

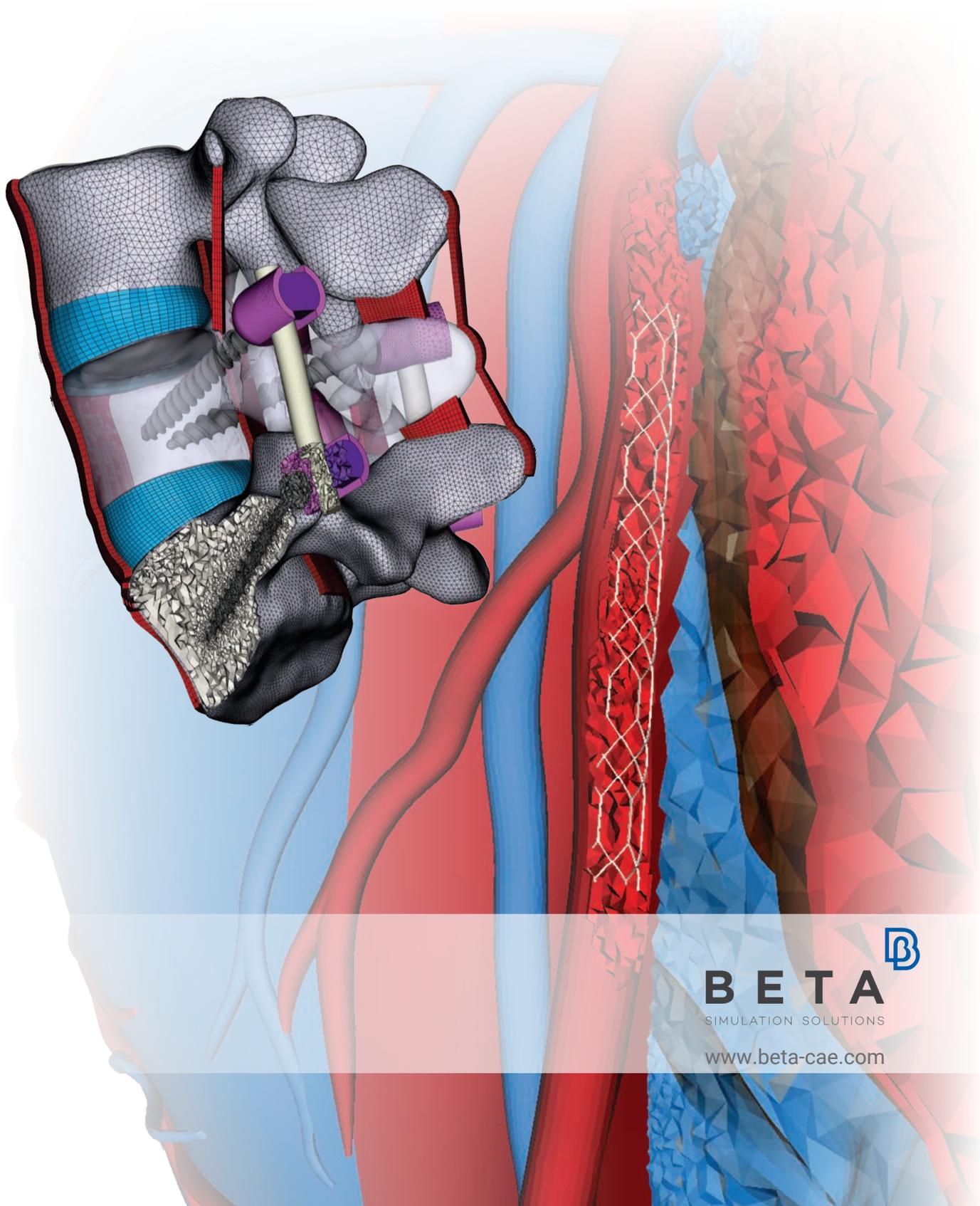
ANSA
PRE PROCESSOR



META
POST PROCESSOR



high performance
pre- & post-processing
for Biomechanics



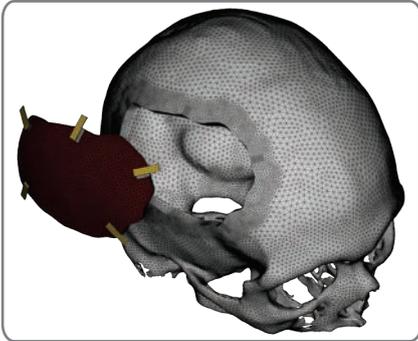
BETA
SIMULATION SOLUTIONS

www.beta-cae.com



ANSA is an advanced multidisciplinary CAE pre-processing tool that provides all the necessary functionality for full-model build-up, from a variety of FEM-based data (such as STL) to ready-to-run solver input file, in a single integrated environment. The broad range of functionalities and special tools, along with the high level of procedure automation, ensures high performance and efficiency for all the required tasks for Bio Mechanics applications.

