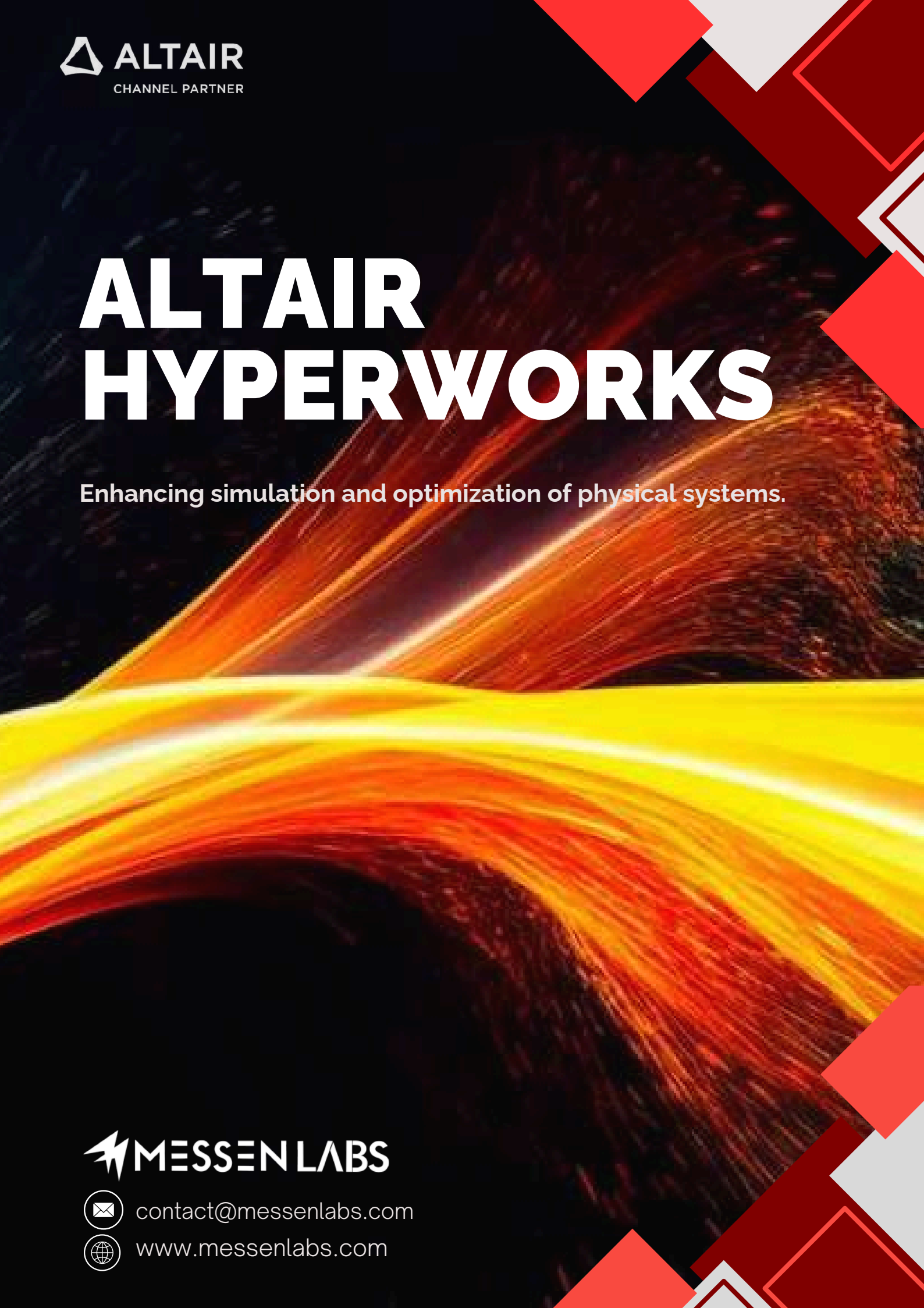
ALTAIR
CHANNEL PARTNER

ALTAIR HYPERWORKS

Enhancing simulation and optimization of physical systems.



