Efficient watertight preparation tools & methods for CFD meshing at Groupe PSA

BETA SIMULATION SOLUTIONS

PSA GROUPE

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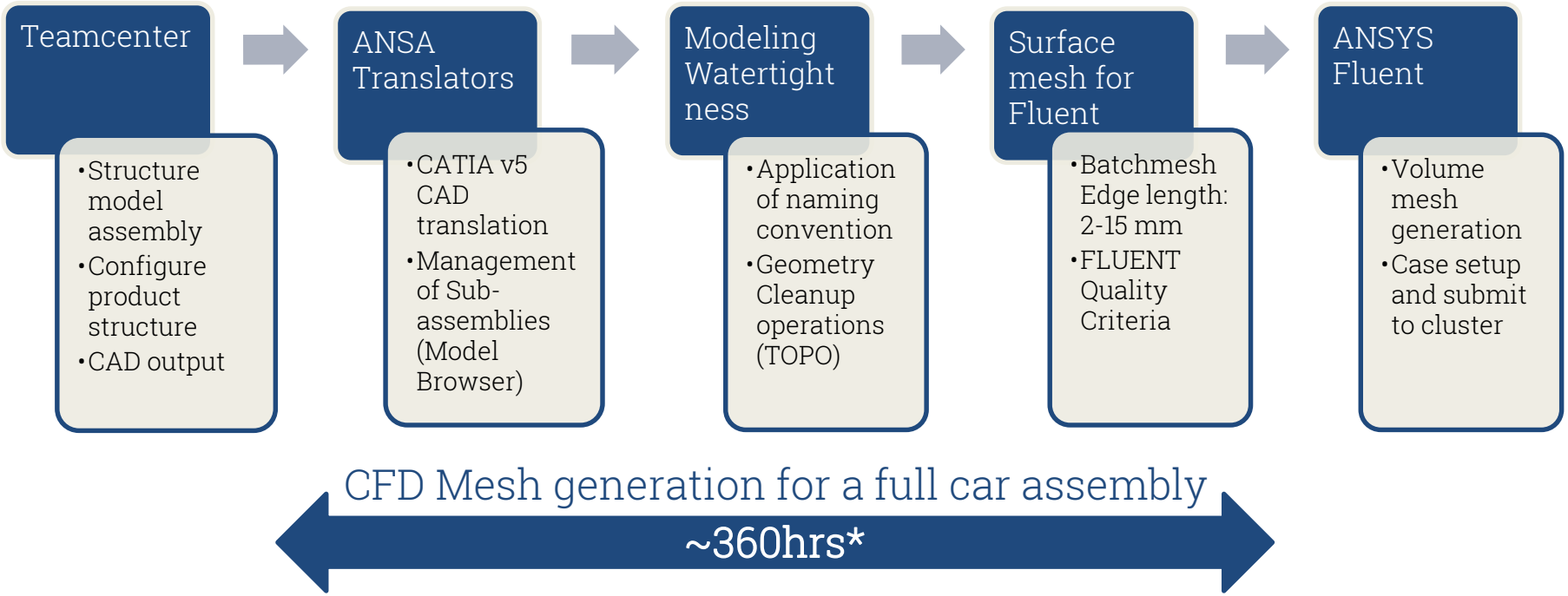
BETA CAE Systems SA

Gaël Roy
Groupe PSA

physics on screen

CFD model preparation cycle at Groupe PSA



*modeling work performed by Tech Center Morocco

Watertight preparation challenges

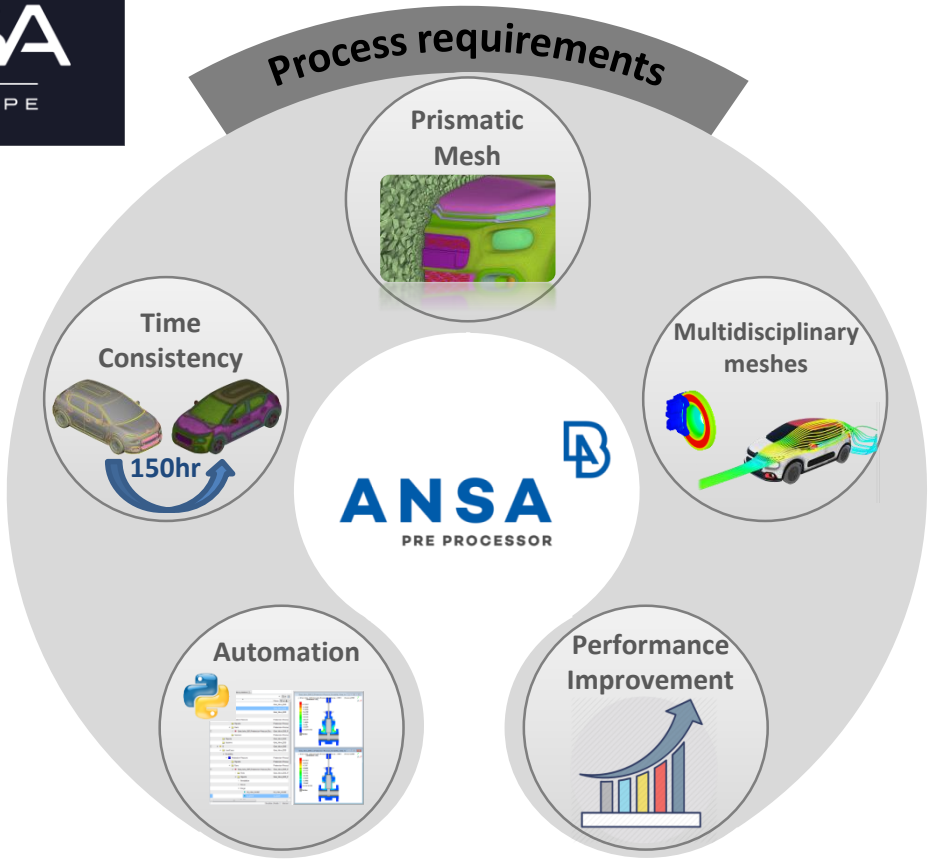
Watertight Preparation Challenges

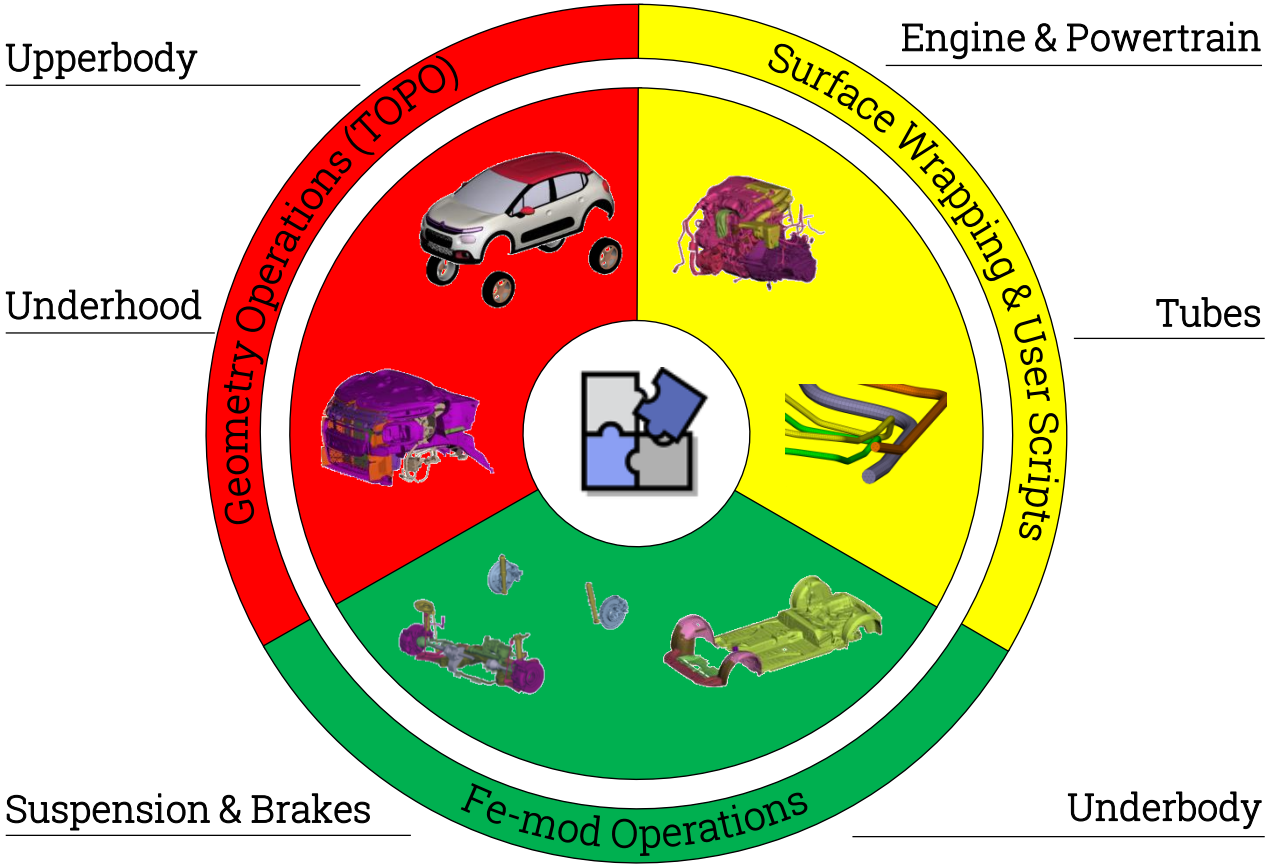
- Incorrect translation data
- Poor CAD description – TOPO errors
- De-featuring of complex parts
- Isolate exterior surfaces
- Low automation level
- Other…

360hr

Reduce CFD mesh generation turnaround times

Modeling process requirements

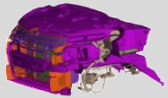
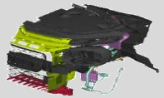
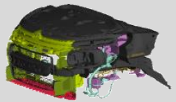
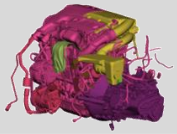
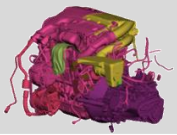
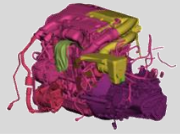
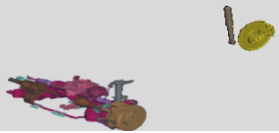




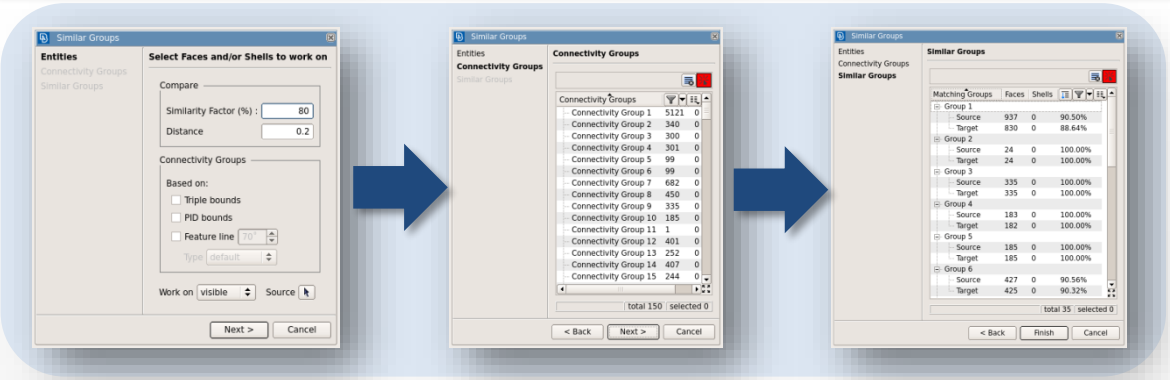
Assembly Management in Model Browser

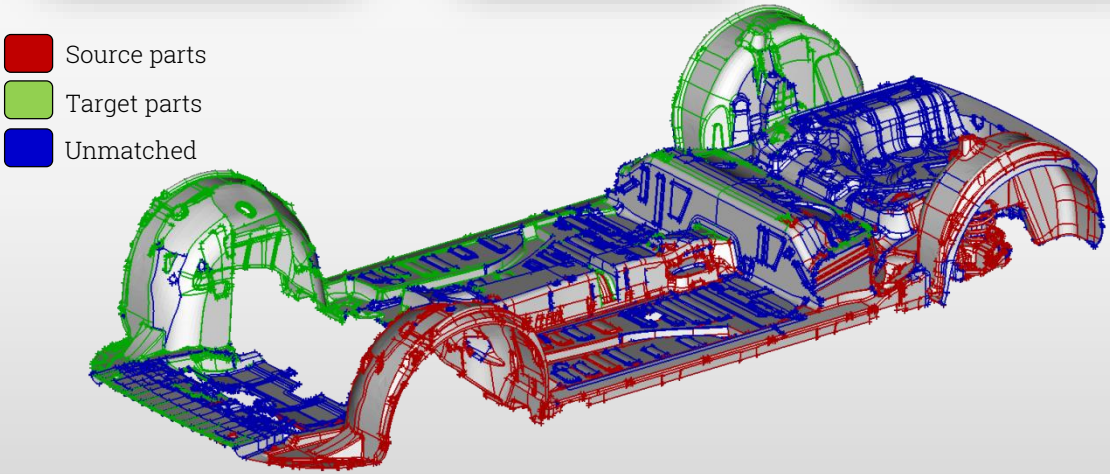
- High aerodynamic importance
- Average aerodynamic importance
- Low aerodynamic importance

