



CAE data and process management

ANSA Data Management

ANSA Task Manager

- 1. Motivation and objectives**
- 2. ANSA Data Management for CAE data organization**
- 3. Assembly process with the aid of ANSA Data Management**
- 4. Working with ANSA Data Management**
- 5. ANSA Task Manager concept and principles**
- 6. Conclusion**

The discipline models build-up is a complicated, time consuming and error prone procedure due to physical deficiencies. Most important:

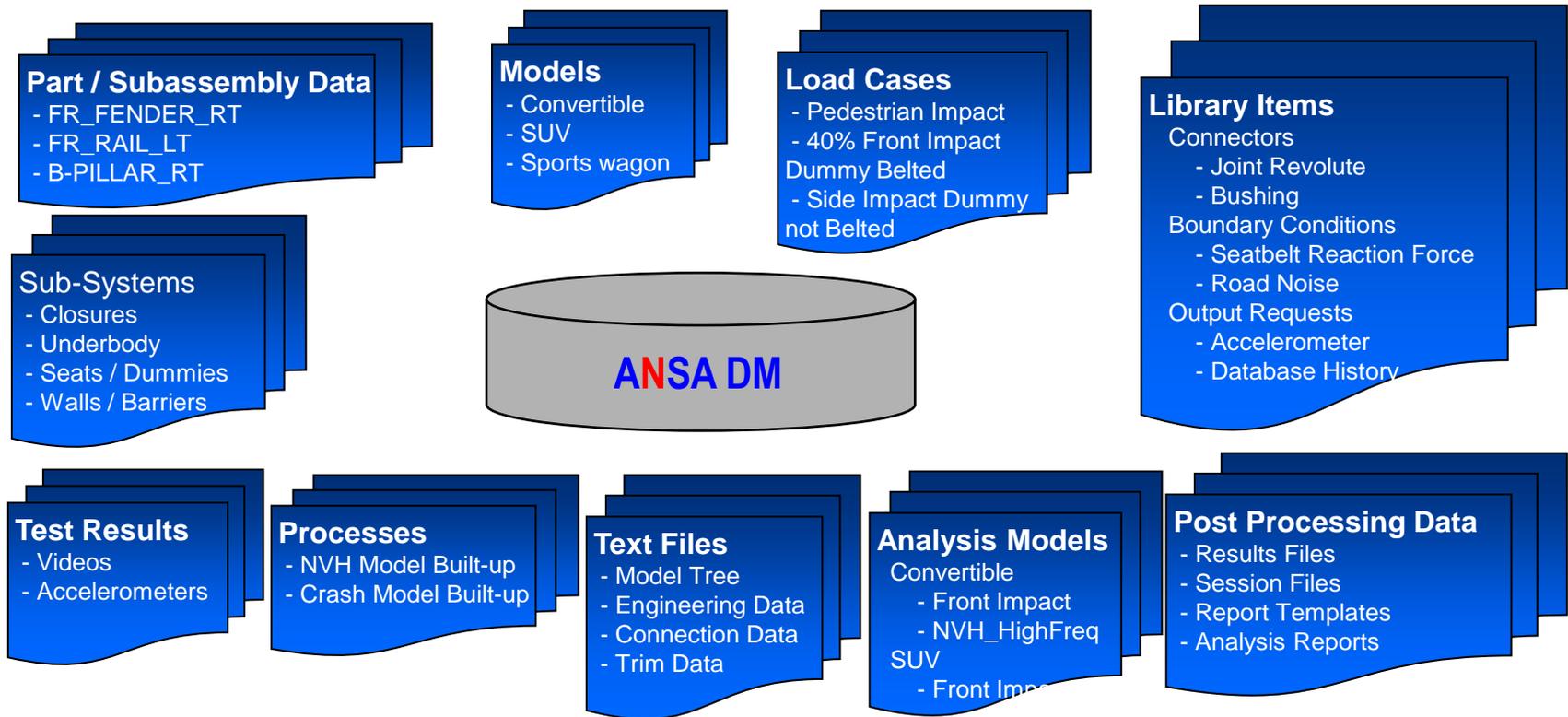
- ◆ CAE data variety and diversity
- ◆ Variety of data sources
- ◆ Product evolution process, which dictates major changes at early stages of the model build-up
- ◆ The model quality is highly dependent upon the engineer's experience and expertise
- ◆ Dependence between modelling actions
- ◆ Great number of parameters that can affect the simulation results

Our objectives:

- ◆ Primary objective: Organize all CAE data
- ◆ Secondary objective: Streamline the model build-up process