META is a highly sophisticated and user friendly multi-purpose post-processor that meets the needs of various CAE disciplines. Through its undisputable high performance, its top quality 3D graphics and 2D plots, its automation and reporting capabilities, post-processing becomes more comprehensive and faster than ever.

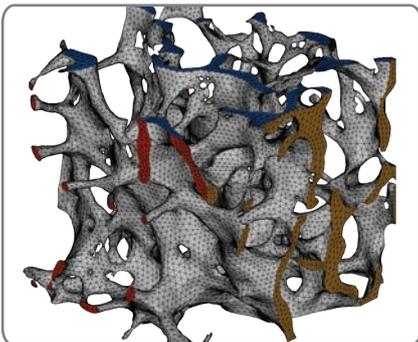


General features

- 32 or 64 bit code, for unlimited memory usage.
- Multi-core CPU usage, taking advantage of all the hardware's CPU power.
- Double precision for maximum accuracy.

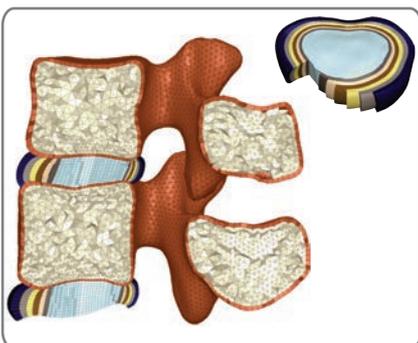
Topology & geometry clean-up

- CAD interfacing with neutral and native formats such as: IGES, STEP and Catia, SolidWorks.
- Integrated CAD tools for geometry creation, modification, cleanup, defeaturing and watertight preparation.
- Easy identification and isolation of inner and outer surfaces, internal passages, intersections and more.
- Leak detection tools.
- Automatic identification of similar geometry and substitution with virtual linked geometry, speeding up the model build-up due to the interactive relation between the linked geometries.



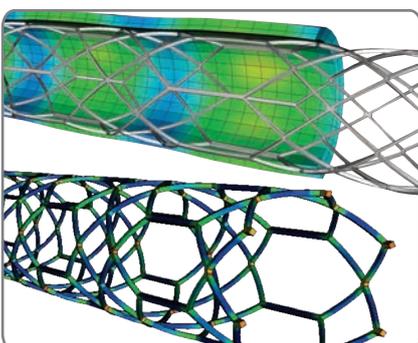
Model management

- Powerful model management through parts and properties extracted from the CAD input data but also modifiable in the ANSA Part Manager and Property List.
- Novel comparison tool to simultaneously load two models and automatically identify their differences with respect to geometrical discrepancies or model characteristics. Option to automatically replace only differences allows the quick update of the current model.



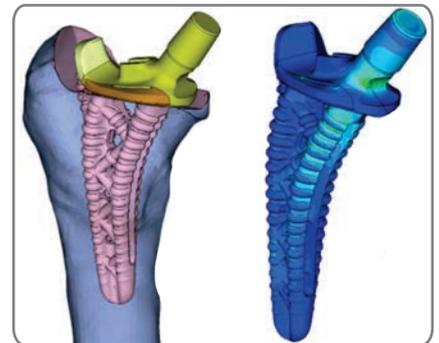
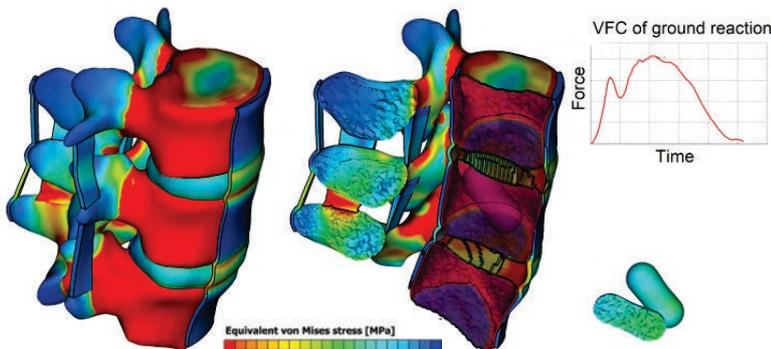
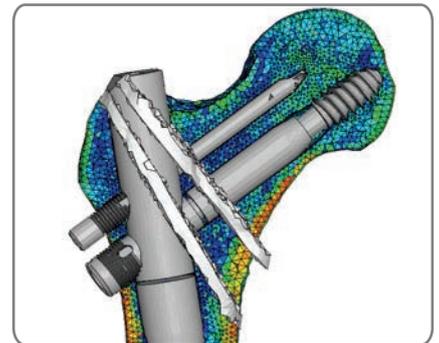
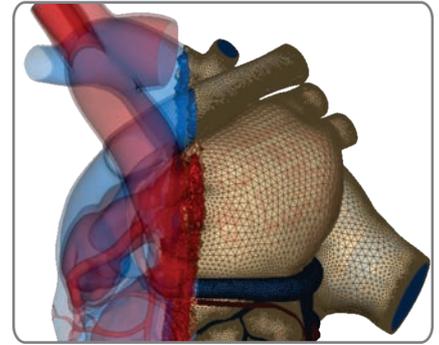
Meshing