MESSEN LABS

contact@messenlabs.com
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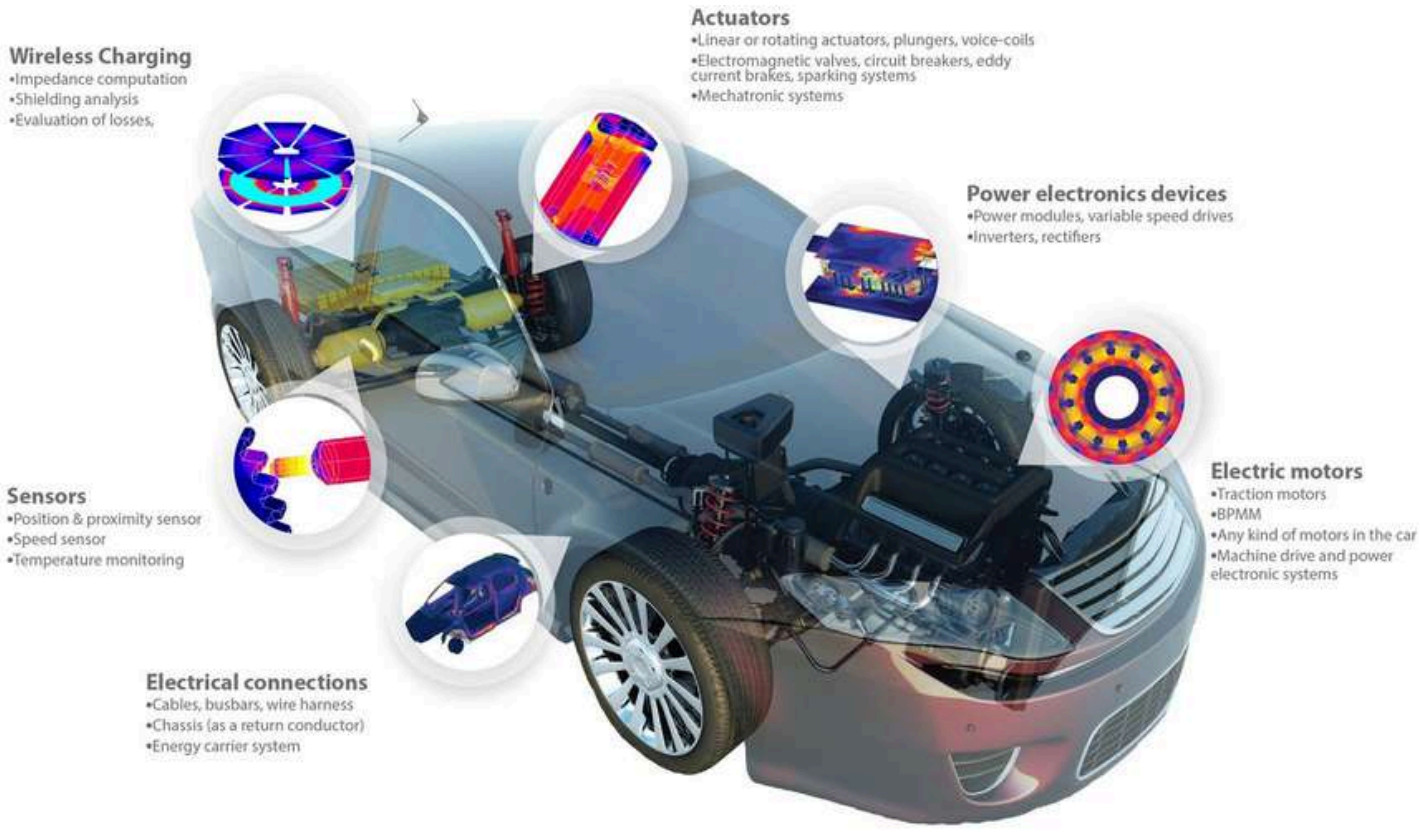


Altair Hyperworks

Design & Simulation Platform

Altair® HyperWorks® provides a comprehensive design and simulation platform for professionals across various industries, enabling them to solve complex problems with ease. It supports a wide range of disciplines, including structures, motion, fluids, thermal, electromagnetics, electronics, and embedded systems, while also offering AI solutions and realistic visualization.

With its open-architecture, interoperable environment, HyperWorks breaks free from platform limitations, streamlining workflows and enhancing productivity. As an all-in-one CAE solution, it accelerates processes, improves decision-making, and reduces costs, empowering companies to innovate and lead in their markets

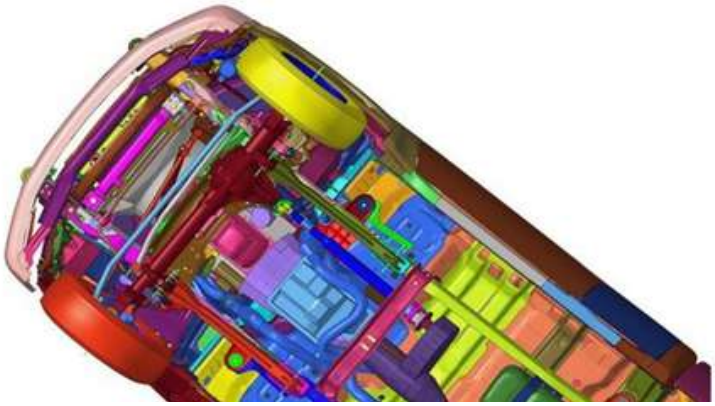
Altair HyperMesh™

Market-leading Finite Elements Pre-processor

Altair HyperMesh is a high-performance finite-element pre-processor that provides a highly interactive and visual environment to analyze product design performance . With the broadest set of direct interfaces to commercial CAD and CAE systems and a rich suite of easy-to-use tools to build and edit CAE models, HyperMesh provides a proven, consistent analysis platform for the entire enterprise.

Product Highlights

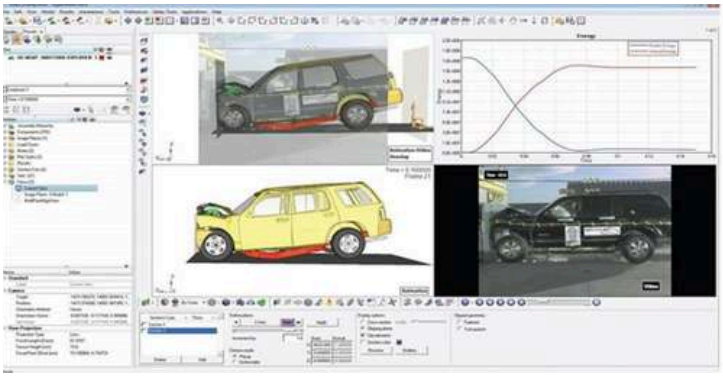
- Strong shell and solid meshing algorithms, either fully automatic or with detailed manual control
- Excellent CAD interoperability
- Comprehensive composites modeling support
- Complete interfaces to the industry's most popular solvers
- Management of complex assemblies promoting common model build



Altair HyperView™

CAE Results Visualization and Reporting

Altair HyperView is a complete post- processing and visualization environment for finite-element analysis (FEA), multi-body system simulation, digital video and engineering data. Amazingly fast 3D graphics, open architecture design and unparalleled functionality set a new standard for speed and integration of CAE results post- processing. Coupling these features with Altair HyperView's advanced process automation tools dramatically improves visualization, correlation, and reporting results .



