



# BEST PRACTICES FOR MANAGING AND VALIDATING PRODUCT CONFIGURATIONS

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PTC

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## TOPICS

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- Product Platforms Overview
- Product Platform/Configuration Management
- Product Platform/Configuration Validation
- Q&A

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# WHAT ARE PRODUCT PLATFORMS



**STRATEGY:** An enterprise strategy to efficiently meet diverse customer needs by focusing on high levels of re-use.

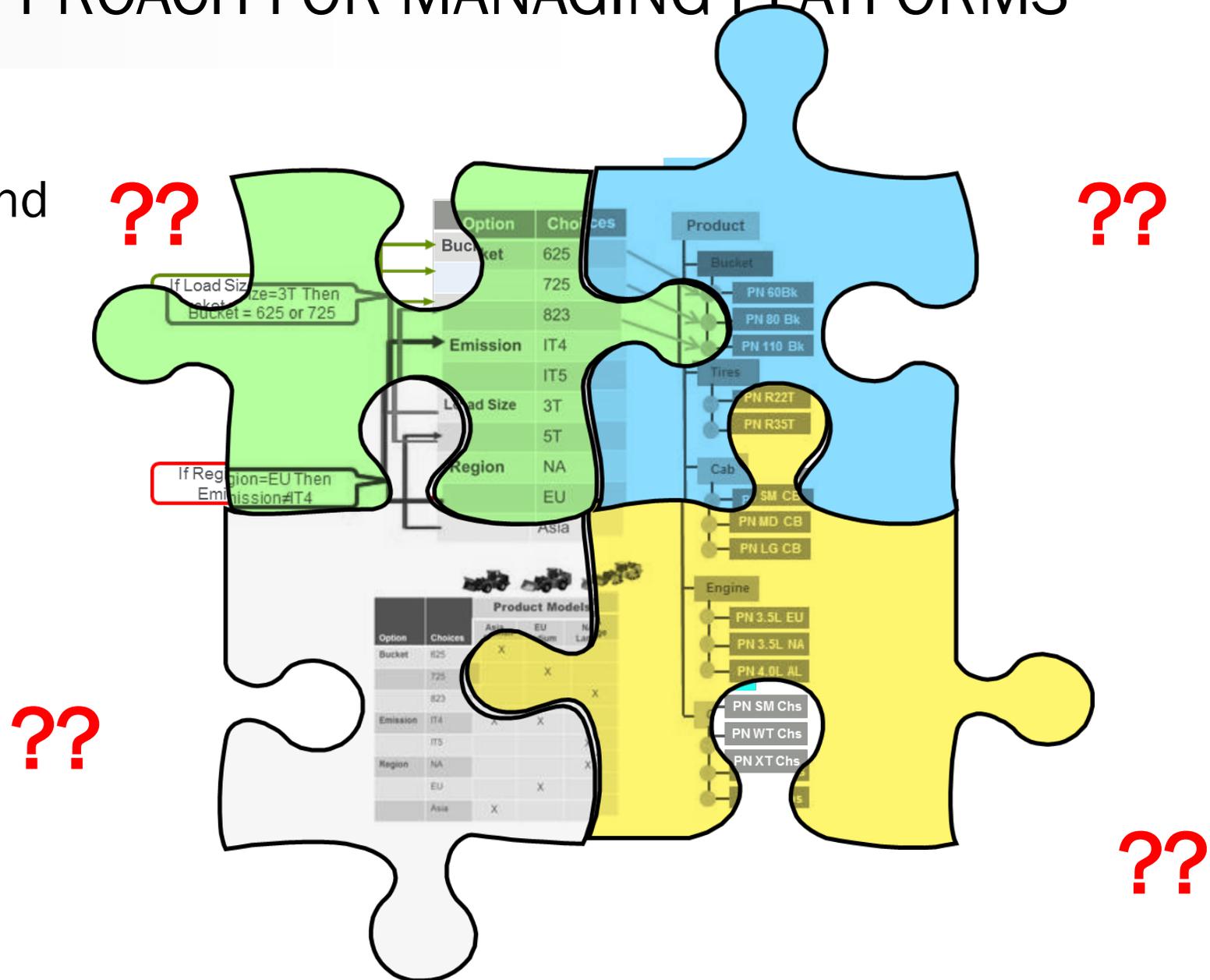
**DEFINITION:** A platform includes elements and architectural rules that enable a set of broad product offerings



# THE PUZZLING APPROACH FOR MANAGING PLATFORMS

The information for a Platform is created and managed **separately!**

In a **jigsaw** puzzle of company systems



# TRYING TO SOLVE THE PUZZLE FOR THE ENTERPRISE

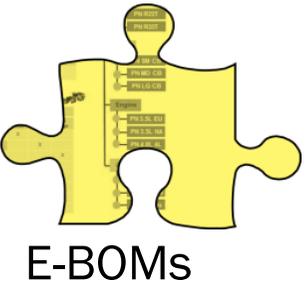
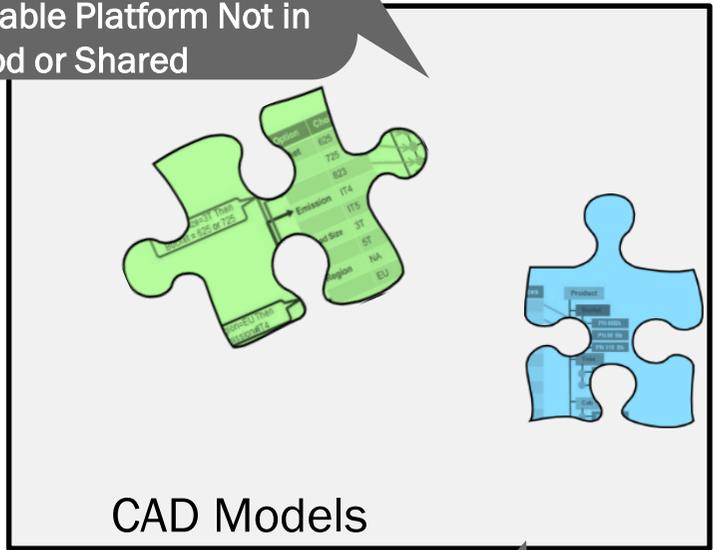
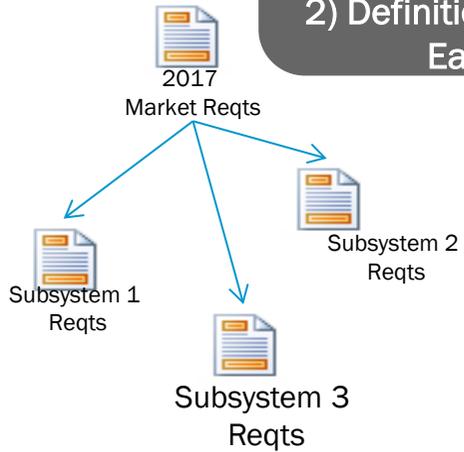
**Delayed Time to Market**