- Automatic and robust mesh area simplification and de-featuring.
- Shell mesh generation of tria-, quad- or mixed mesh using several meshing algorithms oriented to specific applications ensuring the best quality with the minimum possible creation of elements.
- The use of size boxes for refinement of specific regions and a fully automated curvature dependent surface meshing that allows the control of the growth rate, min & max element size and mesh feature angle create a flexible mesh with small element size at regions of high importance and with a coarse mesh in regions of low importance. This ensures the creation of a model with respect to the smallest details of the geometry for a better accuracy but also the creation of the least possible elements for decreasing the solver's computational time.
- Generation of smooth layers zones with advanced controls to overcome quality and proximity issues facilitates the creation of the compact bone and articular cartilage or even the vertebral body.
- Automatic volume detection and definition algorithm. Unstructured volume mesh generation of tetra, prism, pyramid, hexa- and polyhedral elements and Structured or pure hexa-volume mesh generation through map and sweep algorithms or HexaBlock tools.



Post-processing

- Hot Spots (crucial regions and points) identification through filtering capabilities incorporated in many tools of META.
- Overview of results achieved through statistics tables with spreadsheet functionality.
- Integrated calculator for linear combination of results deriving from other load cases. New datasets can be created by applying any mathematical operation on existing data.
- Calculation of forces and moments on any user defined section and output in solver format to be used for sub-modeling.
- Integrated powerful graph tool for direct plotting of data deriving from the 3D model or from imported solver time history files.
- Post-processing for durability and fatigue analysis is greatly assisted by parametrized sessions and scripts.
- Coupling of META with external optimizers achieved through an integrated toolbar.
- Support of CFD results format such as ANSYS FLUENT and OpenFOAM. Streamlines, pathlines, iso-surfaces and cut-planes colored by any available variable.
- Image matching and video synchronization for results validation.
- Reports creation in html, Postscript or pptx format using the Report Composer.
- Dragging and dropping images and copy to clipboard functionality for transferring data.
- Customized toolbars creation through the toolbar designer.
- Support of multiple safety factors (Failure Indexes) in the same contour plot in order to compare the parts loads with their maximum load.

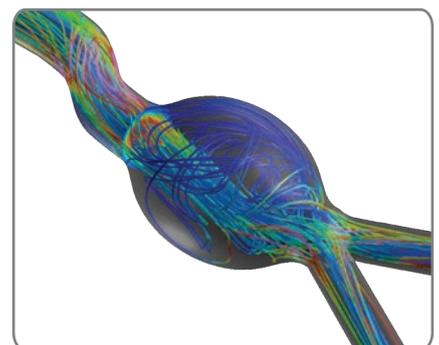


Features

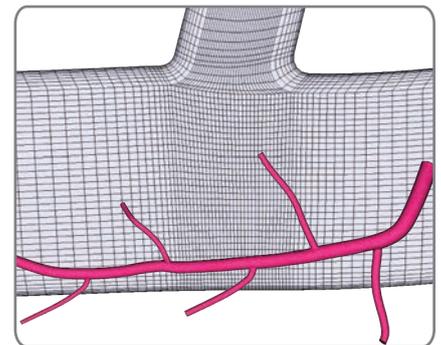
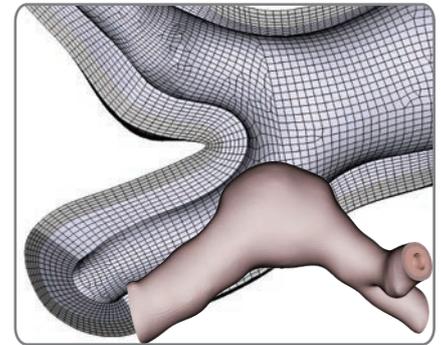
- Process automation
- Geometry clean up
- Shell and Volume meshing
- Boundary layer meshing
- Interoperable decks
- Solver-like entity cards
- Auto positioning of parts
- Model checks & fixes
- Mass trimming
- Substructuring
- Results mapping
- FE and geometry parametric morphing
- Coupling with optimizers
- Automated 3D & 2D post-processing
- Results calculation
- Automated reporting
- Physical tests and simulation correlation

