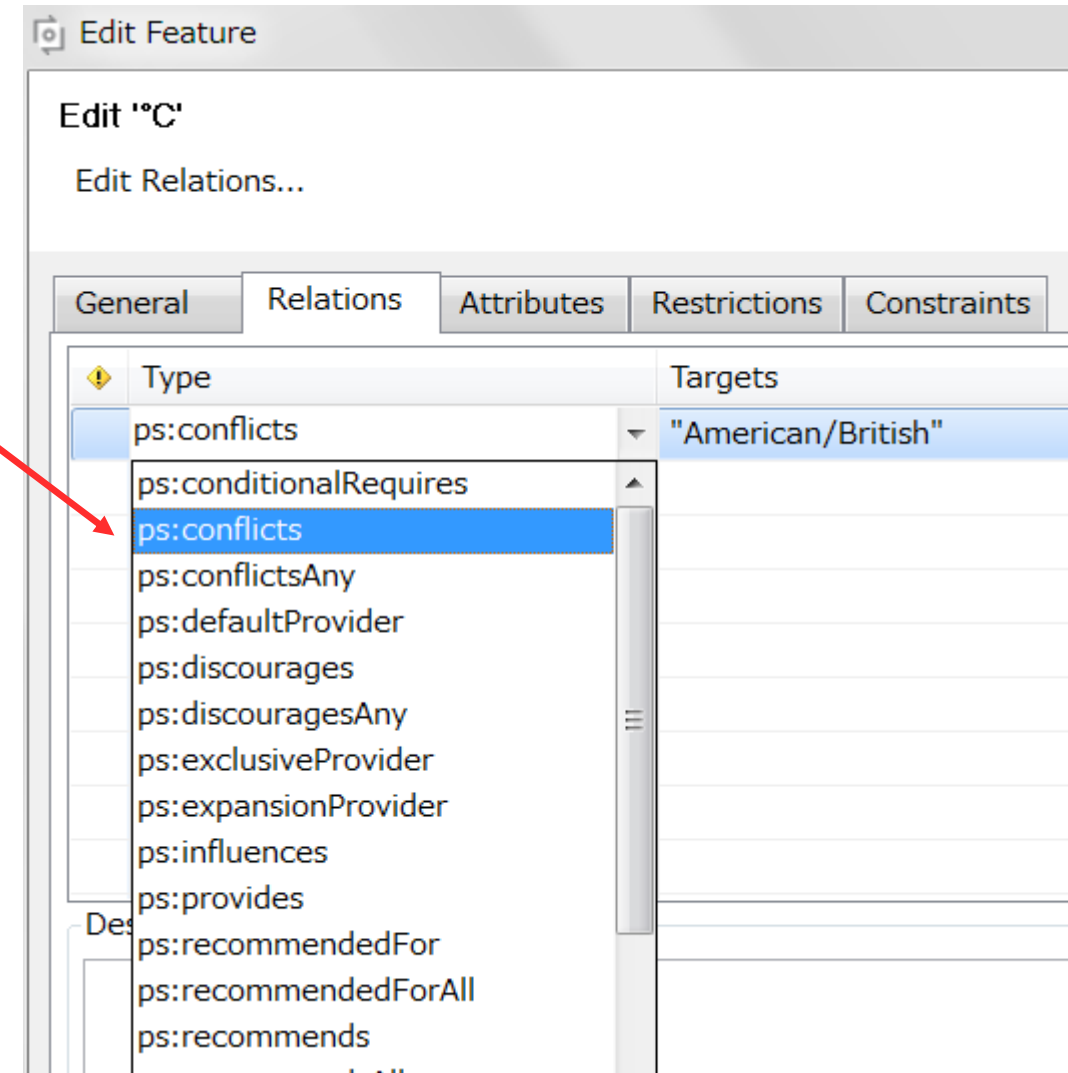
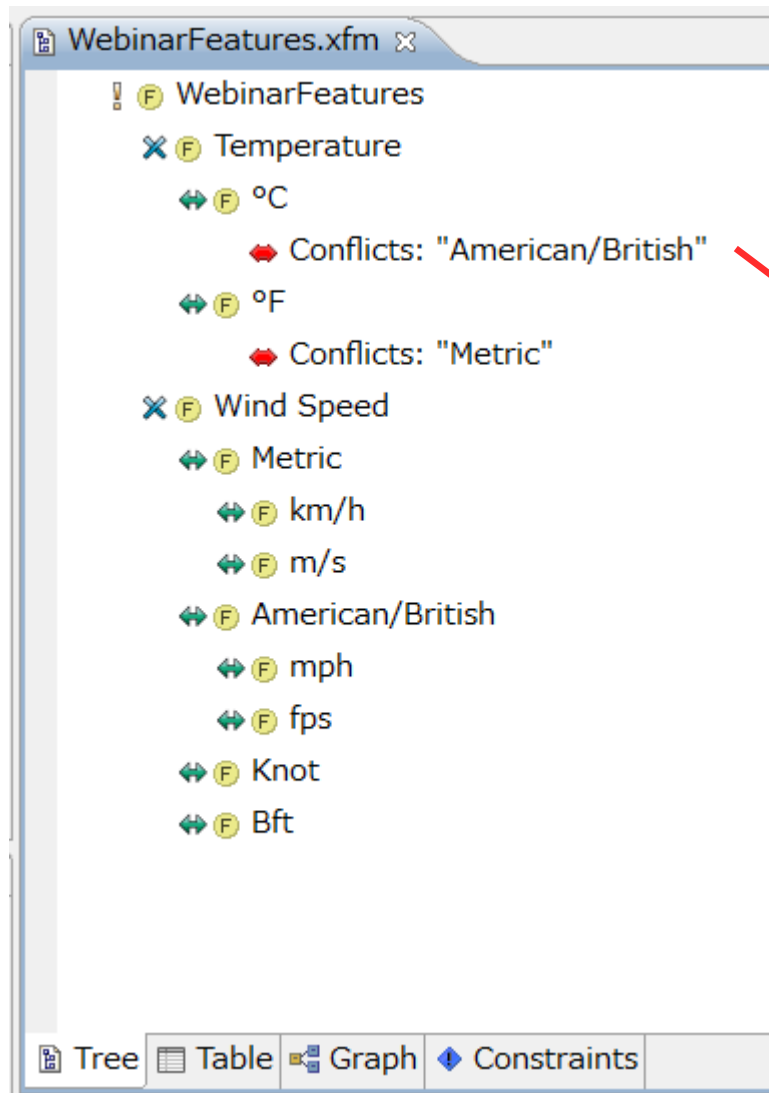
タイプ : = Mandatory (必須) = Optional (選択自由) = Alternative (どれか一つ) = Or (少なくとも一つ)

Feature Model - attribute



タイプ : ! = Mandatory (必須) ? = Optional (選択自由) ↔ = Alternative (どれか一つ) ⌗ = Or (少なくとも一つ)