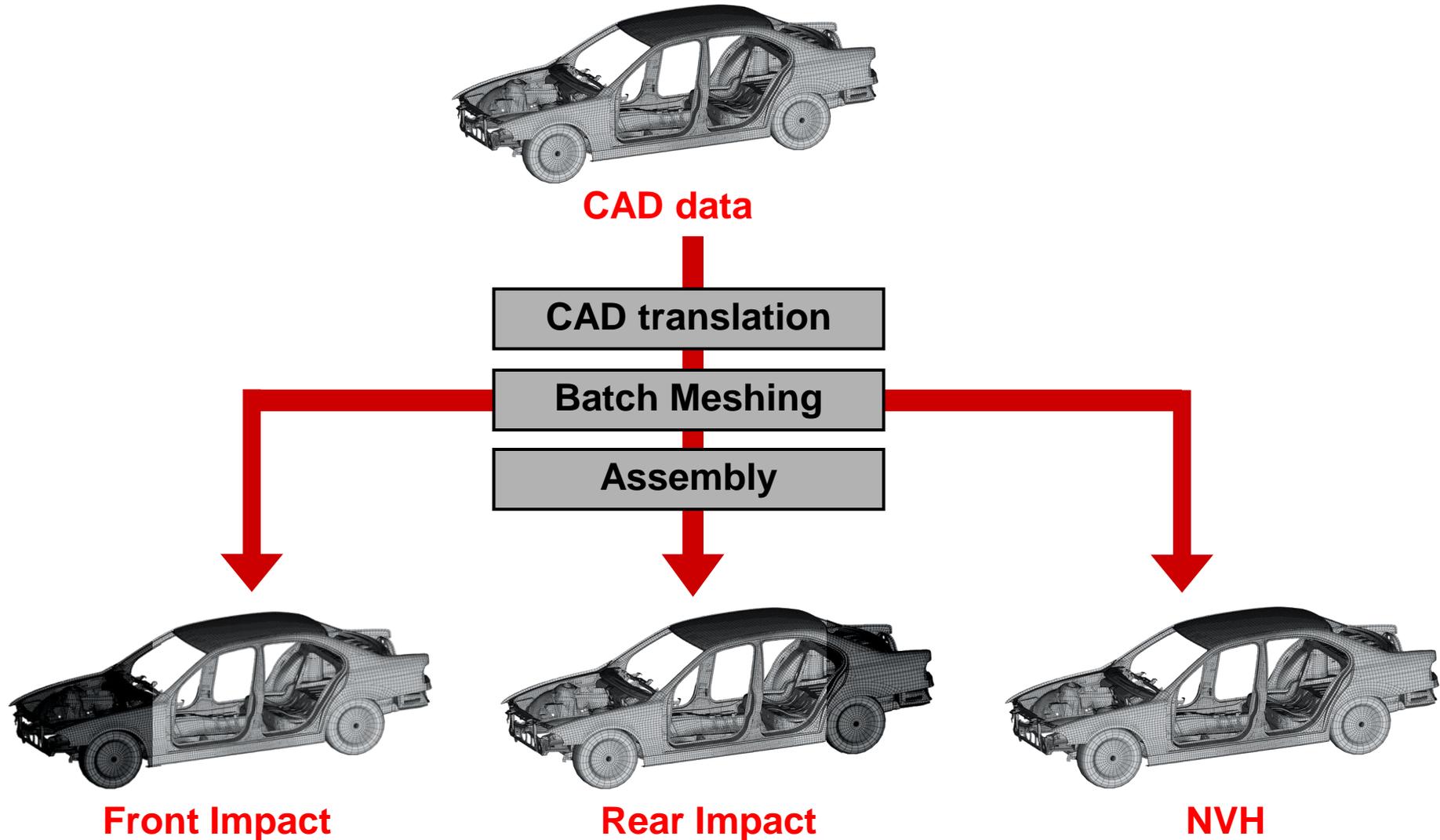


ANSA Data Management (ANSA DM) is a centralized data management system, used to collect and store in a structured and hierarchical form, all engineering data that are used during the development process of a vehicle simulation model.



Under ANSA DM, all engineering data are stored in the same physical location. This location is made known to ANSA, so that all communication related to the storage / retrieval of engineering data and their updates is managed automatically.

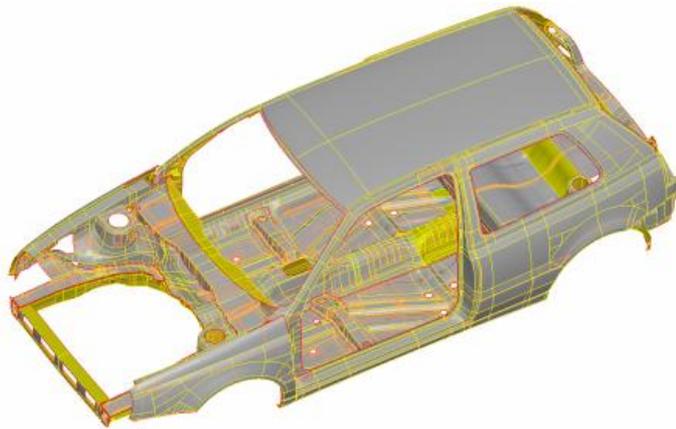
The objective is the efficient creation of discipline models, starting from CAD data



The objective is the creation of the Common Model

The Common Model is an assembly model stripped of any discipline dependent entity which incorporates:

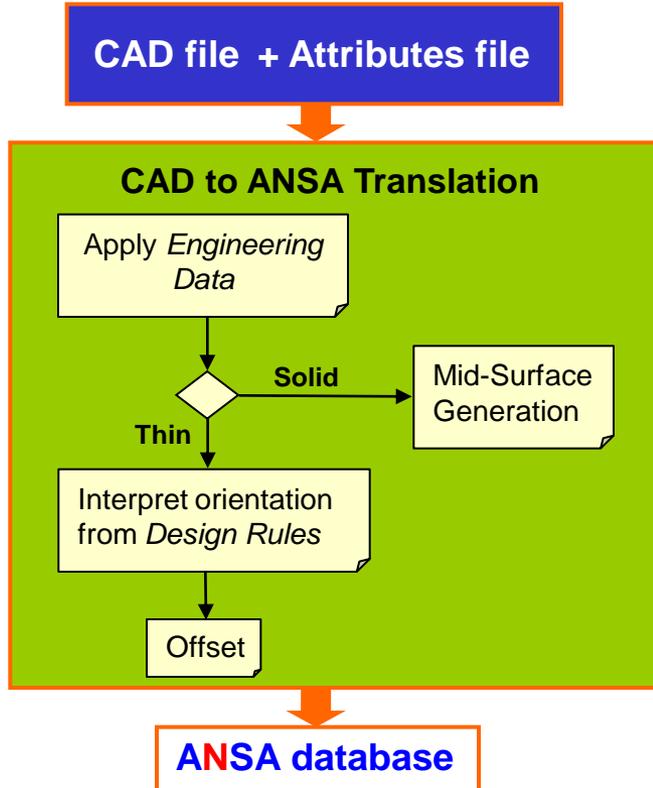
- ◆ “Cleaned-up” model geometry
- ◆ Welding information
- ◆ Connector Entities



The Common Model is ready to adopt any form suitable for the analyses that will follow.