Reduce workload by deleting symmetry parts

1. Separate model in sub assemblies	2. Delete unnecessary and symmetrical components	3. Watertight per assembly and symmetry copy back	4. Merge and connect all assemblies
			
			
			

Identify Similar components

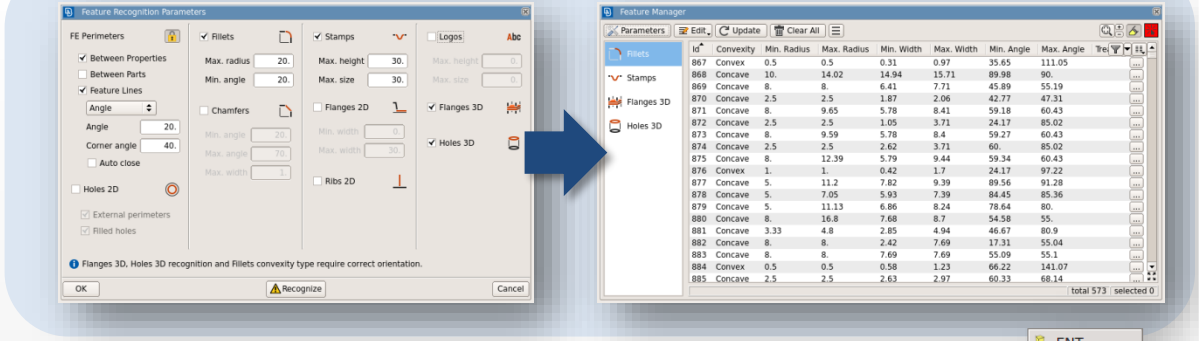


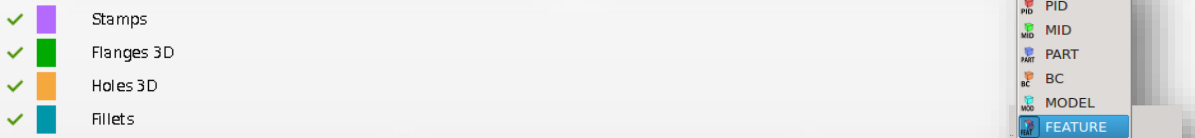


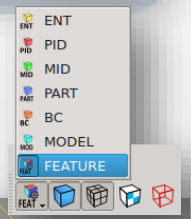
Isolate>Similar Groups – Key features

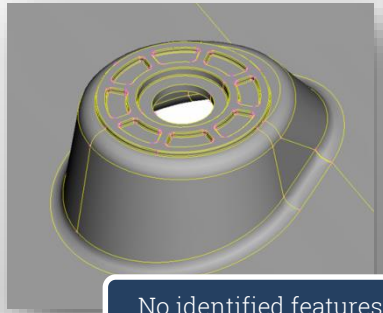
- ✓ **Automatic identification** of similar components
- ✓ **Preview of matching groups**
- ✓ User defined **Similarity tolerance**

De-featuring complex parts

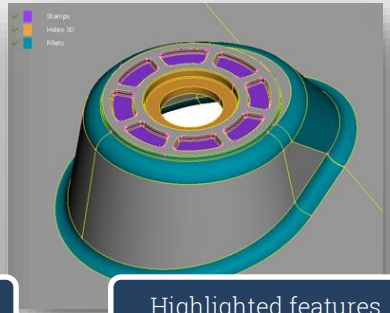




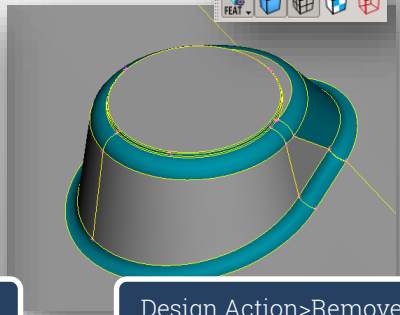




No identified features



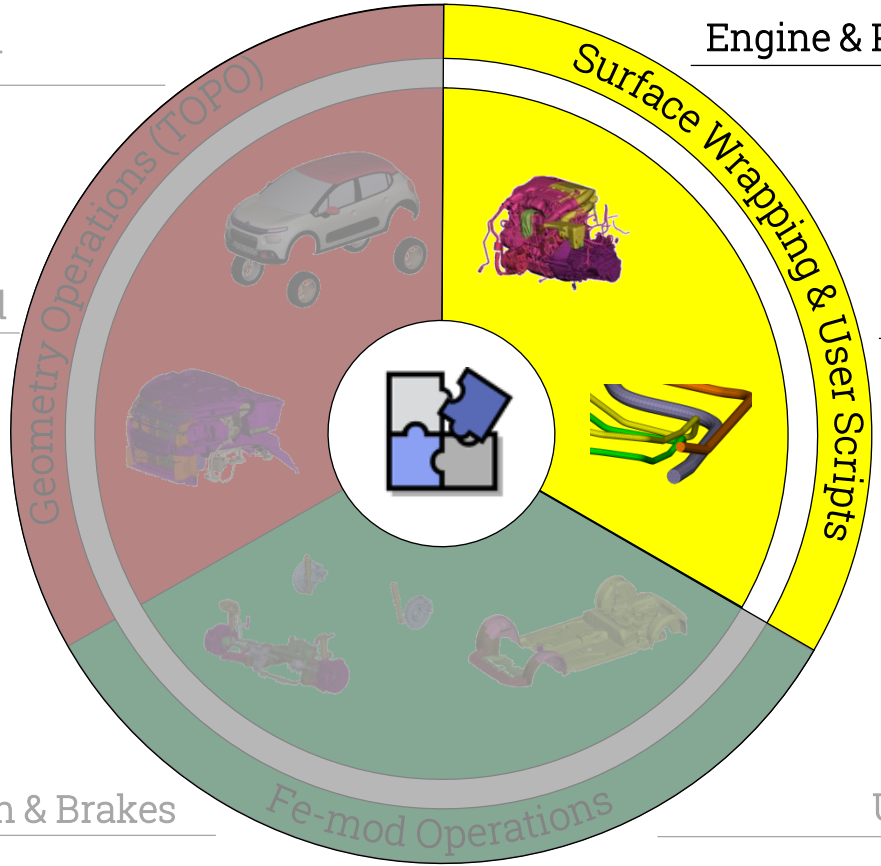
Highlighted features



Design Action>Remove

Feature Manager – Key features

- ✓ **Automatic tool** for identification of features (2D/3D holes, fillets, stamps etc)
- ✓ **Customized Mesh treatment**



Assembly Management in Model Browser

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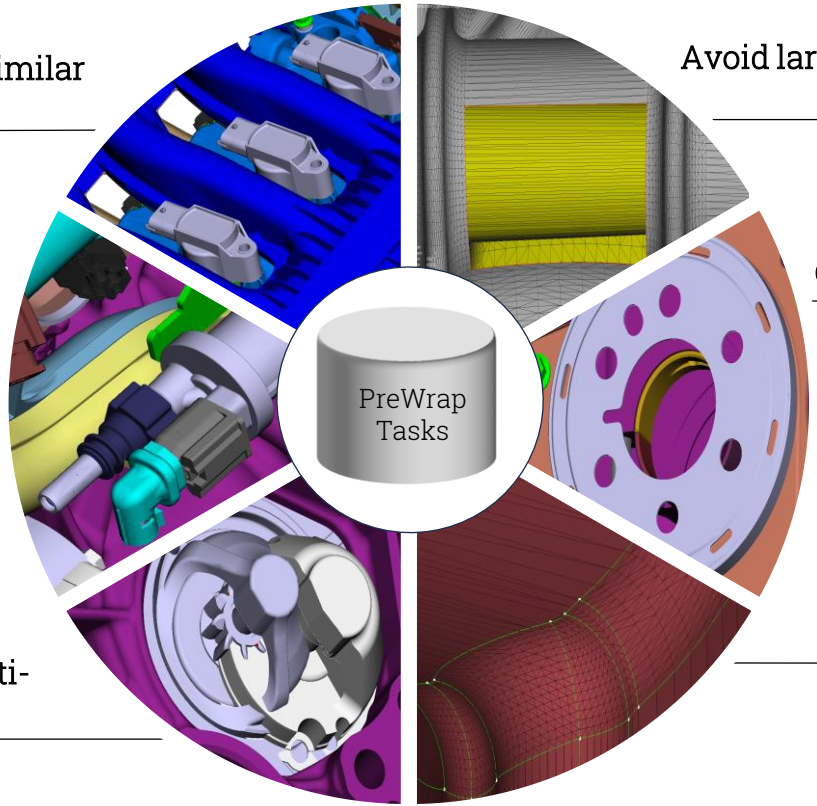
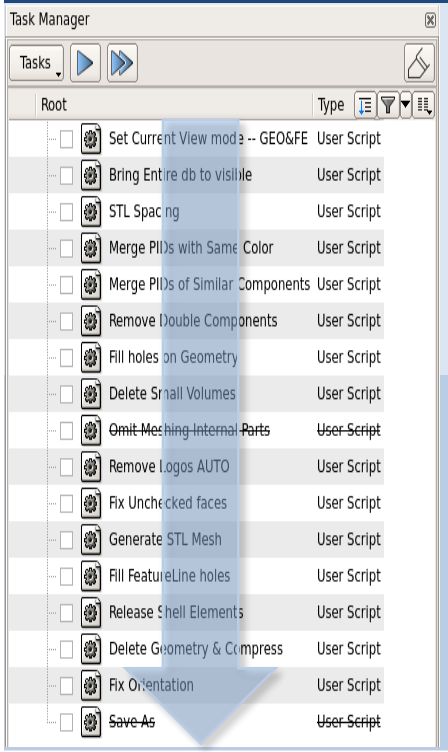
Challenges in PreWrapping process



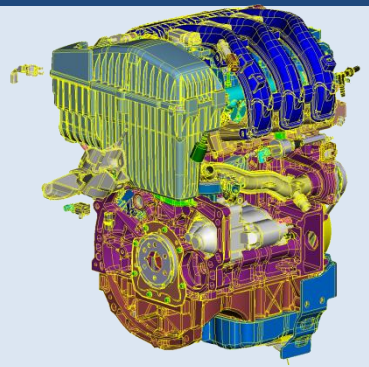
Automation for Prewrapping process

ANSA Task Manager - PreWrap Template



PID's: 3100
Conn Groups: 5765
Faces: 3mil

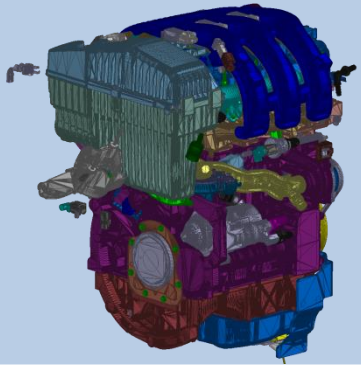
Size: 2.5GB



Geometry

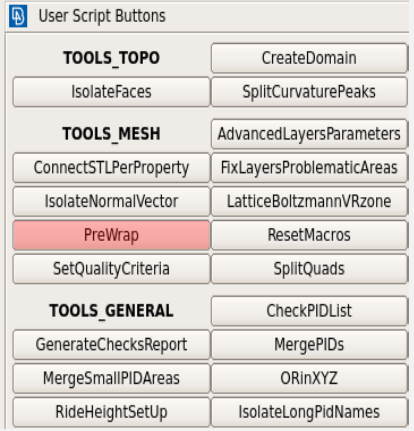
PID's: 190
Conn Groups: 645
Shells: 7mil

