Multi BOM Configuration Management

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Multi BOM Configuration Management

Introductions
Complexities of CAD and Multi BOM integration
Configuration Control Zones (CCZ)
Establishing Use Cases
Questions
Introductions

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• Presentation created as a collaboration between aerospace companies (CIMData Aerospace and Defense Action group)

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• The aerospace industry is working with the CIMdata group to collaborate on areas where we agree to work on commonality.
• Sub teams were formed to prototype use cases and report out findings.

• Examples:
  • CAD data standards
  • Multi BOM accountability

• What we have learned so far…..
  • After several discussions between Boeing and Airbus on multi BOM accountability (EBOM/MBOM), we discovered that we first needed a good way to communicate concepts. A way to communicate conceptual EBOM and MBOM architecture.
We discovered we need a common “accepted” vocabulary for talking about configuration complexities. Where Processes and System integrate to manage configuration lifecycles. Boeing shared our method of using “Configuration Control Zones”

Configuration Control Zones (CCZ):
- Definition: The data that is owned by a single revision of a configuration.
- Examples: A revision of an assembly owns the relationships to the components and related data unique to that assembly.
CCZs communicate a conceptual configuration architecture

The Configuration Control Zones concept creates a language that can describe system behavior without needing to use the abstract definitions of UML.

If an arrow is used, there is an Association between objects. Association is whenever the Class A object needs to know about a Class B object to perform its functionality. Example: An airplane is associated to an engineering inspector.

If the diamond is left empty, it signifies an Aggregation. Class A owns a relationship instance to Class B. But the lifecycle of B is independent of the lifecycle of A. If A is deleted, B can live independently. Example: A factory location aggregates airplanes that are being built.

If the diamond is black, this means it is a Composition. Class A completely contains the relationship and the ownership of Class B. The lifecycle of Class A also controls the lifecycle of Class B. If A is deleted, B will also be deleted. Example: An airplane is composed of an engine.
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• The cost and complexity of implementing each new generation of PLM creates the need for the Aerospace industry to consolidate on common functionality.

• PLM providers create flexible capabilities for managing the variation that occurs when we integrate CAD/EBOM/MBOM.

• Some of this variation is created by “opposing forces” that drive customizations in PLM because there is no industry standard or best practice.

• The pain points we all experience – the opposing forces:
  • Flat vs. Hierarchical product structures
  • Filtered configuration by option vs. persistent definition
  • Internal tabulation (150% BOM) vs. part number control
Multi BOM Configuration Management - EBOM and MBOM Concepts

- PLM systems allow effectivity on objects and relationships without a common schema to ensure accountability. Without an industry best practice in this area, **every company must create internal effectivity schemas that are very difficult to change once implemented.**

- There are many different approaches to simplifying this problem.
  1. Create PLM customizations to keep the EBOM and MBOM reconciled **prior to release.** (Boeing non-787 models)
  2. Use as COTS, eliminate the MBOM and force the EBOM to manage all mfg changes (Airbus)
  3. Use as COTS with MBOM and use reconciliation reports post release (ENOVIA/DELMIA)

**Boeing 787 Multi BOM Configuration Management - EBOM and MBOM Concepts**

- EBOM
- Effectivity range 1-9999
- Eng Effectivity
- Mfg Effectivity
- MBOM
- Operations
- Plan

- Eng Effectivity
- Mfg Effectivity

- EBOM and MBOM Concepts
Split Design Use Case

Design is split between two plans

- Effectivity
  - Eng. Instl Level Design
  - Eng. part
  - Mfg plan (Instl level plan)
  - Part omitted in MBOM

MBOM

25-9999
MFG plan ABC
Rev A
-1
-3
-4

EBOM

25-9999
-1
-2
-3
-4

MFG plan DEF
Rev A
-1
-2

Design is split between two plans
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EBOM Installation

Part 1
Part 2
Part 3

Boeing non-787 Programs

Boeing 787

Plan CCZ owns part relationships

Plan CCZ

Boeing non-787 Programs

Plan CCZ

Plan CCZ

Installation

Plan BCD
Part 1
Part 2
Part 3

Plan ABC

MBOM Accountability view CCZ owns part relationships

Dynamic CCZ extendable up to a defined scope

Airbus A350

Plan CCZ

Plan CCZ

Plan CCZ

Plan BCD
Part 1
Part 2
Part 3

Plan ABC
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- Deeper description of the method used on Boeing non-787 programs (737, 767, 747, 777)

Initial State:

- 25-9999 -1 REV A
  - 2
  - 3
  - 4
- 25-9999 -2 REV A
  - 5
  - 6

25-9999 MFG plan ABC

Second State:
Mixed case of splitting Installation in several manufacturing plan and merging several installation in a common manufacturing plan

- 25-9999 -1 REV B
  - 2
  - 3
  - 4
- 25-9999 -2 REV A
  - 5
  - 6
- 25-9999
- 25-29
- 30-9999

25-9999 MFG plan ABC

25-9999 MFG plan DEF

REV A

REV A
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- Deeper description of the method used on Airbus A350

Initial State:
One to one relation between manufacturing plan and installation eBOM

Second State:
Mixed case of splitting Installation in several manufacturing plan and merging several installation in a common manufacturing plan

CCZ is defined by the Installation scope

CCZ is extended to the second installation: reconciliation is performed in the full CCZ perimeter

New plan managed by PNR control

• Deeper description of the method used on Airbus A350

Initial State:
One to one relation between manufacturing plan and installation eBOM

Second State:
Mixed case of splitting Installation in several manufacturing plan and merging several installation in a common manufacturing plan

CCZ is defined by the Installation scope

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New plan managed by PNR control
Conclusions

• We continue to work with CIMData and the A&D Action group to mature the ideas above and statement of direction in 2017

• We would like to invite additional companies that would like to help us collaborate and mature these concepts
Questions?

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