



CFD

Follow the leaders



Accomplish top notch model quality

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

- 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.
- Supporting standard and polyhedral meshes
- CFD mesh input/output for: ANSYS FLUENT, STAR-CD & CCM+, OpenFOAM, CFD++, DLR-TAU, SC/TETRA, UH-3D, CFX5, CGNS.
- Pre-processing and interfacing with all major CAE codes (NASTRAN, Abaqus, ANSYS, THESEUS-FE, TAITherm 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 in order to speed up model build-up time thanks to the interactive relation between the linked geometries.
- Creation of periodic meshes with matching nodes with the use of linked geometry.
- Generation of surface mesh from point cloud data.

Model management

- Powerful model management through hierarchical part assemblies and properties, extracted from CAD input data and modifiable through 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 differences only, 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, achieves optimum mesh quality according to user specifications.

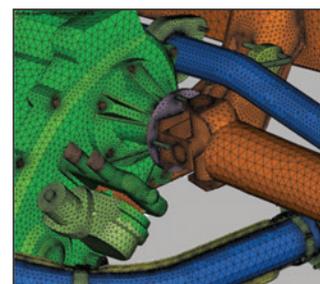
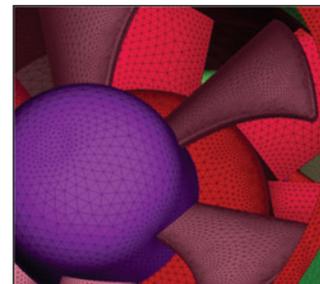
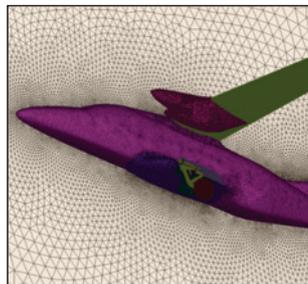
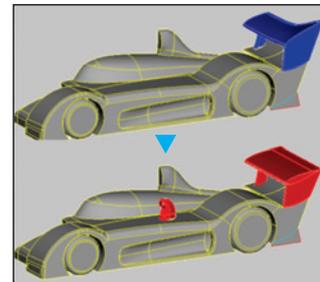
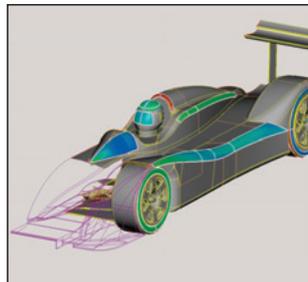
Features

- Geometry clean up and defeaturing
- 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
- Highly controllable and automated best in class quality meshing
- Minimizes cost and time to market
- Novel features lead to results faster, ensuring quality and consistency
- Common preprocessing platform for numerous CFD & FEA codes

- Generation of tria, quad or mixed mesh using several meshing algorithms intended for 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 on high curvature 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, subject 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 (closing holes & gaps, removing features, intersecting meshes, fusing contacts and proximities, mesh coarsening etc.).
- Powerful and versatile tools for handling and combining CAD geometry and imported shell mesh.
- Quality checking and fixing according to numerous criteria for various solvers. Clear identification of poor-quality elements, colored according to 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 in html reports.



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 considered.
- 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, including high quality smoothing.
- Fast 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.

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 other CFD solvers.
- 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

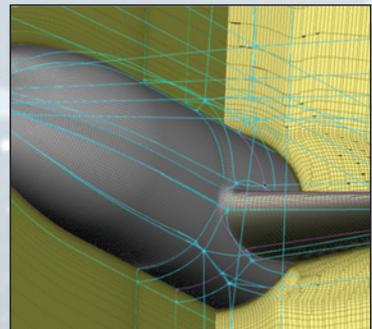
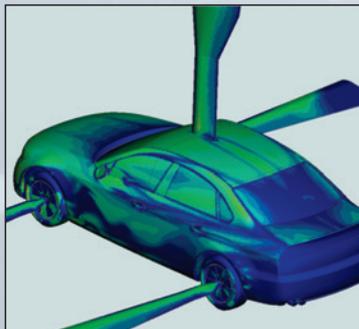
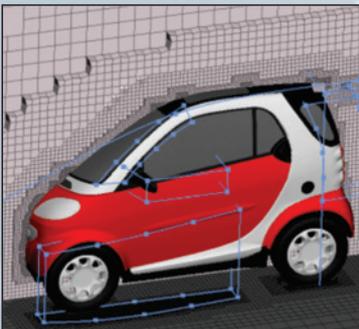
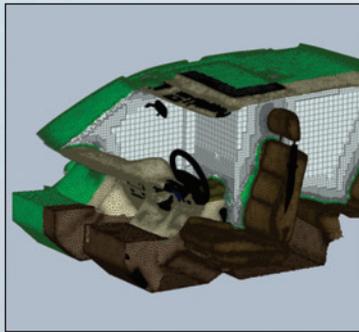
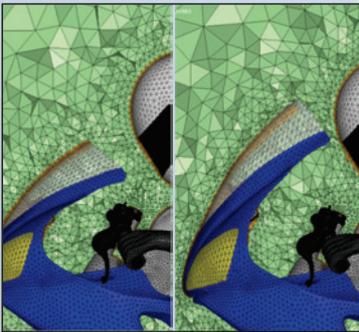
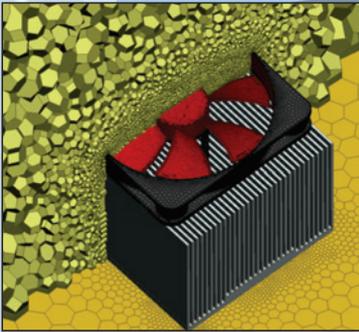
- Flexible parameterization of your model.
- Fast and controllable Morphing of surface & volume mesh of large and complex models through Morphing Box techniques.
- Direct Fit Morphing (DFM) for quick shape optimization without morphing boxes, applicable to mesh as well as CAD geometry.
- Integrated tool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