Size: 350MB

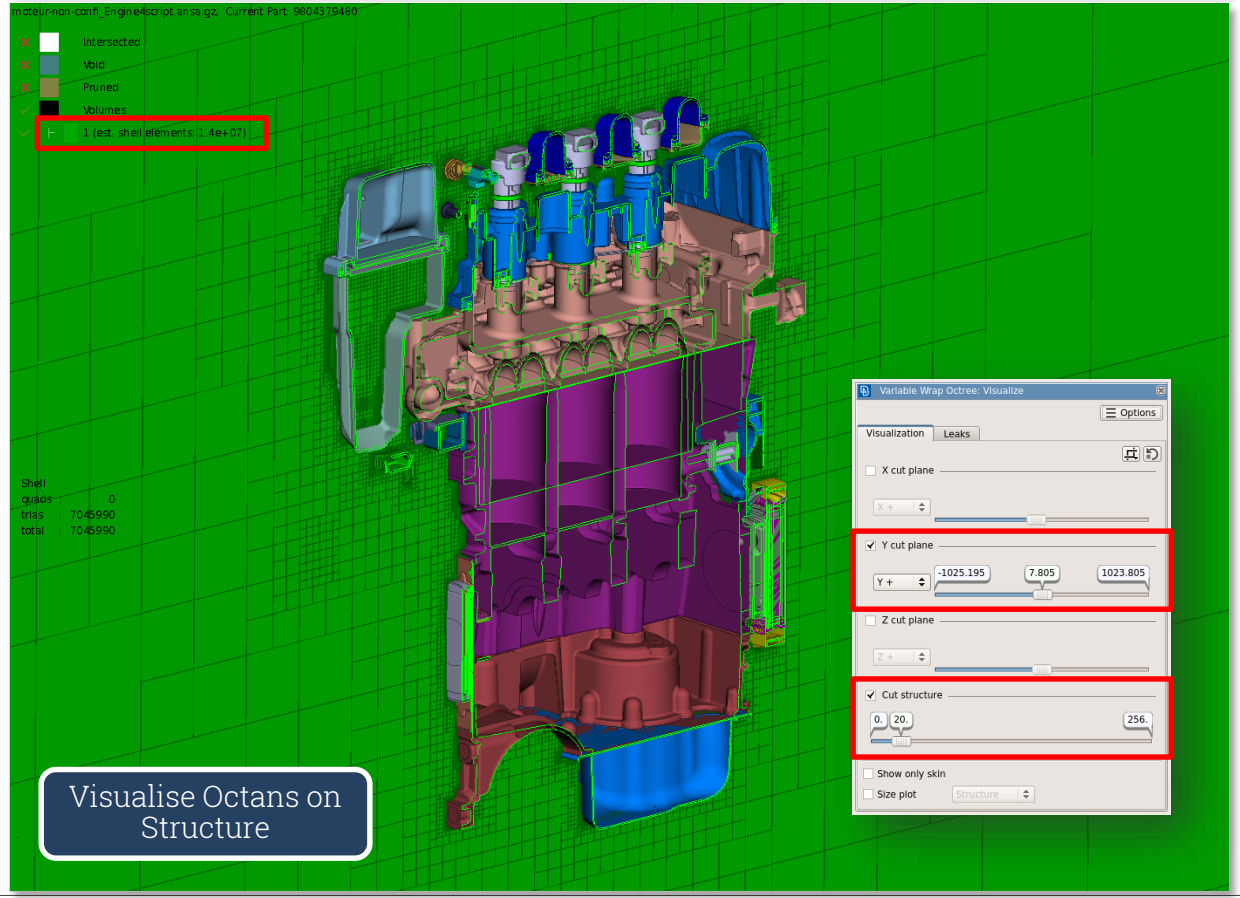


FE-mod

CFD Script Buttons



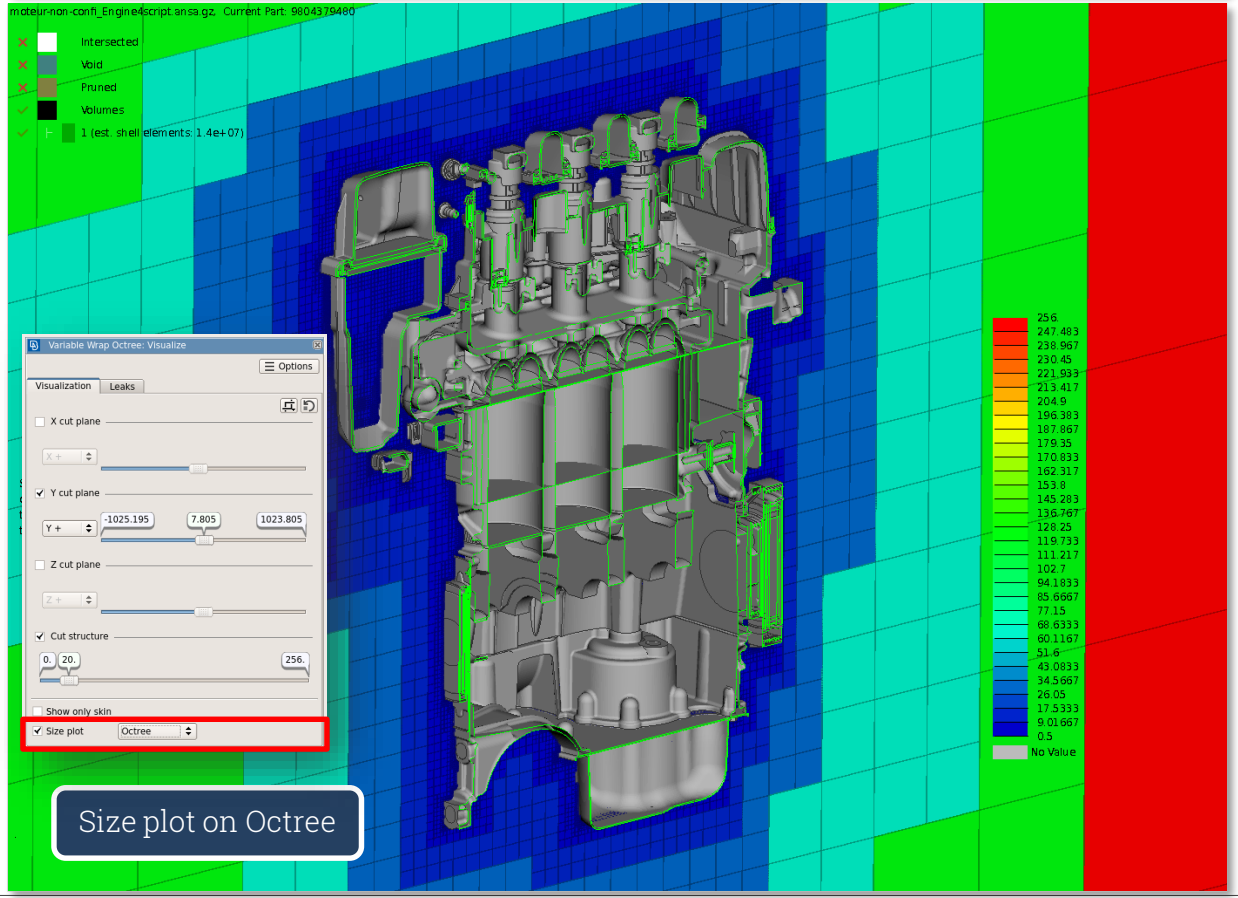
Visualization of Octree entity



All new Octree algorithm

- ✓ **Visualization of Octree** along Structure assembly
- ✓ **Easy-to-handle cut planes** on both Octree and Structure
- ✓ **Estimation of total shell elements** during Visualize stage

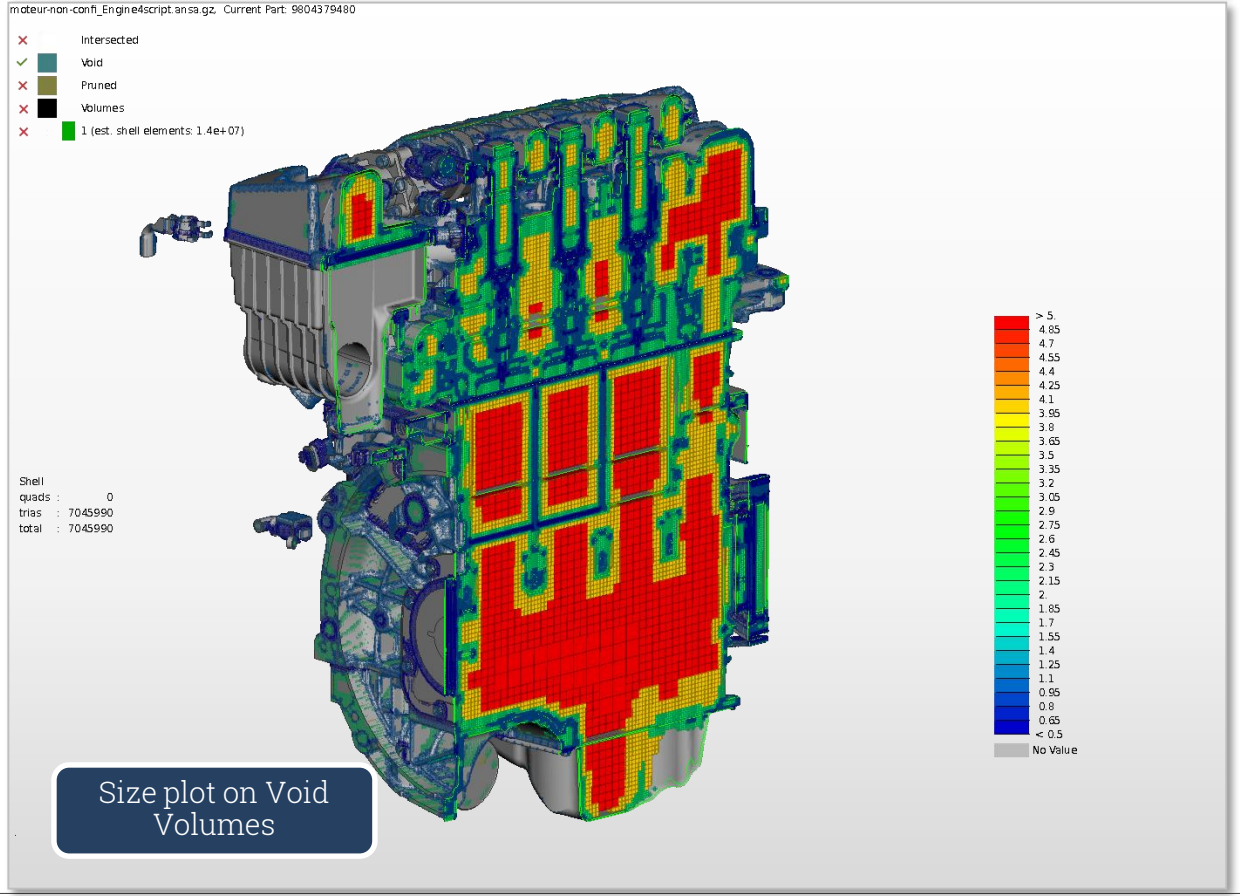
Size plot on Octree entity



All new Octree algorithm

- ✓ **Preview of size length** on the Octree

Identification of Void Volumes

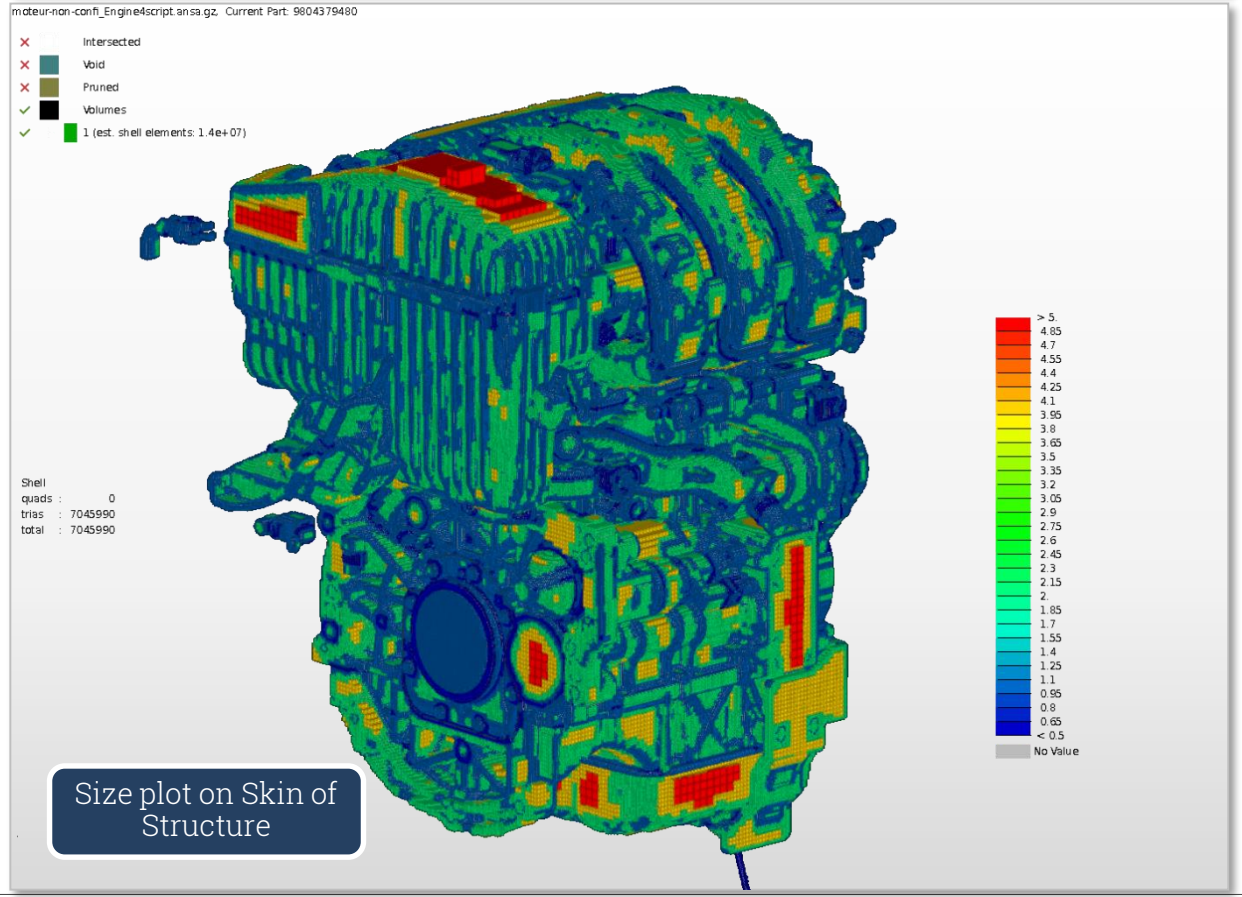


Size plot on Void Volumes

All new Octree algorithm

- ✓ **Easy identification of Void volumes** (no Octree intrusion)

