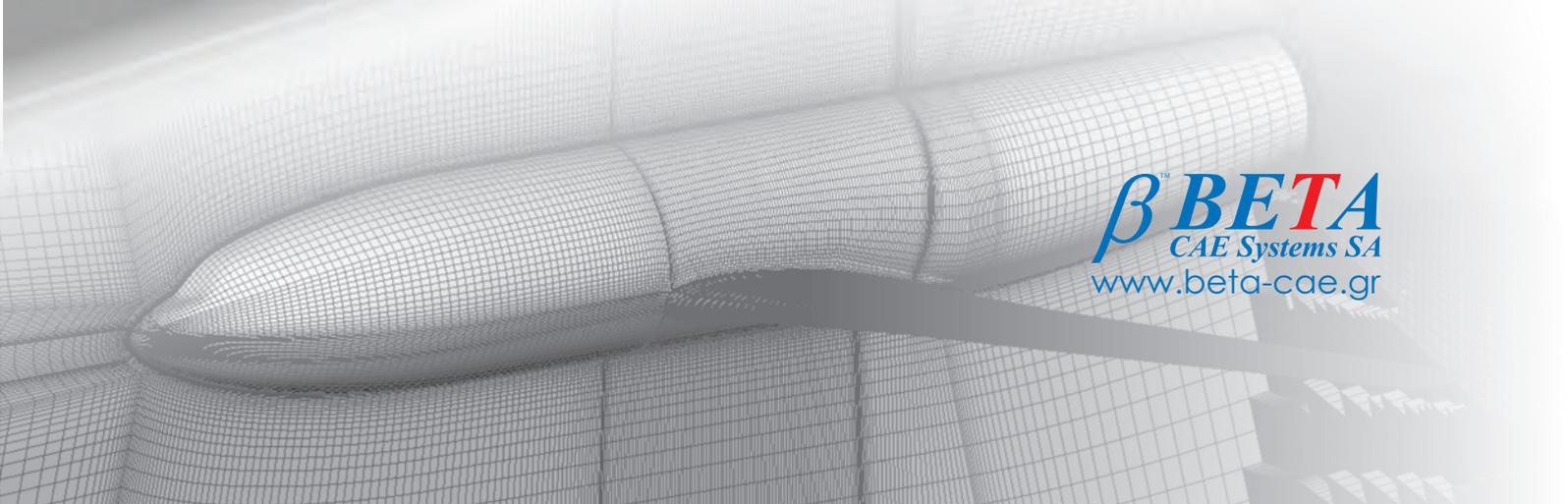
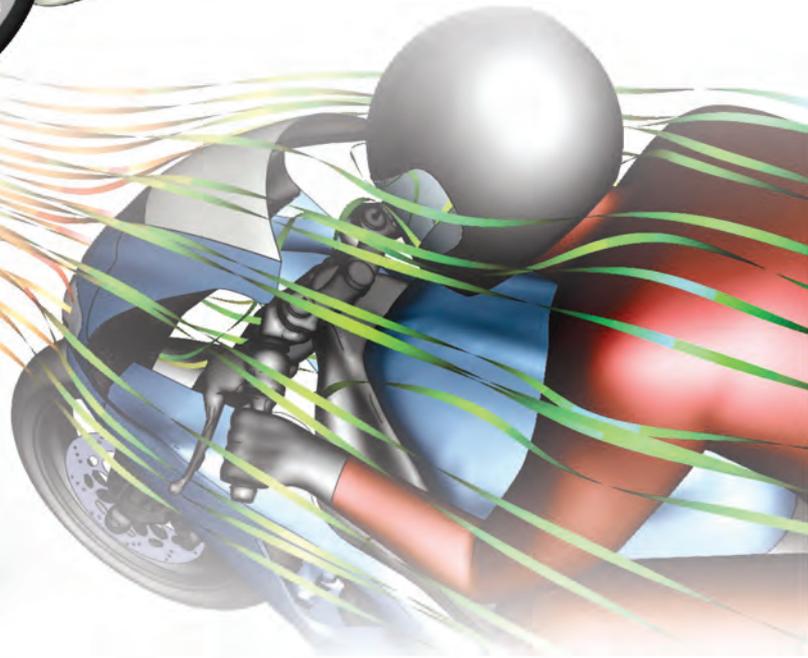