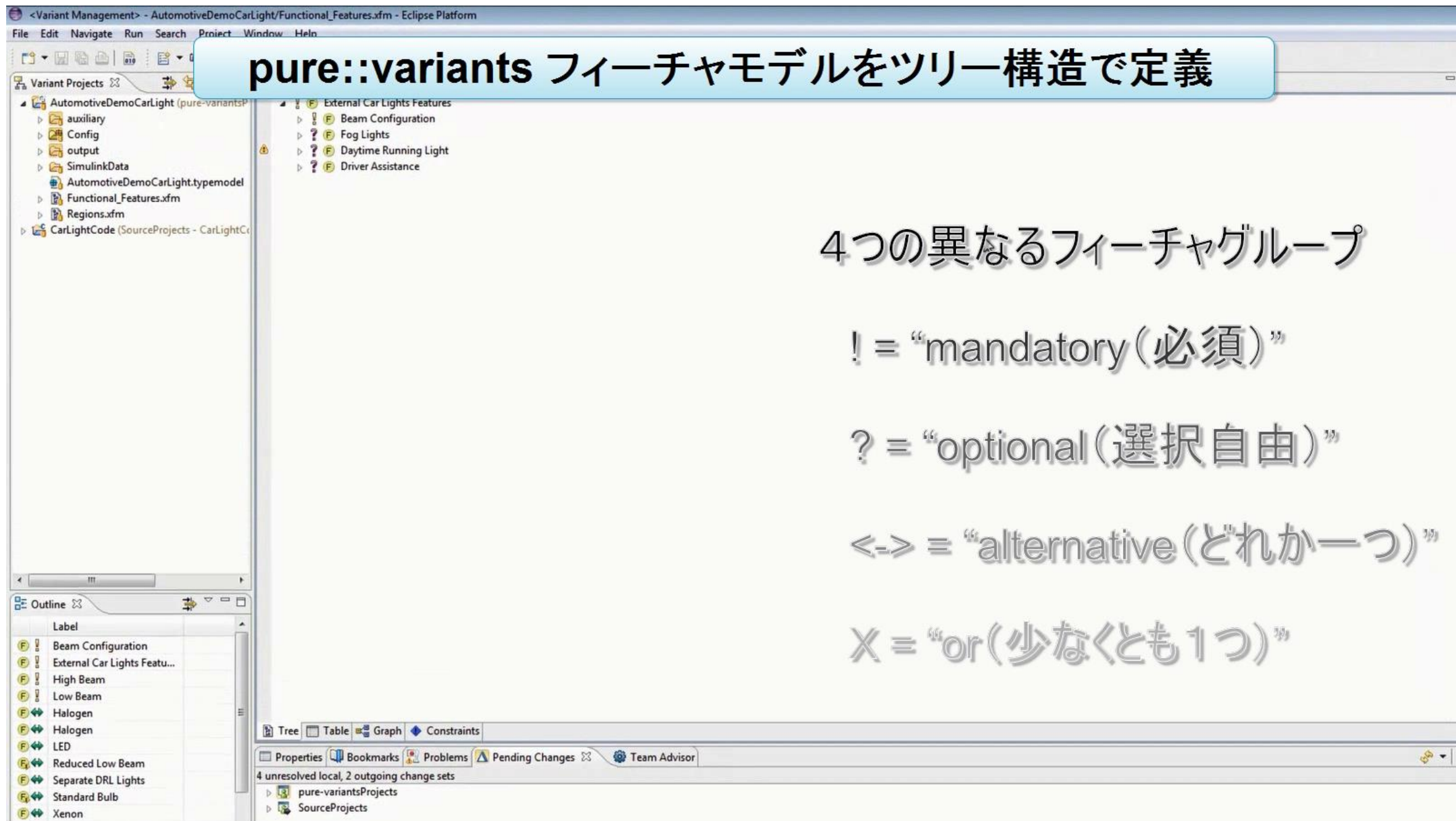
フィーチャ間の依存・排他関係



Feature Models

External Car Light Product Line

Role: Product Line Engineer



The screenshot shows the Eclipse Platform Variant Management interface. The top menu bar includes File, Edit, Navigate, Run, Search, Project, Window, and Help. The main workspace is divided into several panes. The left pane, titled 'Variant Projects', shows a tree structure for 'AutomotiveDemoCarLight (pure-variantsP)' with sub-items like auxiliary, Config, output, SimulinkData, AutomotiveDemoCarLight.typemodel, Functional_Features.xfm, Regions.xfm, and CarLightCode (SourceProjects - CarLightC). The right pane, titled 'External Car Lights Features', shows a tree structure with items like Beam Configuration, Fog Lights, Daytime Running Light, and Driver Assistance. The bottom pane, titled 'Outline', shows a list of features with icons indicating their status: Beam Configuration, External Car Lights Featu..., High Beam, Low Beam, Halogen, Halogen, LED, Reduced Low Beam, Separate DRL Lights, Standard Bulb, and Xenon. The bottom status bar shows '4 unresolved local, 2 outgoing change sets' and 'pure-variantsProjects' and 'SourceProjects'.

pure::variants フィーチャモデルをツリー構造で定義

4つの異なるフィーチャグループ

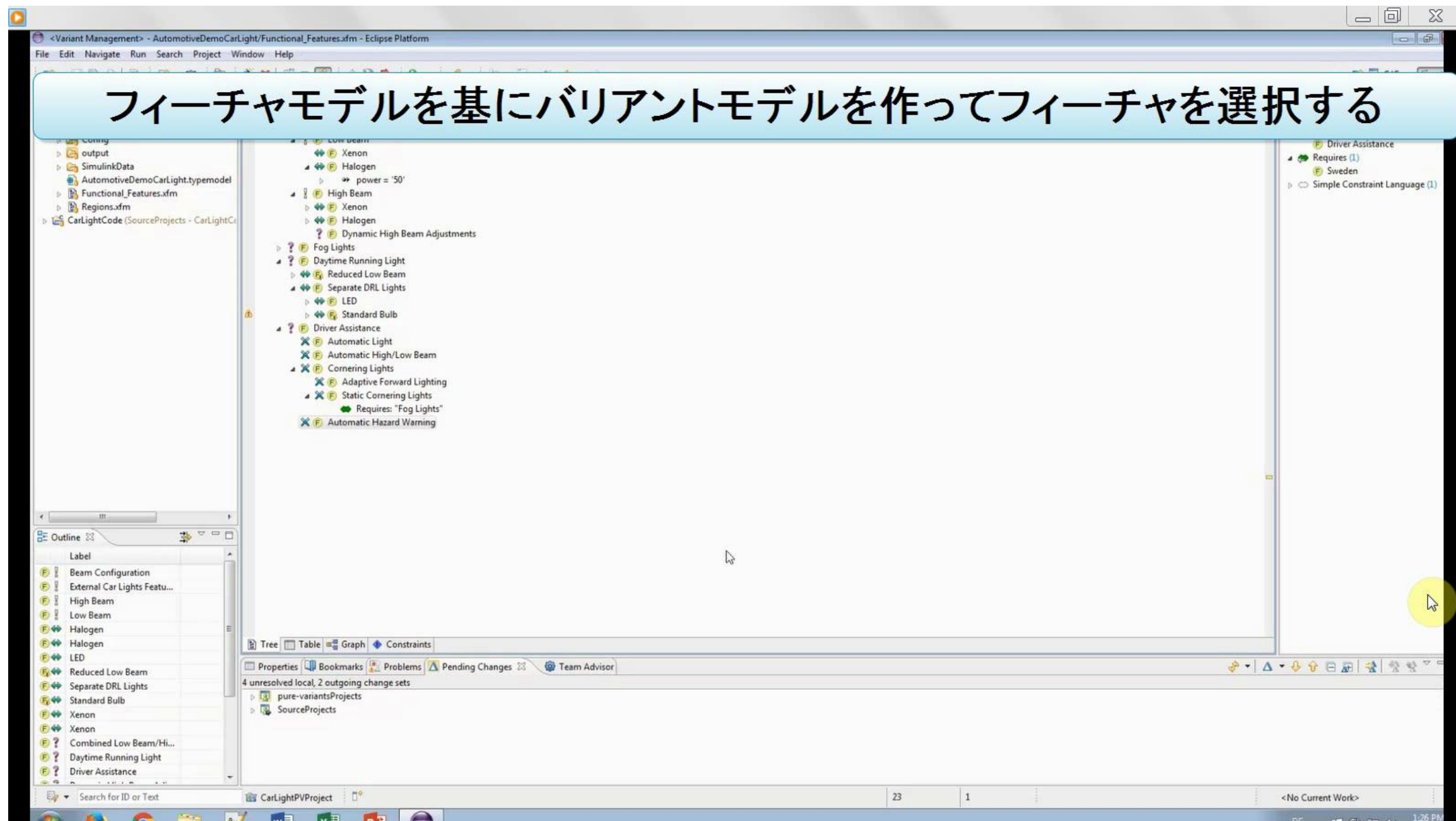
- ! = “mandatory (必須)”
- ? = “optional (選択自由)”
- <-> = “alternative (どれか一つ)”
- X = “or (少なくとも1つ)”