Highlight high resolutions areas

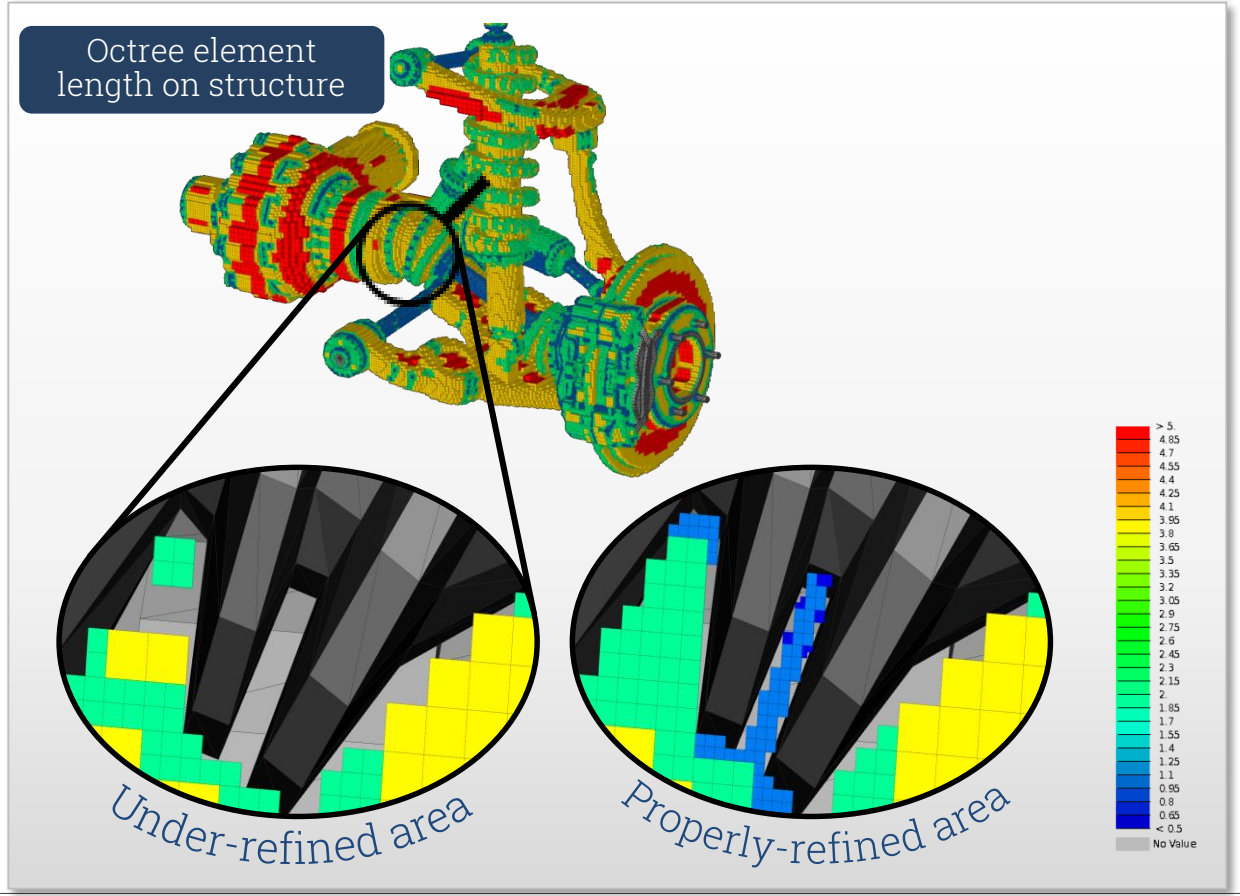


Size plot on Skin of Structure

All new Octree algorithm

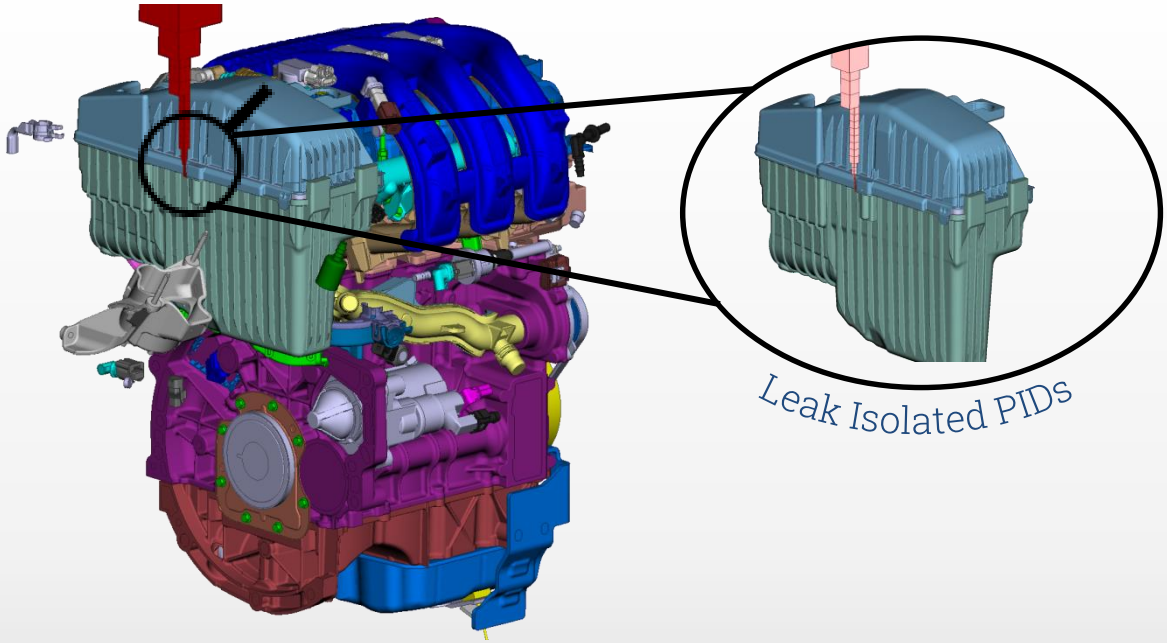
- ✓ **Easy identification of refinement zones** across proximities

Identification of under-refined areas



All new Octree algorithm

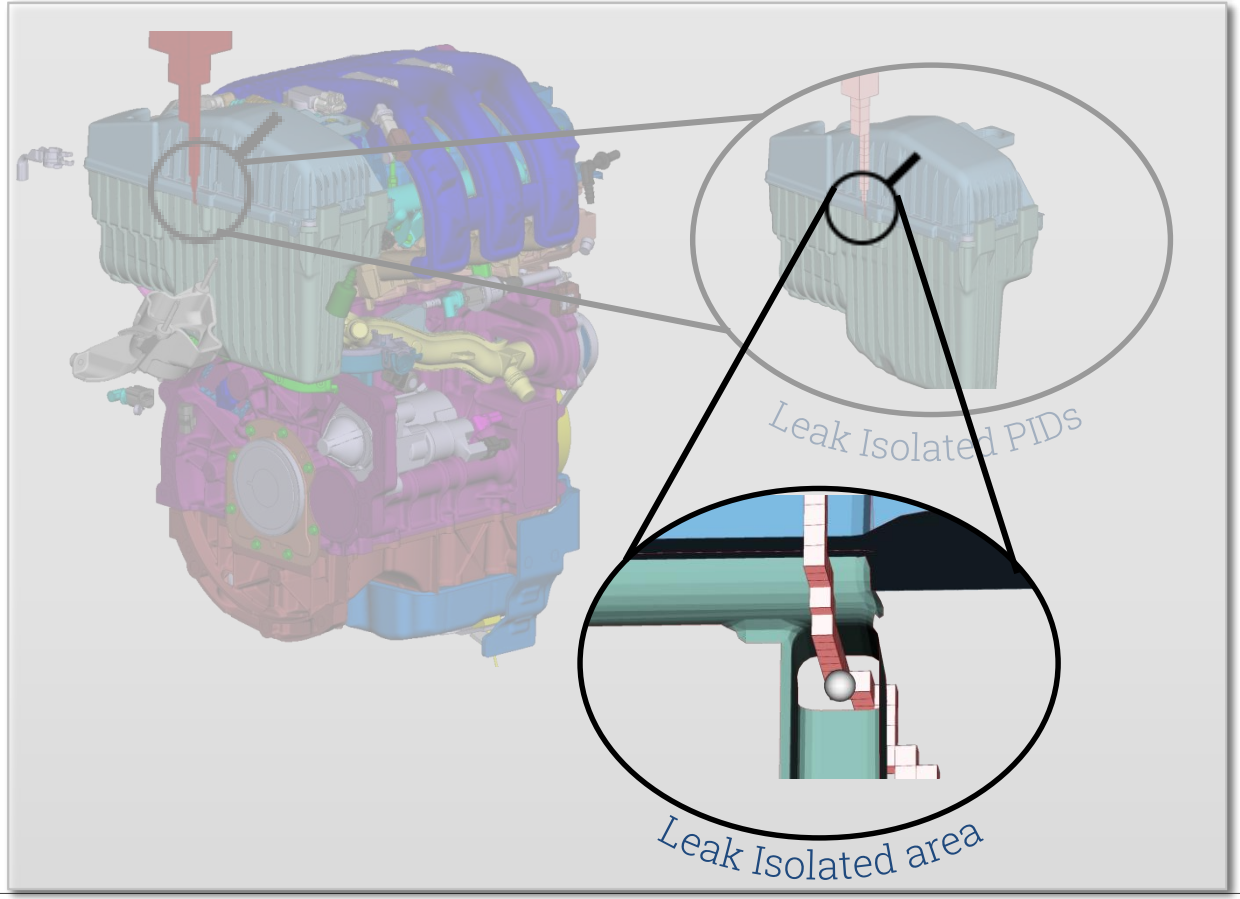
Leak detection



All new Octree algorithm

- ✓ Isolation of leaked properties/areas

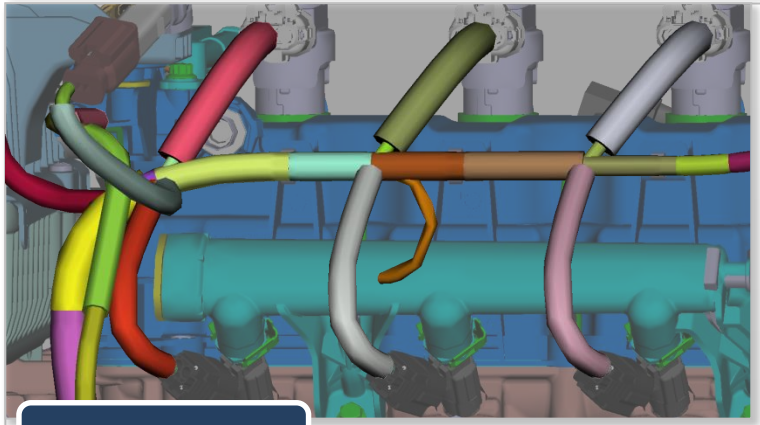
Leak detection



All new Octree algorithm

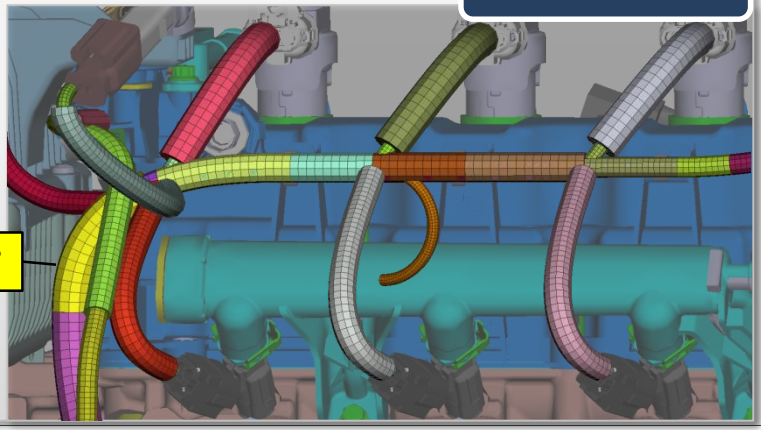
- ✓ Isolation of leaked properties/areas

Tubes & Wires Mesh Generator



Tubes-Geometry

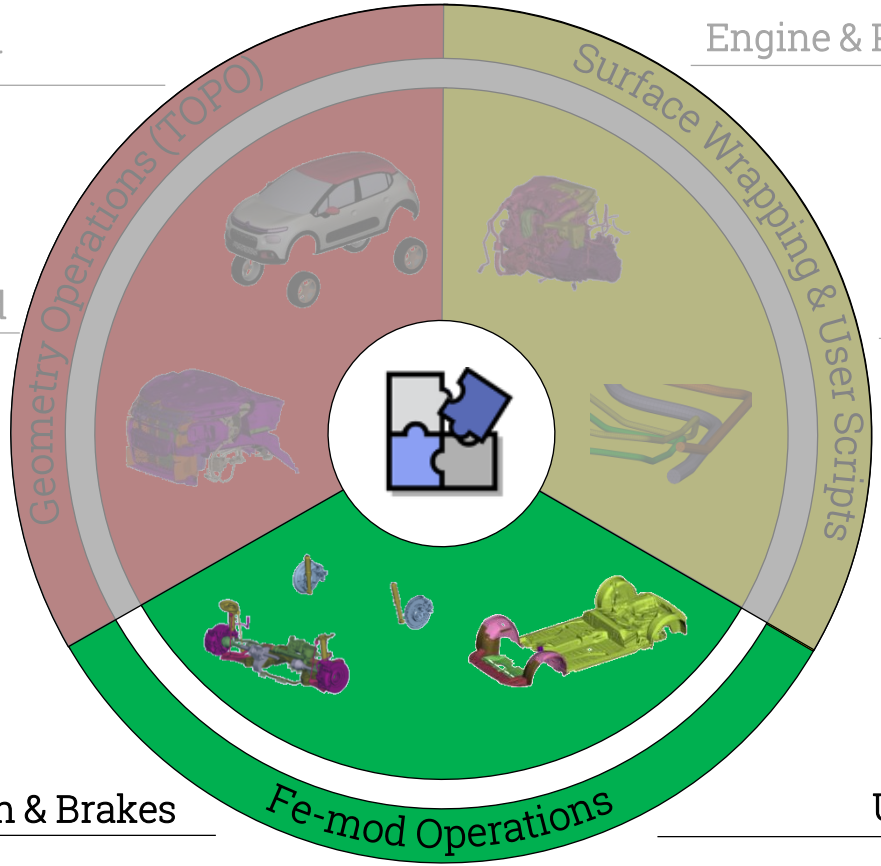
Tubes-Fe-mod



Distortion: 30°

TubesWires user script button

- ✓ **Automatic tool** for shell mesh generation
- ✓ Available for **quad/ortho tria** shell type
- ✓ **Automatic assignment of element length** based on distortion angle