Step 2: CAD data translation

- ◆ CAD-data to ANSA Translator translates the CAD files, based on the list exported by the VPM Tree Editor
- ◆ The ANSA_TRANSL application aids the translation process, assigning to each component the engineering data available



Engineering Data can be:

- Property name/id and thickness
- Material name/id and values
- Component name/VPM values
- Component target mass

For Catia components, Design Rules include:

- "Materialstaerken" vector
- Orientation vector
- Thickness lines

Step 3: Import all geometry data

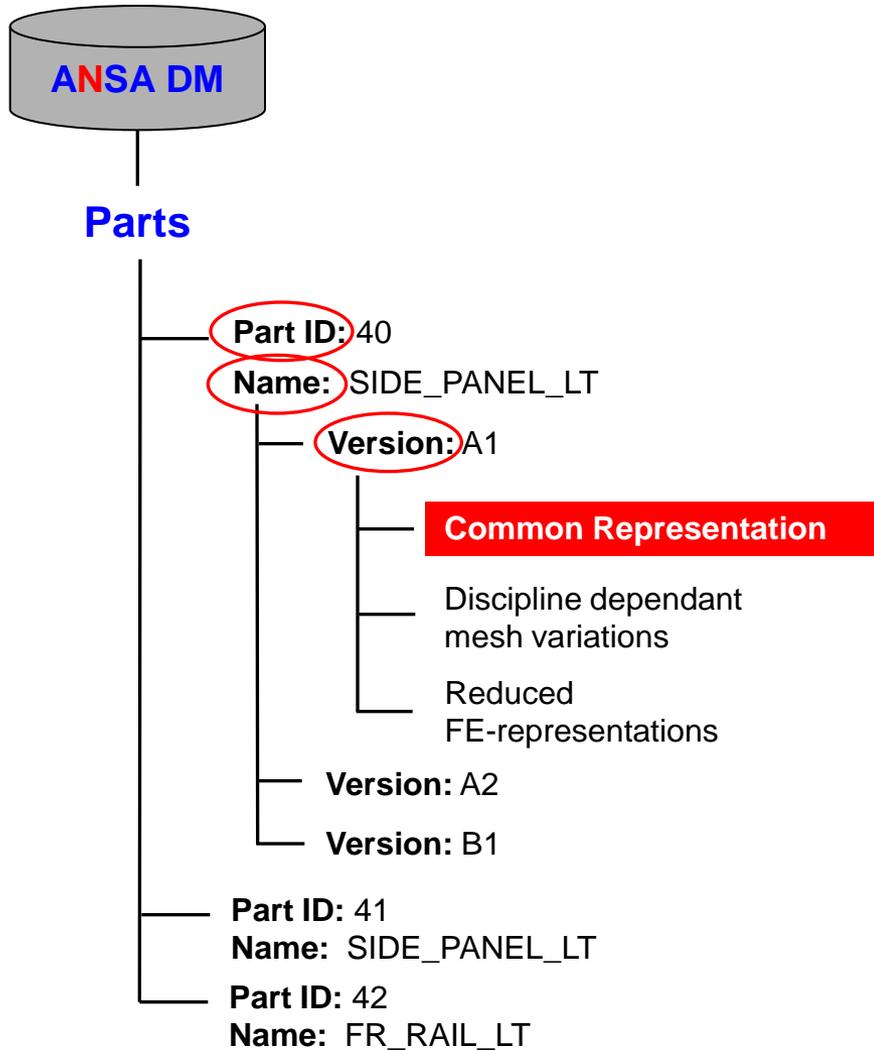
- ◆ All translated components are imported in the database containing the model definition
- ◆ Components that already exist in DM are also invoked
- ◆ The welding information is imported
- ◆ Connector Entities are created

Step 4: Check the model / Errors Report

- ◆ Missing parts
- ◆ Translation errors (Missing engineering data, orientation vector)
- ◆ Intersections due to wrong components positioning
- ◆ Welding information references

The Common Model build-up process is complete !

Step 5: Populate the components geometry in ANSA DM. Parts Management.

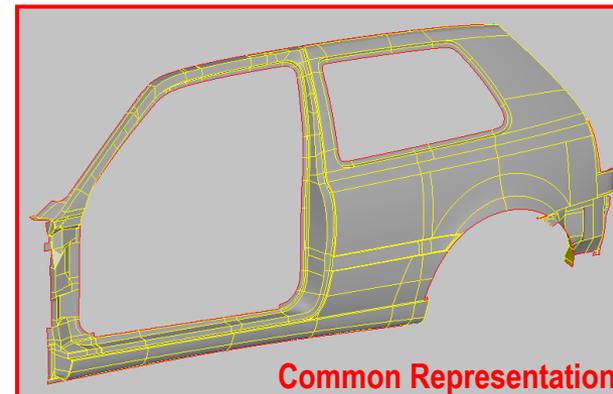


Parts are managed according to their “signature”:

- Part ID (Module ID)
- Part CAD version (Version)
- Part name

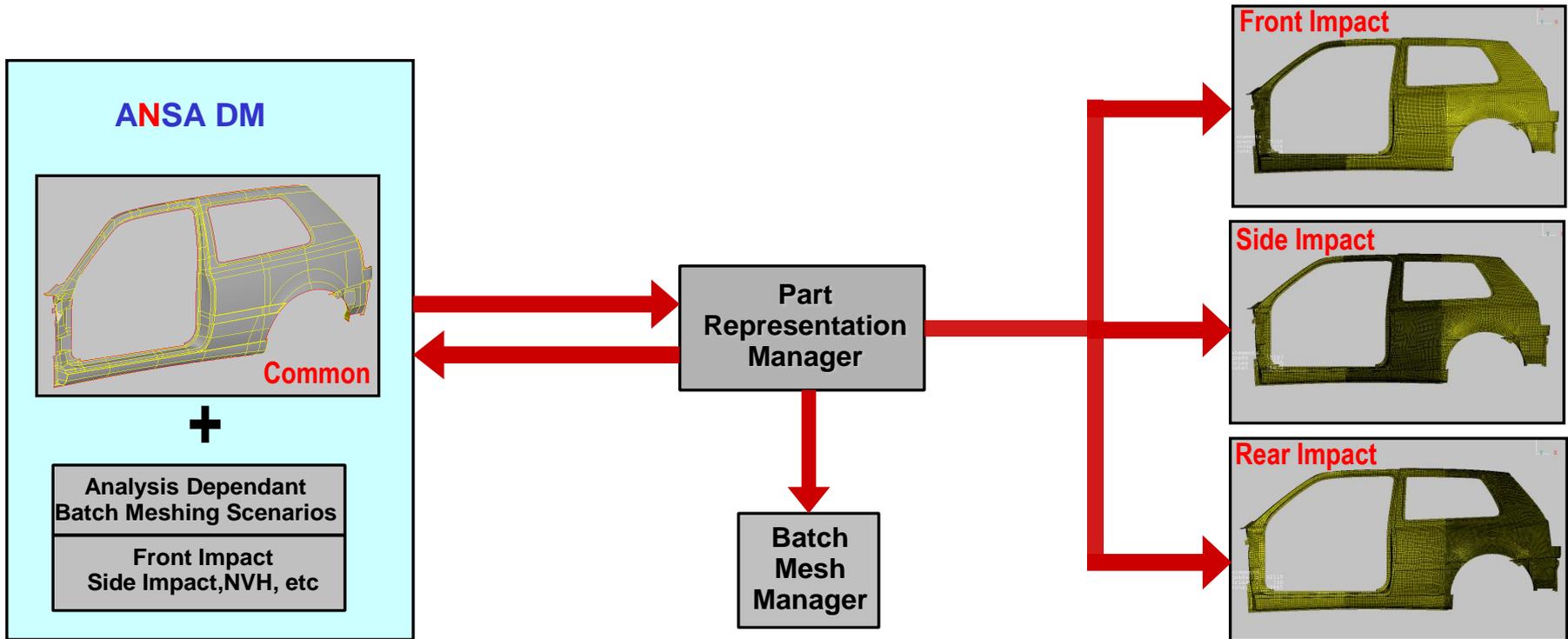
The “Common Representation”:

- Consists only of the part's geometry
- Is populated to the ANSA DM right after the completion of the Common Model
- Will be the basis for the creation of all meshed representations



Step 6: Create the Discipline Models

- ◆ Discipline Models creation is guided by pre-defined meshing scenarios
- ◆ The meshing always takes place on the Common Representation of the parts
- ◆ The complete process is handled by the Part Representation Manager



An insight to the Batch Meshing process

- ◆ The meshing scenarios allow the meshing of the complete model with different mesh parameters for each component - Batch Mesh Sessions
- ◆ The distribution of components in Batch Meshing Sessions is achieved with part filters



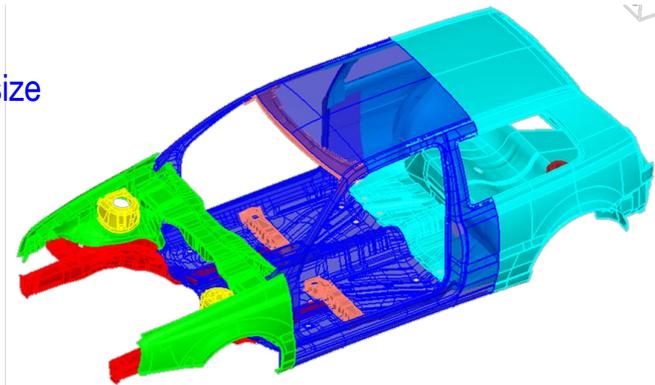
meshing scenarios

- front_impact
- side_impact
- rear_impact
- NVH
- durability

Name	Parts	Mesh Param	Quality Criteria	Status
<input checked="" type="checkbox"/> FrontImpact	210			Error
<input checked="" type="checkbox"/> FR_Rails	21	6mm	5minlen	Error
<input checked="" type="checkbox"/> FR_SmallParts	37	8mm	5minlen	Completed
<input checked="" type="checkbox"/> FR_BigParts	22	10mm	5minlen	Completed
<input checked="" type="checkbox"/> TransitionArea_Rails	15	12mm	5minlen	Completed
<input checked="" type="checkbox"/> TransitionArea	29	15mm	5minlen	Completed
<input checked="" type="checkbox"/> Rear_SmallParts	35	10mm	5minlen	Completed
<input checked="" type="checkbox"/> Rear_BigParts	49	25mm	5minlen	Error
<input type="checkbox"/> Default_Session	0	10mm	5minlen	Completed

Built-in filters include:

- Component mass / area / size
- Component name / id
- Component location

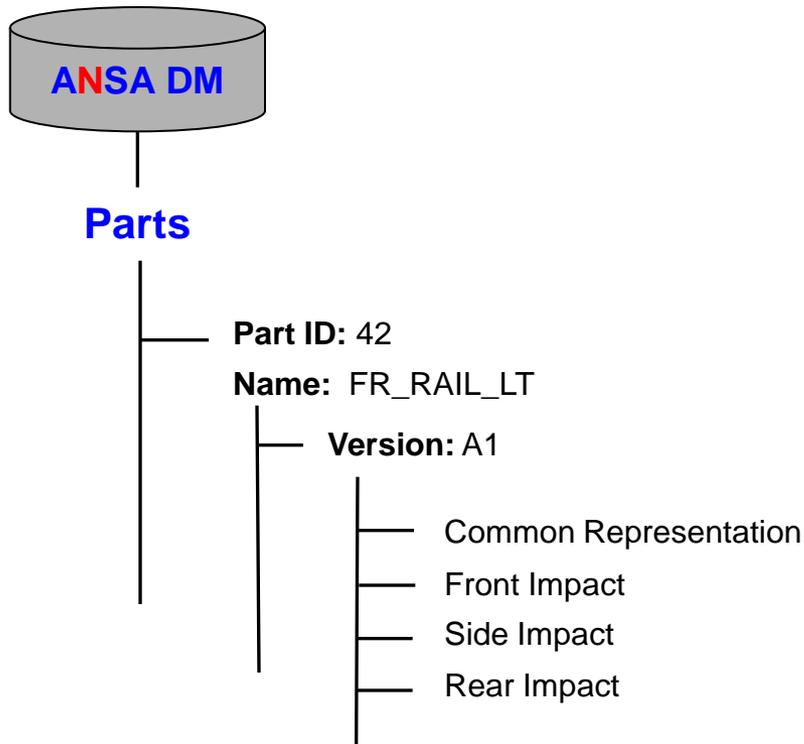


Meshing scenarios are built **once** and are then saved in ANSA DM as templates.
The proper meshing scenario is invoked each time by the Part Representation Manager.

Step 7: Mesh quality check and improvement

- ◆ The Batch Meshing report gives a quick overview of the results and enables the direct isolation of problematic regions
- ◆ Manual mesh improvement can be distributed to multiple users to work simultaneously

Step 8: Populate the meshed components in ANSA DM. Parts Management.



Creating Discipline Representations features:

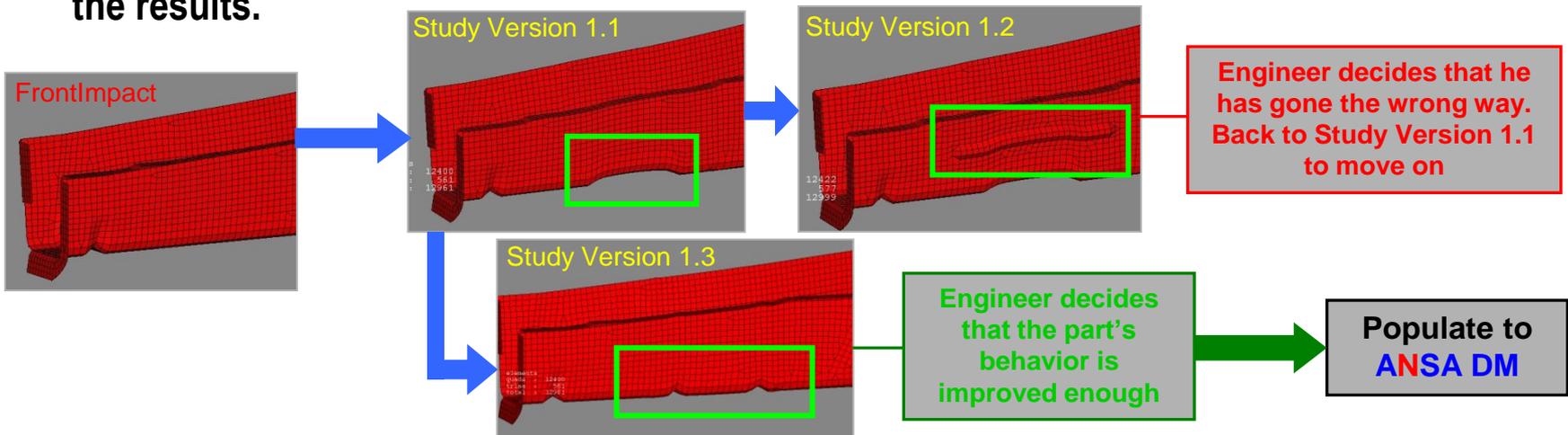
- When the mesh type requested for a component - in terms of meshing specifications - already exists in ANSA DM, this component is not meshed again
- Multiple-instances are meshed only once. Then, the representation of all is synchronized with the one meshed
- Meshing always takes place on the components' Common Representation, which is error-free. Thus, the errors corrected in the first steps will not arise again

New CAD versions

- ◆ New CAD versions of components are accompanied by a new model definition file
- ◆ The new components have to enter ANSA DM as Common and Meshed Representations

New CAE versions - Study Versions

- ◆ Study Versions represent alternative approaches of the part geometry, proposed and created by the CAE engineers. The engineer is able to study the behaviour of certain components by introducing slight modifications to their original design. Such modified geometry may either lead to the improvement of the component's behaviour and thus be adopted by the whole CAE department, or be discarded, in case it does not really affect the results.