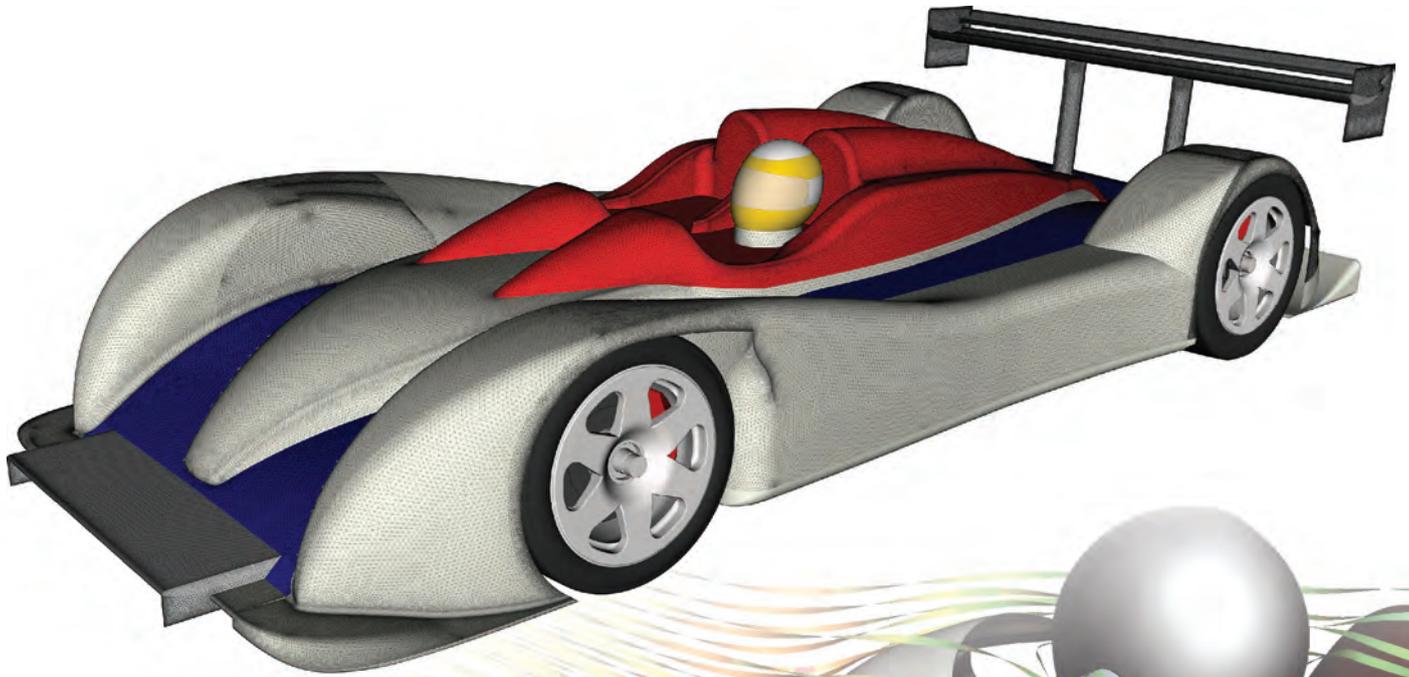