Assembly Management in Model Browser

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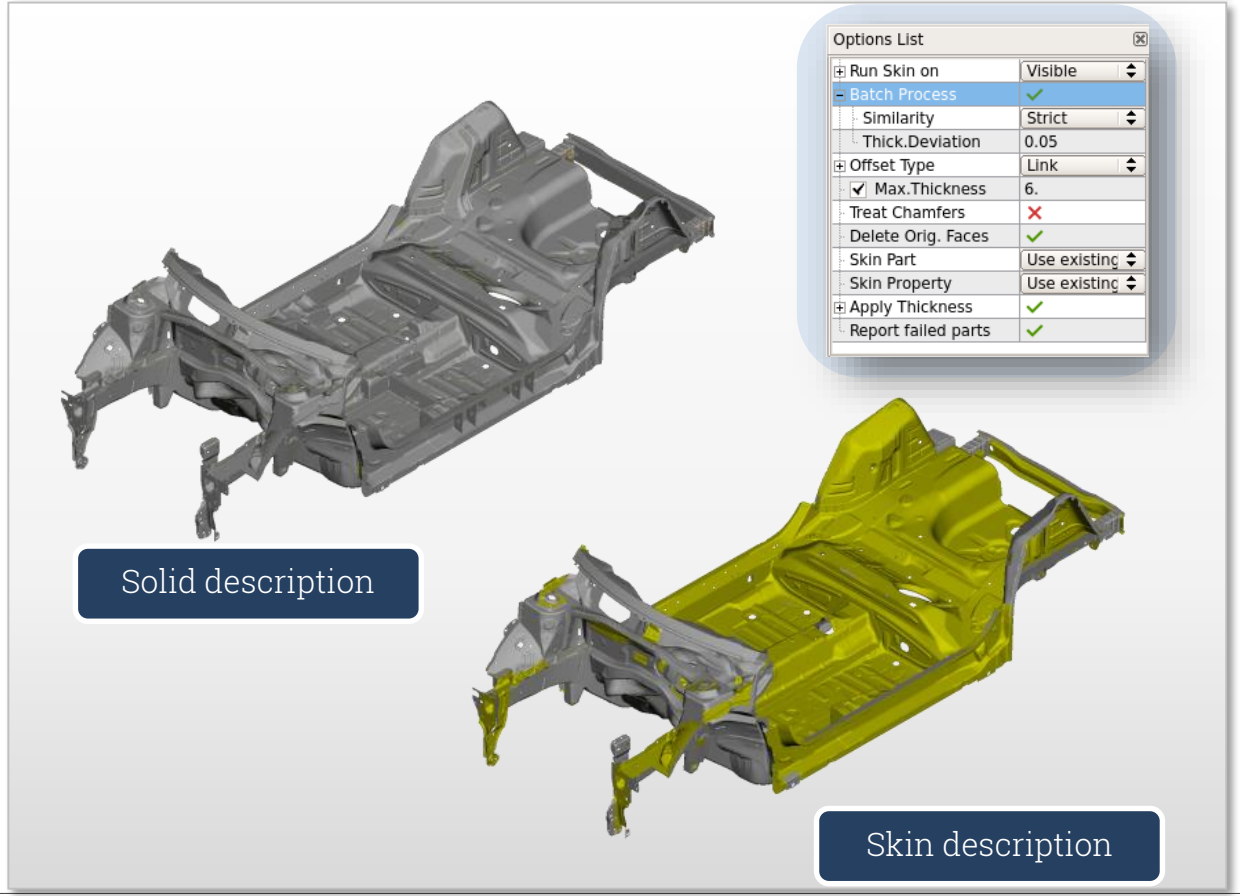
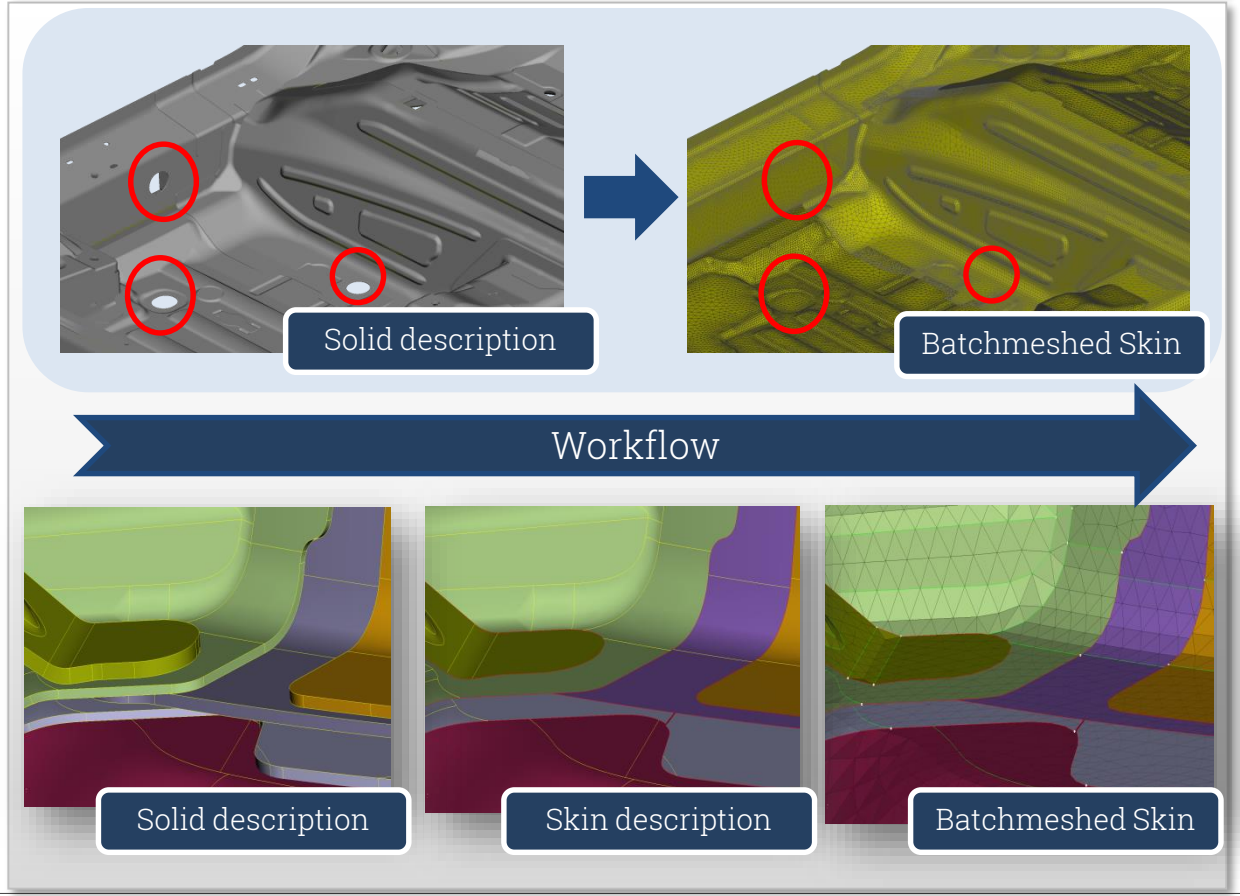
Middle Surface Extraction



Mid.Surface>Skin – Key features

- ✓ **Process acceleration – up to 70%** through execution in **batch process**
- ✓ **Generation of report** for failed parts (casted, topo problems)

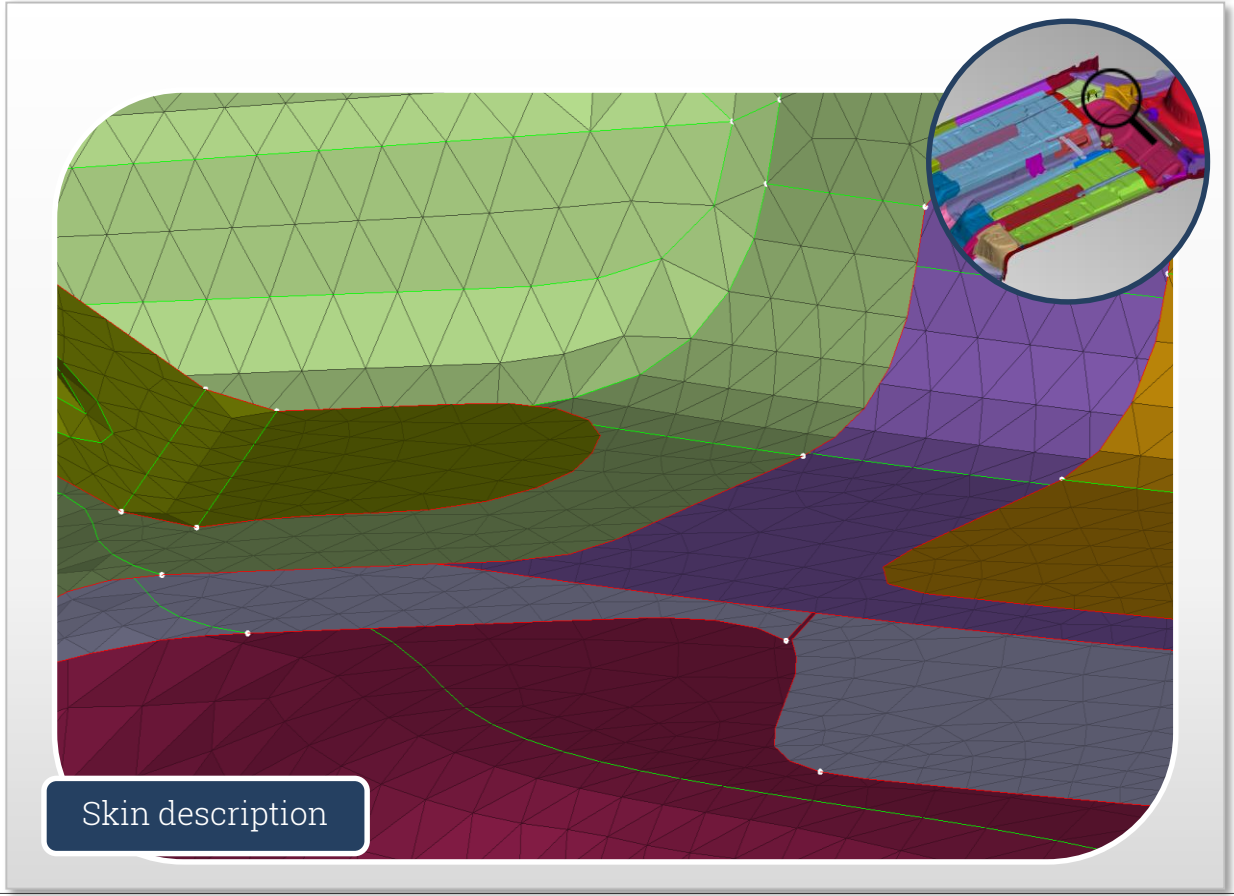
Methodology steps for intersection at FE-mod



Methodology steps before panel Connection

1. **Extract Mid.Surface** from Solid thickness
2. **De-featuring of intense features**
3. **Automatic** closure of holes
4. **Batchmeshing of panels** (Fillet treatment etc)

Fusing gaps of Skin parts – demo case



Intersect Skin– Key features

- ✓ **Automatic tool** with **acceleration of 90%** of watertight closure compared to Geometry operations
- ✓ **Preservation of all geometrical features** of underlying surfaces

