



ANSA Data Management ANSA Task Manager

28 June 2010

## **Overview**



- 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:** 

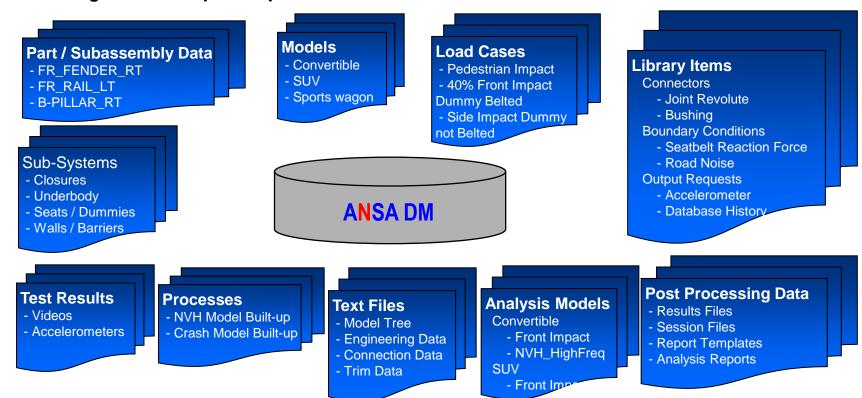
- Primary objective: Organize all CAE data
- Secondary objective: Streamline the model build-up process



# **ANSA Data Management: Definition**



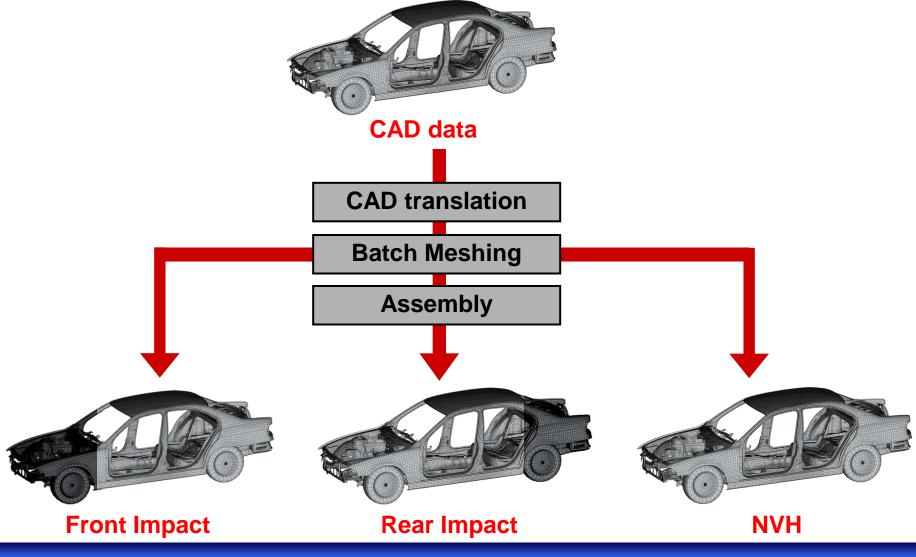
ANSA Data Management (ANSA DM) is a centralized data management system, used to collect and store in a structured and hierarchical form, all engineering data that are used during the development process of a vehicle simulation model.



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.



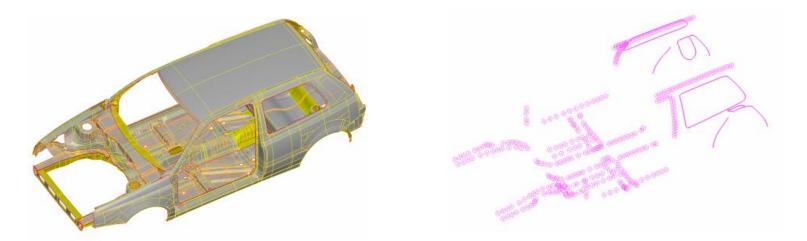
The objective is the efficient creation of discipline models, starting from CAD data





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 1: Read-in the model definition

- The model definition is an ASCII format file, exported by CAD-data systems
- It is imported into ANSA through the VPM Tree editor
- In ANSA it is reflected in the Parts Manager

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DM	COMPLETE		-HINGE ASSY - FRT LWR RT_DOOR_SIDE			5155088 A			
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#### VPM Tree Editor features

- Filtering for components exclusion from the model
- Sub-system isolation
- Availability of components in DM indication
- List creation including the components that must be translated into ANSA databases