CFD FEA coupling

- Reading & visualization of CFD results (pressure, y^+ , etc.) on surfaces.
- 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 mesh, through the Deformation Mapping tool.

Liquid level calculations

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



Generate comprehensive reports in no time

META, the leading post-processor in structural analysis, extends its support to CFD codes. META 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 META 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.
- Supporting standard and polyhedral meshes.
- 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 integrals and forces calculations.
- Identification of point data in arbitrary position on or off the model.
- The ability to save selected results in native META 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 META 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 reports, through the report composer tool.

Supported formats

- ANSYS FLUENT
- OpenFOAM (including results compressed with FEMZIP)
- STAR-CCM+
- CFD++
- ANSYS CFX
- SC/Tetra
- Powerflow
- DLR-TAU
- CGNS
- Converge CFD
- Ensignt
- Fieldview
- Tecplot
- Paraview
- TAITherm
- THESEUS-FE

Contour plots

- Display of results as contour plots on model surfaces.
- Contour plots on planar or cylindrical cutting sections and iso-surfaces.

Vectors

- Display of vectors and vector components on any surface.

Streamlines

- Display of Streamlines, Pathlines and Particle tracks.
- Draw streamlines as lines, ribbons, cylinders and also animated particles and arrows.

Features

- 3D & 2D post-processing
- Iso-contours, 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

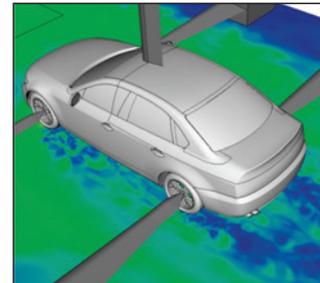
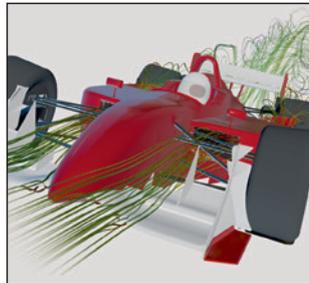
Benefits

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

- 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 are recorded and easily parameterized.
- Python scripting language support.
- User variables and toolbars can be easily created through specific editors.

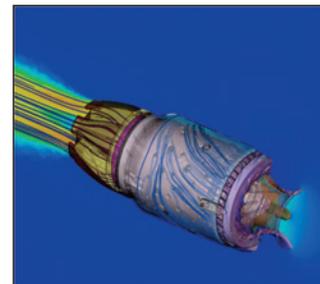
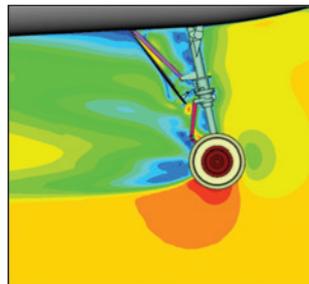
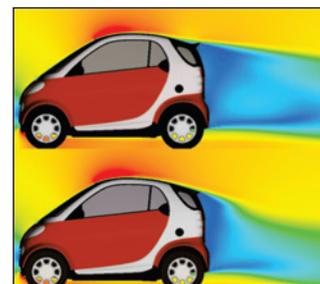
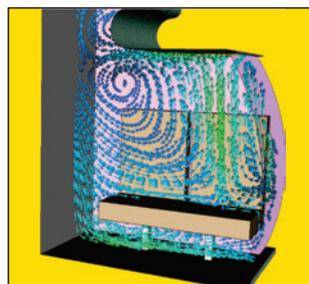


Image and video output

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

Reporting

- Creation of reports in .pptx, .pdf or .html can take place either interactively by means of dragging/dropping images, videos, tables and actual spreadsheets or can be fully automated.
- Input/output and editing of results in .xlsx format using the spreadsheets editor.





physics on screen

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