Configuring a new Variant

Error Markers and Auto-Resolve

Role: Variant Configurator

フィーチャモデルを基にバリエーションモデルを作ってフィーチャを選択する



Comparing and Analyzing Variants

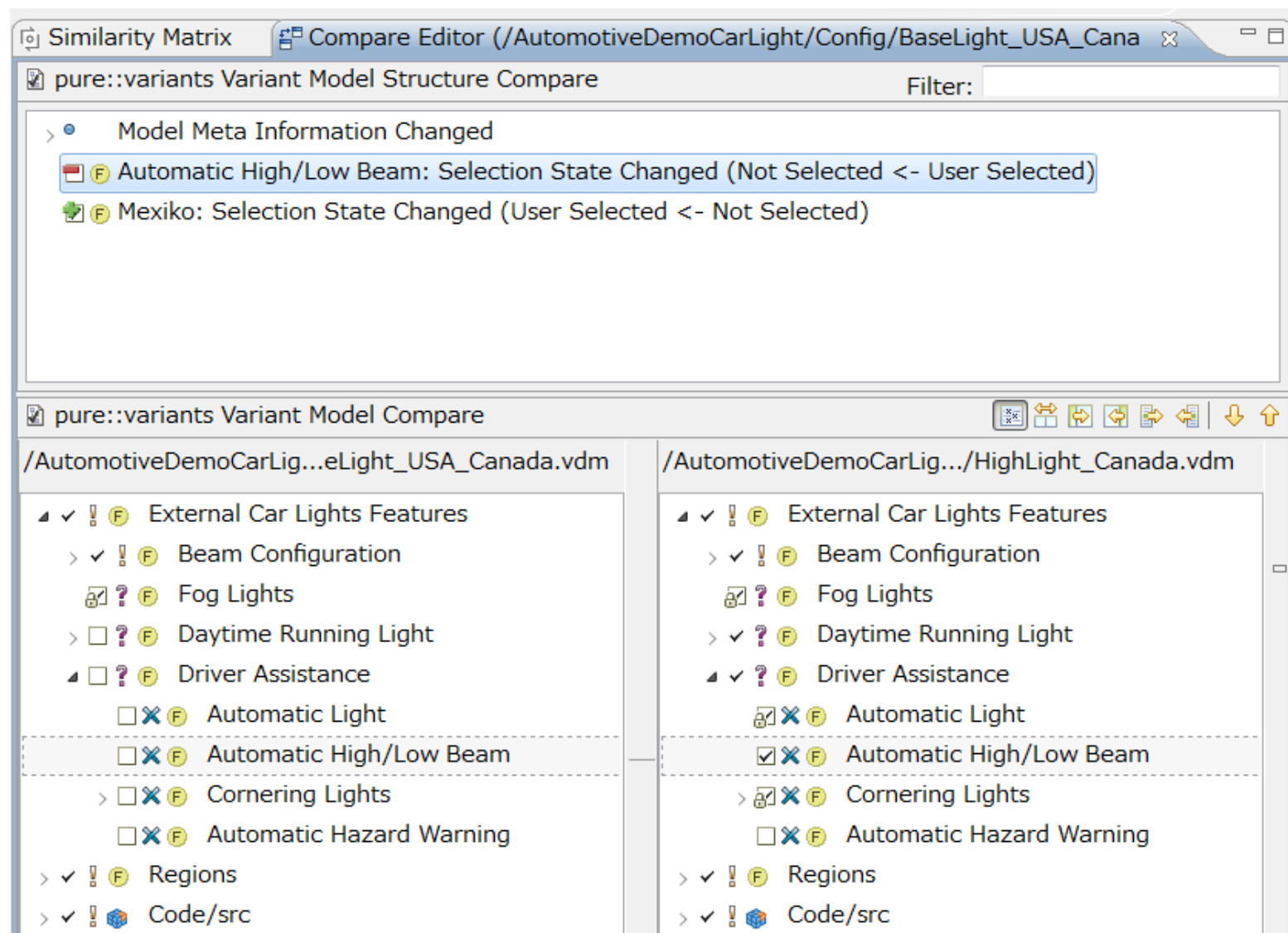
Variants, Versions & Matrix View

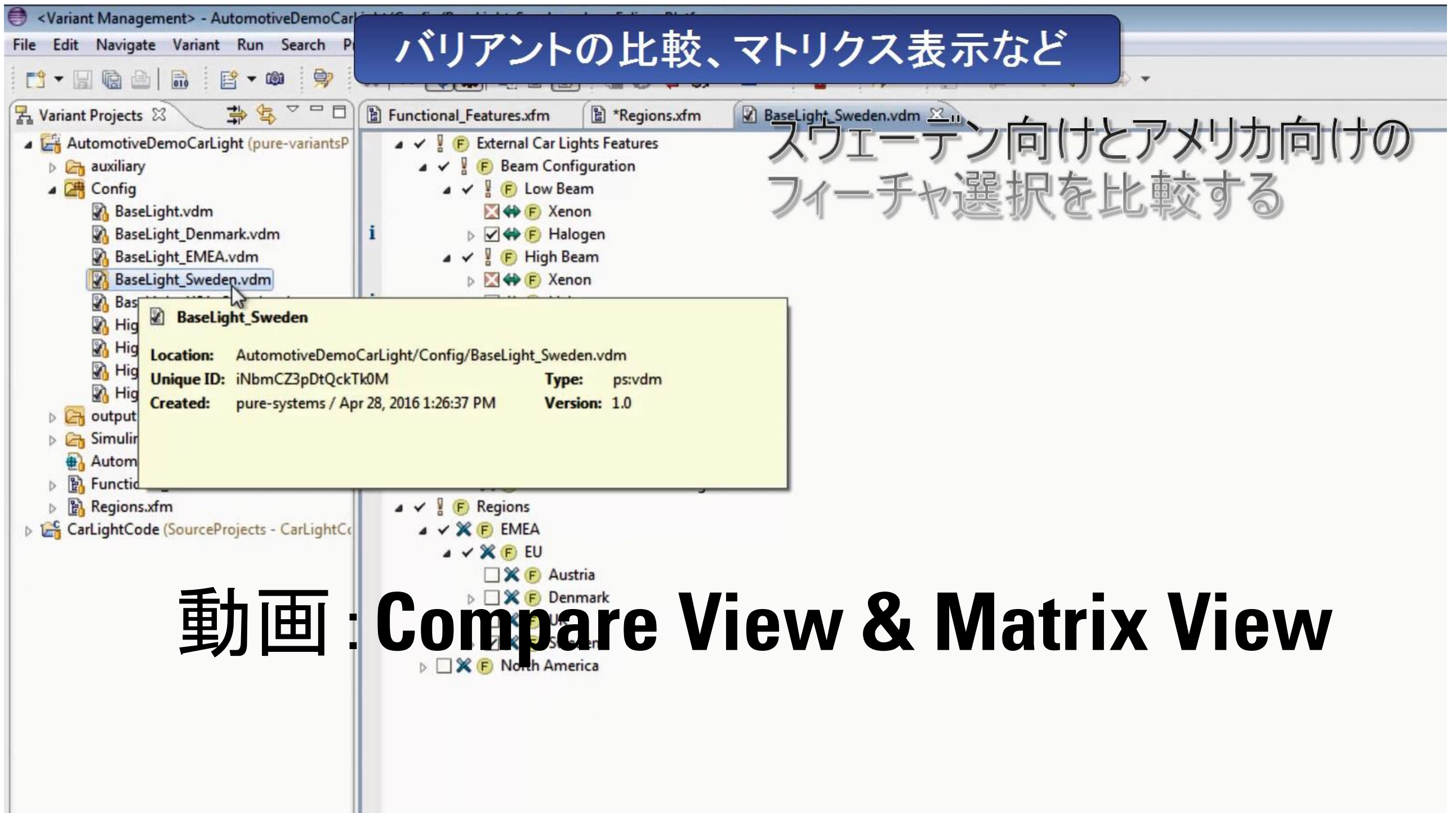
Role: Product Line Engineer / Product Line Analyst

Model Elements		Level	BaseLight	BaseLight_EMEA	BaseLight_USA_C...	Demo	HighLight	HighLight_Canada	HighLight_EMEA	HighLight_US
[-]	CarLightFeatures									
[-]	Car Lights Features		✓	✓	✓	✓	✓	✓	✓	✓
[-]	Regions	1	✓	✓	✓	✓	✓	✓	✓	✓
[-]	EMEA	1.1	☐	✓	✗	☐	☐	✗	✓	✗
[-]	EU	1.1.1	☐	✓	✗	☐	☐	✗	✓	✗
	Austria	1.1.1.1	☐	✓	✗	☐	☐	✗	☐	✗
	Denmark	1.1.1.2	☐	✓	✗	☐	☐	✗	✓	✗
	UK	1.1.1.3	☐	✓	✗	☐	☐	✗	✓	✗
[-]	North America	1.2	☐	✗	✓	☐	☐	✓	✗	✓
	Canada	1.2.1	☐	✗	✓	☐	☐	✓	✗	☐
	Mexiko	1.2.2	☐	✗	☐	☐	☐	☐	✗	☐
	USA	1.2.3	☐	✗	✓	☐	☐	☐	✗	✓
[-]	Beam Configuration	2	✓	✓	✓	✓	✓	✓	✓	✓
[-]	Low Beam	2.1	✓	✓	✓	✓	✓	✓	✓	✓
	Xenon	2.1.1	☐	✗	✗	☐	✓	☐	☐	☐
	Halogen	2.1.2	☐	✗	✗	☐	✓	☐	✗	✗
[-]	High Beam	2.2	✓	✓	✓	✓	✓	✓	✓	✓
	Matrix	2.2.1	☐	✗	✗	☐	✓	☐	✗	✗

バリエーションごとで搭載する機能を比較
 フィルターやソートでバリエーション間の違いや同一性を分析できる

バリエーション間の比較や旧バージョンとの比較もできる





バリエーションの比較、マトリクス表示など

スウェーデン向けとアメリカ向けの
フィチャ選択を比較する

動画: Compare View & Matrix View

Restricting Superset Requirements

DOORS NG Integration

Role: Requirements Engineer

573: CarLightRequirements - R... X

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Meistbesucht pure:variants Model P... Jazz Team Server

IBM Engineering Requirements Management DOORS Next (/rm)

Car Light Car Light

Project Dashboard Artifacts Reviews Reports

CarLight Initial Development Jazz

Search Artifacts

Mini Dashboard

pure:variants

Select a Variant

Please open a configspace

Views

Search Views

pure:variants

pure:variants Preview

ForeignID	Contents	pvRestriction	pvVariationType
1	1 Head Lights		
23	The beam pattern must fulfil the Federal Motor Vehicle Safety Standard 108.	USA or Canada	
5	1.1 High Beam		
28	The high beam is activate if the user presses the high beam lever and the light mode switch is set to full light mode.	NOT(AutomaticLight)	
29	The high beam is deactivated temporarily if incoming traffic is detected by the camera.	HighLowBeamDetection	
21	The beam must conform to R98 — Headlamps equipped with gas-discharge light source	HighBeamXenon AND not(USA OR Canada)	
22	The beam conform to R112 — Headlamps emitting an asymmetrical passing beam and/or a driving beam and equipped with filament bulbs	HighBeamHalogen AND not(USA OR Canada)	
30	The high beam is activated if the user presses the high beam lever and either the light mode switch is set to full light mode or light mode switch is to automatic and light conditions require full light.	AutomaticLight AND NOT(HighLowBeamDetection)	
31	The high beam is activated if the user presses the high beam lever and the light mode switch is set to full light mode or light mode switch is to automatic and light conditions require full light.	AutomaticLight AND HighLowBeamDetection	
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 conform 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 Lights		
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.		