ANSA
μETA
pioneering
software systems

for demanding CFD
pre- & post-processing



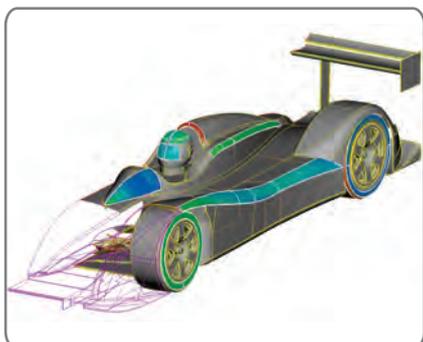
β BETA
CAE Systems SA
www.beta-cae.gr

ANSA with its powerful functionality provides high efficiency solutions for CFD applications. Its capabilities meet the industry's demanding needs for external and internal flow simulations, increase productivity, and contribute to the high quality of CFD results. It is the choice of the leaders in CFD simulations in various sectors such as automotive, motorsports and aerospace among others.



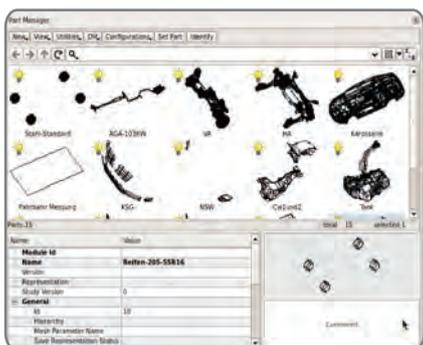
General features

- 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
- Customizable interface with pre-defined CFD oriented layout
- CAD interfacing with neutral and native formats such as: IGES, STEP, VDA-FS, Catia v4 and v5, NX, Parasolid, PTC Creo Parametric, SolidWorks, Inventor, JT
- CFD mesh input/output for: ANSYS FLUENT, StarCD & CCM+, OpenFOAM, CFD++, CFX, SC/TETRA, UH-3D, CGNS
- Pre-processing and interfacing with all major CAE codes (NASTRAN, Abaqus, ANSYS, THESEUS-FE, RadTherm and more) and numerous neutral mesh formats (PATRAN, STL, VRML etc.)
- ANSA Scripting, with Python support, allows the automation of tedious pre-processing tasks, such as CAD data input, model structure build up, surface meshing and output, for increased productivity. It also supports the creation of user defined functions, further extending the software's functionality



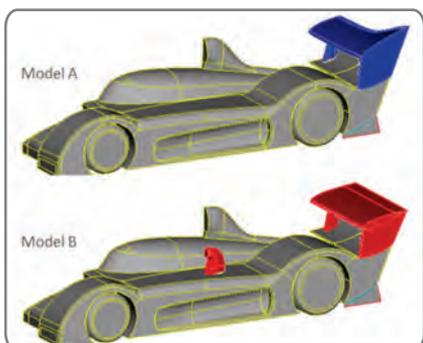
Topology and CAD functionality

- Integrated CAD tools for geometry creation, modification, cleanup, defeaturing and watertight preparation
- Easy identification and isolation of inner or outer wetted surfaces, internal passages, zero-thickness walls, intersections, proximities and more
- Leak detection tools
- Automatic identification of similar geometry and substitution with virtual linked geometry. This, speeds up model build-up due to the interactive relation between the linked geometries



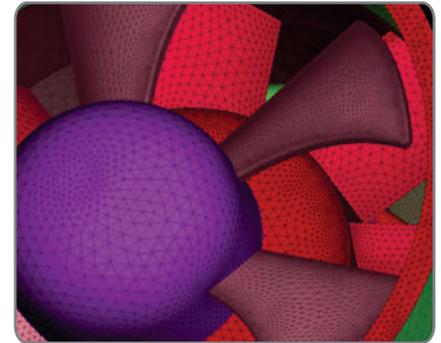
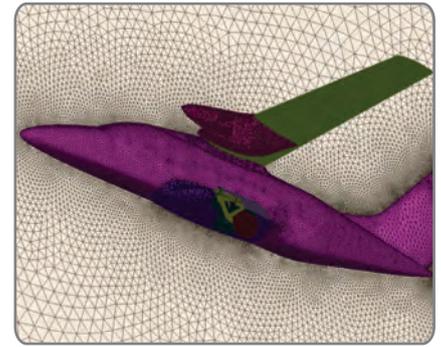
Model management

- Powerful model management through hierarchical part assemblies and properties, extracted from CAD input data and 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 like property names, batch mesh settings etc. Option to automatically replace only differences, allows for the quick update of the current model