Product Highlights

- Complete visualization environment for FEA, CFD, and M BD simulation data
- Multi-page & multi-window post-processing
- Report templates for efficient evaluation of results across different simulations
- Comprehensive post-processing of composites results
- Supports most CAE solver formats
- Industry specific toolkits for NVH, Aero, Safety, CFD, and Manufacturing
- Results comparison & correlation with test data

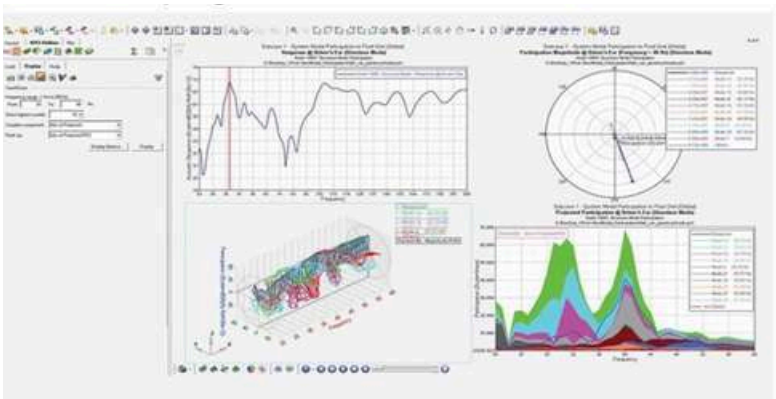
Altair HyperGraph™

2D & 3D Plotting & Data Analysis

Altair HyperGraph is a powerful data analysis and plotting tool with interfaces to many popular file formats. Its intuitive interface and sophisticated math engine make it easy to process even the most complex mathematical expressions. Altair HyperGraph combines these features with high-quality presentation output and customization capabilities to create a complete data analysis system for any or9anization .

Product Highlights

- Plots huge amounts of data in a customized layout from single or multiple result files
- Fast repetitive plot generation through report templates
- Efficient data comparison between model iterations or simulation and test data
- Fully automated PowerPoint report generation
- Over 200 built-in mathematical functions and operators
- Interfaces with morethan 130 data formats



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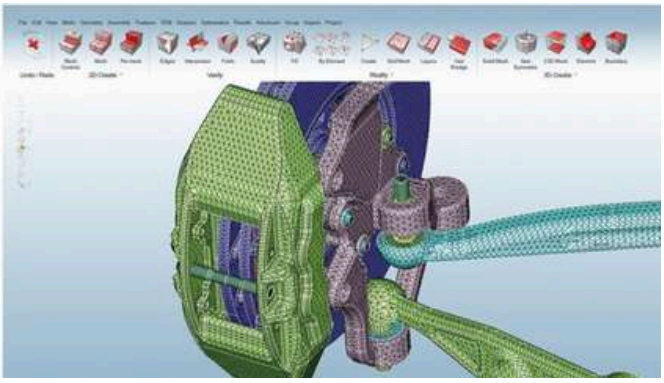
Altair SimLab™

Process-oriented FE Modeling

Altair Simlab is a process-oriented, feature based finite element modeling software that allows you to quickly and accurately simulate engineering behavior of complex assemblies. Altair SimLab automates simulation-modeling tasks to reduce human errors and time spent manually creating finite element models and interpreting results. AltairSimLab is not a traditional off-the-shelf pre- and post-processing software, but a vertical application development platform for capturing and automating simulation processes.

Product Highlights

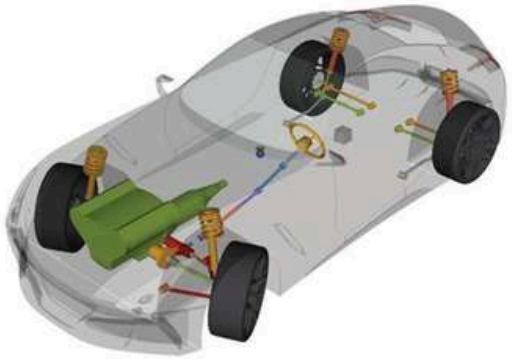
- Process oriented, feature based finite element modeling software
- Automated mesh generation without CAD geometry cleanup
- Reusable mesh specifications at feature level; for example fillets, cylinders, holes
- Templates for contact detection, bolt, and crankshaft modeling
- Solver interfaces include Altair OptiStruct Abaqus, Nastran, and PERMAS



Altair MotionView™

Multi-body Modeling

Altair MotionView is a user-friendly and intuitive multi-body systems modeling environment. Its built-in parametric modeling capability and hierarchical modeling language allows users to quickly build, analyze, and improve mechanical system designs even before physical prototypes are available. In conjunction with Altair MotionSolve, Altair MotionView provides the perfect solution for your multi-body dynamics simulation needs.



Product Highlights

- Intuitive solver neutral environment for multi-body systems modeling
- Hierarchical modeling
- Built-in parametric modeling for efficient studies of model variations
- User extensible GUI and data model to support product customization
- Automated assembly for complex systems

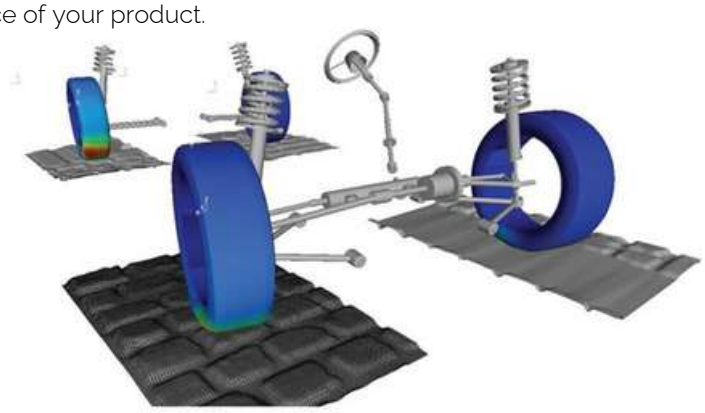
Altair MotionSolve™

Multi-body Dynamic Simulation

Altair MotionSolve is an integrated solution to analyze and optimize multi-body systems. Altair MotionSolve offers powerful modeling, analysis, visualization, and optimization capabilities for simulating complex systems. You can perform kinematic, dynamic:, static, quasi-static, linear, and vibration analyses. Altair MotionSolve helps you to understand and improve the performance of your product.