Showing 33 of 33 (100%)

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DNG上の要件に
フィーチャーを紐付ける

Parametric Variability

Calculations

Role: Requirements Engineer

573: CarLightRequirements - R... X

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Meistbesucht pure:variants Model P... Jazz Team Server

IBM Engineering Requirements Management DOORS Next (/rm)

Car Light | Car Light

Project Dashboard Artifacts Reviews Reports

CarLight Initial Development | Jazz

Search Artifacts

Mini Dashboard

pure:variants

Select a Variant ...

- External Car Lights Features
 - Beam Configuration
 - Fog Lights
 - Daytime Running Light
 - Driver Assistance
- Regions
 - EMEA
 - North America

Views

Search Views

pure:variants

pure:variants Preview

	ForeignID	Contents	pvRestriction	pvVariationType
☐	19	The beam must conform 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 Lights	FogLight and BeamConfiguration	
☐	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	alternative
☐	14	The fog 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.	FogLight and not(DRL)	alternative
☐	36	2.2 Automatic Hazard Warning	HazardWarning	
☐	37	Automatically activate the hazard warning lights under heavy breaking or if the vehicle is involved in an accident.		
☐	3	3 Indicator Lights		
☐	3.1	3.1 Turn Lights		
☐	25	All turn lights on a side must blink simultaneously with a frequency of 1.5 Hz when the blink lever for the respective side is activated		
☐	15	All turn lights must blink simultaneously as long as the hazard blinking switch is activated. The blinking frequency is 1.5 hz.		
☐	9	3.2 Daytime Running Light	DRL	
☐	17	The DRL must be compliant with R87. It must emit white light of 450 candelas.	NOT(USA or Canada)	
☒	16	The DRL is implemented by using the low-beam-lamps. The "on" pulse is [DRL_LowBeam->dutycycle]% of the pulse width of [5+5]ms.	DRL_LowBeam	
☐	18	The LED pulse frequency above 50kHz.	DRL_LED	

Showing 33 of 33 (100%)

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DRL LowBeamフィーチャーの
アトリビュートの計算式を変更

Preview of Variants

Gray-Out

Role: Requirements Engineer

573: CarLightRequirements - R X +

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Meistbesucht pure:variants Model P... Jazz Team Server

IBM Engineering Requirements Management DOORS Next (/rm)

Car Light Car Light

Project Dashboard Artifacts Reviews Reports

Mini Dashboard

pure:variants

Select a Variant ...

- External Car Lights Features
 - Beam Configuration
 - Fog Lights
 - Daytime Running Light
 - Driver Assistance
- Regions
 - EMEA
 - North America

Views

Search Views

pure:variants

pure:variants Preview

	ForeignID	Contents	pvRestriction	pvVariationType
☐	1	1 Head Lights		
☐	23	The beam pattern must fulfil the Federal Motor Vehicle Safety Standard 108.	USA or Canada	
☐	5	1.1 High Beam		
☐	28	The high beam is activate if the user presses the high beam lever and the light mode switch is set to full light mode.	NOT(AutomaticLight)	
☐	29	The high beam is deactivated temporarily if incoming traffic is detected by the camera.	HighLowBeamDetection	
☐	21	The beam must conform to R98 — Headlamps equipped with gas-discharge light source	HighBeamXenon AND not(USA OR Canada)	
☐	22	The beam conform to R112 — Headlamps emitting an asymmetrical passing beam and/or a driving beam and equipped with filament bulbs	HighBeamHalogen AND not(USA OR Canada)	
☐	30	The high beam is activated if the user presses the high beam lever and either the light mode switch is set to full light mode or light mode switch is to automatic and light conditions require full light.	AutomaticLight AND NOT(HighLowBeamDetection)	
☐	31	The high beam is activated if the user presses the high beam lever and the light mode switch is set to full light mode or light mode switch is to automatic and light conditions require full light.	AutomaticLight AND HighLowBeamDetection	
☐	3	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 conform to R112 — Headlamps emitting an asymmetrical passing beam and/or a driving beam and equipped with filament bulbs	LowBeamHalogen AND not(USA OR Canada)	
☐		1.3 Fog Lights		
☐	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.	FogLight and BeamConfiguration	
☐	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.		

Showing 33 of 33 (100%)

1 selected (Clear All Selected)

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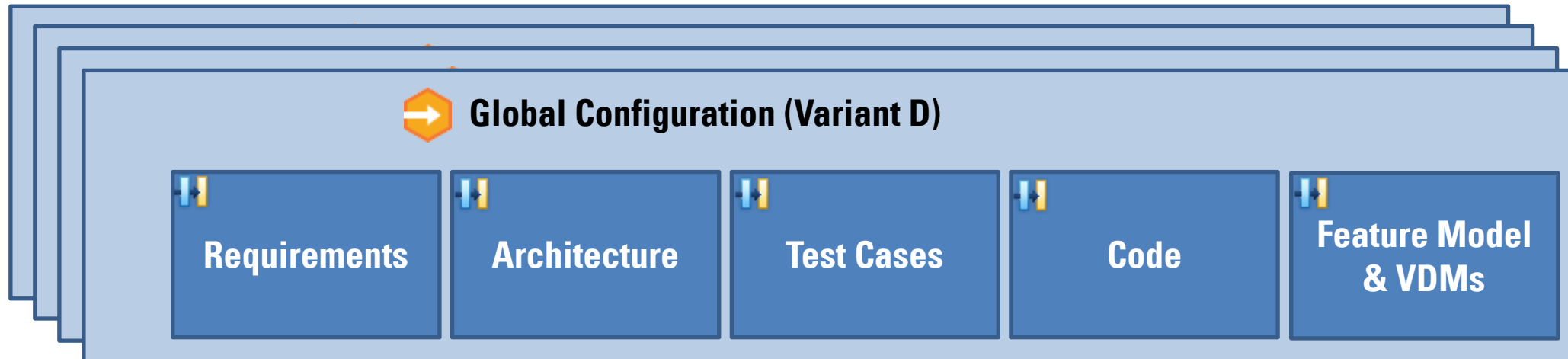
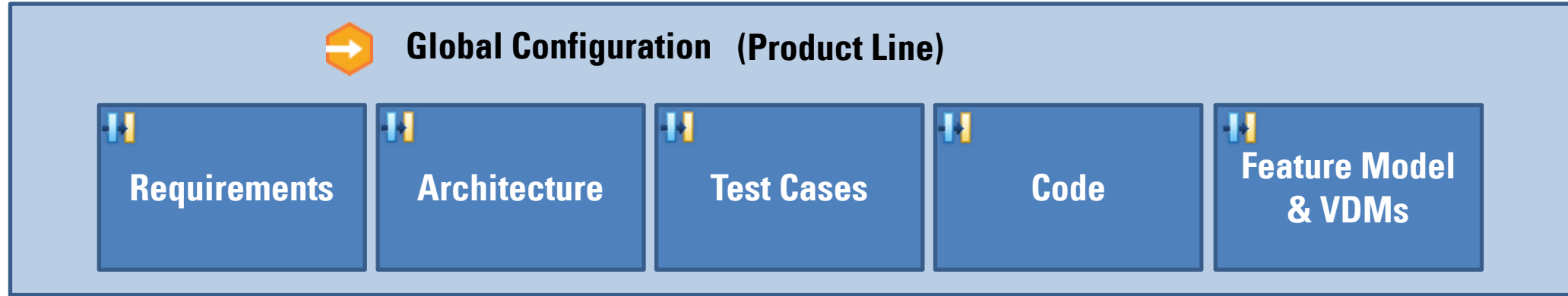
各バリエーションに選択した要件をプレビューする

Deriving Variant-Specific Requirements

Stream & GC Transformations

Role: Variant Configurator / Build Script

Global Configuration Transformation



① pure::variants で、ひとつのグローバル構成に、プロダクトライン全体の資産のスーパーセットを伴うストリームを持たせることができます。また pure::variants のフィーチャモデルもストリーム内に保存できます。

② そして、このグローバル構成のスーパーセットを基に、各製品バリエーション固有のグローバル構成を生成することができます。

573: CarLightRequirements - R... X

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Meistbesucht pure:variants Model P... Jazz Team Server

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Car Light Car Light

Project Dashboard Artifacts Reviews Reports

CarLight Initial Development Jazz

Search Artifacts

Mini Dashboard

pure:variants

BaseLight_Sweden

- External Car Lights Features
 - Beam Configuration
 - Fog Lights
 - Daytime Running Light
 - Driver Assistance
- Regions
 - EMEA
 - North America

Views

Search Views

pure:variants

pure:variants Preview

Loading artifacts...