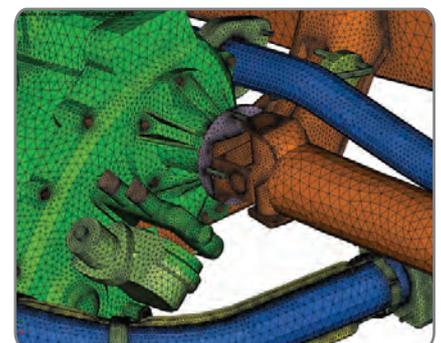
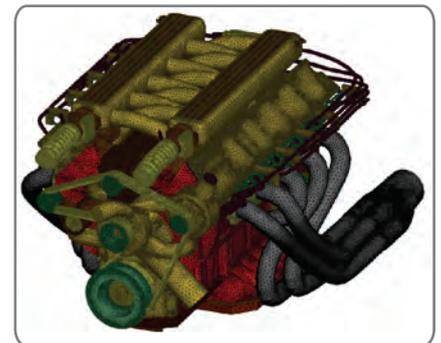
Surface meshing

- Automatic and robust mesh area simplification and defeaturing, by merging small surfaces into larger groups, enables optimum mesh quality according to user specifications
- Generation of tria, quad or mixed mesh using several meshing algorithms oriented to specific applications
- Fast CFD meshing algorithm for high quality surface meshing, with resolution adapted to local surface curvature, sharp edge features and user specified sources
- Generation of boundary layers for 2D analysis, and anisotropic meshing at high curvature at surfaces
- Flexible hexahedral or cylindrical Size Boxes for the automatic refinement of specific regions of the model
- Automatic and manual functions for shell mesh quality improvement
- Powerful reconstruction algorithm used for the improvement or modification of surface mesh, subjected to user-specified requirements (length, element type etc.). Applicable either during geometry based mesh generation or to imported shell mesh
- Shell mesh clean-up tools (close openings, paste nodes, connect elements, intersect meshes etc)
- Powerful and versatile tools for handling and combining CAD geometry and imported shell mesh
- Quality check according to numerous criteria for various solvers
- Clear identification of poor-quality elements, colored by criteria type or value
- Contour plot of mesh colored according to mesh distortion or mesh quality
- Mesh integrity checks (unmeshed areas, intersections, free edges, proximities etc.)
- Detailed mesh information and quality statistics.

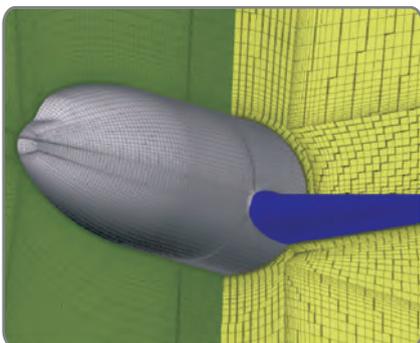
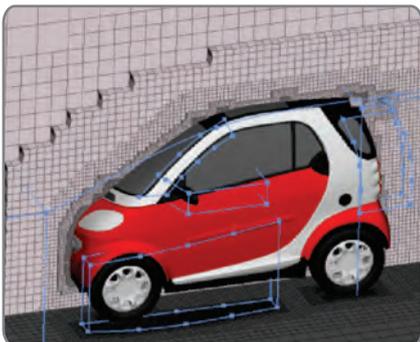
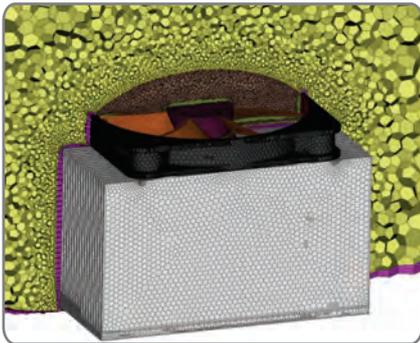
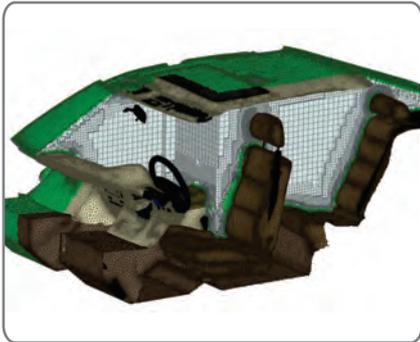
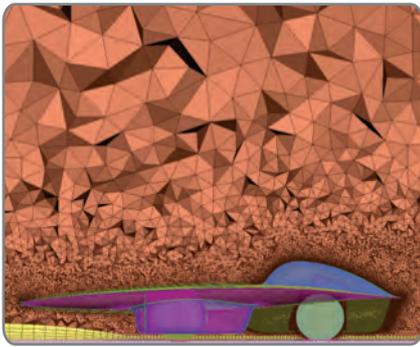