Name		🔄 show All 🔽 show current 🔛 🔀 💠 🕸 🏭 🧮
Module Id	Version	Name 🗸 🦷
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2000378	A	-M 2000378_A_OB - door window sill - FT - L.1
2000380	A	
2000382	А	-Ma 2000382_A_OB -door side impact bar- FT1
2000385	А	- A 2000385_A_OB -win sill reinforcement - FT
2000386	А	-MA 2000386_A_OB -dor side reinforce 1 -FT-L
2000387	А	-MA 2000387_A_OB -dor side reinforce 2 -FT-L
500886		F-FE1500886CDBD113000Z4_DOOR FRONT LEFT W/HINGES
500887		E 500887_CDBD113200J1J541 FRONT DOOR RIGHT HINGES
500889		由官500889CDBD113200D1_J541 DODGE FRONT DOOR RIGHT HINGES
5074255	A	5074255_A_HINGE ASSY - FRT DOOR RT_BODY_SIDE
5074256	A	- E 5074256_A_MINGE ASSY - FRT DOOR RT_DOOR_SIDE
5155087	A	- 5155087_A_HINGE ASSY - FRT LWR RT_BODY_SIDE
5155088	А	5155088_A_HINGE ASSY - FRT LWR RT_DOOR_SIDE
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5008844		自-直5008844DOOR ASSY - FRT RT
5008060	A	S008060_A_STUD PLATE ASSY - FRT DOOR TO HINGE
5115773		中国5115773MTG_STUD PLATE ASSY - FRT DOOR TO HINGE
55396909	A	E 55396909_A_STUD PLATE - DOOR HINGE MTG STUD
6999232	A	6999232_A_STUD-WELD/EXTERNAL - MAT-PT-PIA-SPECIAL-SHOU
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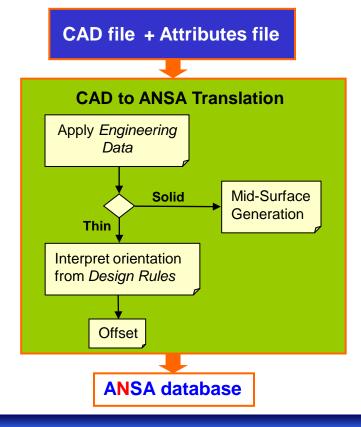
#### Parts Manager features

- Multiple-instances recognition
- Transformation matrix information for each component



#### 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

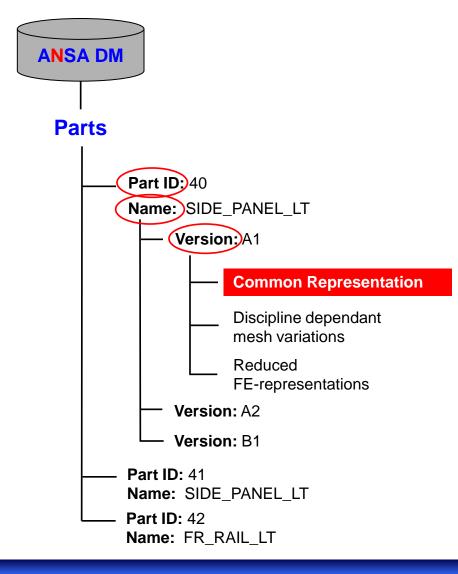
## Step 4: Check the model / Errors Report

- 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.