Benefits

- Control of element growth, min-max element size and curvature refinement
- Increased computational efficiency
- Powerful morphing Deck for adapting an existing meshed model to similar (patient specific) geometries
- Multidisciplinary processing in a single environment
- Cost and time-to-market minimization
- Easy handling of large and complex models
- Fast generation of comprehensive and ready-to-show reports
- Effortless realization and repetition of frequent tasks



- Powerful surface wrapping tool.
- Octree trim-hexa/polyhedral meshing algorithm applicable to non-watertight models for quick generation of volume mesh.
- Powerful reconstruction algorithm used for quality improvement or modification either of surface mesh during the geometry based mesh generation or of bad quality imported shell mesh subjected to user-specified requirements (length, element type etc.).
- ANSA embodies numerous quality mesh criteria for detecting elements that can cause hour-glassing, shear-locking or element-collapse phenomena depending on the solver and automatic and manual functions for fixing them.
- Contour plot of mesh colored according to mesh distortion or mesh quality.
- Mesh integrity checks (unmeshed areas, intersections, free-edges, proximities etc.).
- Detailed report of mesh information and quality statistics.

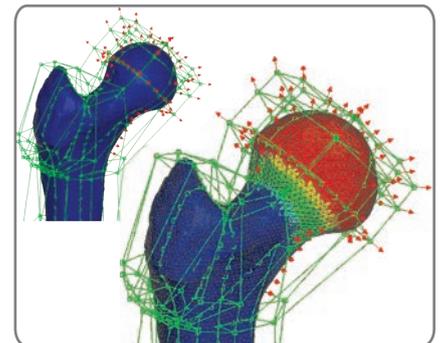


Model setup

- The Task Manager tool organizes a step-wise sequence procedure that manages all steps and actions necessary for the model build up.
- Interoperable pre-processing decks for setting-up the case inside ANSA for numerous FEA and CFD solvers.

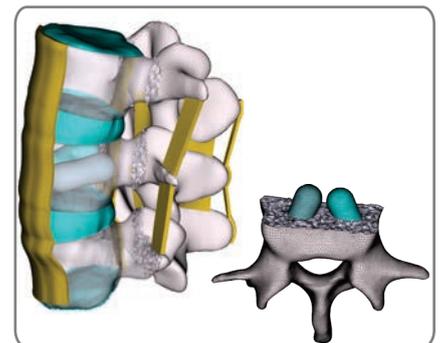
Morphing & optimization

- A powerful morphing Deck is able to adapt an existing meshed model or geometry to similar (patient specific) geometries, sustaining the complex grid characteristics that have been considered at the initial meshed model. A preview tool can validate the adaptation through the animation of the morphing model.
- Flexible parameterization of the model using morphing boxes or direct morphing tools.
- Direct coupling of ANSA and META with various optimization software and solvers.
- Support of Adjoint solver sensitivities based optimization.



Automation

- Two scripting programming languages (a C-like and Python) automate repeated or routine ANSA procedures, manipulating all model entities and driving most of the core functionality. Furthermore, ANSA supports the creation of user defined functions for further extending the software's functionality.
- Powerful Procedure Automation for surface and volume meshing through the Batch Mesh Tool that respects the user specified quality criteria and mesh parameters. Among others, the Batch Mesh tool offers automatic feature recognition and de-featuring, different meshing sessions for different areas of the model, local refinement or coarsening. A process that can be applied repeatedly on new geometries, based on part or property name filtering conventions, ensuring mesh consistency and saving time and resources.



Solver FEA coupling

- Map results from a CFD analyses to different FEA meshes through the ANSA Results Mapping tool.
- Ability to map FEA calculated deformations back to CFD meshes through the Deformation Mapping tool.
- Substructuring an area of interest on the full body, while preserving load case attributes of the original load case setup.