Wrapping

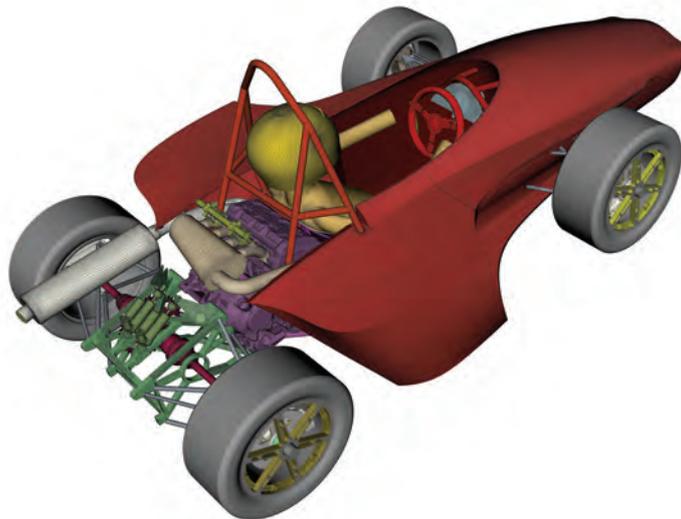
- Powerful surface wrapping tool, allows for the creation of a fully watertight model at a fraction of the time that would be required in the traditional surface meshing approach, regardless of the complexity of the geometry
- Specification of outer or inner wrapping. Domain selection by largest size or through seed point specification.
- Advanced wrapping algorithm that captures all feature lines of the model, with curvature and proximity refinement, variable length, and per property user defined parameters. Size refinement boxes are also applicable
- Intelligent leak detection tools with multiple seed point specification and automatic identification of all leak areas. Advanced manual and automatic tools for leak closure



Volume meshing



- Generation of penta and hexa boundary layers with variable parameters per property, advanced controls for squeezing, collapsing or excluding, to overcome quality and proximity problems, generation of layers from both sides of zero-thickness walls and more. A very robust smoothing algorithm ensures high quality layers generation all around complex model geometries
- Automatic Volume detection and definition algorithm. Fast and robust Volume meshing for tetra, prism, pyramid and hexa elements
- Conformal, variable size, Hexa-Interior/Hexa-Poly mesh, aligned to local coordinate systems
- Flexible hexahedral or cylindrical Size Boxes for tetra and Hexa-Interior/Hexa-Poly with controlled mesh refinement and growth rate in space
- Unstructured hexa and penta meshing through map and sweep algorithms
- Pure hexa meshing based on multi-block decomposition of geometry with associated box topologies
- Polyhedral mesh generation through conversion of hybrid mesh
- Octree trim-hexa/polyhedral meshing algorithm applicable to non-watertight models for quick generation of volume mesh



Features

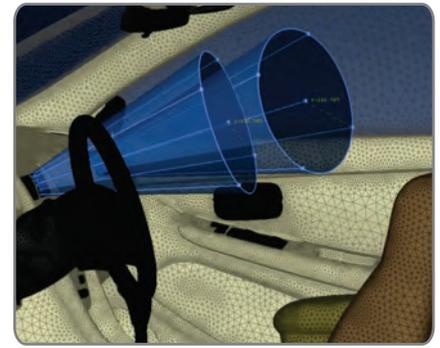
- Geometry clean up and de-featuring
- Watertight preparation
- Shell & Volume meshing
- Surface wrapping
- Boundary layer meshing
- Batch meshing
- Hexablock meshing
- Model checks & fixes
- Mesh & geometry morphing
- Numerous CAD/CAE interfaces
- Coupling with optimizers
- Python scripting language