Product Highlights

- Comprehensive multi-body solution to optimize mechanical system performance
- Easily model, analyze, evaluate, and optimize your mechanical system
- Validated across several automotive, aerospace, and general machinery applications
- Extensively correlated to test data through partnership with customers



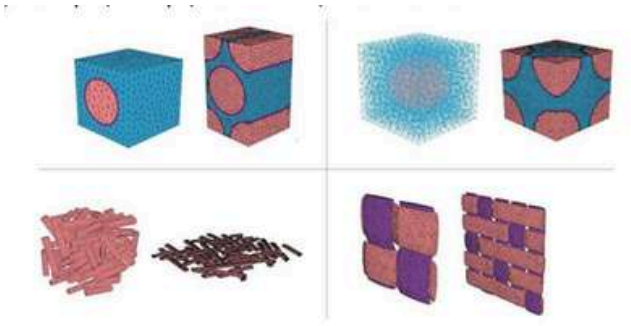
Altair Multiscale Designer™

Simulation of Multiscale Material models

Altair Multi scale Designer is an accurate and efficient tool for the development of multiscale material models and simulation of parts manufactured from any heterogeneous material, such as continuous and chopped fiber composites, honeycomb cores, lattice structures, reinforced concrete, and soil and bones. Applications include multiscale material modeling for design, ultimate failure assessment, statistical-based material allowables, creep, fatigue, fracture, and impact simulations. It also provides user material plug ins to commercial FEA solvers Altair OptiStruct, Altair Radioss, Abaqus, Ansys, LS- DYNA, and Nastran.

Product Highlights

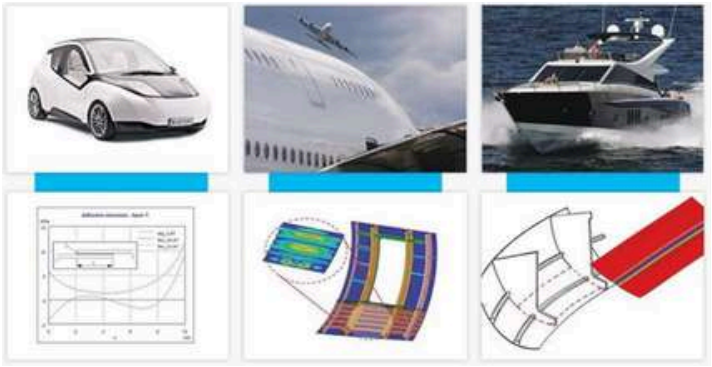
- Multiscale material models for continuous, long, and short reinforcement composites
- Built-in parametric & external unit cell modeling
- Constitute Materia Database including typical industry data for Fibers, Polymers, and Metals
- Fiber-orientation mapping for injection molding
- Virtual material allowable for standard specimens
- Plugins for Altair OptiStruct, Altair Radioss, Abaqus, Ansys, LS-DYNA, and Nastran



Altair ESAComp™

Analysis and Design of Composites

Altair ESAComp is software for analysis and design of composites. Its scope ranges from preliminary design of layered composite structures to advanced analyses that are applicable to final design verification. Altair ESAComp is a standalone software tool with integrations to other Altair HyperWorks products dealing with composites. ESAComp has a vast s et of analysis capabilities for solid/sandwich laminates and structural elements.



Product Highlights

- Altair ESAComp materials database, with properties for 1000+ commercial material systems
- Covers layered composite structures from preliminary design to analysis of details
- Standalone tool that interfaces with general finite element packages
- Altair ESAComp integration with HyperWorks enhances composites pre- &post-processing
- Used worldwide in all industries utilizing high-performance composites

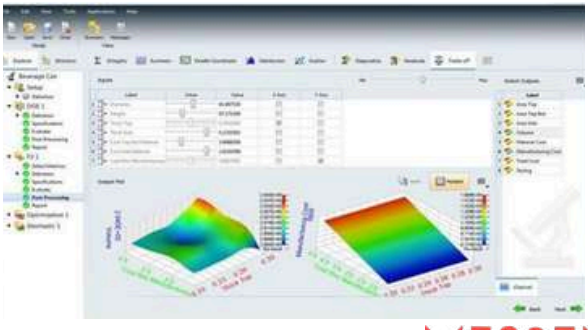
Altair HyperStudy™

Multi-diciplinary Design Exploration & Optimization

Altair HyperStudy is a multi.-disciplinary design exploration software helping engineers to improve their designs. By using an automatic processes combining state-of-the-art mathematical methods, predictive modeling and datamining, Altair HyperStudy explores the design space smartly and efficiently. Users are guided to understand data trends, perform trade- off studies, and optimize design performance and reliability. The intuitive user interface combined with seamless integration to Altair HyperWoriks makes design exploration technology accessible to non-experts.

Product Highlights

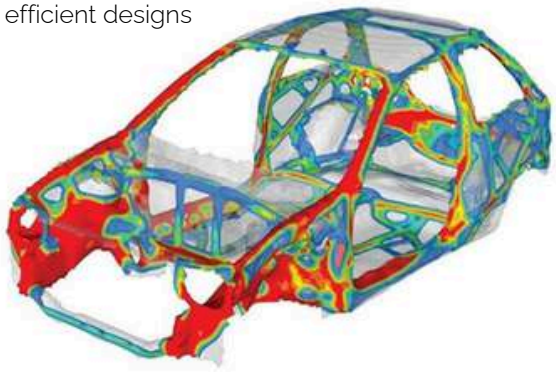
- •State- of-the-art design exploration, predictive modeling, and optimization methods
- Data mining too ls that are easy to understand and interpret
- Direct interface to the most popular CAE solvers
- Fully integrated with Altair HyperWorks, seamless shape optimization