- Delayed offerings
- Difficult to update

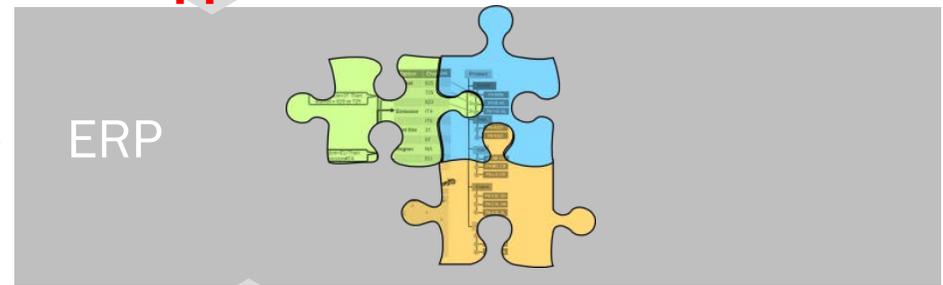


**Strategic Issues**

- 1) No Sandbox to Design Configurable Product
- 2) Definition of Configurable Platform Not in Easily Understood or Shared



PLM



**Unable to Validate by Configuration**

- Virtual Fit
- BOM + Compliance

**Error-Prone Production Planning by Configuration**

- Forecast Volumes
- Mfg Operations

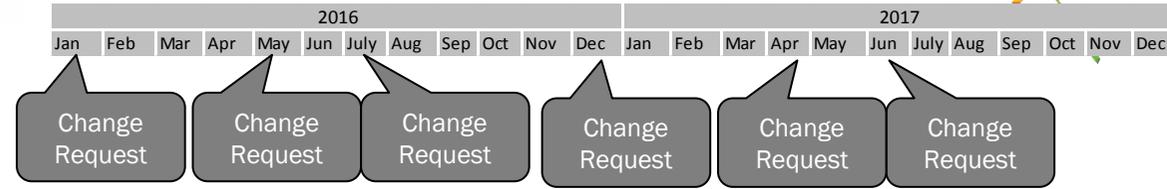
BOMs and  
ned Expressions

# GLOBAL PLATFORMS APPROACH



## Robust WIP PLM to develop Platforms

- All Elements of Platform have lifecycle and revision mgt
  - Architecture
  - Modules - Part Structure and CAD Models
  - Controls - Rules & Expressions
  - Configuration definitions
- Consistent Change Mgt Governance
  - WIP to Release to Obsolescence
  - Change Impact Analysis
  - Evaluate Part and Rule effectivity at same time



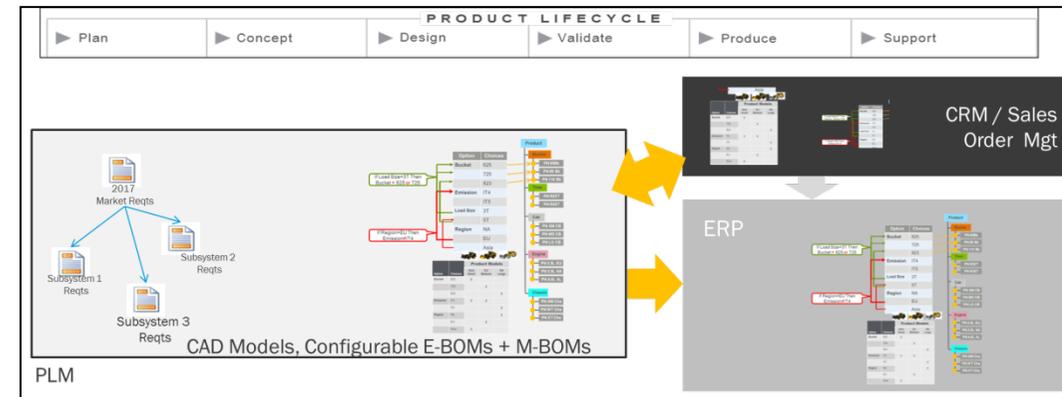
## Flexible Approach to Share with Enterprise

- ESI for Options & Variants - XML descriptions
- Consistent source of truth for product platform



## Key Benefits

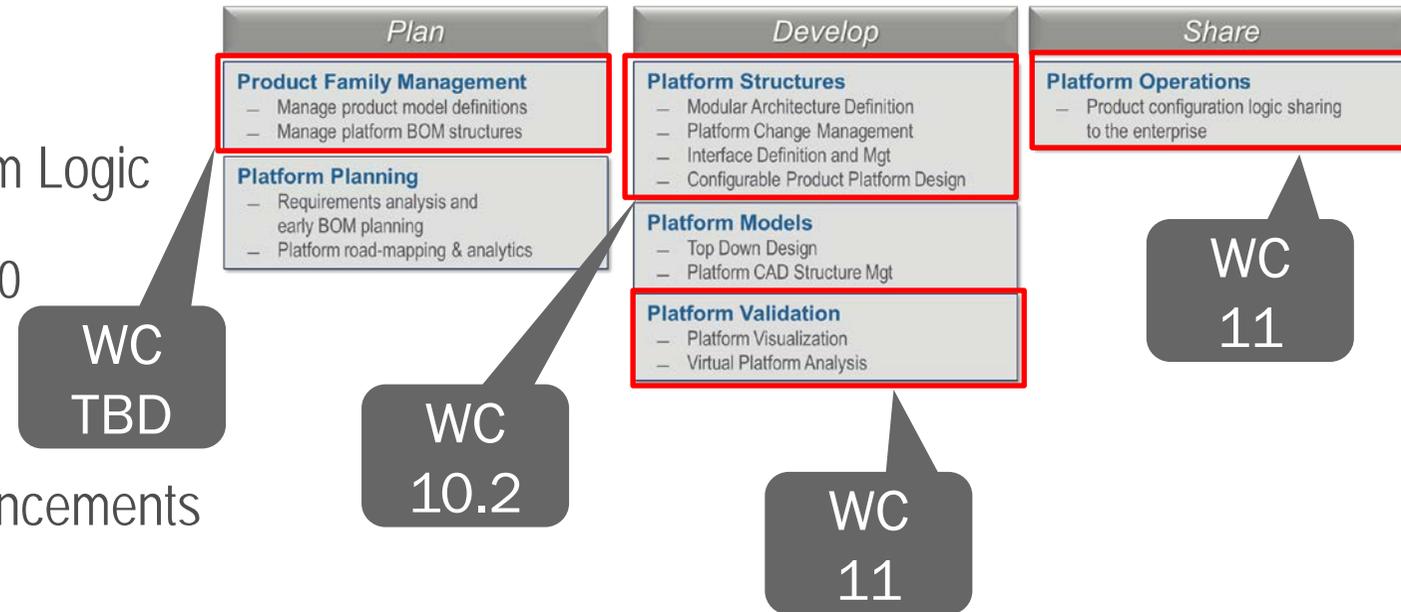
- Validate Platform before Release
  - Virtual fit, Material Compliance
- Enable Production planning before Release
  - Part volumes, Mfg Operations
- Collaborative Market & Sales Planning before Release
  - Share Product Options & Rules with Sales Configurators
  - Plan configurations early with integrity of design information



# GLOBAL PLATFORMS ROADMAP



- **Mature Platform Structures**
  - Expanded Rules and Rule Maintenance
  - Enable Consistent Change Mgt of Platform Logic
  - Releases
    - Updates in WC 10.2 M010, M020, M030
    - Infrastructure updates in WC 11.0
- **Improve Platform Validation**
  - Windchill Interference Management Enhancements
  - Releases - Windchill 11.0
- **Enable Platform Sharing with Platform Operations**
  - ERP Connector for O&V
  - Releases - Windchill 11.0
- **Product Family Infrastructure**
  - Releases - TBD