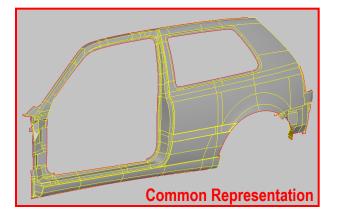


#### Parts are managed according to their "signature":

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

#### The "Common Representation":

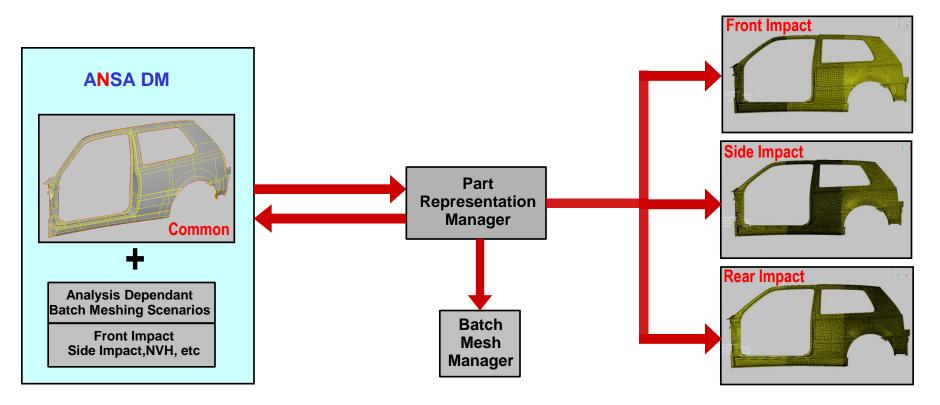
- Consists only of the part's geometry
- Is populated to the ANSA DM right after the completion of the Common Model
- Will be the basis for the creation of all meshed representations





**Step 6: Create the Discipline Models** 

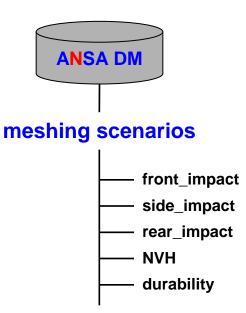
- Discipline Models creation is guided by pre-defined meshing scenarios
- The meshing always takes place on the Common Representation of the parts
- The complete process is handled by the Part Representation Manager





### An insight to the Batch Meshing process

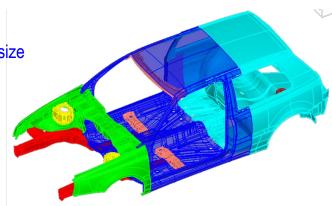
- The meshing scenarios allow the meshing of the complete model with different mesh parameters for each component - Batch Mesh Sessions
- The distribution of components in Batch Meshing Sessions is achieved with part filters



Name	Parts	Mesh Param	Quality Criteria	Status
🗗 🗖 FrontImpact	210			Error
– 📕 FR_Rails	21	6mm	5minlen	Error
– 🗖 FR_SmallParts	37	8mm	5minlen	Completed
– 🗖 FR_BigParts	22	10mm	5minlen	Completed
— — 🔲 TransitionArea_Rails	15	12mm	5minlen	Completed
— 🗖 TransitionArea	29	15mm	5minlen	Completed
— 📕 Rear_SmallParts	35	10mm	5minlen	Completed
— 🗖 Rear_BigParts	49	25mm	5minlen	Error
└ □ Default_Session	0	10mm	5minlen	Completed

#### **Built-in filters include:**

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



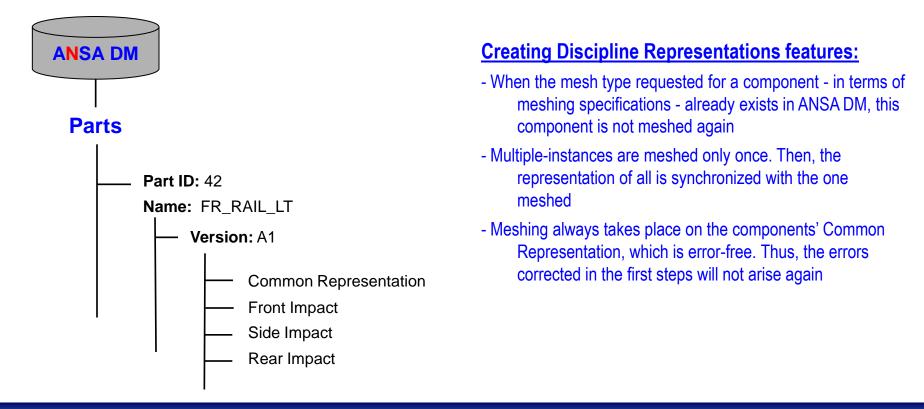
Meshing scenarios are built **once** and are then saved in ANSA DM as templates. The proper meshing scenario is invoked each time by the Part Representation Manager.



### 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.



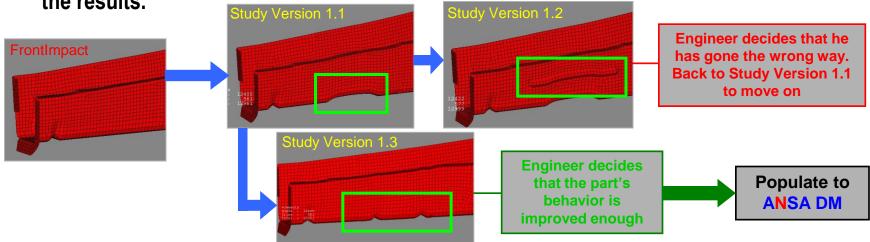


### New CAD versions

- 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.