Altair OptiStruct™

Structural Analysis and Optimization

Altair OptiStruct is an industry proven, modern structural analysis solver for linear and nonlinear simulation under static and dynamic loadings. It is the most widely used solution for structural design and optimization in all industries. Altair OptiStruct helps designers and engineers analyze and optimize structures for performance characteristics such as strength, durability, and NVH, to rapidly develop innovative, lightweight, and structurally efficient designs



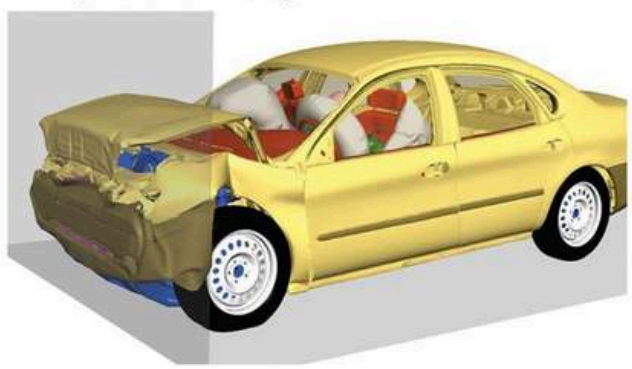
Product Highlights

- Full featured solver for nonlinear analysis
- The most advanced solver for NVH analysis
- Highly parallelized solver
- 20-year legacy of award-winning structural optimization technology
- Advanced laminated composite optimization capability

Altair Radioss™

Crash, Safety & Impact

Altair Radioss is a leading structural analysis solver for non-linear problems under dynamic loadings. It is highly differentiated for scalability, quality, robustness, and consists of features for multiphysics simulation and advanced materials such as composites. Altair Radioss is used across many industries worldwide to improve the crashworthiness, safety, and manufacturability of structural designs.



Product Highlights

- Best scalability for large, highly non-linear structural simulations
- Most complete material and rupture libraries
- Unique feature for accurate airbag simulations
- Rich multiphysics capabilities
- Wide offer of FE safety models, dummies, barriers, and impactors

Altair Feko™

High Frequency Electromagnetics and Antenna Design

Altair Feko is a leading electromagnetic simulation software that uses multiple frequency and time domain techniques. True hybridization of these methods enables the efficient analysis of a broad spectrum of electromagnetic problems mainly related to antenna designand placement, scattering, radar cross section (RCS) and electromagnetic compatibility (EMC),including electromagnetic pulses (EMP), lightning effects, high intensity radiatedfields (HIRF), &radiation hazard.

Product Highlights

- •State-of-the art simulation tool for antenna design and placement, and RCS
- EMC analysis, including emissions, immunity, and shielding effectiveness
- Wide set of hybridized methods to solve large and complex problems
- Specialized tools, including windscreen antennas, arrays, cable modeling, and CMA
- HPC-enabled efficient, reliable, and accurate solvers

Altair AcuSolve ™

Computational Fluid Dynamics

Altair AcuSolve is a powerful Computational Fluid Dy namics (CFD) tool, offering a full range of physical models. Simulations of flow, heat transfer, turbulence, and non-Newtonian materials are all handled by Altair AcuSolve's robust scalable solver technology. The well validated physical models are delivered with unmatched accuracy on fully unstructured meshes: less time building meshes means more time to explore designs.

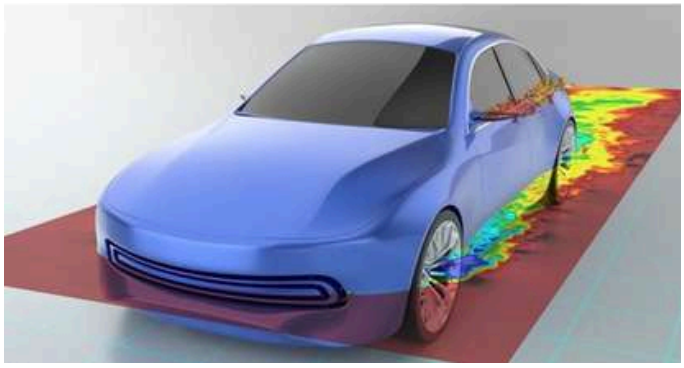
Product Highlights

- Efficient and flexible workflow
- Full set of physical models: flow, turbulence, miscible and immiscible multiphase, and heat transfer simulations
- Accurate and stable even on highly skewed meshes
- Fast efficient solutions for both transient and steady-state simulations
- Parallel scalability on thousands of computing cores
- Advanced, stable multiphysics capability: rigid or flexible body coupling to Altair's solvers or thirdparty applications

Altair Ultra FluidX™

Particle-based Fluid Dynamics

Altair ultraFluidX is a simulation tool for ultra-fast prediction of the aerodynamic properties of passenger and heavy-duty vehicles as well as for motorsport applications. Its cutting-edge technology is optimized for GPUs to deliver unbeatable performance and to allow for overnight simulations even of complex cases on a single server.



Product Highlights

- Wall-modeled LES approach based on the Lattice Bol,tz:mann Method
- Integrated, robust volume meshing for fast design changes
- Efficient Multi-GPU implementation for transient overnight analyses
- Tailor-made solution for external aerodynamics

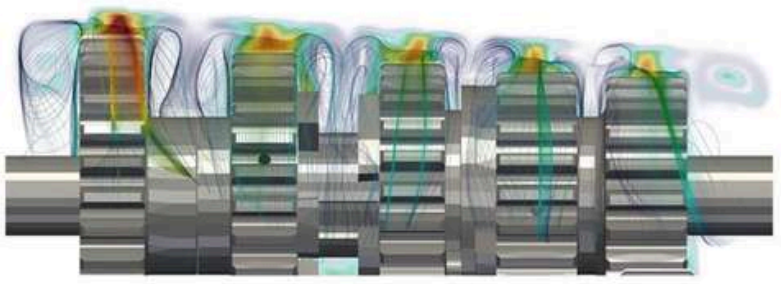
Altair nanoFluidX ™

Structural Analysis and Optimization

Altair nanoFluidX is a particle-based (SPH) fluid dynamics simulation tool to predict the flow in complex geometries with complex motion.It can be used to predict the oiling in powertrain systems with rotating shafts/ gears and analyze forcesand torques on individual components of the system. Utilizing the GPU technology empowers high-performance simulations of real geometries.