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## TOPICS

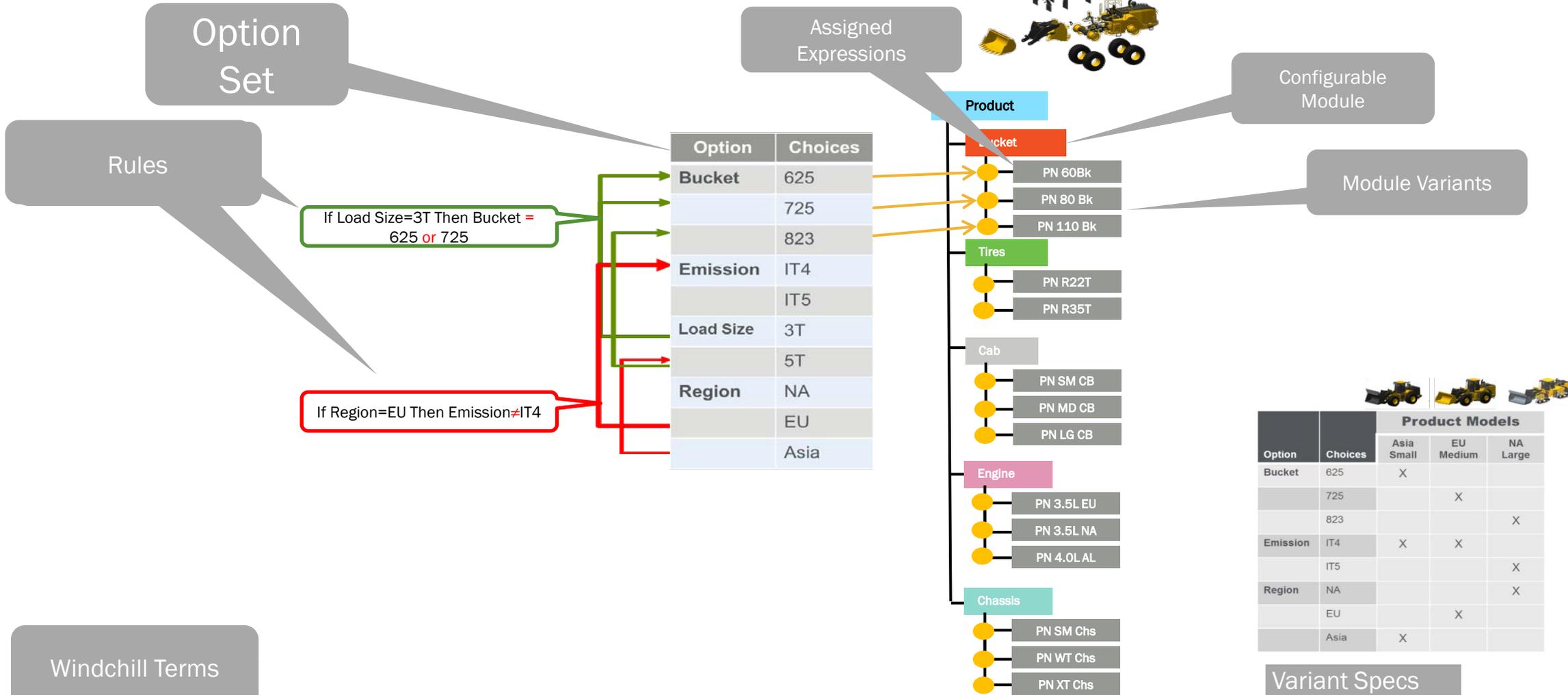
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- Product Platforms Overview
- Product Platform/Configuration Management**
- Product Platform/Configuration Validation
- Q&A

# WINDCHILL PLATFORM MANAGEMENT



## Modular Platform



Windchill Terms

#LIVEWORX

# PIAGGIO MANAGES COMPLEXITY WITH PLM



Piaggio is Europe's largest manufacturer of two-wheeled vehicles and is known throughout the world for their superior technology, craftsmanship and design. Piaggio's stylish and fuel-efficient line of motor scooters are the epitome of practical indulgence.

*“To stay ahead of our competition, we must constantly find new ways to better manage the complexities of sharing product information across multiple brands and throughout multiple geographies. With a solution for Product Lifecycle Management this isn't a problem, it's an opportunity...”*

*Combining know-how with the leading PLM technology gives us the ability to manage the ever-growing complexities of our business so that we can always deliver the right products, at the right time, in any market.”*

<http://www.ptc.com/solutions/product-lifecycle-management/piaggio.htm>



# ENTERPRISE SYSTEMS INTEGRATION FOR OPTIONS & VARIANTS - WINDCHILL 11.0

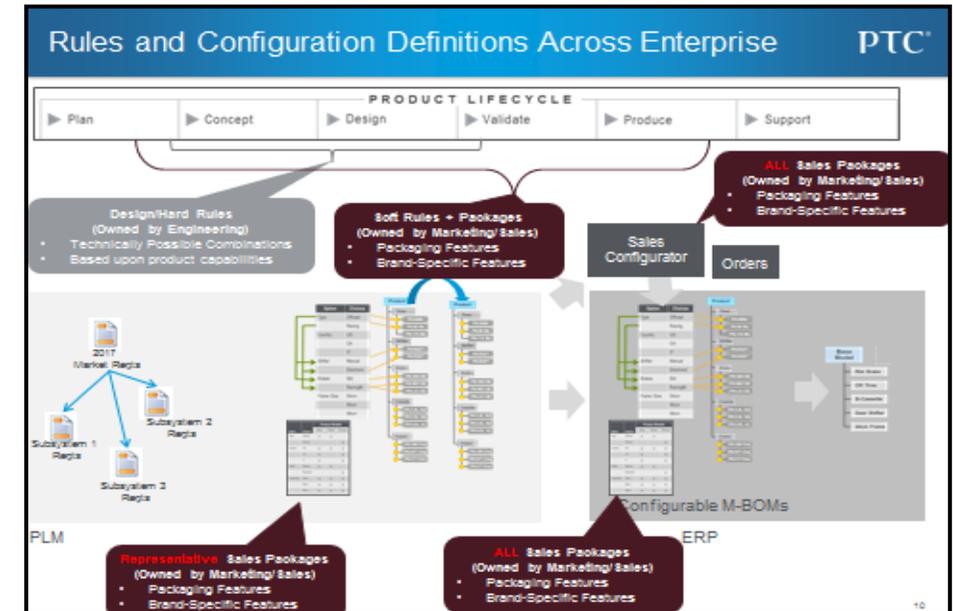


- Goal
  - Reduce Time to Market and Improve Product Quality by Sharing a Full Platform Definition with Order Execution and other downstream environments

**Platform Operations**  
– Product configuration logic sharing to the enterprise

- What to Share
  - Publishing Platform Information Externally
    - Platform release to production systems
    - Full Release or Incremental releases
  - Publishing Platform Definition
    - Configurable E-BOM or M-BOM Structure
    - Options & Choices, Option Set with Local Rules
    - Logic associated with Configurable Structure
    - Associated Change Notices
  - Publishing Updated Platform Definition
    - Updates to all Configurable Structure items
    - Updated Option Set with Local Rules
    - Associated Change Notices
- How to Share
  - API-based/XML, flexible Windchill ERP Connector Approach
  - Publish to 1 or More Distribution Targets