	ForeignID	Contents	pvRestriction	pvVariationType	pvVariants
☐	19	The beam must conform to R112 — Headlamps emitting an asymmetrical passing beam and/or a driving beam and equipped with filament bulbs	LowBeamHalogen AND not(USA OR Canada)		BaseLight_Sweden
☐	7	-1.3 Fog Lights	FogLight and BeamConfiguration		BaseLight_Sweden
☐	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.			BaseLight_Sweden
☐	34	They may be either white or selective yellow.			BaseLight_Sweden
☐	2	-2 Assistance Systems	LightAssistance		BaseLight_Sweden
☐	11	-2.1 Cornering Light	Corneringlights		BaseLight_Sweden
☐	26	-2.1.1 Adaptive Forward Lighting	AdaptiveForwardLighting		BaseLight_Sweden
☐	27	The adaptive forward lighting system is activated only when high or low beam is operating in full light mode.			BaseLight_Sweden
☐	12	-2.1.2 Static Cornering Light	CorneringStaticLights		BaseLight_Sweden
☐	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	alternative	BaseLight_Sweden
☐	14	The fog 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.	FogLight and not(DRL)	alternative	BaseLight_Sweden
☐	36	-2.2 Automatic Hazard Warning	HazardWarning		BaseLight_Sweden
☐	37	Automatically activate the hazard warning lights under heavy breaking or if the vehicle is involved in an accident.			BaseLight_Sweden
☐	3	-3 Indicator Lights			BaseLight_Sweden
☐	4	-3.1 Turn Lights			BaseLight_Sweden
☐	25	All turn lights on a side must blink simultaneously with a frequency of 1.5 Hz when the blink lever for the respective side is activated			BaseLight_Sweden
☐	9	The fog light must blink simultaneously as long as the hazard blinking switch is activated. The blinking frequency is 1.5 hz.			BaseLight_Sweden
☐	7	-3.2 Daytime Running Light	DRL		BaseLight_Sweden
☐	16	The DRL must be compliant with R87 — It must emit white light — 150 candelas.	NOT(USA or Canada)		BaseLight_Sweden
☒	16	The LED must be compliant with R87 — It must emit white light — 150 candelas. The LED pulse is [DRL_LowBeam->dutycycle]% of the pulse width of [DRL->pulseWidth]ms.	DRL_LowBeam		BaseLight_Sweden
☐	18	The LED pulse frequency above 50kHz.	DRL_LED		BaseLight_Sweden

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DNGの150%グローバル構成から
バリエーション固有のグローバル構成を生成する

