CAE Data Management from a single Geometry Revision to multi-disciplinary Simulation Results

Jens Philippeit, Zoran Petrovic

Siemens Product Lifecycle Management Software (DE) GmbH

Stuttgart, Deuschland

Summary:

Development processes for more complex new products and better performance require necessarily verification through digital simulation. Due to shortened development cycles the time to answer questions about reliable product characteristics is cut off and an efficient change management has to be established in the process chain from CAD to CAE.

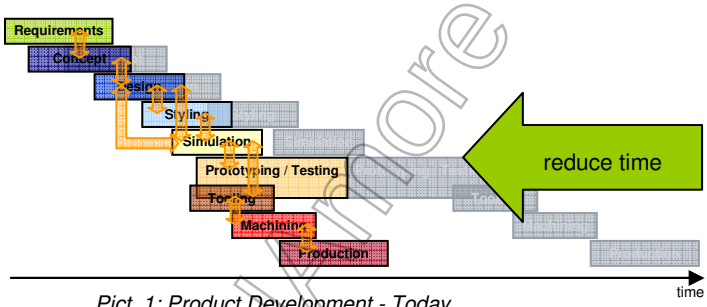
Normally CAE processes start with CAD data from a PDM system. To start CAE analysis it is required to easily filter different product configurations from latest CAD data, automatically prepare data for simulation (i.e. batch meshing) and pass this to simulation processes. Depending on type and number of simulations and change rate of CAD it will be shown what tools a simulation data management system can provide to efficiently guide the CAE process and shorten the cycles between CAD and CAE. Optimized data handling as well as integration of CAE tools will be the key for synchronized and economic development processes. Making decisions on digital simulations mostly involves different simulation disciplines. Therefore decisions for digital optimizations have to run in a multi-disciplinary context, access the same data sources and lead to a common decision of all involved analysis. By establishing a Simulation Data Management this can be done very efficiently keeping the data together and running as fast as possible a decision making process. Tools like workflows and decision tables will support this process.

Keywords:

Simulationsdatenmanagement, Processmanagement, Dokumentation, CAE Workflow, Teamcenter for Simulation

1 Introduction

This session will cover the advantages of CAE being integrated in a PLM environment. Bringing the CAE community in a common data management system is a high priority task for many large companies. The motivation is to accelerate the PLM process and enforce the impact of the simulation through the product development cycle. This consolidation cannot be achieved without partially reconsidering changes in the way the simulation data is managed and the CAE organization is structured today. This investment enhances the data as well the human communication between CAE and other departments by providing an easy access to released or working progress data. These exchanges happen directly in the common PLM environment using neutral formats (JT, movies, office documents ...) and so don't require a non-CAE user to have knowledge of the simulation programs to access the information he's looking for.



Pict. 1: Product Development - Today

Today's challenges in product simulation are growing complexity, reduction of development time and deeper integration of development partner. Managing complexity and handling the partner network can cause additional costs which will drop margin or make products not competitive. To save costs companies have to keep an eye on these points in their development process too:

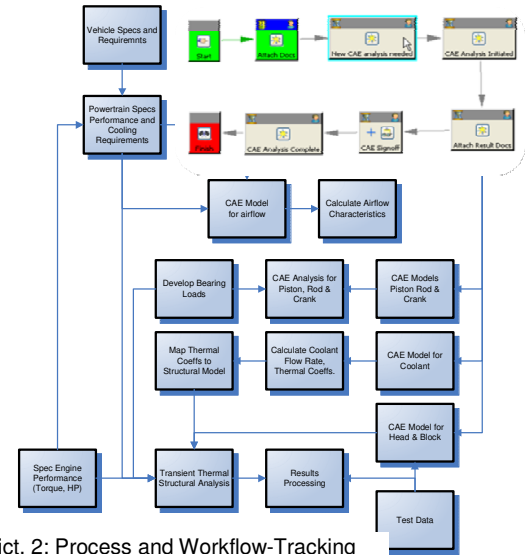
- early simulation already in concept phase (without product structure)
- accelerate preparation of digital prototypes (data collection)
- minimize efforts for model generation and management
- use of digital prototypes for different analysis (reduce no. of different digital prototypes)
- efficient communication between simulation and design
- reduce efforts for supplier coordination in simulation process

The reduction of cost and development time is possible is with efficient interfaces. Simulation data management is a new method for organizing and communicating the work between simulation and design by creating new synergies.

2 Project organization – bridge the gap from CAD to CAE

Today products and innovations are developed in networks. Teamwork, communication and synchronization is one of the main essentials. The interface between design and simulation is mainly a "forward the latest geometry" task which is mainly file based and has almost no automation. In early concept phase and in product development there is an intensive data exchange. With growing complexity of the product the number of people who do product verification grows too. With manual methods normally you reach the limit of scalability.

The tasks of project organization are now to integrate the simulation in the development process that already in early phases the simulation structures are synchronized with product requirements and if already available the product structure. In later development phases product structure, variant management and simulation disciplines must be synchronized, so each individual process contributor has access to the same and actual digital prototype.



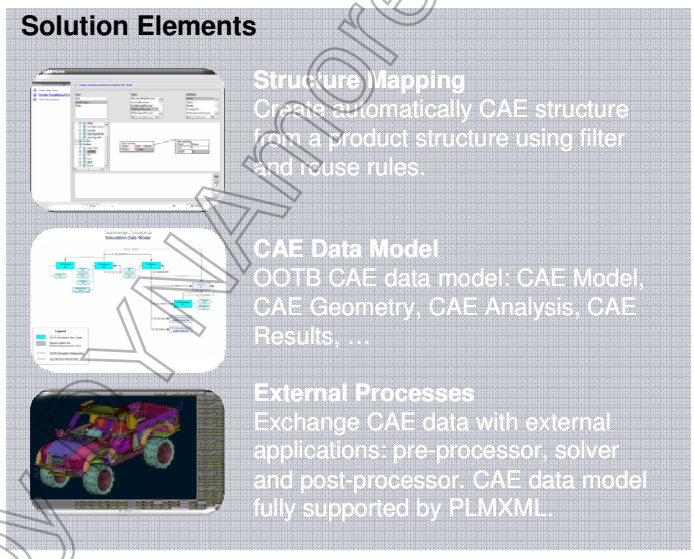
Pict. 2: Process and Workflow-Tracking

The effort to create digital prototypes for design stages, configurations and simulation disciplines can be reduced by automating these tasks. An integrated communication platform for designer and simulation engineers can describe processes, give all users accesses to “work in progress” and based on predefined rules give access to all required data. This will cut model preparation time more than half.

3 Managing multi-disciplinary Simulation Structures

One parameter of complexity is the number of simulation disciplines or types a single part or assembly has to pass and how many cycles lead to the finally required performance.

First there should be a data model available which covers all aspects of simulation like referencing CAD models, model idealization, CAE model and results/reports.



Second a structure mapping of a CAD BOM to an analysis BOM should be done automatically. Moreover the generation of analysis BOMs should be configured for each simulation discipline individually but should always reference same CAD BOM. This way each simulation discipline is linked to CAD source but stays independent with its own simulation structure.

And third when working with the analysis BOM it should be possible to send whole analysis BOM or parts of it to external CAE applications like pre-processors, solver or other creating your CAE models and results from simulations.

When “work in progress” has identified new source (CAD) data your analysis BOM will be updated with new parts. With data tracking functionality it is possible to decide whether to accept new data or stay on previous version.

Once the simulation disciplines have generated results and/or reports it is possible to gather these elements for a final report or a decision cockpit to identity that design which has shown the best performance.

4 Literature

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