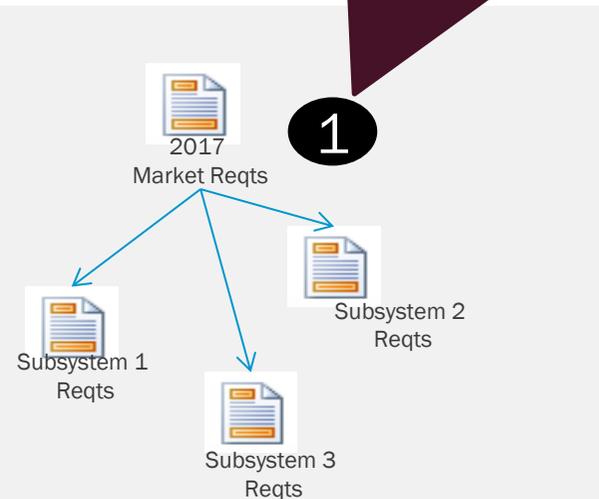
- Packaging & Pricing
  - ESI for Options & Variants Subscription License



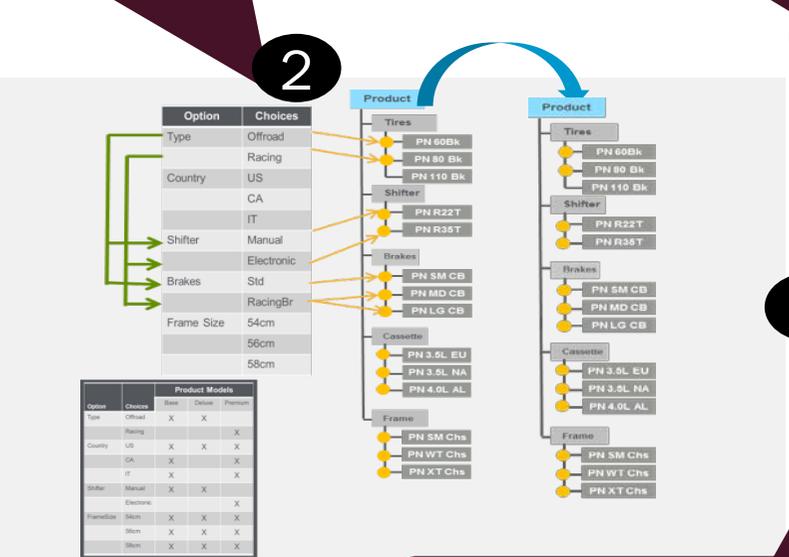
# CONFIGURABLE PRODUCTS – ATO ORDER FLOW



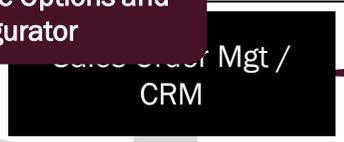
1 Based upon program requirements, identify Options, Choices, important configurations for product



2 Develop Platform-based Product Design



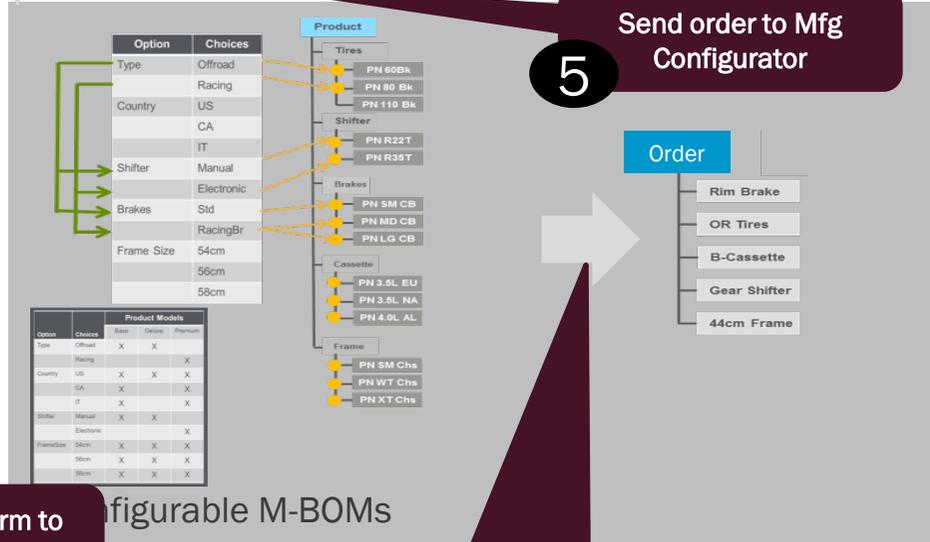
3 Upon Release, Pass Available Options and Rules to Sales Configurator



4 Create sales orders in Sales Configurator

3

5 Send order to Mfg Configurator



3 Upon Release, Share Configurable Platform to Mfg configurator

6 Generate SON and Order BOM from Configurable BOM

CAD Models, Configurable E-BOMs + M-BOMs

Configurable M-BOMs

PLM

ERP

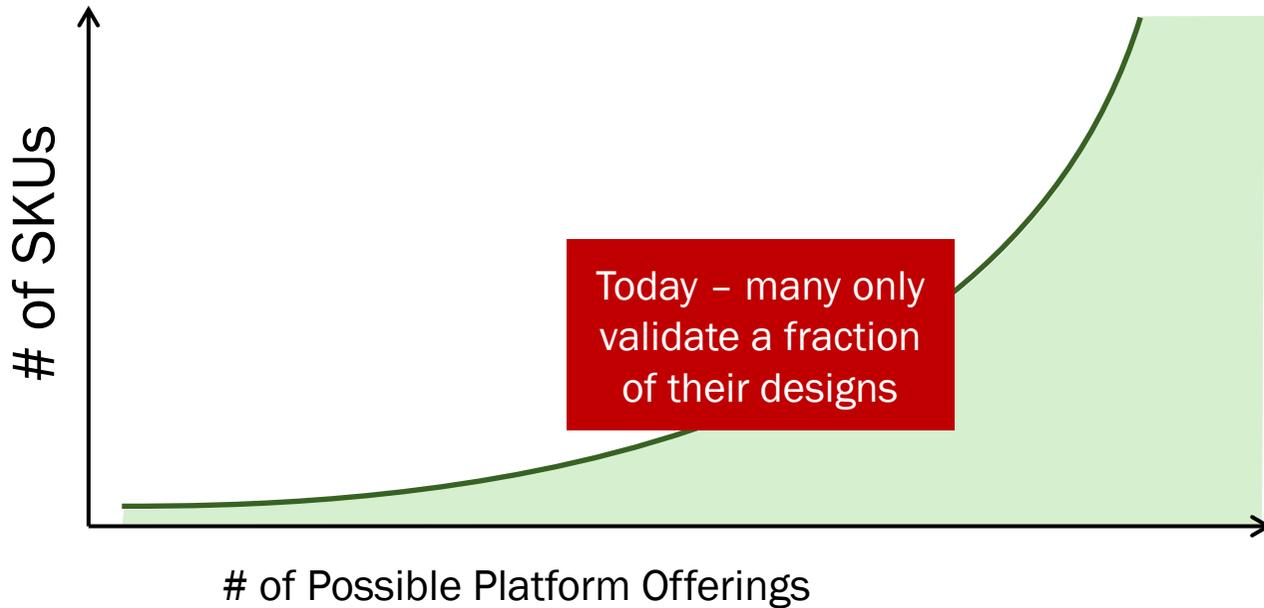
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# VALIDATING PRODUCT PLATFORMS

