

# Optimization

**Discover the optimum design**

## Unleash the benefits of optimization while minimizing set-up time in a common approach for any optimizer

ANSA pre-processor and META post-processor in combination with all popular optimization codes, provide a complete tool for optimization applications.

From concept design to final testing, ANSA & META package brings enormous performance and versatility to the optimization problem set-up. The ability to control the model shape using the ANSA Morphing Tool, ANSA model values and even complicated tasks such as batch meshing and model checking, makes the tool unique.

### Morphing features

- Shaping of FE model through the use of 3D, 2D, 1D, and Cylindrical boxes.
- Morphing on CAD geometry.
- Morphing Parameters to control model shaping in a parametric way.
- Parameterizing any manual morphing operation by the DEFORMATION parameter.
- Accurate morphing of model feature lines by fitting on target curves.
- Recording of morphing states for easy recovering of any previous shape.
- Automatic reconstruction to improve mesh quality after morphing.
- Special entities, called Nested Elements, to constrain the shaping of specific features of the model such as holes and beads.

### Direct Morphing

- A powerful new morphing algorithm performs direct morphing on geometry or FE model without the need of morphing boxes. This process minimizes the set-up time especially in large models.
- Direct morphing can be applied by means of edge fitting or Control Points movement.
- Depressions and simple features definition.
- Parametric control of holes diameter.
- Cross section morphing.

### Process automation

The integrated process automation tool facilitates the set up of the optimization sequence. Design variables are defined in the Optimization Task and are connected with any Morphing Parameter and thus control the shape modifications of the model. In a similar manner, Design variables are connected and control any parameter of any ANSA entity (shell thickness, material density, spotweld distance, etc.). Furthermore, complicated actions, such as

features creation and treatment, parts replacement and mesh quality improvement are assigned to the process and driven by design variables.

### Coupling with optimizers

- Direct coupling with LS-OPT, modeFRONTIER, and OPTIMUS, without the need of any scripting.
- Coupling the Optimization Task with any other parametric optimizer, such as Isight and DAKOTA, without the further need of scripting.
- Integrated TOSCA Structure interface which is able to define Topology, Shape and Bead optimization scenarios.
- Automatic meshing quality improvement of the optimum model and automatic definition of the validation model after TOSCA Run.
- Monitoring the TOSCA Run through the ANSA Interface.
- Simulation and model validation.

- A special tool to simulate and animate the model shape for different combinations of design variable values gives the user the ability to check the model before contacting with the optimizer.
- Video recording of the animated model.
- Enhanced Design Of Experiments, Full Factorial Algorithm for easy definition of experiments.
- Definition of full model reports during the optimization process checking model validity.
- Automatic model fixing, such as property thickness penetration, is performed during the optimization loops.

### Spotweld optimization

- Parametrization of weldings and easy handling by the Optimization Task.
- Control parameters such as spotweld distance, number of spotwelds, spotwelds' diameter, connections' properties or materials, and alternative connections representation types.

## Features

- FE & geometry morphing 2D & 3D parametric morphing
- Edge fitting
- Direct morphing
- Process automation
- Scripting

### Set up for:

- Shape and Parameter optimization
- Composite material optimization
- Spotweld optimization
- Multidisciplinary optimization
- ANSA & META nodes in ModeFrontier and OPTIMUS interface
- LS-OPT direct interface
- TOSCA Structure integrated interface
- NASTRAN SOL 200 interface

## Benefits

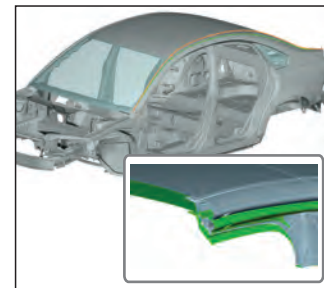
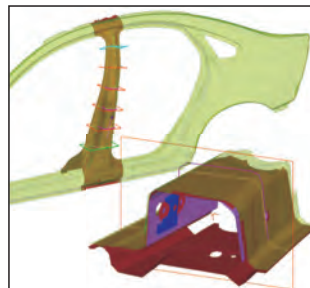
- Minimizes the set-up time in morphing using the Direct Morphing functionality
- Powerful morphing in CAD geometry
- Common approach in coupling with any optimizer
- Fast and flexible optimization sequence set up using the massive definition of design variables

- Combined spotweld and Shape Optimization Morphing Tool can handle Connections Points, Lines and Faces in the same way as the Morphing Tool can handle Connections Points, Lines, and Faces.
- Distribution and control of spotwelds by defining connection density function along the connection line.



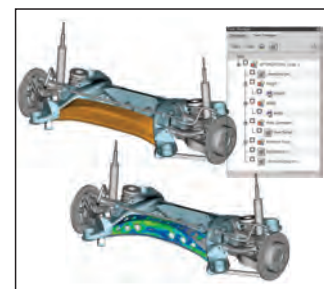
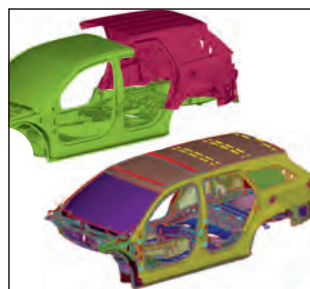
## Multidisciplinary optimization

- A defined optimization sequence can be applied on different representations of the same model and prepared for different solvers and analysis scenarios for the set up of multidisciplinary optimization problems.
- The use of common Optimization Task and Morphing Boxes in different analyses ensures the identical shaping.



## Post-processing

- A special tool in META offers a flexible way for the responses and histories extraction, from the solvers result files.
- Responses extraction from the 3D model and the 2D Plot.
- The automatic definition of post-processing sessions to participate in the optimization loop, and the calculations upon solvers results, are only a few of META's powerful capabilities.



## NASTRAN SOL 200

- Support of the required keywords for the definition of NASTRAN SOL 200 cases for property, and material optimization.
- Use of the Morphing tool for the massive definition of the DVGRIDs for shape optimization according to the Manual Grid Variation method.
- Support of the keywords TOPVAR, TOMVAR and BEADVAR for topology, topometry and topography optimization.