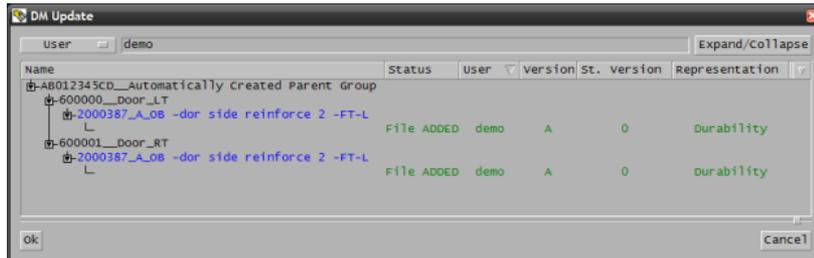
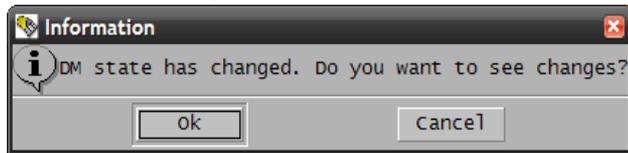
Update levels

- ◆ **Newer Files:** Files that have been modified since the last save of the model
- ◆ **Newer Versions:** New CAD or CAE versions that entered ANSA DM since the last save of the model

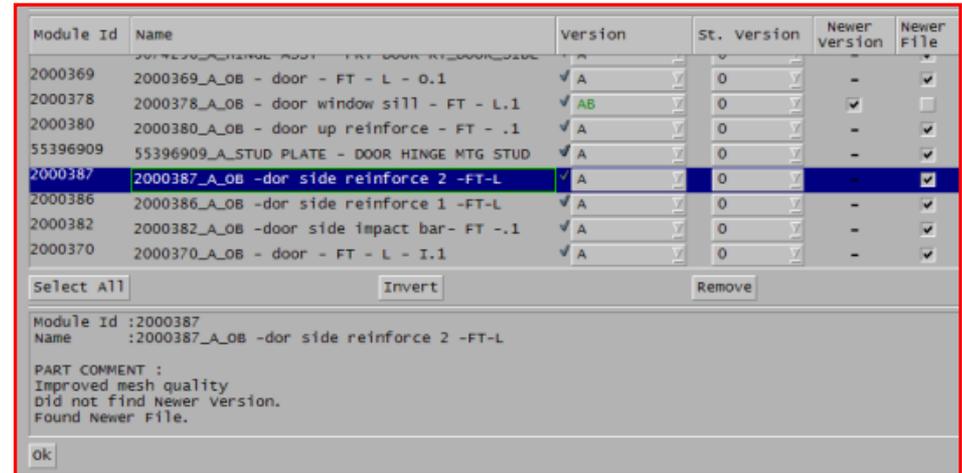
Getting notified for updates

- ◆ **Notification upon request**
- ◆ **Automatic notification for updates**

DM Monitoring



Check DM Updates

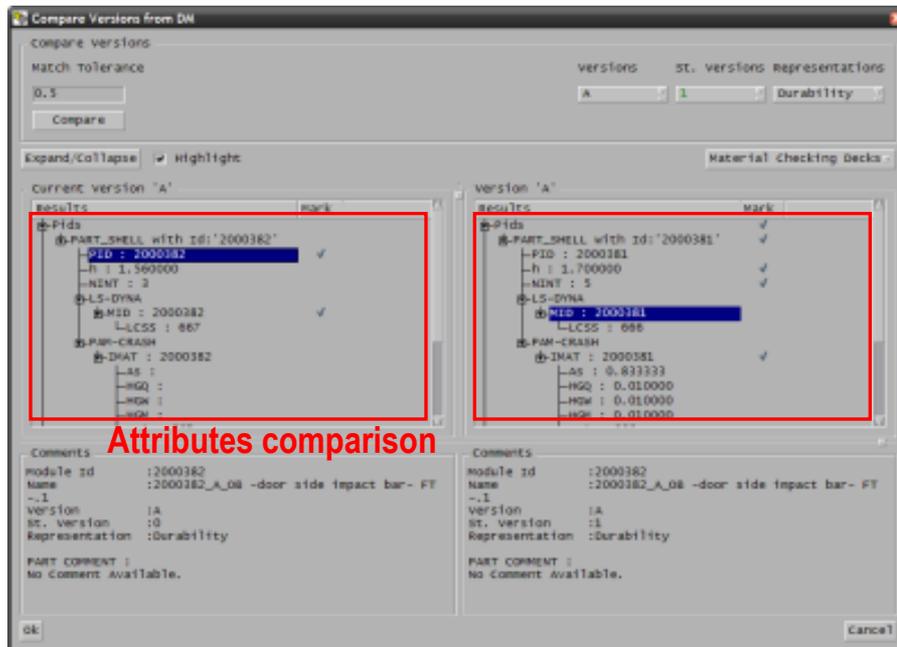


Accepting component updates:

- Components are replaced automatically
- Welding information is re-applied
- Boundary conditions and Output Requests are updated

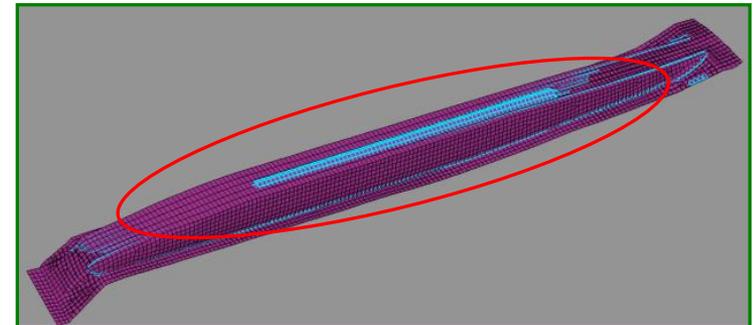
Comparison can be made between two components:

- ◆ Attributes - based: Property / Material ID and values
- ◆ Geometry - based: For both geometric and FE-model entities
- ◆ Visual inspection capability



Attributes comparison

Visual inspection of geometric comparison



The user can proceed to “selective” updates:

e.g. Adopt new version’s geometry and material values
but maintain:

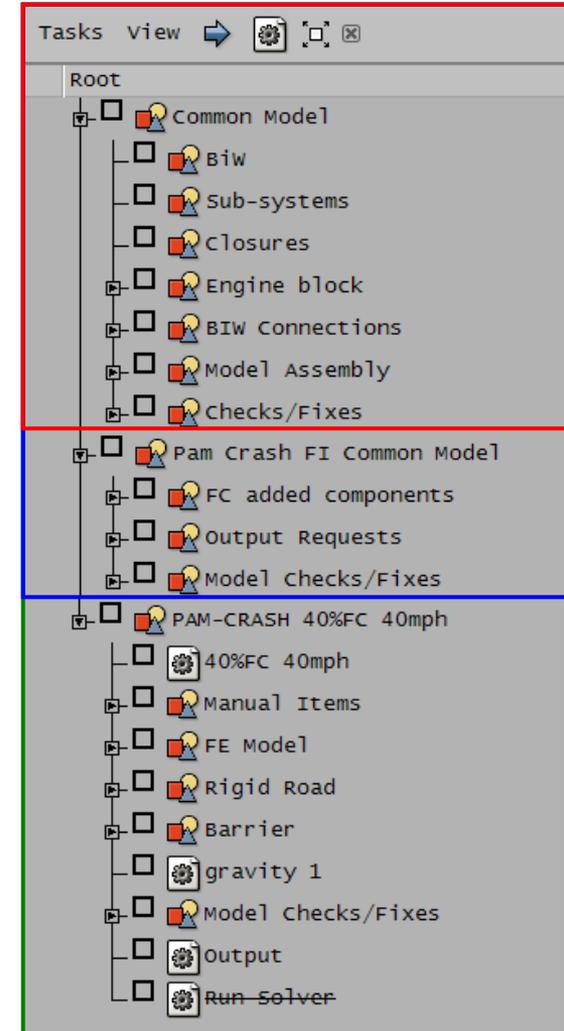
- Old thickness
- Old number of integration points

ANSA Task Manager splits the simulation model set-up in 3 distinct stages:

- ◆ **Common Model:** Stripped of any analysis specific entity and ready to “adopt” any form suitable for the analysis that will follow
- ◆ **Solver Common Model:** “Transforms” the Common Model in a form suitable for the analysis that will follow and adds all the items that will be common to all load-cases that will follow
- ◆ **Solver Load Case:** Contains all the solution specific information that will make the model suitable for the investigation of a certain simulation scenario

Each task item reflects a single modelling action or even a sequence of actions

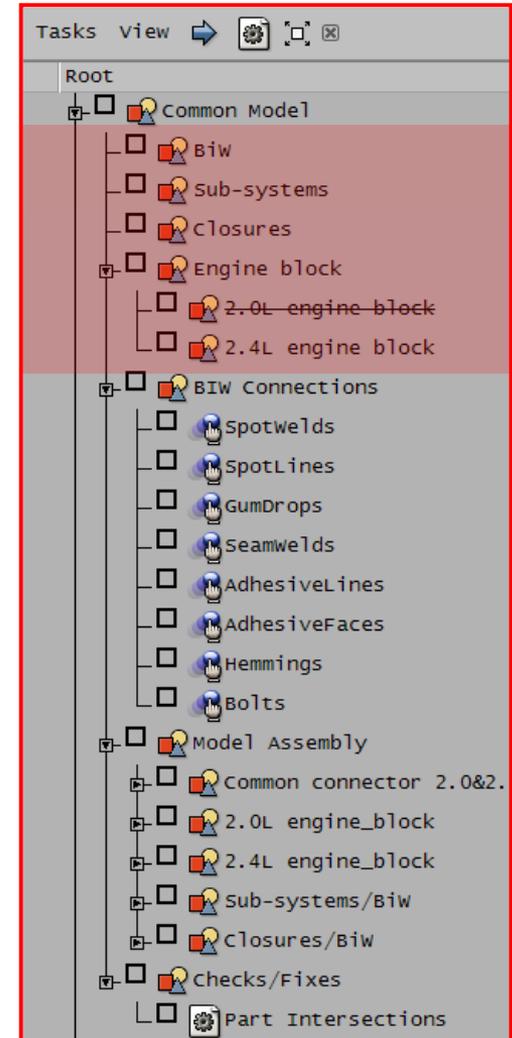
Tasks in Task Manager are built by the CAE experts and are then saved as template processes in ANSA DM



The Common Model Task summarizes the steps followed for the Common Model creation for ANSA DM. Additionally:

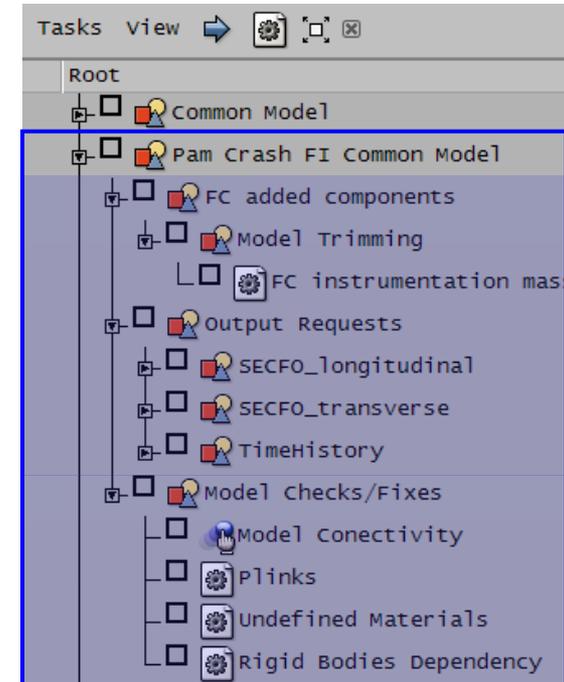
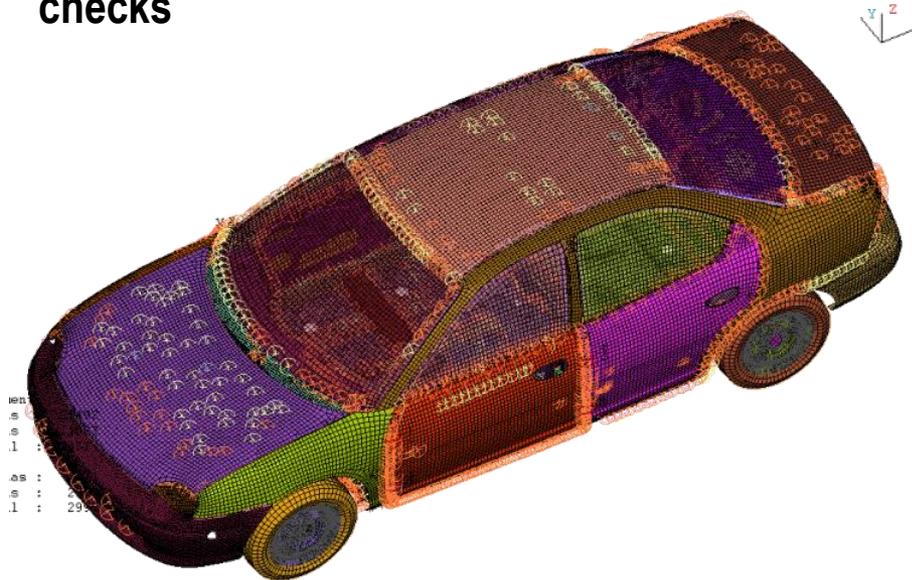
- ◆ It allows for a model grouping suitable for the discipline models build-up
- ◆ These items act at the same time as “data containers”. All entities referenced by the “data containers” are considered to be under the influence of Task Manager
- ◆ “Data containers” can be:
 - ANSA Groups
 - Include files
- ◆ In the same manner as all other Tasks, it considers the dependencies between Task items

e.g. With the incorporation of a component update, related items, like BiW connections, are notified and must be re-applied



The Solver Common Model dictates the “transformation” of the Common Model

- ◆ All the components get a suitable mesh representation
- ◆ Welding information are realized with suitable FE entities
- ◆ Connector Entities are realized with suitable FE entities
- ◆ Items common to all the load-cases that will follow are added
- ◆ First level of model quality check with built-in and custom checks

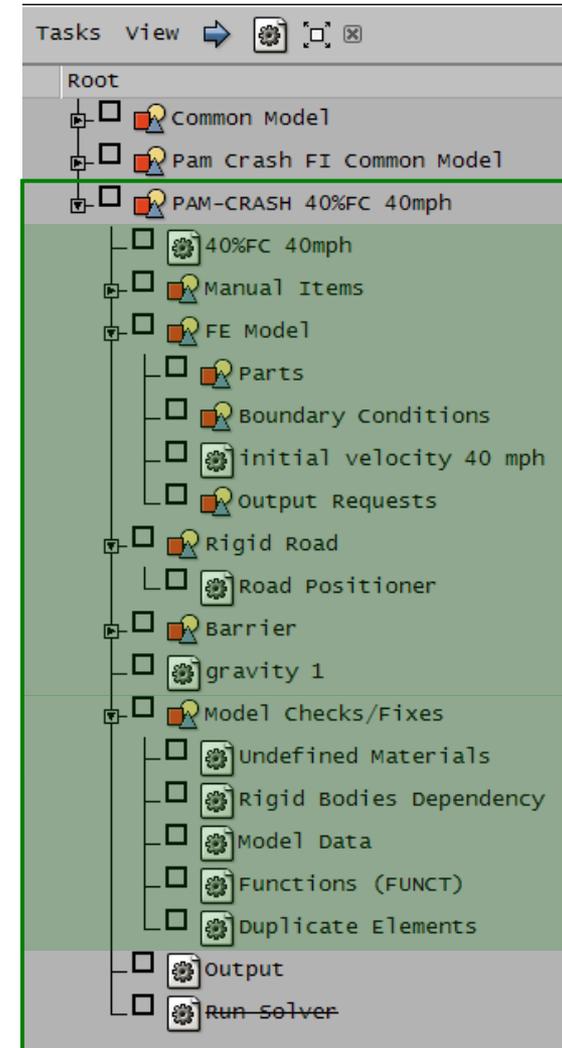


The Solver Load-case adds the solution specific items

- ◆ Solver Controls
- ◆ Boundary Conditions / Output Requests
- ◆ Initial Conditions
- ◆ Final level of model quality check with built-in and custom checks

The output format can be pre-defined by the CAE expert

- ◆ Automatic creation of includes during the Task execution
- ◆ Pre-setting of output options (*read-only, inline*)



- ◆ **ANSA Data Management stores all CAE-related data under a common location, enabling flawless data storage and retrieval**
- ◆ **Following the “Common Model” concept, a common core is created, regardless of the discipline that will follow, increasing the efficiency of the model build-up process**
- ◆ **Discipline models are assembled with a single step selection of the representation**
- ◆ **ANSA DM embeds powerful tools for component updates and changes tracking, assuring that the user always works with the most up-to-date data**
- ◆ **After the incorporation of component updates in the assembly model all affected entities are “notified” and re-applied automatically**
- ◆ **The Tasks in ANSA Task Manager reflect step-by-step the procedure that must be followed for the set-up of a simulation model**
- ◆ **Tasks created by the CAE expert and are then saved as template processes in ANSA DM.**
- ◆ **These template processes are repeatable and can be also executed by inexperienced users, making the model quality independent of the user expertise**