Benefits

- Covers all the CFD pre-processing needs in a single environment
- Provides and combines both high quality and "push button" meshing approaches
- Eliminates the use of task-specific software
- Minimizes cost and time to market
- Novel features lead to results faster, ensuring quality and consistency
- Common preprocessing platform for numerous CFD & FEA codes

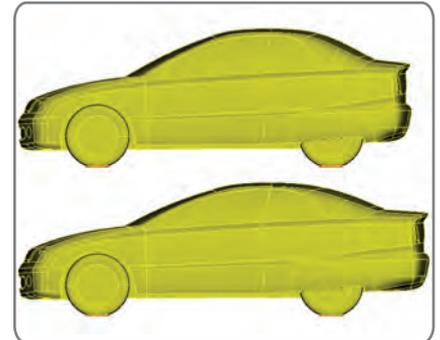
Batch meshing

- Complete automation of all the steps of CFD mesh generation based on pre-defined scenarios, for surface meshing, wrapping, layers generation and volume meshing
- 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



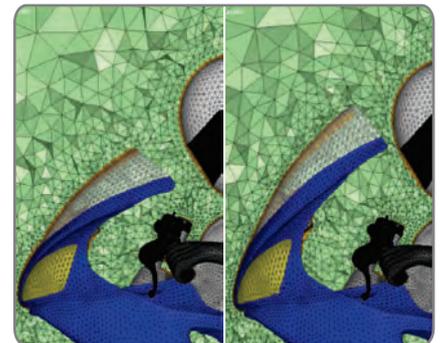
Model setup

- Model validity checks with customizable templates of several checks available per specific task, through the Checks Manager
- Specification of boundary condition types for ANSYS FLUENT, Star CD/CCM+ and UH-3D
- Complete solution setup for OpenFOAM cases, including initial and boundary condition specification, physical and numerical parameter set-up, and solution controls
- Support also for THESEUS-FE and Radtherm model files setup



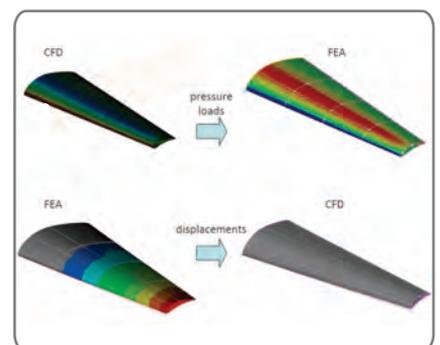
Morphing & optimization

- Flexible parametrization of your model
- Fast and controllable Morphing of surface & volume mesh of large and complex models through Morphing Box techniques
- Direct Fit Morphing (DFM) for quick shape optimization without morphing boxes applicable to mesh and CAD geometry
- Integrated tool in the same environment with all the other pre-processing functionalities of ANSA
- Fully automated batch process coupled with various optimization software and CFD solver
- Support of Adjoint solver sensitivities based optimization



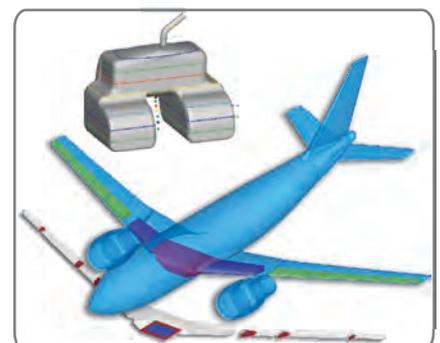
CFD FEA coupling

- Ability to map pressure loads from 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

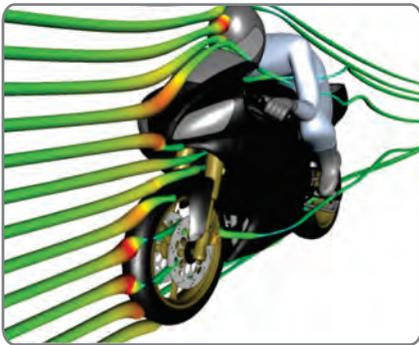


Liquid level calculations

- Fast calculations of liquid volume, levels and CoG positions for liquid tank systems
- Detection of resting and unused liquid areas
- Also applicable for initialization of two-phase flow simulations