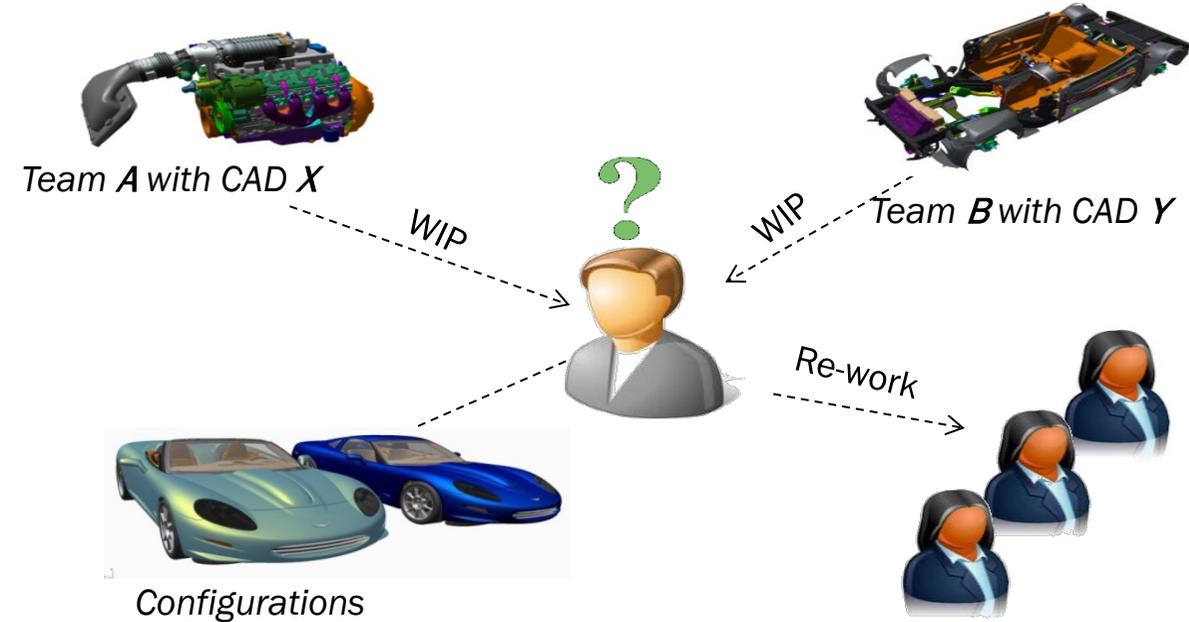


- Platform Structures enables the creation of large amounts of product variation

- But...how do you know if there are interference issues in the designs?

- This can be too complex and time consuming to try to accomplish by hand

# INTERFERENCE MANAGEMENT CHALLENGES



## Challenges

- .....
- Inability to check large and multi-CAD design packaging
- Inability to validate multi-team designs
- Inability to validate product configurations
- Significant manual effort required

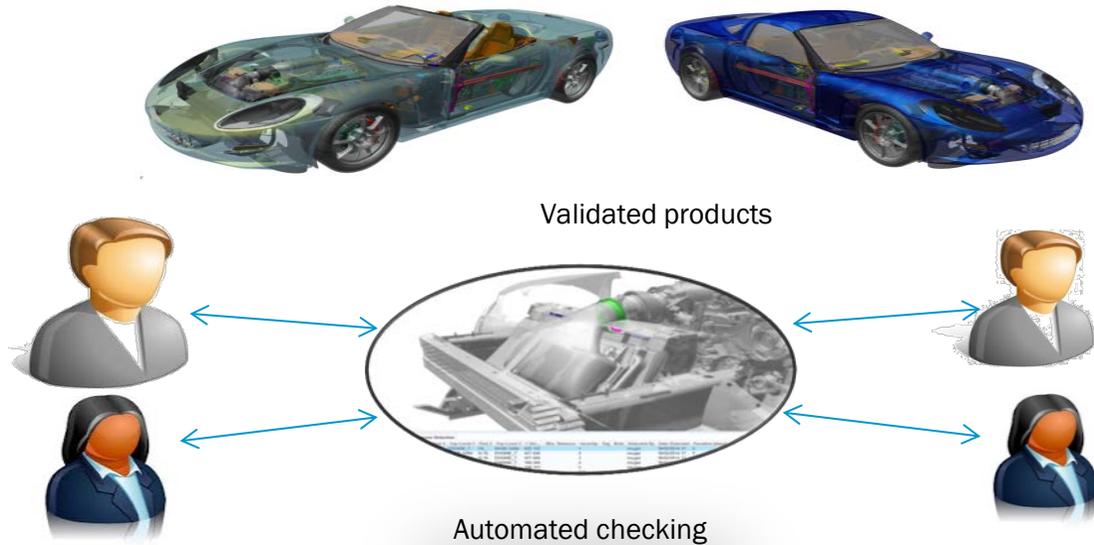
## Negative Consequences

- Expensive late-stage re-work
- Missed schedules
- Low product confidence

## Metrics

- Number of ECOs
- Cost of design changes
- Delay in product release due to design interferences

# AUTOMATED INTERFERENCE CHECKING TRANSFORMED CUSTOMER



## After Scenario

### Clash-free designs

from disparate teams and tools

### Accelerated issue resolution

clear communications and disposition

### Validated product packaging

from product configurations

## Positive Outcomes

Reduced re-work and lowered development cost through automated interference checks

Schedules met

Improved product confidence

## Justification

Siemens Rail Systems uses EVR Interference Checking to validate large and complex train designs.

“Strong credit must also be given to PTC’s interference checking product”  
– CIMdata Oct, 2013

# AUTOMATED INTERFERENCE CHECKING AND MANAGEMENT



*Challenge: Ensure timely interference checks on multiple products and product configurations*

## Practice

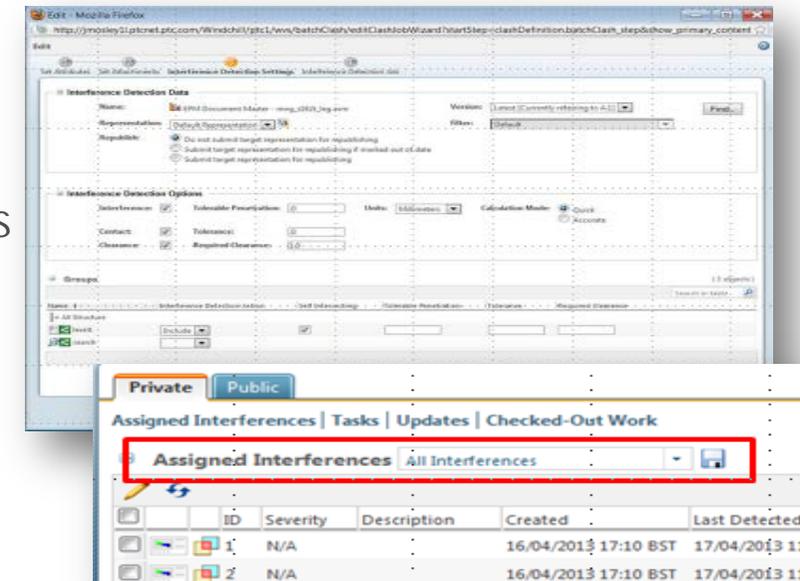
- Use automated interference checking and interference management to validate multiple products are interference free

