Managing Multiple Lifecycle Representations

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Managing Multiple Lifecycle Representations - Outline

- Overview
- Managing Multiple Representations
  - Occurrence Management
  - Context Management
  - Lifecycle Representations and Associativity
- Summary/ Future Direction
- Q&A
A Complete Lifecycle Approach

- Which types of lifecycle data need to be managed?
- Each domain area can contain multiple data representations
- The major lifecycle domains provide a high level view of the total representations that need to be managed
- As the lines indicate, there are dependencies between lifecycle domains
- These dependencies imply the need for associativity among the representations in these domains

Major Lifecycle Domains within PLM
Examples of Lifecycle Representations

What type of data is needed to represent and define a product? What type of data is needed to perform my function?

Data for a single user in a single functional area

Data Referenced
Data Authored

Other users in the same functional area

Other users
An **Occurrence** is a specific usage of an item in the context of a higher-level node in a hierarchical structure of business items.

Where do I put information belongs to the front left wheel?

Note: This example talks about parts, however, plant, functional and other types of structures often need to reference individual occurrences as well.
Absolute Occurrences are used to model the indirect usage of an element in the context of some higher-level assembly.

Available in Teamcenter Enterprise and Teamcenter Engineering.
Occurrences at Any Level

Product Structure of Car

Car
Axle Assembly #P123
Qty=2

Axle #P789
Qty=1

Rear Axle Assembly #O123B

Occurrences In Context of the Axle

Axle Assy Context

Left Wheel
Right Wheel
Axle

Occurrences In Context of the Car

Car Context

Front Axle Assembly #O123A

Relative Occurrences

Rear Axle Assembly #O123B

Absolute Occurrences

Front Left Wheel #O456A
Front Axle #O789A
Front Right Wheel #O456B
Rear Wheel #O456C
Rear Axle #O789B
Rear Right Wheel #O456D

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Uses of Occurrences

- To store occurrence specific data
  - E.g. Usage specific names and descriptions
  - E.g. Positional overrides for non rigid body assemblies
    - The shock absorber assembly positions its sub-parts in a relaxed state. However, in the context of the vehicle the position of the connecting points is compressed. The vehicle must override this position for a part that is not it’s immediate child
- To preserve accountability between representations (e.g. manufacturing plans consume design occurrences not parts)
- Visualization support
  - Exploded views, Color overrides
- Facilitate CAD integration
  - Positional overrides, Copy with associativity, Wave links
  - VCP, Arrangements, Flexible Components (NX4 support)
Overriding Occurrence Data in Teamcenter Engineering

- Following data can be overridden
  - Occurrence Notes
  - Occurrence Type
  - Quantity
  - Absolute Transform
  - Sequence Number
  - Variant Condition (excluding modular variant expression)
  - Occurrence Position Constrained
  - Occurrence Suppressed
Application Drivers for Occurrences in Teamcenter

- **Manufacturing**
  - Provides accountability and reconciliation between the plant, process and product representations

- **Platform Designer Application**
  - Product Architecture breakdown uses absolute occurrence model

- **Mechatronics**
  - The ports (GDE) and connections model that is used to model functional and electrical systems relies on having not just absolute occurrences of items in a structure but also absolute occurrences of the ports and connections themselves e.g. a chip with 12 pins must be able to separately identify each occurrence of the pin, even though the pins are not separate parts, just connection points from a circuit perspective

- **CAD Data Management/ Visualization**
  - Essential construct for storing geometric and positional information

- **MRO/ In-Service**
  - Requires the occurrence model to identify location information for tracking purposes and for proper linking to the engineering structure. Needs enhancements to deal with restructuring, option & variant interoperability, view support etc
Occurrence – An object describing a usage of a business item in a context of a representation
Occurrence Group – A collection of occurrences from a specific representation. It is used to scope a subset of a large representation for a specific design task.
Motivation for Context Management

- For full lifecycle integration, we must understand the different types of product data representations and the associations between them. Additionally, we must understand how users and applications need to access and share this product data.

  - Users often need information that may come from different representations.
  - They use this information to author new information.
  - Compositions and Context provide an information context to support the in-work use of data while ensuring consistency in the broader context.
Context Management: Fundamental Constructs

- **A Composition** is a mechanism for representing an environment composed of occurrences from different products, for making design decisions that take into account information from different products’ representations.

- **A Structure Context** is a mechanism to persist structure data and the configuration context by which the data is configured.

- **A Configuration Context** represents the collection of qualification criteria needed to configure a representation e.g. selected options, effectivity, maturity state, closure etc.

- **A Collaboration Context** is an information structure that is needed to manage the information boundary between an intended working task and shared data as a whole.
  - A collection of structure contexts to be used for a specific task.
Collaboration Context isolates data needed for some task

The user makes design choices from within the boundary that has been defined.

The user performs their task which authors new information.

Changes are incorporated back into the shared product data and reconciled.
Configuration Context – A persistent object representing the configuration rules of a representation in Teamcenter (Revision Rules, Variant rules, Closure Rules)
- **Structure Context** – A persistent container for representations and/or occurrence groups with their corresponding configuration context (revision rules, variant rules)
For the purpose of analyzing the interface between the boat, car and the trailer, we need only the occurrences in this area.
Collaboration Context

- **Collaboration Context** - A persistent collection of Structure Contexts describing a design context for a specific design task
Composition – A representation describing an environment, composed of occurrences from different products, for making design decisions that take into account information from different products’ representations.
Lifecycle Representations and Associativity
A Manufacturing Associativity Example
Process - Product Configuration

- Automatic process configuration based on product configuration
  - Configuration of the product drives the configuration of the process
  - Additional configuration rules can be applied to the process structure – new options and variants can be introduced. These are not propagated back to the product

- Operations will not be configured, if one of their consumed parts is not configured in the product structure

- Consumed parts are associated with their corresponding part instance from the product
Comparing Representations

- Teamcenter allows the components in two representations to be compared
  - Components added, deleted or changed are highlighted
- The two representations being compared may be two different structures or the same structure with two different configuration contexts applied (e.g. effectivity, view, variant etc)
- Two types of Compare
  - Non-occurrence based compare
  - Occurrence based compare
Representation

- **Representation** – Composed of occurrences that together representing one aspect a program e.g. design BOM or manufacturing BOM
Multiple Representations:
MBOM-> BOP (Manufacturing Process)
Summary/ Roadmap
Summary:
Collaboration Context application

- A Teamcenter application allowing the user to do the following:
  - Create Structure Context and Collaboration Context
  - Creating multiple representations by allocating occurrences from one representation to another
  - Creating/editing occurrence groups
  - Creating composition by allocating occurrences/occurrence groups from one representation to compositions
  - Reposition occurrence groups in a composition
  - Comparing structures that share occurrences
  - Find occurrences by occurrence id
  - Partially loading assembly structure
  - Capture snapshots from base structures
  - Exchange objects from the collaboration context with external system
Questions?