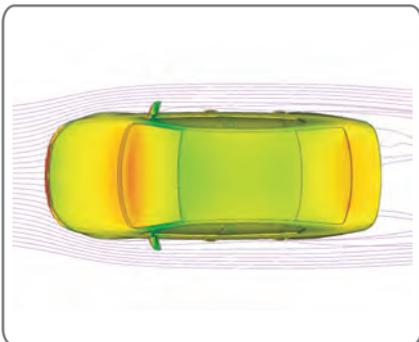
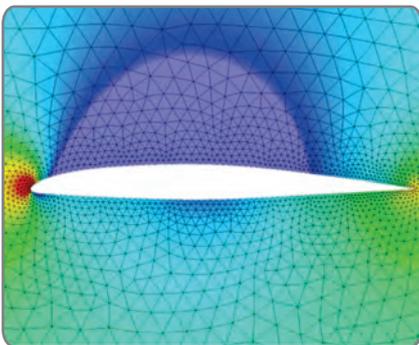
μETA, the leading post-processor in structural analysis, extends its support to CFD codes. μETA's indisputable high performance capabilities enable engineers to easily handle and explore extremely large and complex models. Through the numerous validated analysis tools and automation capabilities, engineers avoid time-consuming data mining and focus their engineering judgement on important facts.



CFD results visualization, correlation and reporting, benefits from the high-performance and multitude of μETA's features and tools that are already successfully deployed in the structural analysis field.

Some of the main features of the software are:

- Extremely fast reading and handling of large data sets with low memory footprint
- Complete automation and customization from results input to report creation, through session files and scripting
- Powerful graphics for the display of contour plots, iso-surfaces, cut planes, streamlines and vector plots
- The easy model handling through Properties and Groups like in ANSA
- Full domain representation for symmetrical and periodic simulations
- Surface intergrals and forces calculations
- Identification of point data in arbitrary position on or off the model
- The ability to save selected results in native μETA format, reducing the amount of stored data
- The query of model dimensions
- The query of highest and lowest values of flow variables, and their location
- The superimposition of annotations, enables the quick extraction and display the exact information needed
- A notable strength of μETA is its capability to load and process more than one simulation model simultaneously for correlation studies. Differences on the results between different CFD solvers, geometries, meshes or numerical setups can be easily identified
- High quality images and animations can be created and inserted in .pptx, .pdf and .html reports, through the report composer tool



Supported formats

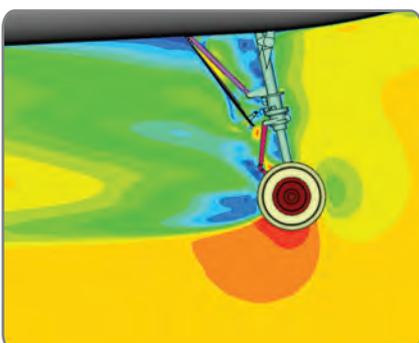
- ANSYS FLUENT
- OpenFOAM
- STAR-CCM+
- CFD++
- SC/Tetra
- Radtherm
- Enight
- Tecplot

Contour plots

- Display of results as contour plots on model surfaces
- Contour plots cutting planes and iso-surfaces

Vectors

- Display of vectors and vector components on any surface



Streamlines

- Draw streamlines as lines, ribbons, cylinders and also animated particles and arrows
- Colour, twist and modulate streamlines by any available variable
- Oil flow visualization