## Capabilities

- Automated, server-based and scalable interference checking service
- Powerful dynamic groups support work-in-progress designs and product configurations
- Powerful reporting and assignment disposition tools
- Intuitive navigation of interference reports directly from PLM
- Compare interference reports
- Manage, Assign, and Track Interference tasks to their logical end

## Value

- Interference checking automation helps ensure large, configurable, complex products are interference-free to reduce design management cost, reduce re-work and prevent schedule slippage



# SMS SIEMAG IMPROVES OPERATIONS WITH PTC CERO VIEW



## Challenges

- Early detection of possible collisions of steel structure, pipework and machine parts
- Identifying where crane tracks or escape routes are obstructed or blocked due to the confined plant space
- Creating extensive and comprehensible customer documentation early in the planning phase

## Solution

- Creo View is used to prepare DMU models needed for collision checks
- DMU model is used to check crane tracks and plant escape routes
- Virtual model is used for customer presentations and training of customer maintenance teams

## Results

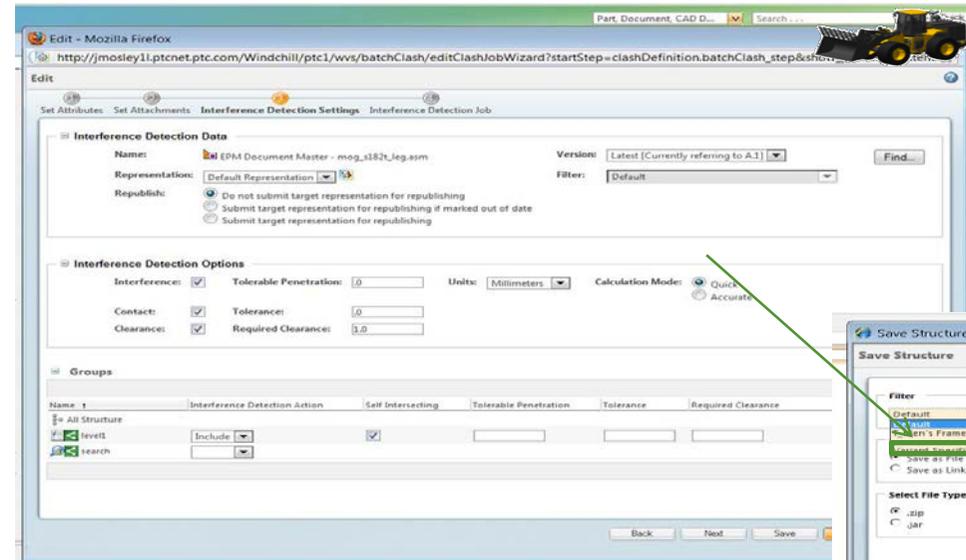
- Expensive, on-site modifications are avoided improving overall schedule effectiveness
- Improved safety planning due to virtualized crane tracks and route concepts
- High level of customer satisfaction due to quicker familiarization and greater overall understanding of the plant

# BATCH INTERFERENCE – VARIANT SPECIFICATION SUPPORT FOR FILTER CRITERIA



## Capabilities

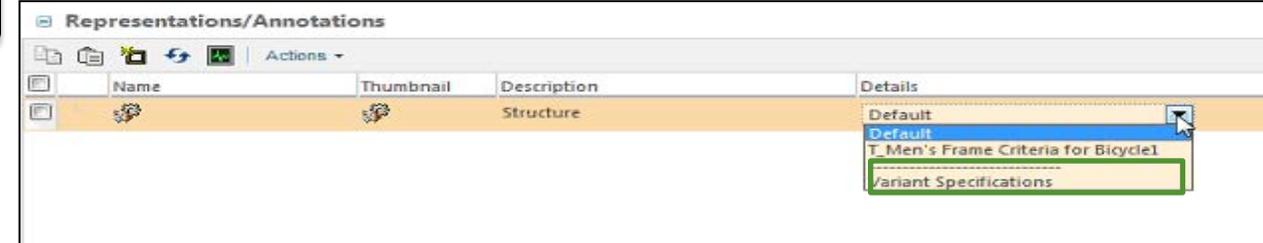
- Re-use product configuration definition – Variant Specifications from Configurable Design
- Set Variant Specifications in Interference Definitions
  - Facilitates common understanding and analysis of related product configurations
  - Updates to variant specification definitions can propagate to Interference Definition
- Enhanced Ad-hoc Representation Creation
  - Create representations from Variant Specifications



Product Models				
Option	Choices	Asia Small	EU Medium	NA Large
Bucket	625	X		
	725		X	
	823			X
Emission	IT4	X	X	
	IT5			X
Region	NA			X
	EU		X	
	Asia	X		

## Benefits

- Improved Quality and Consistency of Interference Analysis Results tightly aligned with Product Design



Note: The user must be a member of the Platform Structures Group to use Variant Specifications

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# BATCH INTERFERENCE – INTEGRATION WITH CHANGE MANAGEMENT



## Capabilities

- Interferences can be associated with change notice, change request, problem report, variance
- A New Change management Object can be created directly from an Interference Report
  - What is added as Affected Objects and Annotations is controlled by a preference
- The Clipboard can be used to add interferences to existing Change Management Objects
- Open Interference Report into Creo View for detailed examination

## Benefits

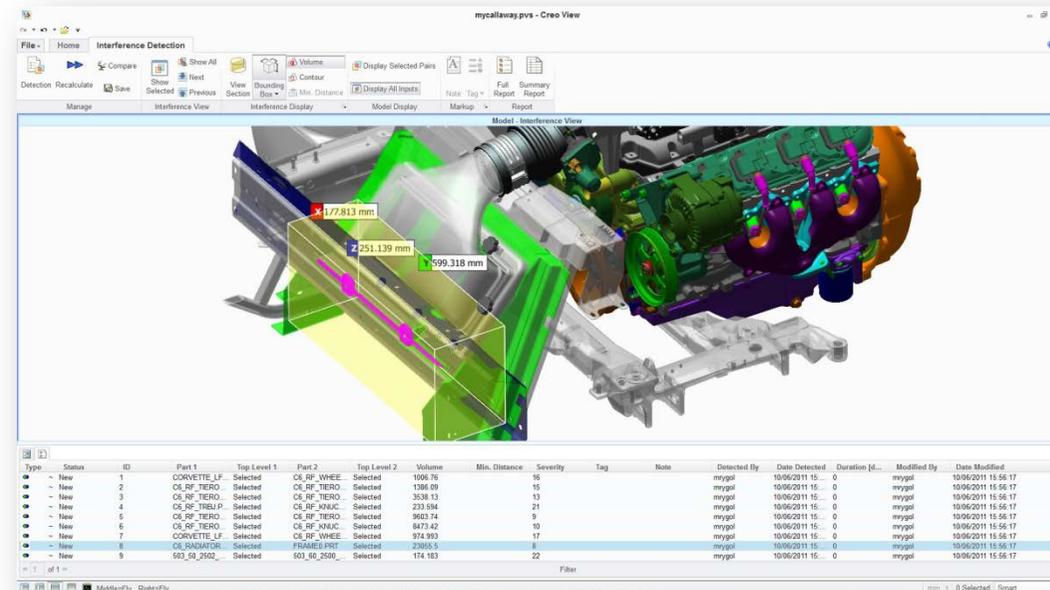
- Change management can be used to track the resolution of interferences



