Integration of Engineering and Design

Managing Design and Simulation without Gaps

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Content

- Background

- PROSTEP Group

- Integration of Engineering and Design – The Concept

- Outlook: The Integration Architecture for Engineering
Background

- PROSTEP supports Airbus in developing a solution for the inter-disciplinary integration of CAE data and processes

- Requirements definition for a **CAE product structure**
- **Simulation View** of the product
- Ways to **inter-relate CAE** with CAD, Flight Physics, Test, ...
- **Configuration** and **change** management aspects
- Enablers for **Product Data Management** of CAE information
PROSTEP Group

PLM-Consulting
CA-Technologies
PDM-Integration
Supplier Engineering-Communication
Software Development
mySAP/PLM Consulting

AeroSpace Solutions

Standard Software Development

The mySAP/PLM Experts
Enterprise Application Integration for Technical Data

Information – Location vs. Meaning

- Data Management: Provide the right information in time at the right place and in the right format
- Information scattered across organizations – each of which taking its own perspective on it
- Scattered: where is it held (location)
- Perspective: how is it interpreted (meaning)

Data Management:
- Provide the right information in time at the right place and in the right format

Information scattered across organizations – each of which taking its own perspective on it

Scattered: where is it held (location)

Perspective: how is it interpreted (meaning)
Design integration over different locations

- Meta information exchanged between PDM systems, but always remains in the design domain – meaning retained

- One major type of design tool: the “CAD system” – high information content overlap – meaning retained
The Challenges of Simulation Data Integration

- Integration over different domains and semantic breaks

- Completely new level of complexity
The Challenges of Simulation Data Integration

- Maintain **product context** for CAE information
- Make CAE information referable
- Keep **interrelations** of CAE information with other domains
- Manage CAE information during the **product lifecycle**

Design

CAD PDM Vault

CAD

CAD

CAD

CAE Information
A Common Reference Base for Simulation Information

- Other than CAD the area of CAE covers a variety of different proprietary software tools
- Consequently, simulation information today is redundant, distributed and represented by a large number of proprietary data formats
- Information can only be referenced as files – granularity tool related rather than oriented on product structure
A Common Reference Base for Simulation Information (2)

- Redundancy free and consistent
- Single source of information
- Centrally manageable data access and administration
- Decoupling of tools and data / data store
- Reference base
CAE data today is typically based on files, “managed” in file systems.

- Virtually no information about „Who has done what when and why?” and „What is is file for?”
- CAE perspective on the product is different from CAD.
- Organizing and granularity of data file can barely be called product oriented.
- Data management is done manually.
- Digital simulation information can today not be referenced.
“CAE data clusters” effectively play the role of the CAD files – can be referenced and managed by a PDM system

- product oriented structure for CAE reference based based on function and behavior
- information related to the analysis of a certain component is clustered

→ Introduction of an engineering simulation view
Inter-relating CAE Information with other Domains

- **Close interrelation** exists by nature between information in product design and simulation
- **Changes** in one domain *cause* respective *activities* in the other – dependent – domain
- These interrelations – even though logically existing – cannot be *represented persistently* today
- Consequence: No possibility to *trace dependencies*
Inter-relating CAE Information with other Domains

- **Discipline integration at PDM level:** dependencies → change management

- **Discipline integration at CAE data level:** information context → engineering intent
CAE Product Data Lifecycle Management
Development processes run over time

Information of different domains (such as CAD, CAE, …) is manipulated concurrently in different views on the product

Synchronization between CAD and CAE required at determined points in time (such as mile stones, quality gates)

Information often needs to be kept for a long time
- True **concurrency** in product development
- CAE information this can be **maintained over time**
- **Synchronization** at milestones
- In between each domain is free to **act independently**
Roadmap for the Implementation of Simulation Data Integration (2)

1. **CAE domain tool integration** – redundancy-free, tool-independent management of simulation data

2. **PDM for CAE** – Managing simulation data in a product context

3. **Inter-domain integration** – managing relationships between CAE and other domains, such as CAD

4. **PLM for CAE** – Managing simulation data during the product lifecycle
Outlook – Functional Architecture

- Design
  - Engineering Simulation
    - Simulation Data
      - Access Layer
        - Simulation Tool 1
        - Simulation Tool 2
        - Simulation Tool 3
        - Simulation Tool 4
        - Simulation Tool 5
      - Workspace
        - Modification in Workspace
          - load/store
      - CAE Reference Base
        - CAE Data Cluster
          - CAE Data Cluster
          - CAE Data Cluster
          - CAE Data Cluster
          - CAE Data Cluster
        - Simulation Data
          - load/store
        - Navigation by Topology
        - check in/out
      - Navigation by Product Structure
        - PDM System
Outlook – Functional Architecture (2)

- **Simulation Tools:**
  - Simulation Tool 1
  - Simulation Tool 2
  - Simulation Tool 3
  - Simulation Tool 4
  - Simulation Tool 5

- **Workspace:**
  - Modification in Workspace

- **Simulation Data Access Layer:**
  - Simulation Data
  - CAE Data Cluster

- **Information Model:**
  - (UML Classes)

- **Usage Requirements:**
  - (Scenarios)

- **Business Logic:**
  - (UML Use cases)

- **Information Requirements:**
  - (Simulation Data Model)