Restricting Superset Architecture

Rhapsody Integration

Role: System Architect

Rhapsody と連携 : モデルにフィーチャを紐付けする

動画 : Restricting UML/SysML Elements

プロダクトラインの全資産からなるモデルに
pure::variants からフィーチャを紐付けする



Preview Variant-Specific Architecture

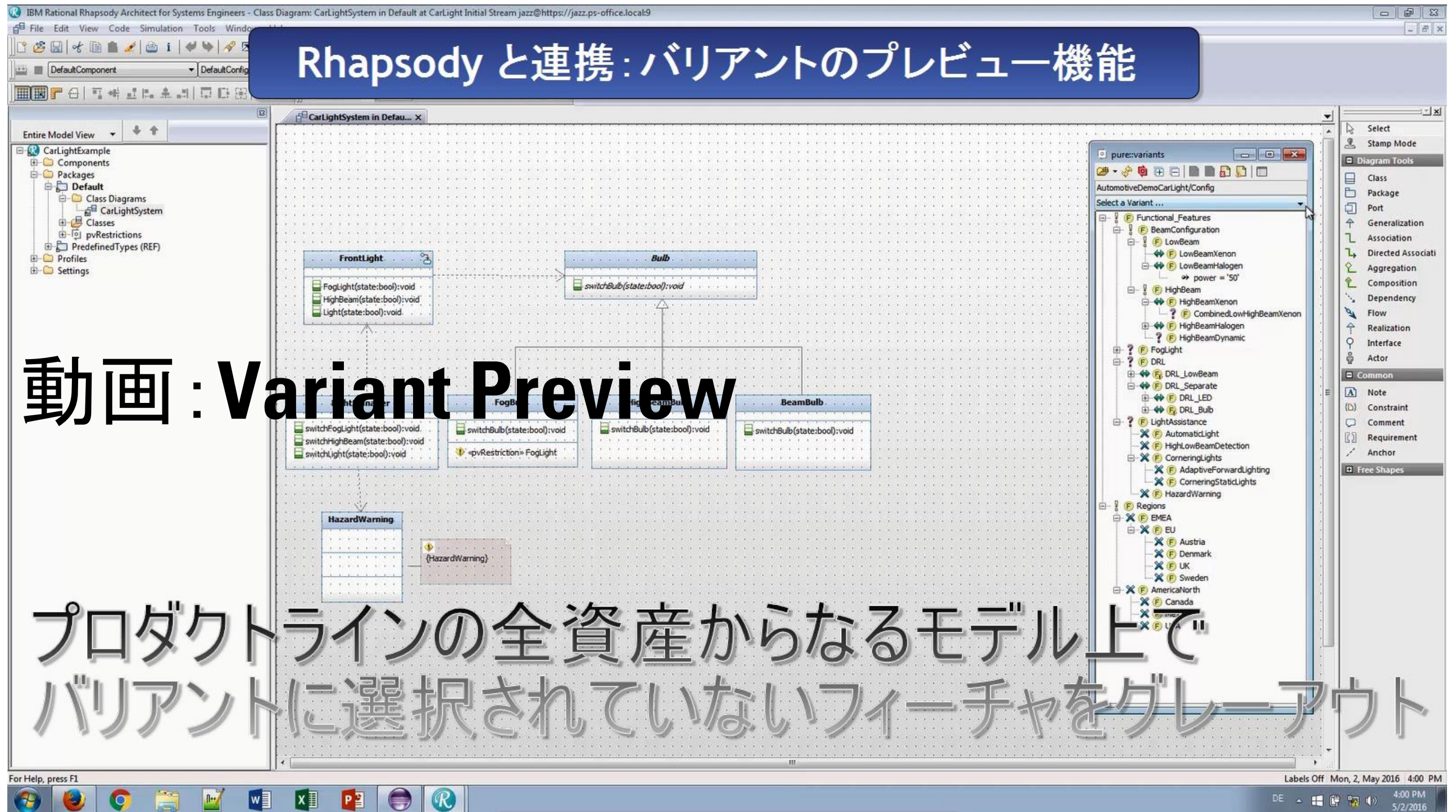
Load and Preview Variant Configurations

Role: System Architect

Rhapsody と連携 : バリエーションのプレビュー機能

動画 : Variant Preview

プロダクトラインの全資産からなるモデル上で
バリエーションに選択されていないフィーチャをグレーアウト



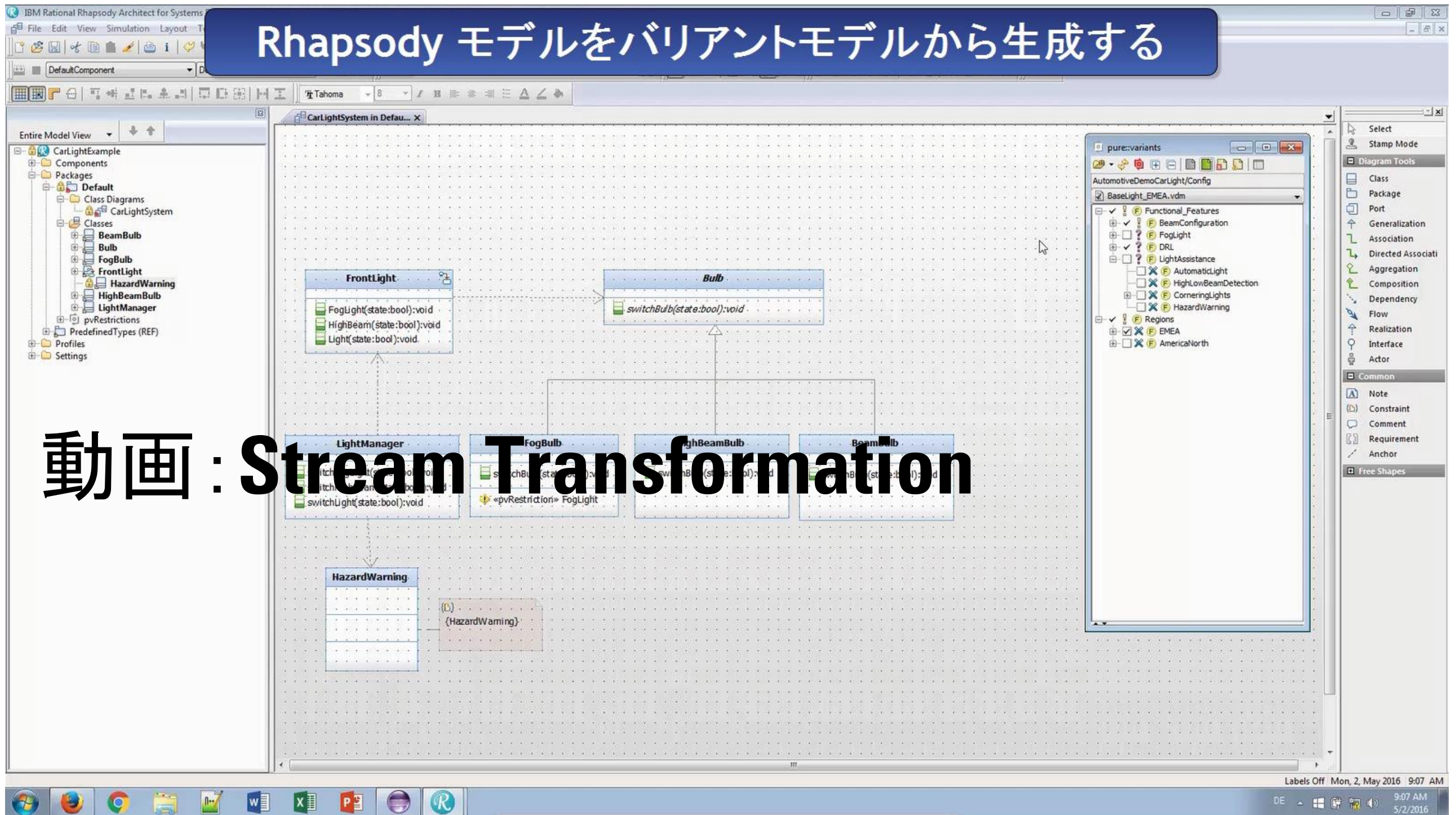
Deriving Variant-Specific Architecture

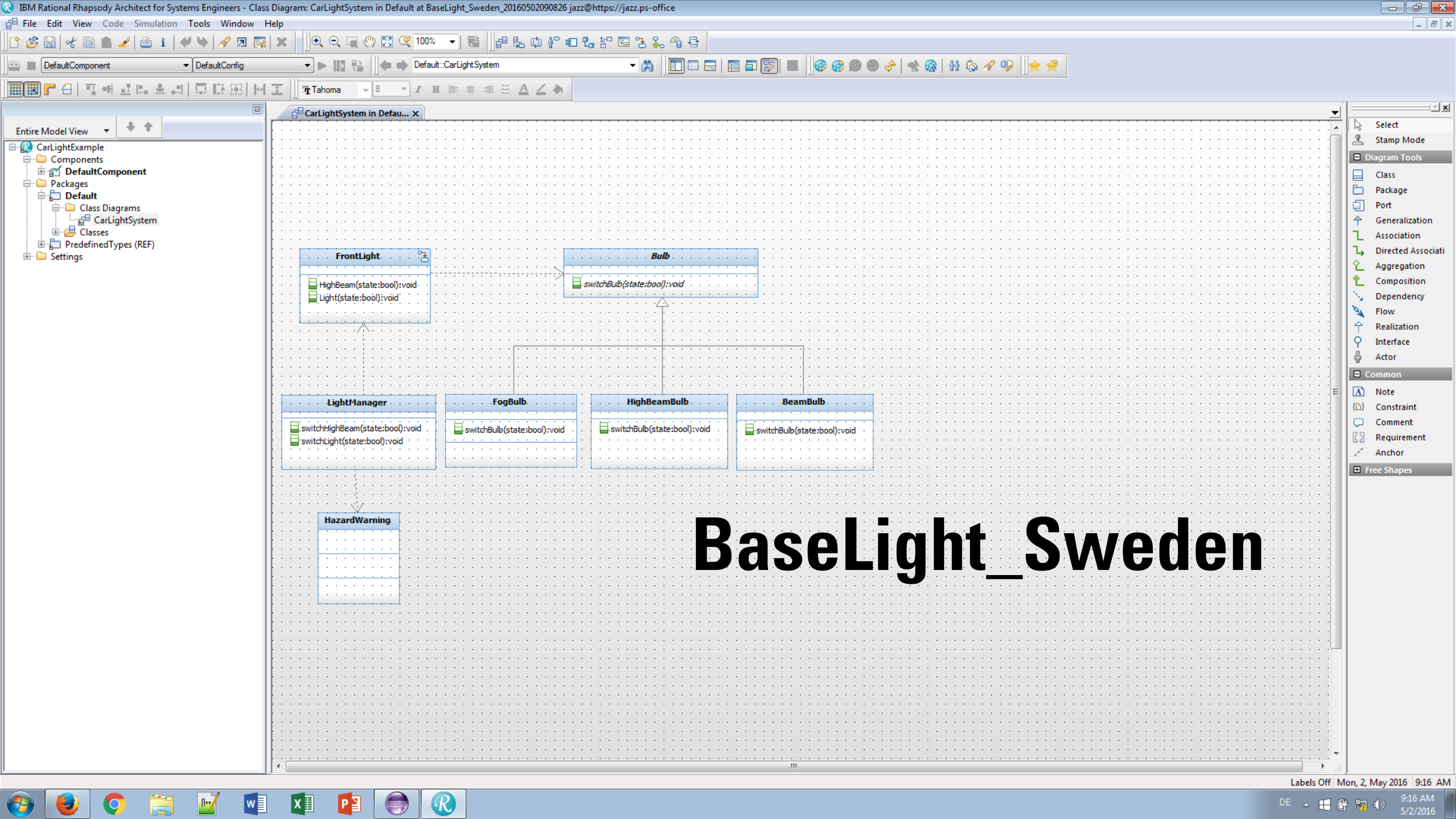
Transformation

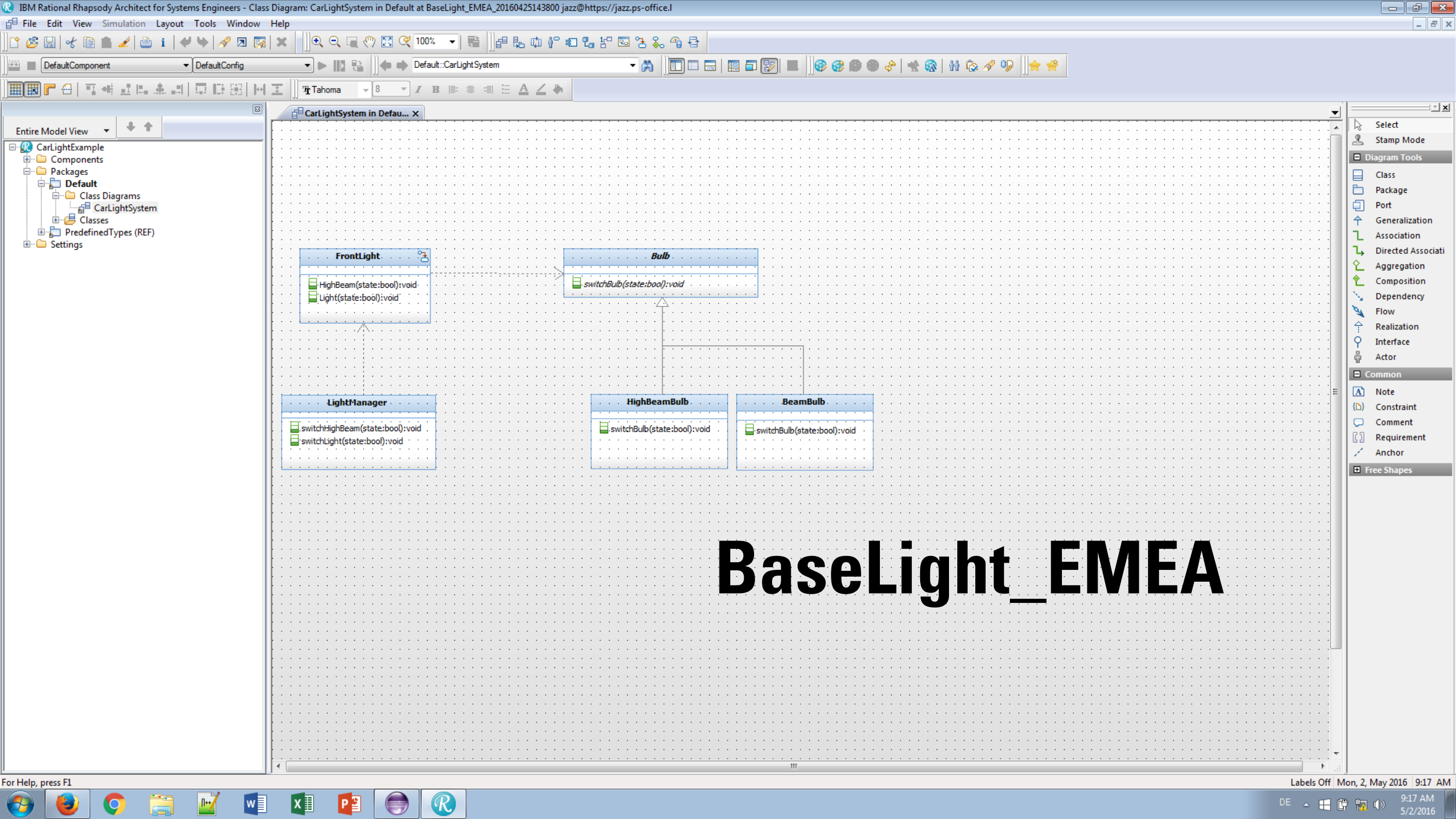
Role: System Architect

Rhapsody モデルをバリエーションモデルから生成する

動画 : Stream Transformation







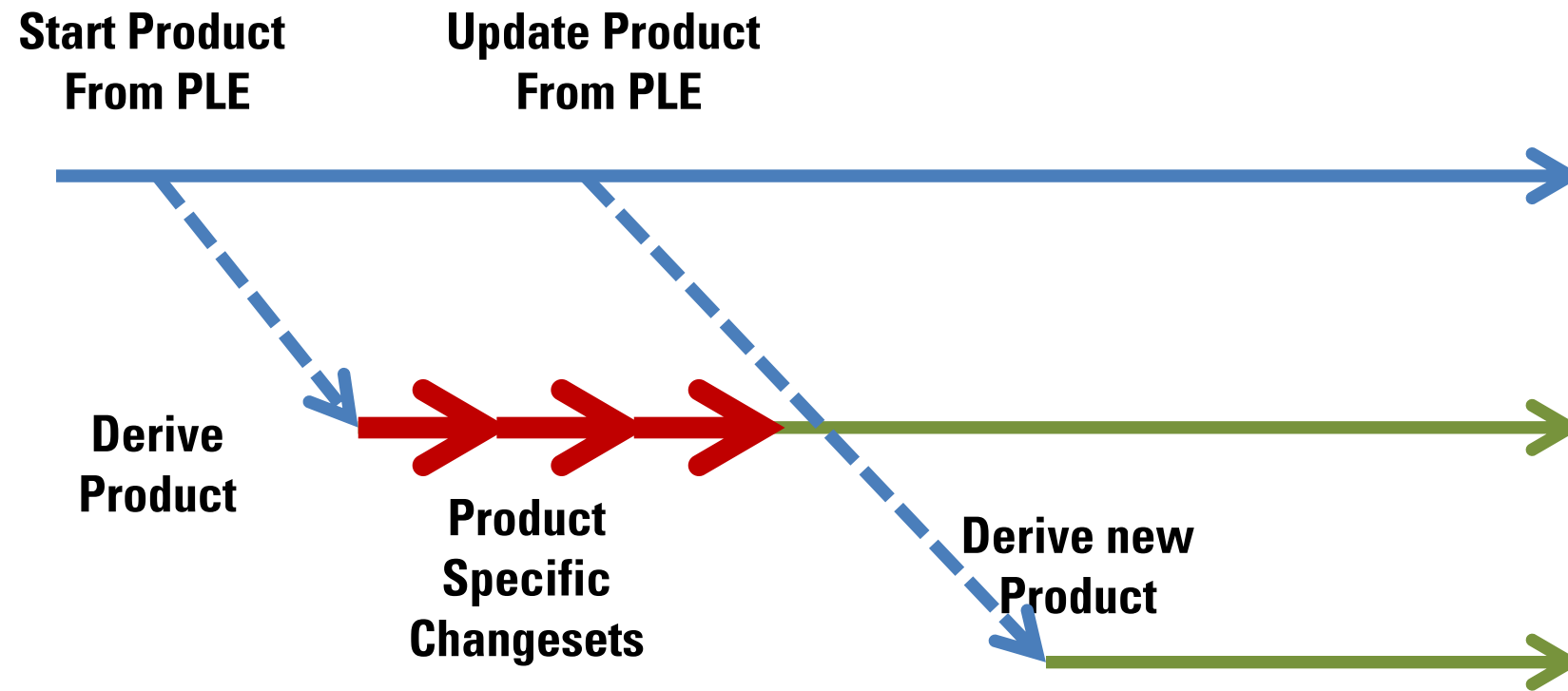
BaseLight_EMEA