Product Highlights

- Particle-based (SPH) fluid dynamics simulation
- Mesh-less method to si1mulating complex fluid flow
- Superior performance due to high-density GPU computing
- Well suited for elaborated powertrain applications - gearboxes, crankshafts, etc.



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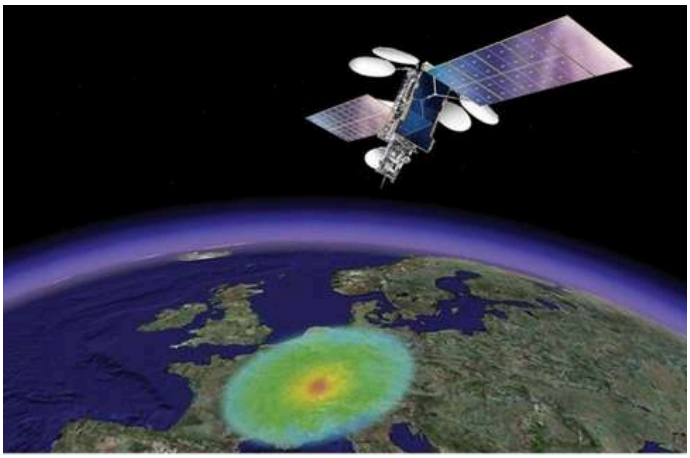
Altair WinProp™

Wave Propagation and Ratio Networking Planning

Altair WinProp is the most complete suite of tools in the domain of wireless propagation and radio network planning. With applications ranging from satellite to terrestrial, from rural via urban to indoor radio links, Altair WinProp's innovative wave propagation models combine accuracy with short computation time.

Product Highlights

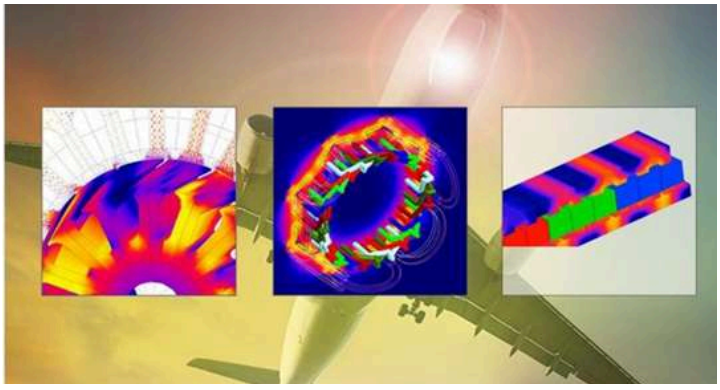
- Innovative, either empirical or ray optical/deterministic wave propagation models combining high accuracy and short computation times
- Wide range of scenarios and map data supported, even allowing combination of different scenarios for hybrid analyses
- Network planning modules available for most standards (cellular incl. LTE and beyond,
- W- LAN, etc.)
- The flexible WinProp API allows the integration of the wave propagation models and network planning modules ,into other software tools



Altair Flux ™

Low Frequency Electromagnetic Analysis for Electrical Engineering

Capitalizing on 35 years of innovation in the global context of design optimization and reducing time-to-market, Altair Flux FE software simulates low-frequency electromagnetic and thermal conditions. With open and user-friendly interface, Altair Flux easily couples with other Altair sottwa.re for multiphysics solutions.



Product Highlights

- Magnetic, electric and thermal analysis of 2D/skew/3D projects
- Static, harmonic and transient
- FluxMotor import and motordedicated environment
- Advanced losses modeling
- Proven speed and accuracy
- Excellent multiphysics and optimization interoperability
- Comprehensive customizable environment: automation; design acceleration

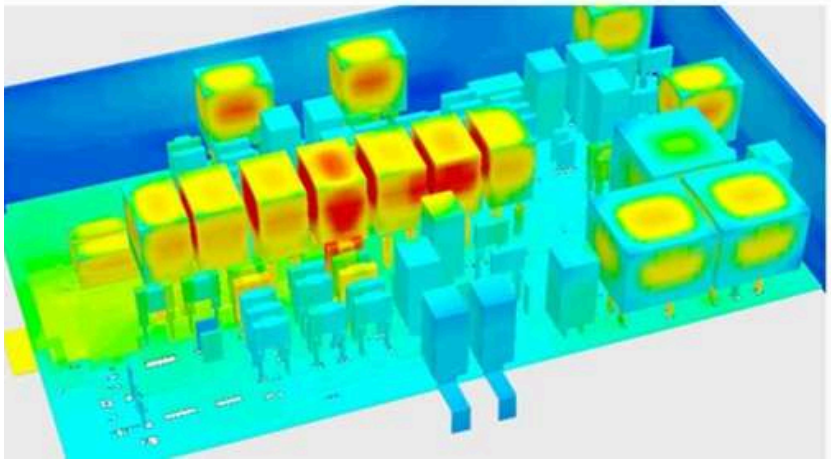
Altair ElectroFlo™

Electronics Thermal CFD Management Software

Altair E.lectroFlo is a CFD-based thermal package to simulate challenging electronics cooling and other EDA thermal management applications. Easy to use even for non-CFD experts, it is capable of solving complex problems involving conduction, natural and forced convection, radiation and conjugate heat transfer.

Product Highlights

- Coupled electrical analysis
- 1 D Flow network co-simulation and patented radiation solver
- Embedded thermal/electrical networks
- Fully automated modeling approach for common procedures
- Extensive error-checking
- The object-oriented modeling makes the software easy to use



Altair FluxMotor™

Electric Rotating Motor Design

Altair FluxMotor is a flexible open software tool dedicated to the pre-design of electric rotating machines. It enables the user to build a machine from standard or customized parts, add windings and materials to run a selection of tests and compare results.