**Name** : Affected objects for change management  
**Description** : Specifies which parts involved in an interference to collect as affected objects for a change. Whether this is an EPMDocument or WTPart is determined by the interferences association, controlled by the preference "Object Types to associate Interference Detections to". In all cases the Interference will be associated to the change and any collected parts as supporting information.  
**Interfering Parts**: Associates both parts directly involved in the interference.  
**Common Parent**: Associates the common parent part of the interference.  
**None**: Associates no parts related to the interference

**Context** : Site  
**Value** : Interfering Parts  
**Comments** : Interfering Parts  
Common parent  
None

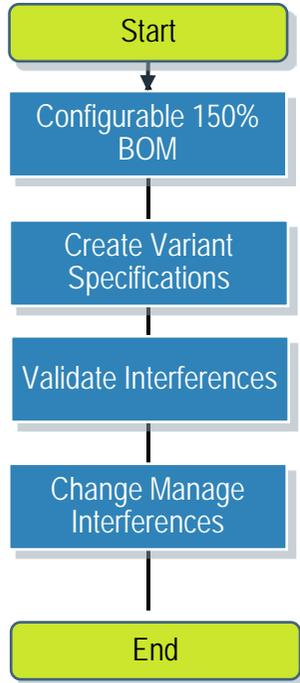
**Locked** :



# PLATFORM VALIDATION BEST PRACTICE STEPS



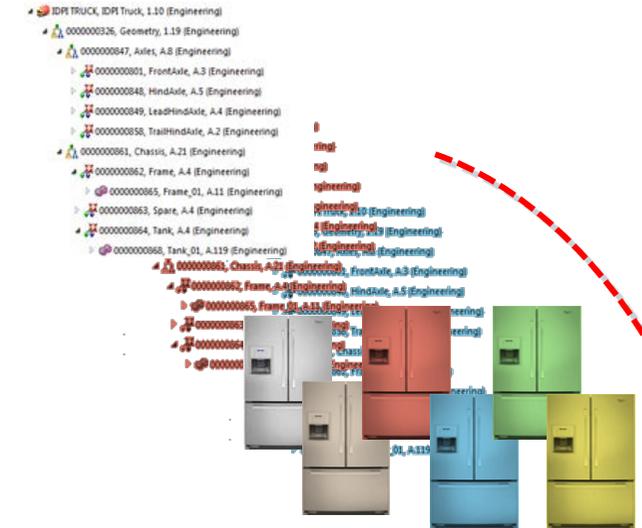
## ► Storyboard Overview



*Configurable 150% BOM*

- ▶ IDPI TRUCK, IDPI Truck, 1.10 (Engineering)
  - ▶ 0000000326, Geometry, 1.19 (Engineering)
    - ▶ 0000000847, Axles, A.8 (Engineering)
      - ▶ 0000000801, FrontAxle, A.3 (Engineering)
      - ▶ 0000000848, HindAxle, A.5 (Engineering)
      - ▶ 0000000849, LeadHindAxle, A.4 (Engineering)
      - ▶ 0000000858, TrailHindAxle, A.2 (Engineering)
    - ▶ 0000000861, Chassis, A.21 (Engineering)
      - ▶ 0000000862, Frame, A.4 (Engineering)
        - ▶ 0000000865, Frame\_01, A.11 (Engineering)
        - ▶ 0000000866, Frame\_02, A.11 (Engineering)
        - ▶ 0000000926, Frame\_03\_c, A.6 (Engineering)
      - ▶ 0000000863, Spare, A.4 (Engineering)
    - ▶ 0000000864, Tank, A.4 (Engineering)
      - ▶ 0000000868, Tank\_01, A.119 (Engineering)
      - ▶ 0000000869, Tank\_02, A.70 (Engineering)
      - ▶ 0000000924, Tank\_03\_c, A.11 (Engineering)
      - ▶ 0000000925, Tank\_04\_c, A.6 (Engineering)

*Create Variant Specification(s)*



*Validate Interferences*

*Change Manage Interferences*

Private Public

Assigned Interferences | Tasks | Updates | Checked-Out Work

Assigned Interferences All Interferences

ID	Severity	Description	Created	Last Detected
1	N/A		16/04/2013 17:10 BST	17/04/2013 11
2	N/A		16/04/2013 17:10 BST	17/04/2013 11

*Send to Windchill Clash Engine*

*Load into CreoView*

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## TOPICS

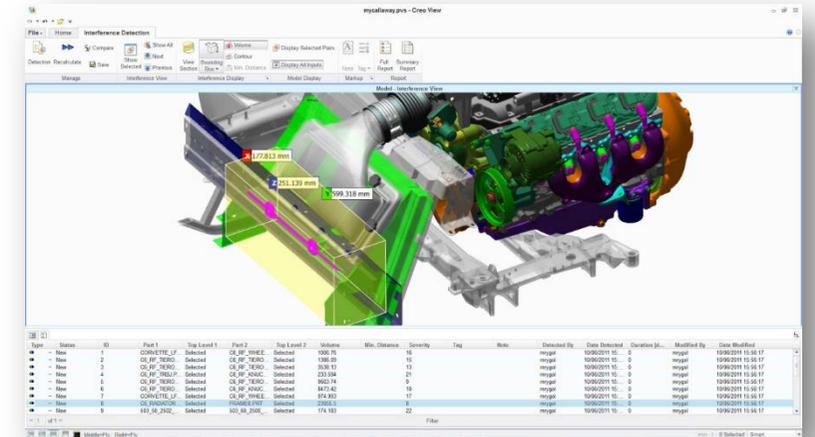
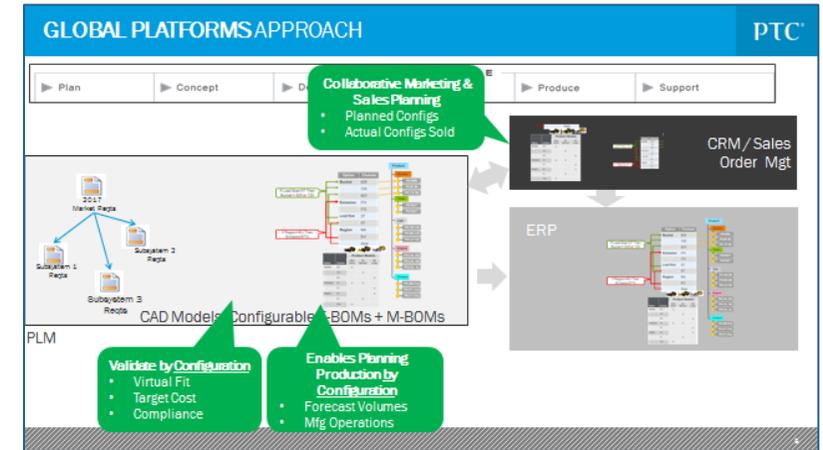
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- Product Platforms Overview
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# SUMMARY



- Managing and Validating Product Configurations
  - Enabling Platform Validation across the Enterprise
- ESI for Options and Variants
  - Share Released Platform Definitions to other Enterprise Systems
  - Manage Platform Updates
- Windchill Interference Management
  - Validate a much wider range of the platform
  - Confirm designs earlier in the process



The image features several colorful geometric shapes, primarily triangles and lines, scattered across the white background. A large, multi-colored triangular shape is prominent on the right side, composed of various shades of blue, green, yellow, and purple. Several thin, colored lines (blue, pink, green, orange) radiate from the center of the text area. The text 'LIVE WORX 16' is the central focus, with 'LIVE' in a thin, outlined font and 'WORX 16' in a bold, solid black font. A small 'TM' trademark symbol is positioned to the upper right of the '16'.