Coevolution of Product Line and Variants

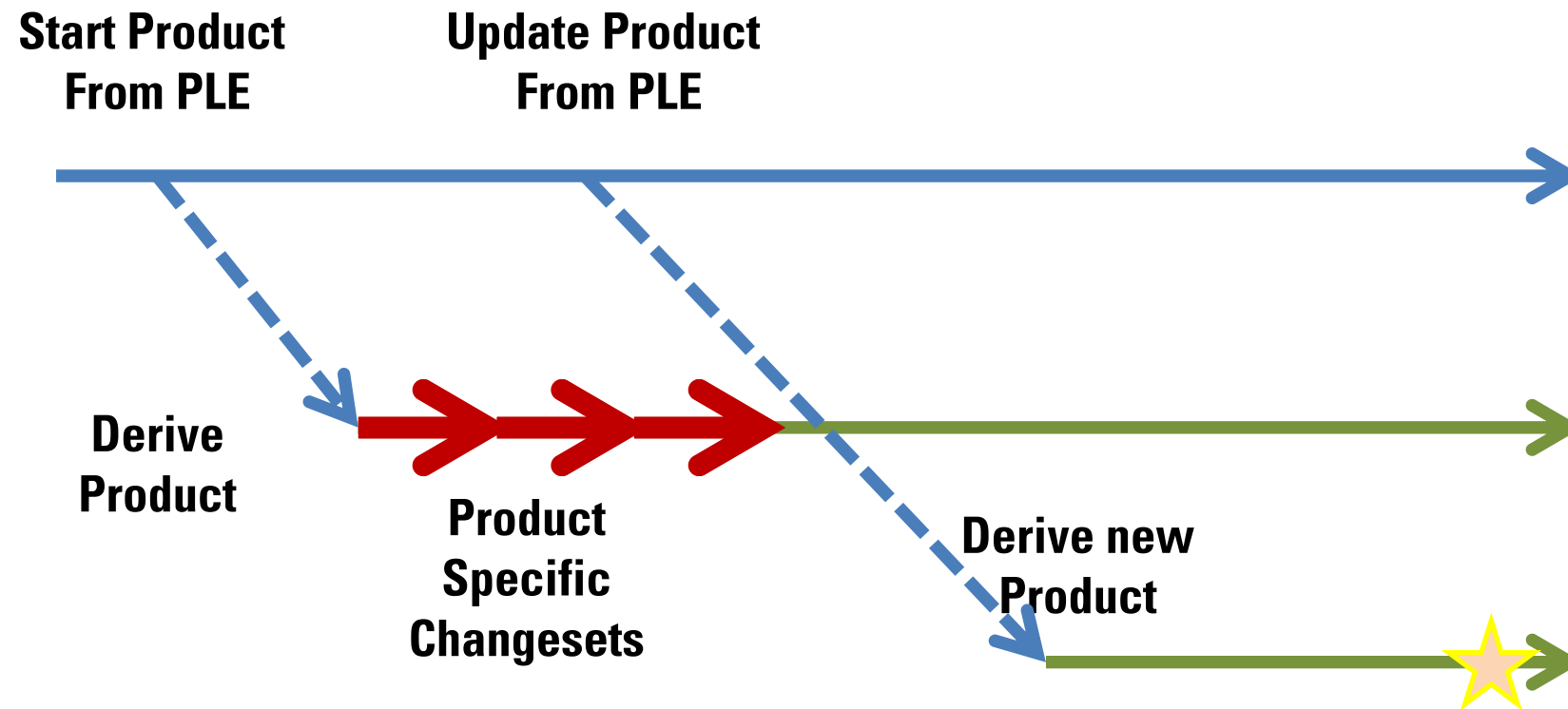
Update Existing Variants

Role: Product Line Engineer / Application Engineer

Update with Changesets



Update with Changesets



573: CarLightRequirements - R... X

https://jazz-ps-office.local:9443/rm/web#action=com.ibm.rdm.web.pages.showArtifactPage&artifactURI=https%3A%2F%2Fjazz-ps-office.local%3A9443%2Frm%2Fresources%2FMD_eXZuUWkEevNJUjRjC...

Meistbesucht pure:variants Model P... Jazz Team Server

IBM Engineering Requirements Management DOORS Next (/rm)

Car Light | Car Light

Project Dashboard Artifacts Reviews Reports

Mini Dashboard

pure:variants

BaseLight_EMEA

- External Car Lights Features
 - Beam Configuration
 - Fog Lights
 - Daytime Running Light
 - Driver Assistance
- Regions
 - EMEA
 - North America