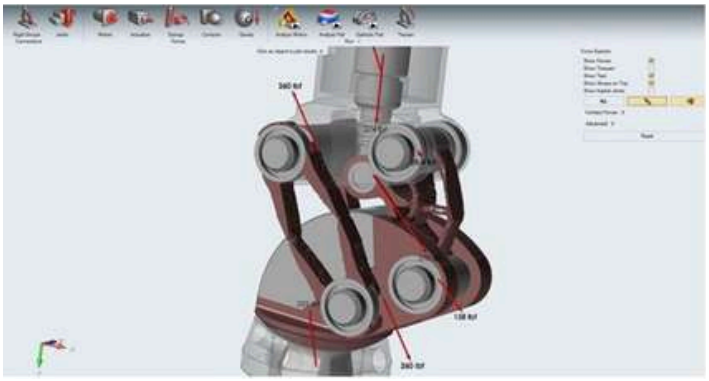
Product Highlights

- Dedicated to electric rotating motor design
- Rapidity of design
- A user-oriented winding tool
- Automated tests and reports allowing quick evaluation of machine efficiency
- •Fast analysis with good accuracy
- Effective machine parts management (slots, bars, magnet shapes, etc.) with customizations
- An innovative way to manage project with catalog

Altair Inspire™

Generative Design Taken to the Next Level

Altair Inspire enables design engineers, product designers, and architects to create and investigate structurally efficient concepts quickly and easily. Inspire uses the industry leading Altair OptiStruct technology to generate and analyze design concepts. The software is easy to learn and works with existing CAD tools to help design structural parts right the first time, reducing costs, development time, material consumption, and product weight.



Product Highlights

- Intuitive solver neutral environment for multi-body systems modeling
- Hierarchical modeling
- Built-in parametric modeling for efficient studies of model variations
- User extensible GUI and data model to support product customization
- Automated assembly for complex systems

Altair Inspire Cast™

5-step Casting Simulation

Altair Inspire Cast was developed with its end users in mind. We strive to make casting simulation as easy as possible by using 'foundry man's language' in our software. Every word in the interface comes from the casting process world. Not only is the software incredibly easy to use, it is also highly accurate and powerful. Get started with Altair Inspire Cast today to further investigate and explore your casting process with just a few clicks.

Product Highlights

- Guided casting process simulation software with innovative user experience
- Identify casting defects such as air entrapment, cold shuts, turbulence, and shrinkage porosity in just a few clicks
- Visualize flow front, solid fraction, solidification modulus, temperature/ velocity profiles, and more
- Simulate high/low pressure, gravity, sand, and permanent mold castings
- Optimize "ingate" design and location

Altair Inspire Form™

Electric Rotating Motor Design

Altair Inspire Form enables users to better design products while reducing lead time by enabling early consideration of formability, process parameters, material utilization, and cost.

Product Highlights

- Stamping simulation software with the ability to do product design, feasibility analysis and cost estimation
- User-friendly interface facilitating natural workflow for innovative user experience
- Identify potential stamping defects such as splits and wrinkles and modify product design early in the design cycle
- Quick and optimal nesting of blank in the sheet metal coil to maximize material utilization for progressive and transfer die forming

Altair Inspire Extrude™

Metal and Polymers Extrusion

Altair Inspire Extrude is a simulation environment designed to help extrusion companies meet the ever increasing demands to produce complex profiles with tight tolerances, quality surface finishes, and high strength properties at reduced cost. Altair Inspire Extrude is a virtual press where users can visualize material flow and temperature inside a die during extrusion and make necessary changes to ensure balanced flow, while identifying and eliminating product defects.

Product Highlights

- Test and validate new die designs
- Improve productivity
- Optimize/correct die designs and process conditions
- Determine product quality
- Automated, easy to learn, extrusion-specific user interface

Altair Activate™

Multi-Disciplinary System Simulation

Altair Activate provides an open integration platform for modeling, simulating, and optimizing multi-disciplinary systems-of-systems using inherent 1D block diagrams. Users have the option to include subsystem models either from Altair's 3D tools, such as Altair MotionSolve and Altair Flux, or from 3rd -party tools. Models can also be imported from Simulink.

Product Highlights

- Hierarchical systems-of-systems defined as parameterized models
- Signal-based and physical modeling can be conveniently combined to define a system model
- Built-in block libraries can be easily managed and extended
- Model exchange or co-simulation achieved through FMI / FMU
- Multi-disciplinary models can include multi-body models, electromagnetic
- models, FEA models, CFD models, and more
- OD, 1 D, and 30 modeling can be used together, allowing the best approach for different types of subsystems

Altair Compose™

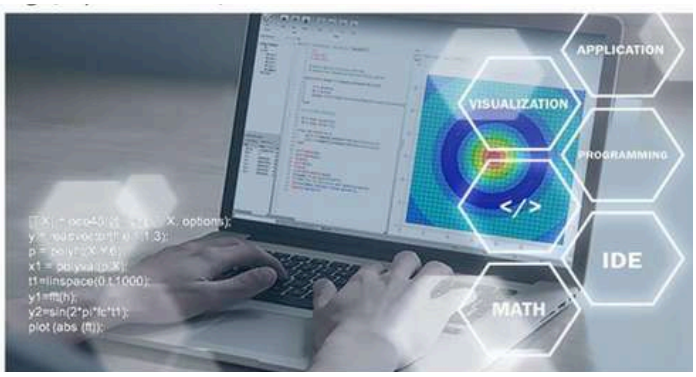
Math, Scripting, Data Processing, and Visualization

Altair Compose enables engineers, scientists, and product creators to efficiently perform calculations one at a time or grouped together in the form of scripts facilitating process automation . Altair Compose also enables the analysis, processing, and visualization of data such as from CAE or test results. It is an interactive & unified programming environment for all types of math - including matrix analysis, differential equations, signal processing, control design, optimization, and much more .