LIVE  
WORX 16™

TAKE A FRESH LOOK AT THINGS

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# APPENDIX A – GLOBAL PLATFORMS UPDATES FOR WINDCHILL 10.2 M020 & M030

# PLATFORM STRUCTURE FEATURES

## WINDCHILL 10.2 M020



- Platform Structures**
- Modular Architecture Definition
  - Platform Change Management
  - Interface Definition and Mgt
  - Configurable Product Platform Design



- Enhanced Platform Rules
  - New Requires Rule



- Improved Platform Logic Change Management
  - New Global Rule Change Management



- Improved Support for Managing Configurations
  - Improved usability of Variant Specification access for filtering configurations (variant specifications)



- Usability and Filtering Enhancements
  - Improved Edit Filter, Preview and Configure dialog

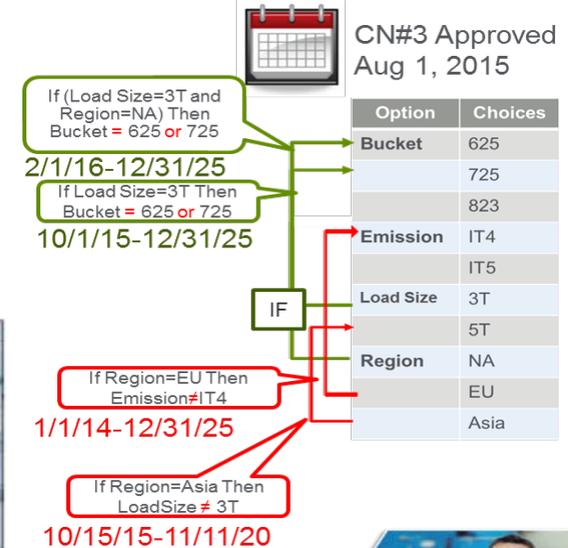
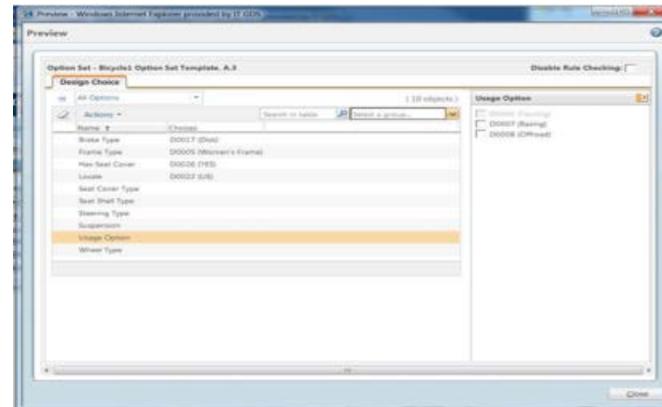
**Set Configuration Specifications for Options Filter**

**Configuration Specification**

Choose a Type:

Effectivity Context:

\* Effectivity Date:



# PLATFORM STRUCTURE FEATURES

WINDCHILL 10.2 M030



**Platform Structures**

- Modular Architecture Definition
- Platform Change Management
- Interface Definition and Mgt
- Configurable Product Platform Design

## Topics



### Enhanced Platform Rules and Assigned Expressions

- Alias - Streamline rule and assigned expression definition
- Choices with Numeric values - simplify rules and reduce maintenance

SmallTires →

Tires=28IN/30IN/32IN/36IN/48IN

IF (Tires>=32IN) THEN HP=45HP/55HP



### Improved Platform Logic Change Management

- Added Local Rule Change Management
- Added Assigned Expressions Change Management

Calendar icon: CN#2 Approved July 1, 2015

If (Load Size=3T and Region=NA) Then Bucket = 625 or 725  
2/1/16-12/31/25

If Load Size=3T Then Bucket = 625 or 725  
10/1/15-12/31/25

IF

If Region=EU Then Emission#IT4  
1/1/14-12/31/25

Option	Choices
Bucket	625 725 823
Emission	IT4 IT5
Load Size	3T 5T
Region	NA EU Asia



### Enhancements for Managing Module Variants

- Support for Assigned Expressions on Part Occurrences
- Create & Edit Module Variants with Spreadsheets



### New Administrative Support for Creating Configurations

- Spreadsheet and API support to create & update configurations (variant specifications)
- Programmatically create and update variant product structures

**Create new Module Variants in the Matrix**

Line Number	Find Number	Unit of Measure	Quantity	Name	Number	GC000001	GC000002	GC000003	GC000004	GC000005	GC000006	GC000007	GC000008	GC000009	GC000010
1		ea	1	b		1									
2	65	ea	1	CP001-01	1	1	1	1	1	1	1	1	1	1	1
3	70	ea	1	CP001-02	1	1	1	1	1	1	1	1	1	1	1
4	75	ea	1	CP001-03	1	1	1	1	1	1	1	1	1	1	1
5	80	ea	1	CP001-04	1	1	1	1	1	1	1	1	1	1	1
6	85	ea	1	CP001-05	1	1	1	1	1	1	1	1	1	1	1
7	90	ea	1	CP001-06	1	1	1	1	1	1	1	1	1	1	1
	119	ea	1	CP000-01	1	1	1	1	1	1	1	1	1	1	1
	105	ea	1	CP000-01	1	1	1	1	1	1	1	1	1	1	1
	91	ea	1	CP000-02	1	1	1	1	1	1	1	1	1	1	1
	82	ea	1	CP000-03	1	1	1	1	1	1	1	1	1	1	1
	93	ea	1	CP000-04	1	1	1	1	1	1	1	1	1	1	1
	94	ea	1	CP000-05	1	1	1	1	1	1	1	1	1	1	1
	107	ea	1	GC000002	1	1	1	1	1	1	1	1	1	1	1
10		ea	1	GC000019	1	1	1	1	1	1	1	1	1	1	1
20		ea	1	GC000019	1	1	1	1	1	1	1	1	1	1	1
		ea	1	GC000038	1	1	2	3	4	5	6	7			
		ea	1	GC000040	1	1	1	1	1	1	1	1	1	1	1
		ea	1	J201	1	1	1	1	1	1	1	1	1	1	1
		ea	2	J202	2	2	2								

**Add parts for a set of module variants**



### Usability and Filtering Enhancements

- New filter type - filter out incomplete assigned expressions
- Tailor-able logic expression display (with/without Options)