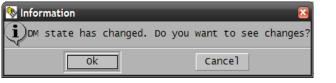
#### **Update levels**

- 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**

Module Id	Name	version		st. v	ersion	Newer Version	Newer File
2000369 2000378	2000369_A_08 - door - FT - L - 0.1 2000378_A_08 - door window sill - FT - L,1	✓ A ✓ AB	Y	0	7 7	-	
2000380 55396909	2000380_A_OB - door up reinforce - FT1 55396909_A_STUD PLATE - DOOR HINGE MTG STUD	√ A √ A	Y	0	<u>7</u>	-	~ ~
2000387	2000387_A_OB -dor side reinforce 2 -FT-L	✓ A	Y	0	- 7	-	~
2000386 2000382 2000370	2000386_A_0B -dor side reinforce 1 -FT-L 2000382_A_0B -door side impact bar- FT1 2000370_A_0B - door - FT - L - I.1		N N	0 0 0	<u>7</u> 7	-	2 2 2
Select All	Invert			Remov	e		
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#### Accepting component updates:

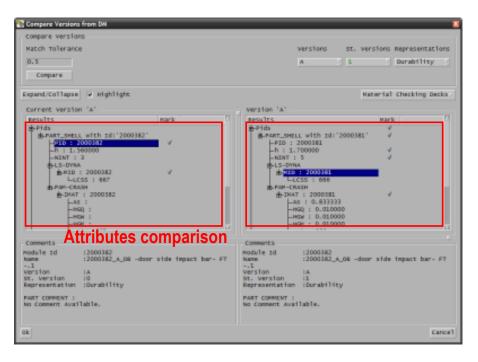
- Components are replaced automatically
- Welding information is re-applied
- Boundary conditions and Output Requests are updated

# **Tracking changes between component versions**

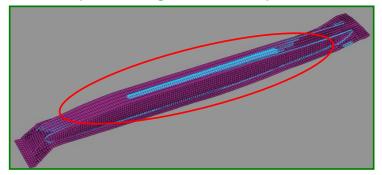


Comparison can be made between two components:

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



#### 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

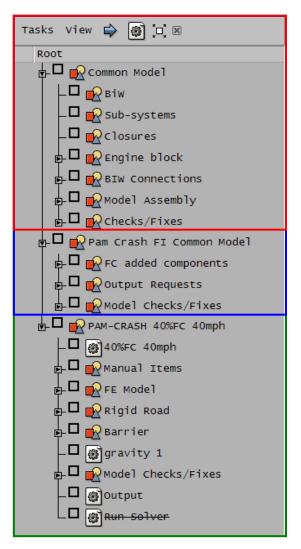


## ANSA Task Manager splits the simulation model set-up in 3 distinct stages:

- 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 loadcases 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

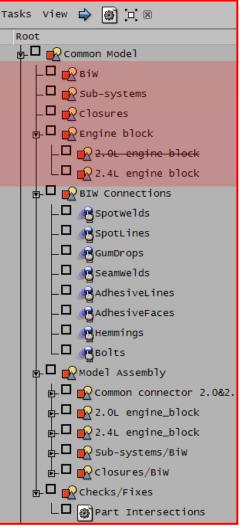
Each task item reflects a single modelling action or even a sequence of actions

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

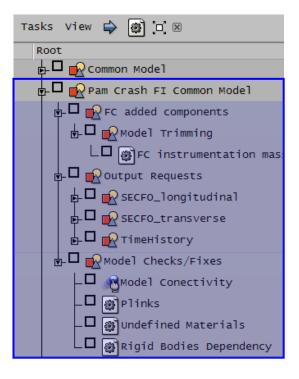




## The Solver Common Model dictates the "transformation" of the Common Model

- 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)

Tasks View 🖨 🍘 🗔 🗵
Root
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🚽 🗖 🙀 РАМ-СКАЅН 40%FC 40mph
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p_□ p_Barrier
 gravity 1
🗗 🗖 🙀 Model Checks/Fixes
🗖 🐺 Undefined Materials
_ 🗖 🗑 Rigid Bodies Dependency
Model Data
Duplicate Elements

# Summarizing...



- 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