Views

Search Views

pure:variants

pure:variants Preview

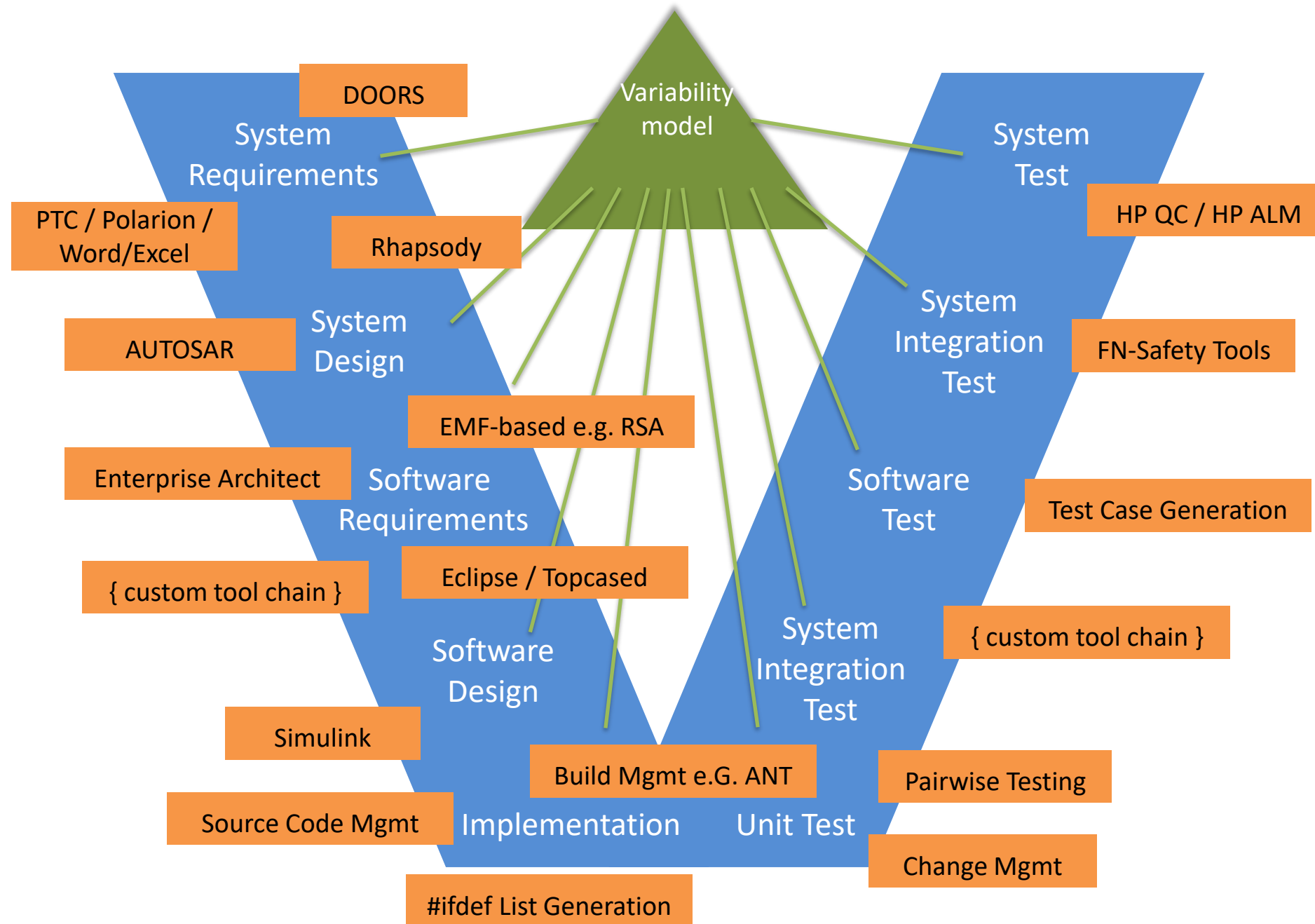
	ID	Contents
	574	•1 Head Lights
	577	•1.1 High Beam
	578	The high beam is activate if the user presses the high beam lever and the light mode switch is set to full light mode.
	581	The beam conform to R112 — Headlamps emitting an asymmetrical passing beam and/or a driving beam and equipped with filament bulbs
	584	The high beam is dynamically adjusted if the wight is not balanced.
	585	1.2 Low Beam
	587	The beam must conform to R112 — Headlamps emitting an asymmetrical passing beam and/or a driving beam and equipped with filament bulbs
	592	•2 Assistance Systems
	609	•2.1 Automatic Hazard Warning
	610	Automatically activate the hazard warning lights under heavy breaking or if the vehicle is involved in an accident.
	599	•3 Indicator Lights
	601	•3.1 Turn Lights
	602	All turn lights on a side must blink simultaenously with a frequency of 1.5 Hz when the blink lever for the respective side is activated
	603	All turn lights must blink simultaenously as long as the hazard blinking switch is activated. The blinking frequency is 1.5 hz.
	604	•3.2 Daytime Running Light
	606	The DRL must be compliant with R87. It must emit white light of 450 candelas.
	607	The DRL is implemented by using the low beam lamps. The "on" pulse is 70% of the pulse width of 10ms.

Showing 17 of 17 (100%)

IBM. jazz

特定バリエーションに固有の機能変更として
High Beam フィーチャーに "長押し" 条件を追加

pure::variants Enterprise Integrations



フィーチャモデルに
プロダクトラインの問
題空間のバリエー
ションを表現して、解
決空間上のあらゆる
資産と紐付けられる

pure::variants プロダクトラインライフサイクルをサポート



DOORS 9

DOORS Next

Polarion Requirements

Rhapsody

RTC

Rational Quality Manager

C/C++/Java

MS Word, Excel

AUTOSAR

EMF

Enterprise Architect

Simulink

MagicDraw

...

Zuken

medini analyze

Variant Management Use Cases

(Automotive) OEM Variant Management Challenges

- Each Project may have its own way of writing specifications
- プロジェクトごとに独自のやり方で仕様書が記載される
- Similar behavior / UI makes for strong “brand experience”
- ブランドイメージを強固にする類似した振舞いやUI
- Least Possible Amount of variability gives biggest economies of scale
- バリアビリティを最小限にすることによるスケールメリット
- Continuous Innovation and Variation sells
- 継続的な革新とバリエーションがセールスポイント
- Each Project has its own time line
- プロジェクトごとで納期が定まっている
- Often requirements and V&V tests and calibration are main focus areas
- 要求仕様、V&Vテスト、キャリブレーションが主な関心領域

Benefits of Using pure::variants

- Supports full tool chain (Doors, Simulink, Enterprise Architect, standard calibration data formats via extension, custom transformation generates code)
- 全ての開発ツールをサポートできる
- Uniform Variability Concept over all asset types
- 全ての資産に対して共通したバリエービリティのコンセプト
- Uniform approach across different tools
- 異なるツールに対して共通した扱い
- Migration of home-grown approach to COTS tool based approach
- 自社製の取組みから汎用ツールへの移行をサポート
 - DOORS Variant Matrix
 - Simulink Variability
 - Calibration Tool-independent Calibration Data Reuse controlled via pure::variants Extension

(Automotive) Supplier Variant Management Challenges

- Each Customer in a Customer Project may have its own way of writing specifications
- 顧客のプロジェクトごとに独自のやり方で仕様書が記載される
- Least Possible Amount of variability gives biggest economies of scale
- バリアビリティを最小限にすることによるスケールメリット
- Continuous Innovation and Variation sells
- 継続的な革新とバリエーションがセールスポイント
- Each Customer Project has its own time line
- 顧客のプロジェクトごとに納期が定まっている
- Anything from requirements over code assets to tests and documentation needs to be handled
- 要求仕様からコード、テストやドキュメントなど全てに対処しなければならない

Benefits of Using pure::variants

- Supports full tool chain (Doors/Doors NG, Enterprise Architect, Rhapsody, Custom Tools via API, RQM, RTC, custom transformation generates code)
- 全ての開発ツールをサポートできる
- Uniform Variability Concept over all asset types
- 全ての資産に対して共通したバリアビリティのコンセプト
- Uniform approach across different tools (Easy from Migration from DOORS to DOORS NG)
- 異なるツールに対して共通した扱い(例: DOORS から DOORS NGへの移行も容易)
- pure::variants Update allows to quickly address project needs
- プロジェクトごとの需要に即座に応じた更新をサポート

Customer Examples Data

Starting and Running Success Product Lines – Real World Data

業界 / 製品 プロジェクト内容	始める前の取り 組み	PLの第一段階で 管理できた資産	完全な適応まで の期間	バリエーション数	Tools
Industry Automation Frequency Converters	既存製品の コピーを修正 (Code)	2 ヶ月でソース コードの60%を再 利用資産化	4-5 年 (Req, Code, Parameter Database)	~10-20 at any point in time	ClearCase, Git, Caliber, BuildForge, Inhouse, C++, pure::variants
Transportation Railway Signaling Systems	Requirements (Catalog Approach)	3-6 ヶ月 (Requirements)	18 ヶ月 (Req, Code, Tests, other assets)	初期段階は 2つで、 後から追加	Doors, Inhouse, C/C++, pure::variants
Automotive Transmission Systems	部品の選択と #ifdef	3 ヶ月	6 ヶ月	50以上	ClearCase, ClearQuest, make, C, pure::variants
Automotive Airbag Systems	既存製品の コピーを修正 (Req), #ifdef (Code)	9 ヶ月 (まずReqか ら)	12ヶ月	100以上	Doors, RTC, Inhouse tools, pure::variants

フィーチャ数は40くらいから数千まで様々な事例がある

プロダクトラインエンジニアリングの バリエーティ(変動性)と バリエーション管理の海外事例

独立行政法人情報処理推進機構(IPA/SEC)
「先進的な設計・検証技術の適用事例報告書 2016年版」より抜粋

概要

多くの共通性を持つ、複数のソフトウェア集約型製品の開発や保守には、体系的な再利用を支える戦略が要求される。しかしながら、体系的な再利用戦略は、製品固有のバリエーションを共有資産から迅速に実装することの必要性和相反し、結果的に共通資産は異なるチームごとで勝手に変更され、メンテナンスや大規模な再利用は非常に困難になっているのが現状である。本事例は、この現状を踏まえた身の丈に合い短期的に投資効果が得られる段階的なプロダクトライン整備の事例である。

本書子は独立行政法人情報処理推進機構(IPA/SEC)が公開している
「先進的な設計・検証技術の適用事例報告書 2016年版」
<https://www.ipa.go.jp/sec/reports/20170302.html>より抜粋したものです。



pure::variants について:

<https://www.fuji-setsu.co.jp/products/purevariants/>

Dr.Danilo の実践的 ソフトウェアプロダクトライン開発

https://www.fuji-setsu.co.jp/products/purevariants/Danilo_Blog.html

富士設備工業(株) 電子機器事業部

<https://www.fuji-setsu.co.jp>