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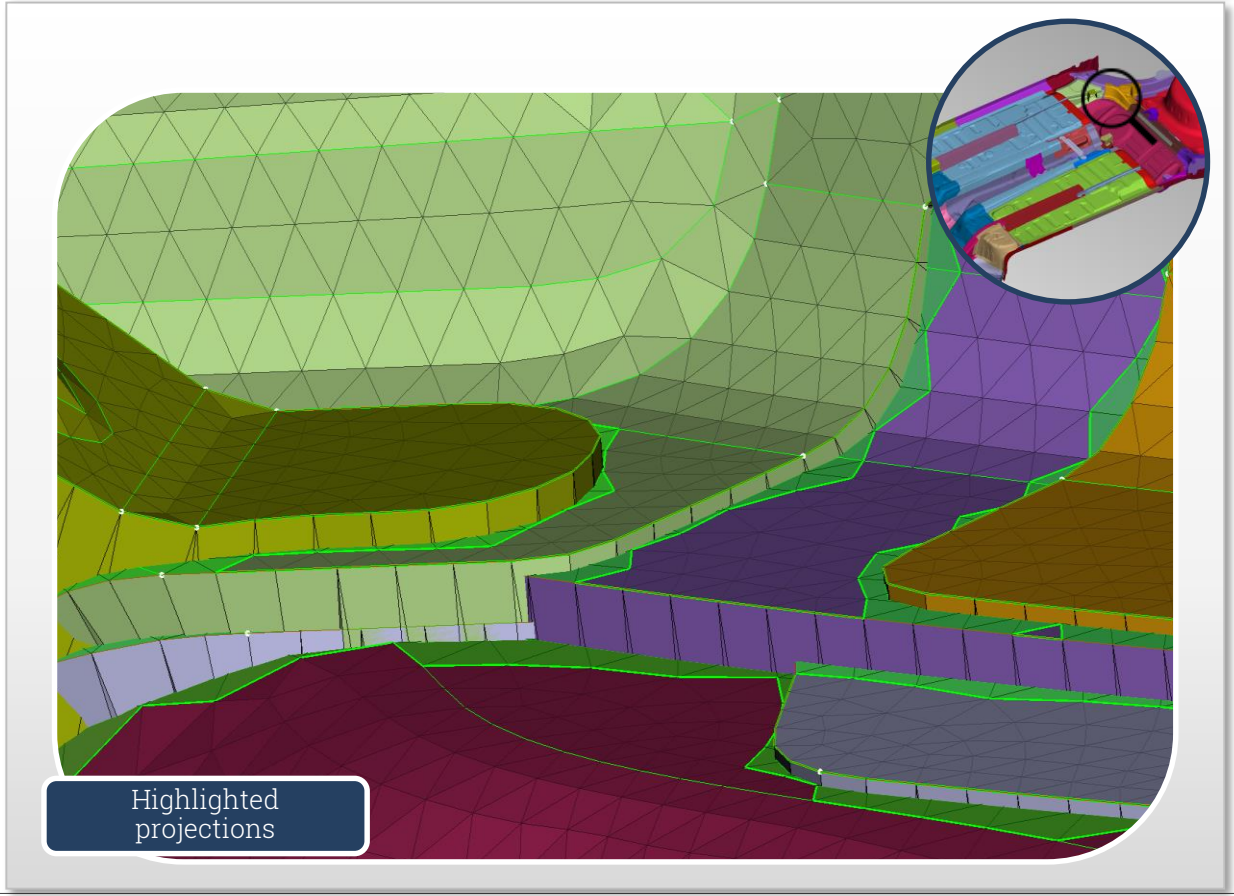

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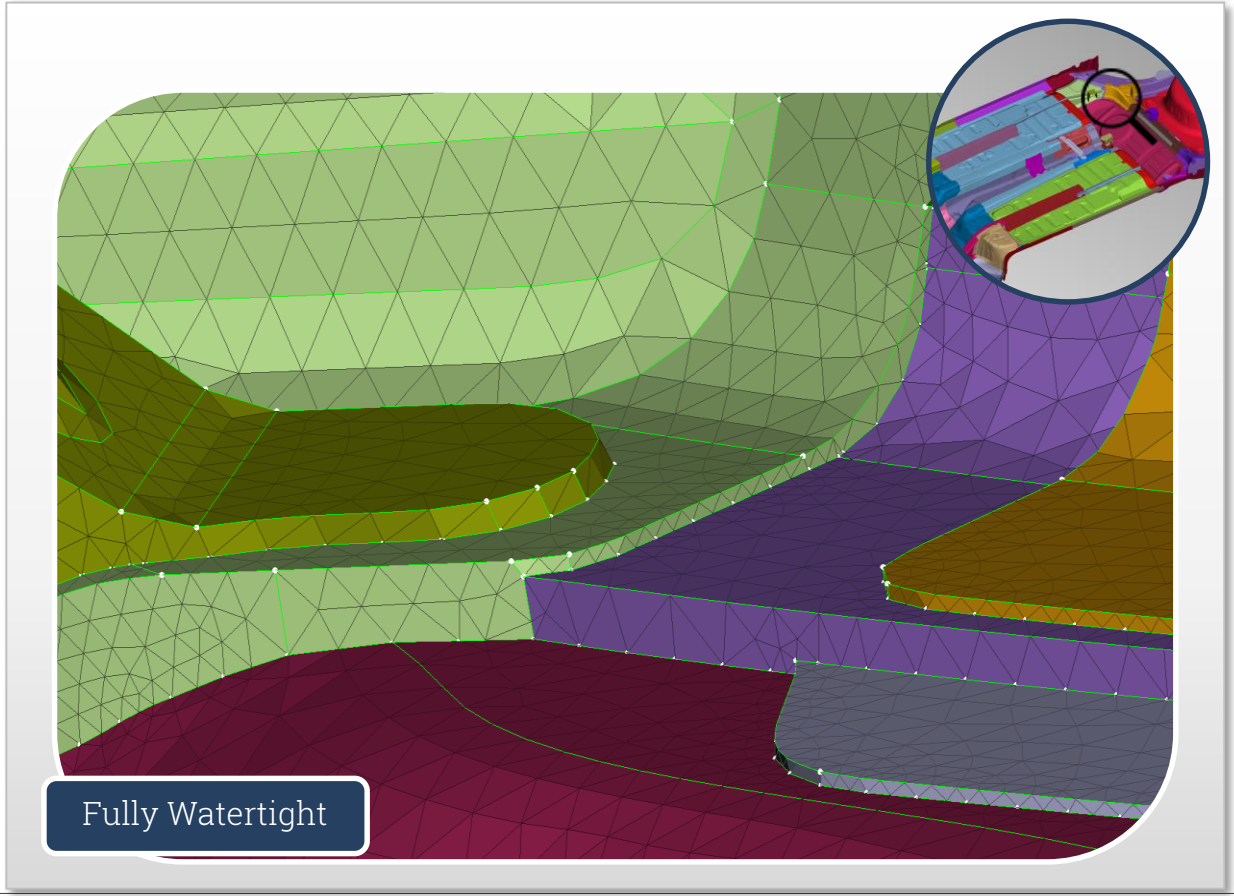

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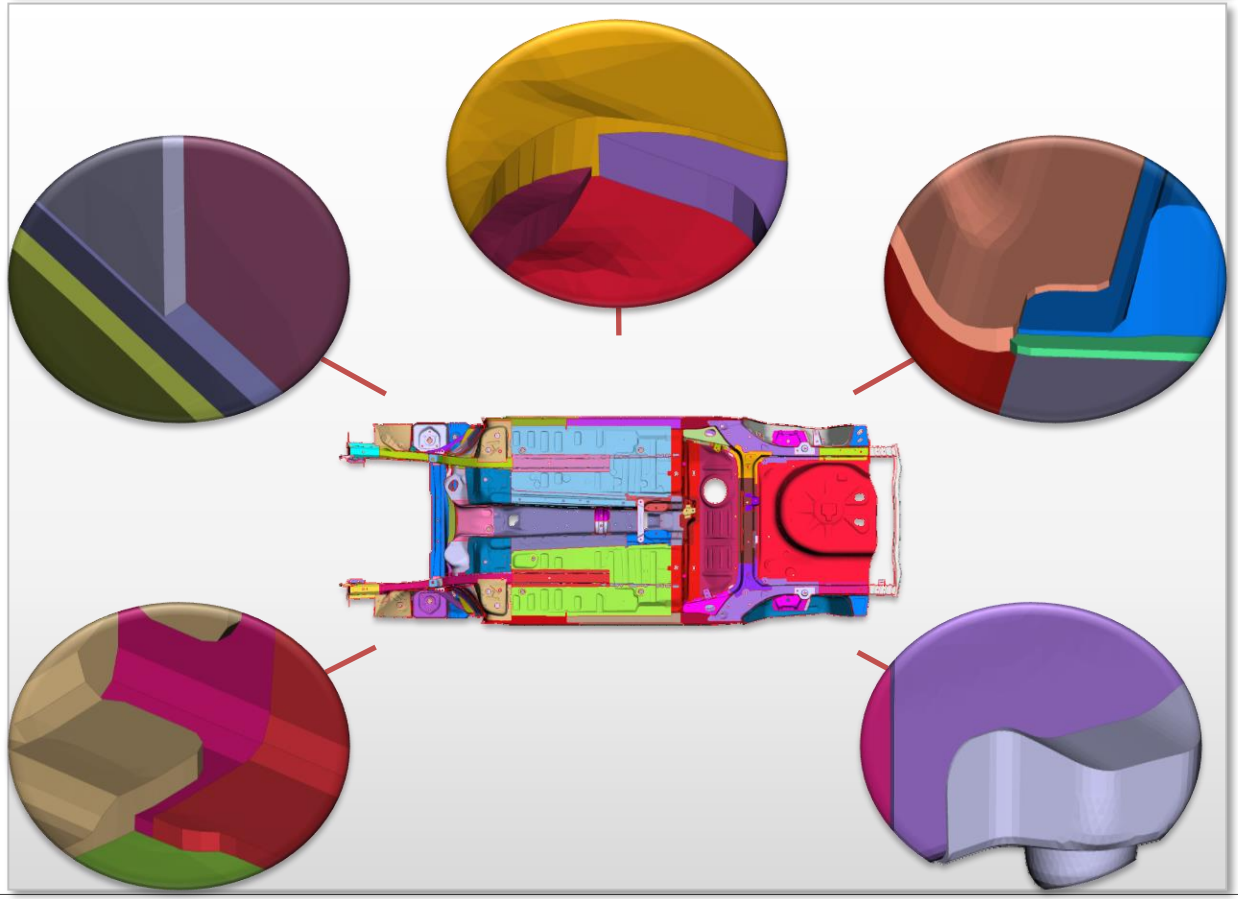

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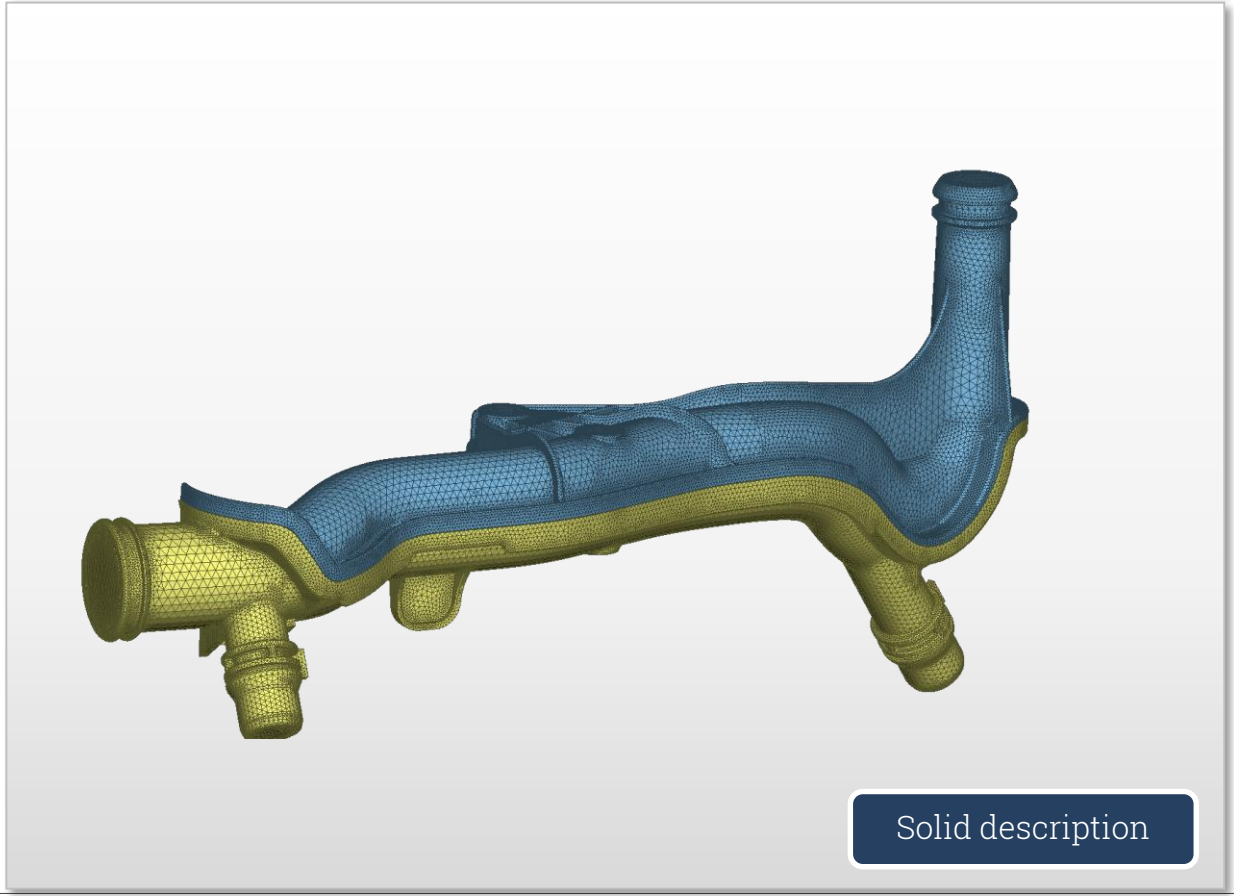