Display

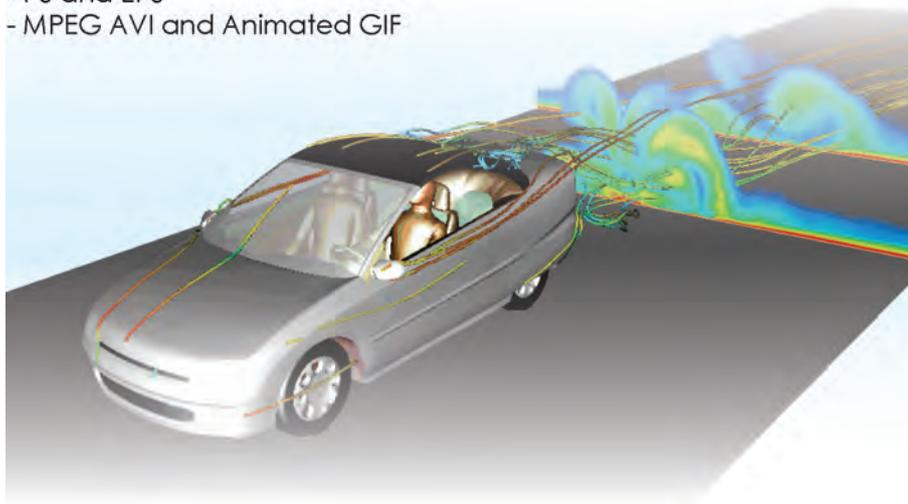
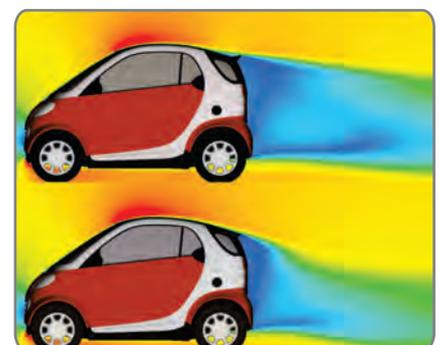
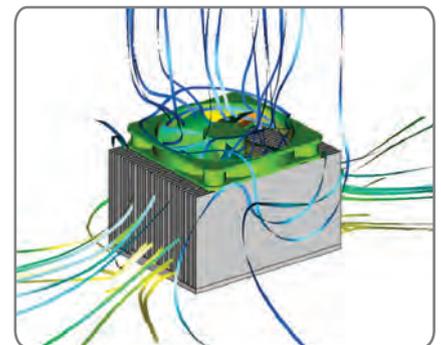
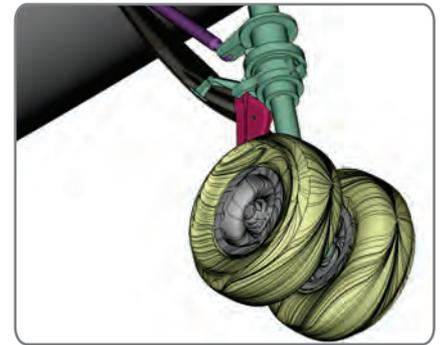
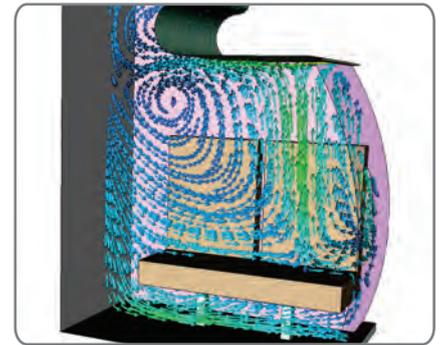
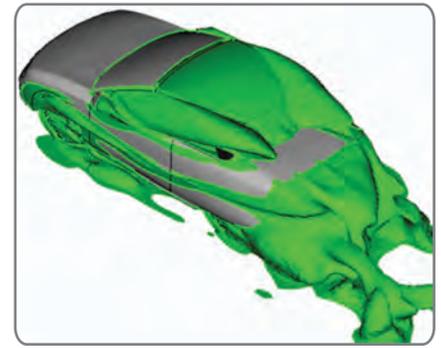
- Interactive view control
- Results animation
- Orthographic or perspective views
- Stereoscopic viewing (using special equipment)

Automation

- Session files
- Python scripting language support
- User toolbars
- User variables

Image and video output

- Popular image formats : JPEG, PNG, TIFF, BMP, GIF
- PS and EPS
- MPEG AVI and Animated GIF



Features

- 3D & 2D post-processing
- Iso countours, Cut planes, Vectors, Streamlines
- Multiple model handling and comparison
- Numerous interfaces
- Process automation
- Python scripting language
- Parameterized sessions
- Video & image correlation
- Annotations
- Reporting
- Native database
- Free viewer

Benefits

- Extremely fast reading and processing of large data sets ensure maximum productivity
- Automation techniques that minimize cost and time to market
- Common post-processing platforms for numerous CFD and FEA codes