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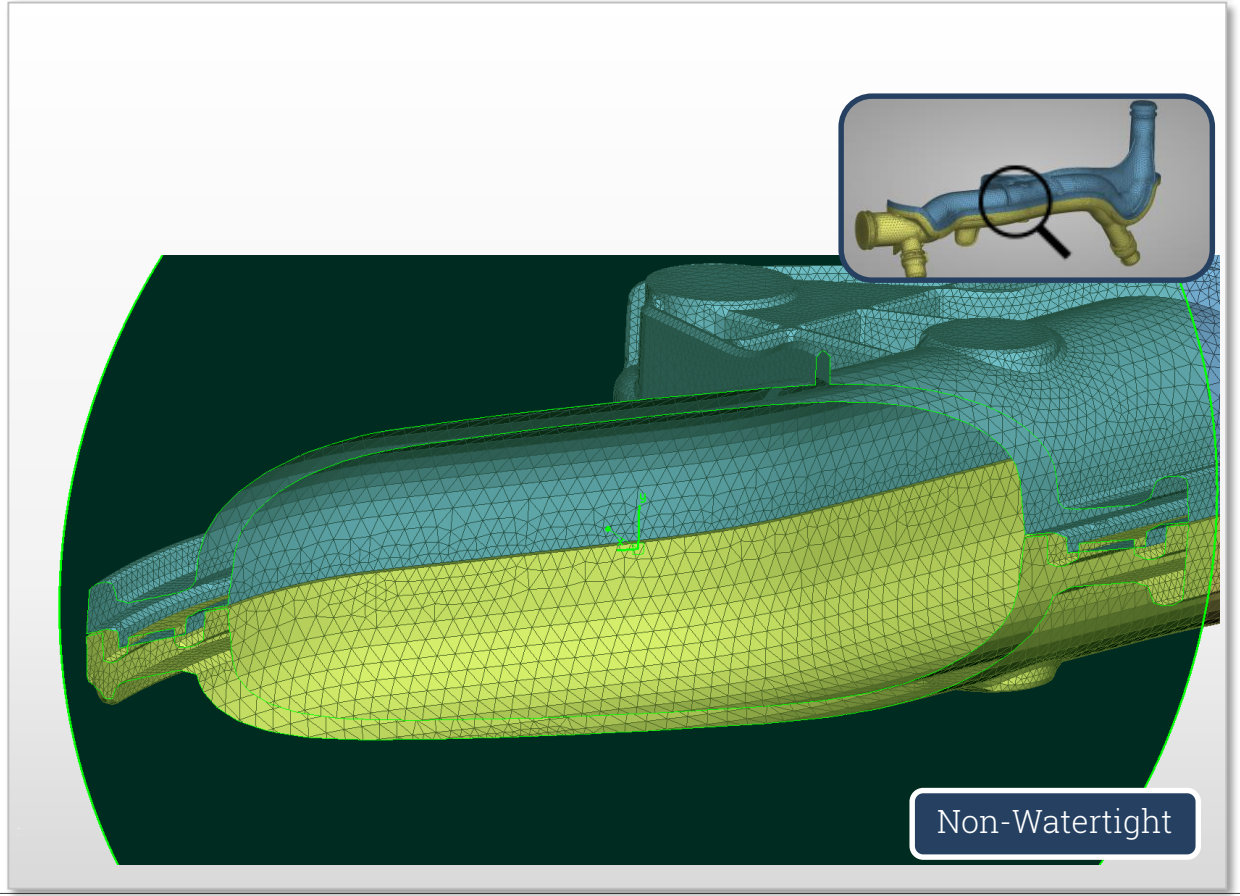

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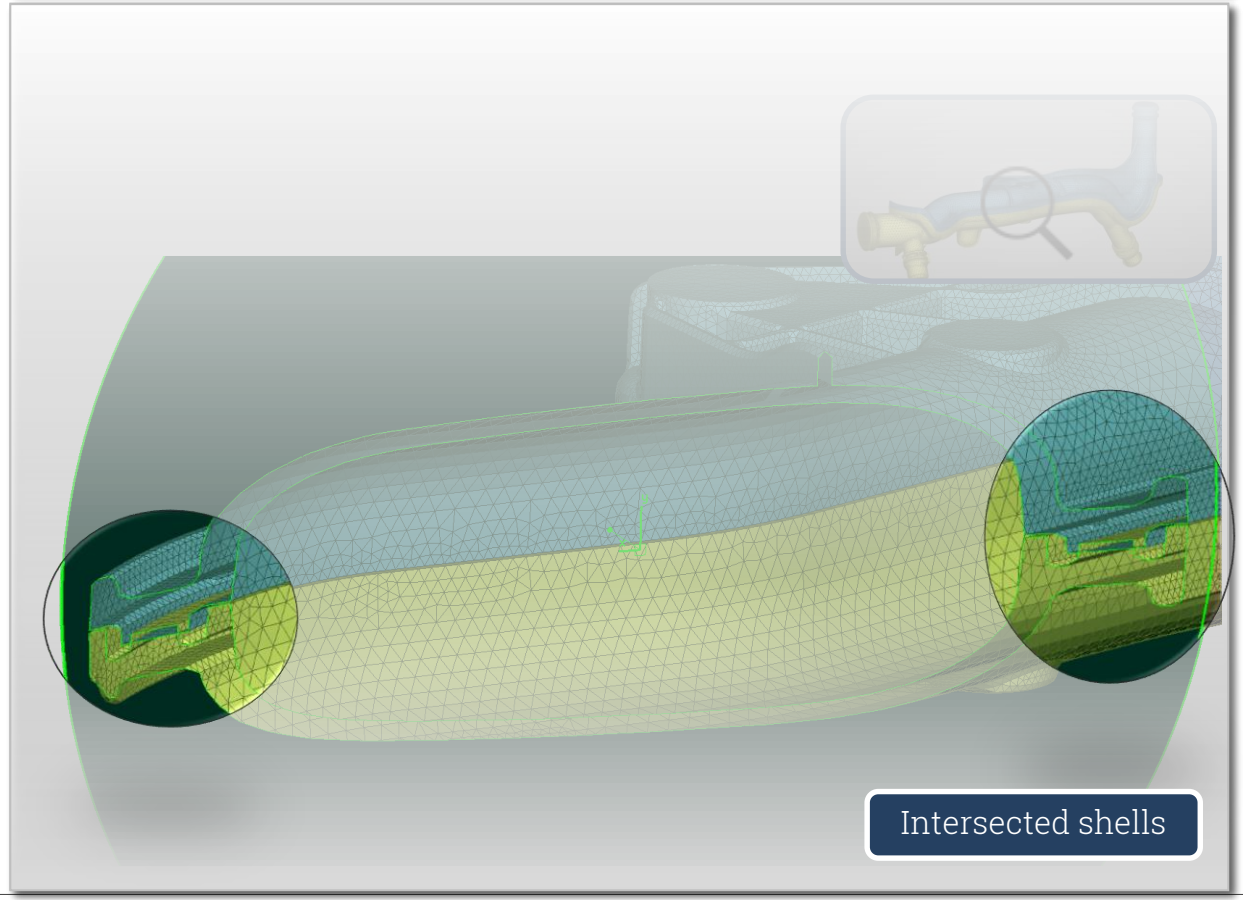

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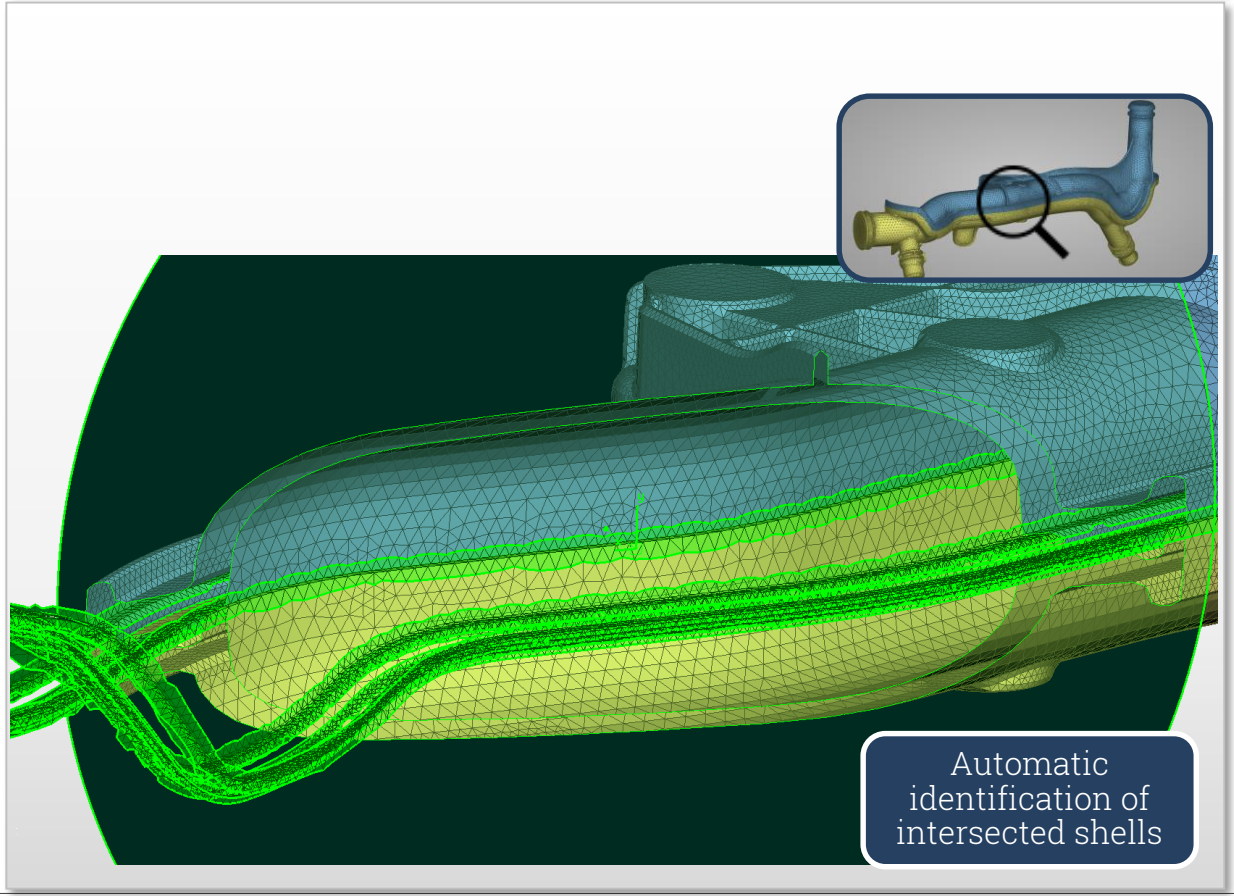

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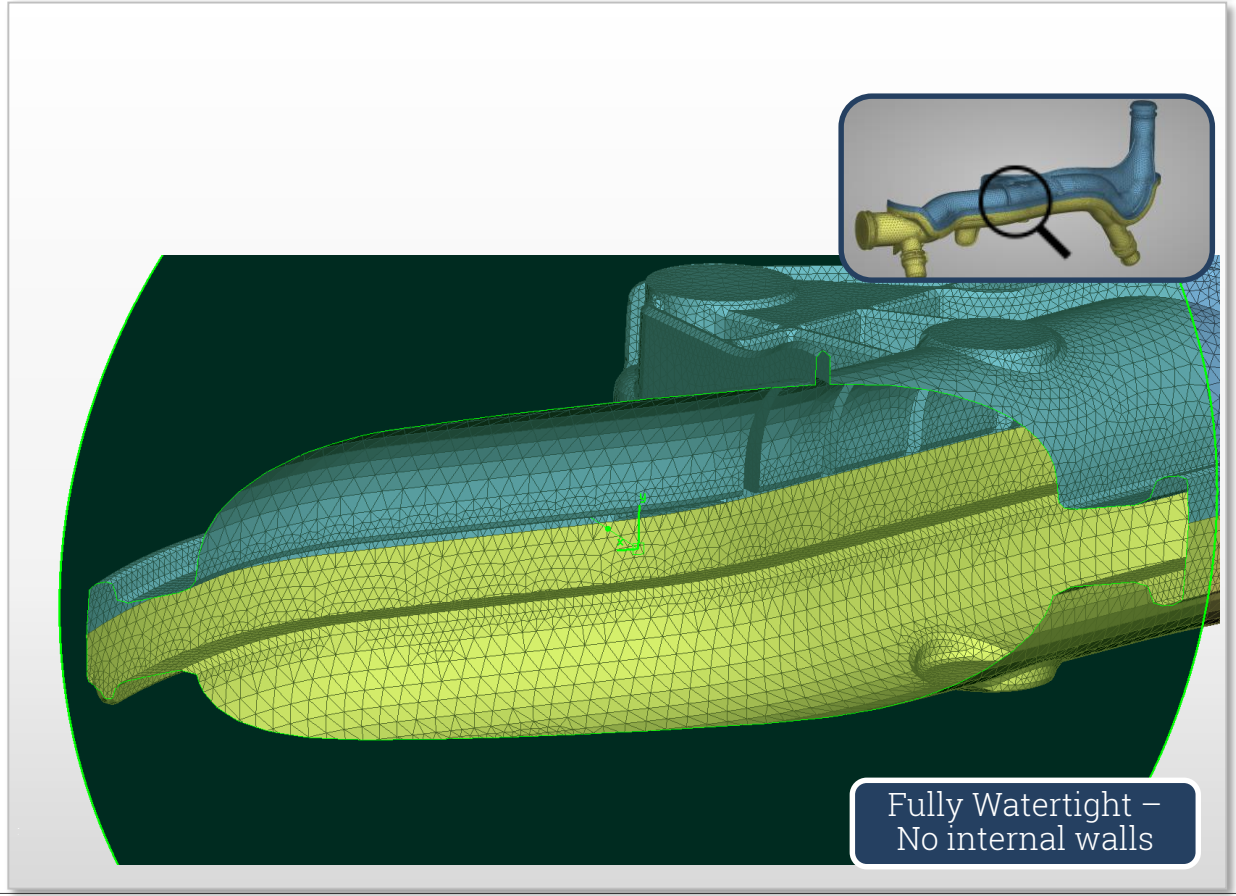

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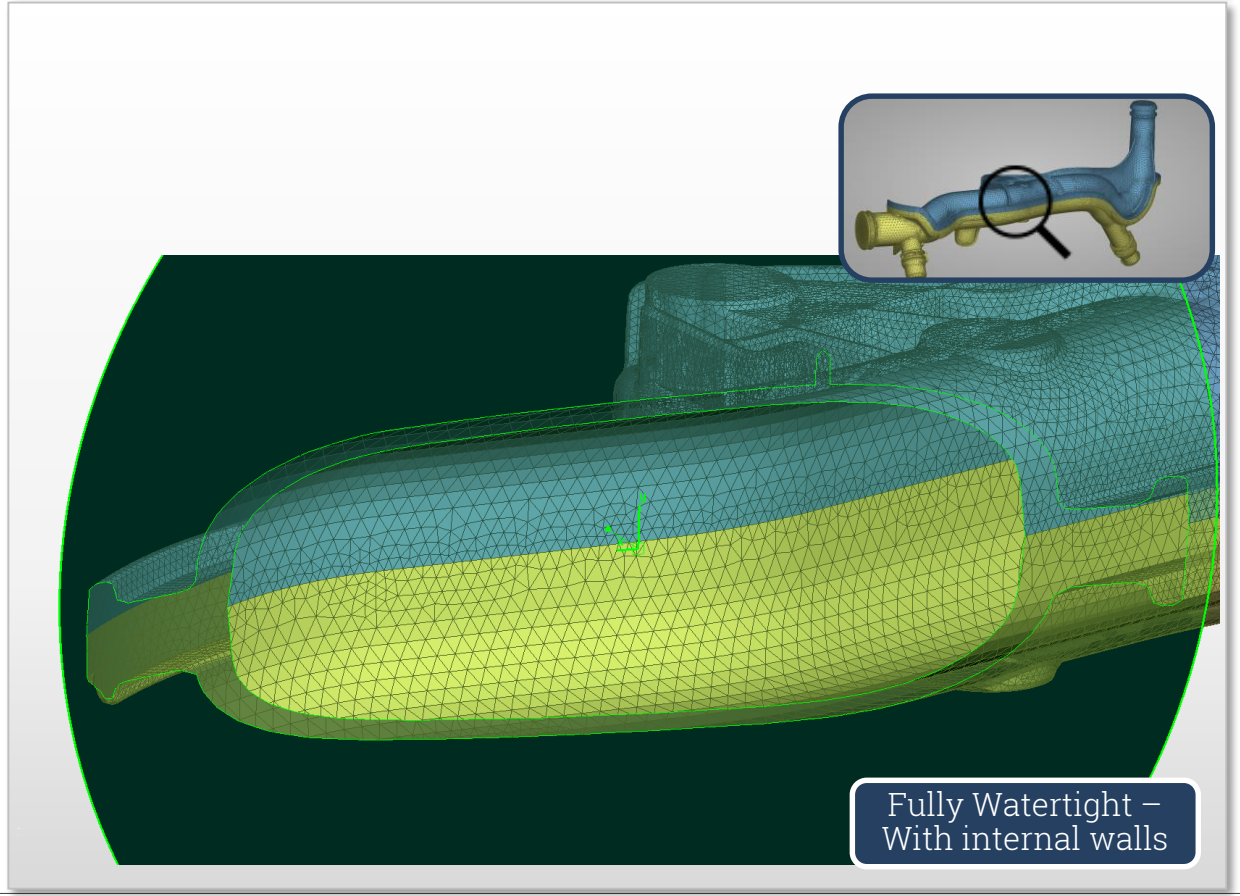

Intersect Solid– Key features

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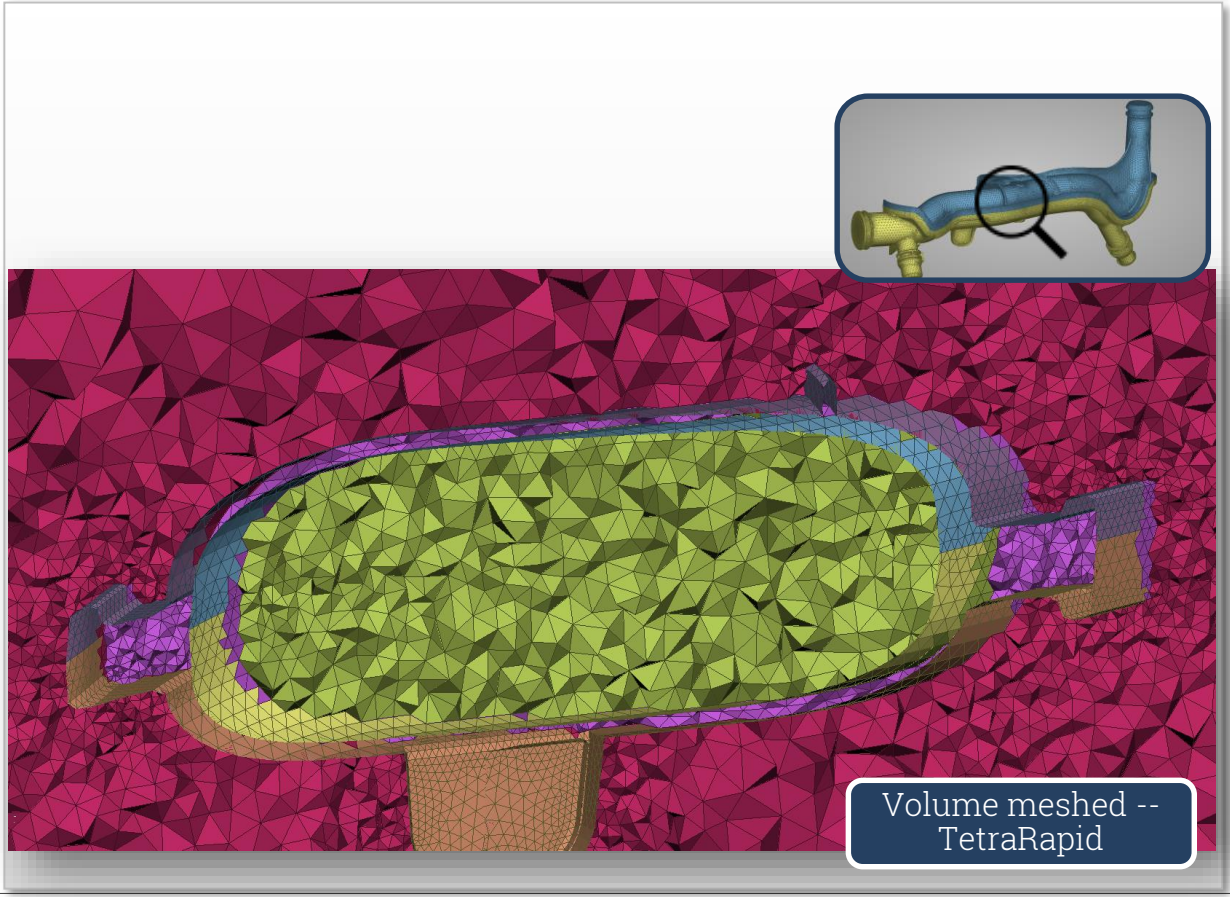
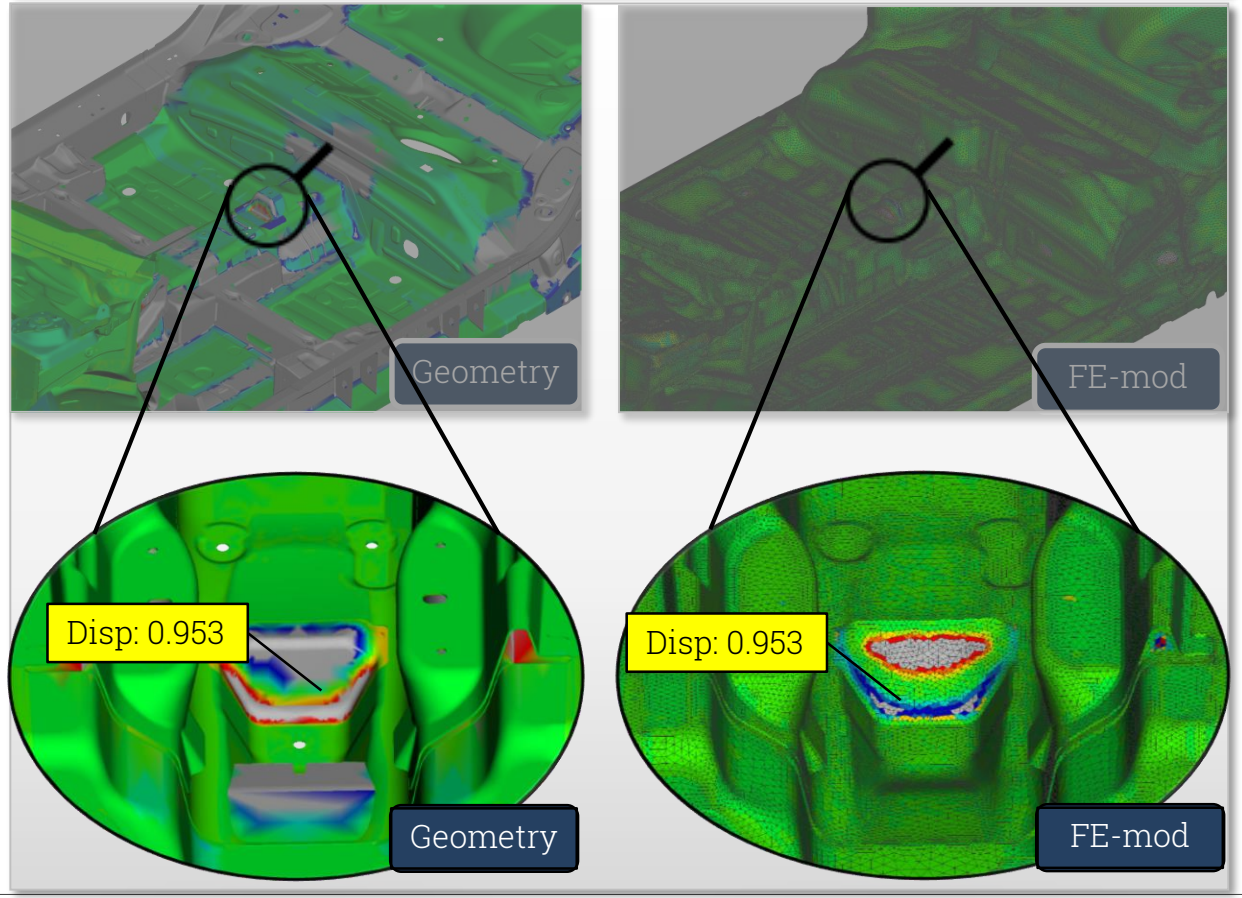
Volume meshing of Solid Components



Intersect Solid– Key features

- ✓ Applications for thermal simulations

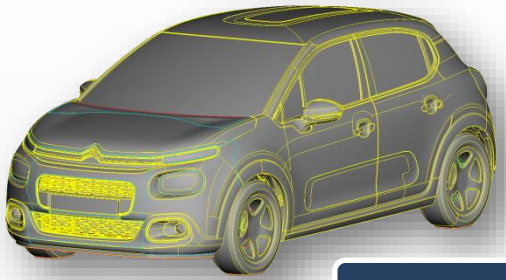
Verification of resulting watertight mesh



S.Graph – Key features

- ✓ **Direct comparison** between different ANSA models

Target performance goals



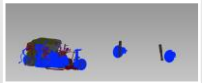
Geometry

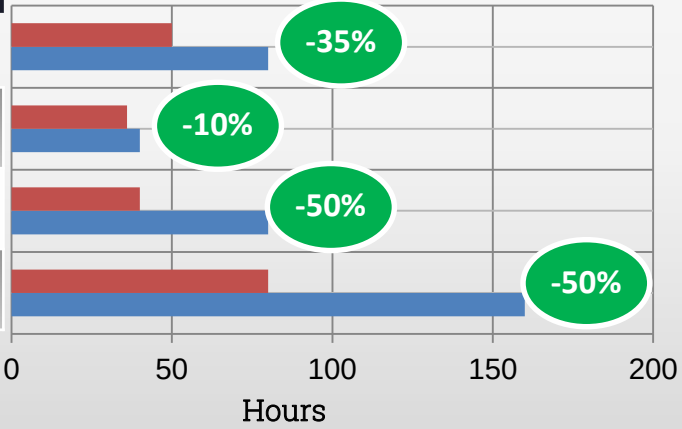
Surface mesh

PSA GROUPE

Performance pre-processing times

Merging of Sub assemblies





New Methodology – Key features

- ✓ **Improved turnaround processing times**
- ✓ More **Consistent Quality**
- ✓ Enable users with **less experience** to build complex models
- ✓ **High level of automation** and modeling standardization – ANSA scripting

BETA
SIMULATION SOLUTIONS

PSA
GROUPE

Stay connected