Product Highlights

- High-level matrix- based interpreted language for numerical computing
- Integrated development environment for authoring and debugging all types of math including multi language support
- Built-in connectivity to pre/postprocess CAE data or test data
- Extensive math libraries:

1. Statistical data analysis
2. Matrix analysis
3. Differential equations
4. Signal processing
5. Control design
6. Optimization
7. Interactive 2D &3D plotting



Altair Embed ™

Visual Environment for Embedded Systems

Altair Embed is an intuitive graphical environment for model- based embedded development. Diagrams are automatically converted to highly-optimized and compact code, which is essential for low-cost microprocessors and high-speed sampling rates. The code can be verified, debugged, and tuned with off-line simulation before downloading it to the target microcontroller (MCU).

Product Highlights

- Highly efficient diagram-to-code capability

>Visual real -time operating system
>Fast run time >Low memory footprint
>Human readable code

- Interactive SIL, PI L, and HIL

>Parameter tuning while system is in operation
>Gaining system insight through data logging, buffering, and digital scopes

- State charts

>Graphical editing of Finite State Machines
>Simulation and code generation

- Scaled, Fixed-Point Algorithms

>Fixed-point block library
>Auto-scaling >Fast target code

Altair PBS Works™

HPC Workload Management Suite

Altair PBS Works, named the #1 solution by HPCwire readers, is Altair's comprehensive secure workload management suite for high performance computing (H PC) environments. This integrated suite simplifies the use of HPC while improving resource utilization and ROI. Altair is the only company to offer best- in-case application software, H PC workload management tools, cloud computing capabilities and an industry leading licensing and business model to fit growing simulation needs .

Product Highlights

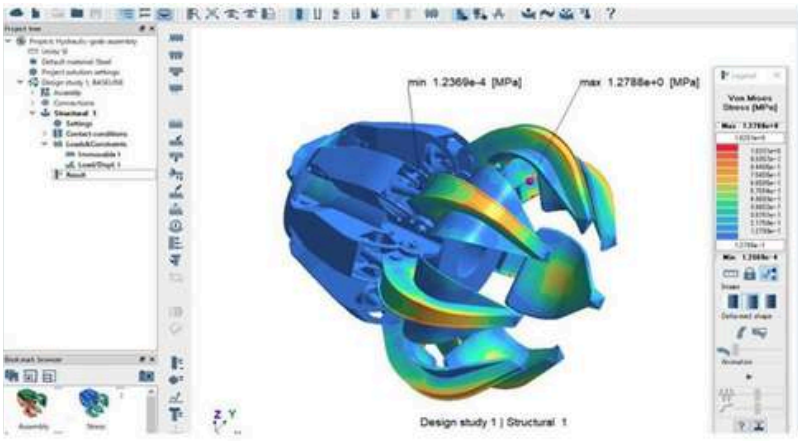
An enterprise-class solutions to increase productivity a nd reduce expenses for all organizations leveraging HPC

- Altair PBS Professional: Industry-leading workload manager and job scheduler for HPC environments .
- Altair PBS Access: Gateway to HPC and remote visualization for engineers and researchers.
- Altair PBS Control: Admin portal to control HPC workloads and optimize cluster a nd cloud use.

Altair SimSolids™

Structural Analysis for Rapid Design Iterations

Altair SimSolid is a structural analysis software developed specifically for rapidly evolving design processes. It eliminates geometry simplification and meshing, the two most time- consuming and expertise-extensive tasks done in traditional FEA, enabling the analysis of fully-featured CAD assemblies in minutes without meshing



Product Highlights

- Eliminate geometry simplification and meshing. With SimSolid, model preparation is done in minutes.
- Analyze complex parts and large assemblies. SimSolid is tolerant of imprecise geometry, and its assembly connections are industry best at handling ragged contact surfaces.
- Advanced automation workflows are built into SimSolid to help setup large models in a few minutes
- Get results in seconds to minutes, SimSolidis fast, really fast. Hence, multiple design scenarios can be quickly analyzed &compared..

Benefits

Eliminate Geometry Simplification and Meshing

Sim Solid's unique technology completely eliminates geometry simplification and meshing, the two most time consuming, expertise extensive and error prone tasks d one in traditional FEA. With Sim Solid, model preparation is done in minutes .

Analyze Complex Parts and Large Assemblies

SimSolid has been designed to analyze complex parts and large assemblies not practical with traditional FEA.
SimSolid is tolerant of imprecise geometry. Its assembly connections are industry best at handling ragged contact surfaces with both gaps and overlapping geometry.
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Get Results in Seconds to Minutes

SimSolid is fast, real fast. Solution times a re typically measured in seconds to minutes on a standard PC.
With SimSolid, multiple design scenarios can be quickly analyzed and compared . And, accuracy can be specified on an individual part level allowing a rapid drill down to any level of detail that is required.

Altair EDEM™

Introducing EDEM simulation technology

EDEM is high performance software for bulk material simulation. Powered by the Discrete Element Method (DEM), EDEM simulates and analyzes the behavior of bulk materials such as rocks, soils, ores and gravel. EDEM provides engineers with crucial insight into how materials will interact with their equipment during a range of operating conditions, and it enables them to use realistic loads in Finite Element Analysis and Multi body Dynamics simulations for optimal designs .
EDEM simulation technology is used for the design, performance testing and optimization of mining and construction equipment such as dump trucks, bulldozers, diggers and excavator buckets.

Benefits of EDEM Simulation

By including EDEM is their design workflow, engineers are able to:

- **Understand** how different materials affect designs
- **Virtually test** designs for a wide range of materials with different properties
- **Predict bulk** material behavior: identify risk of blockages, spillage an d wear
- **Get key insight into** equipment material interactions
- **Shorten** design cycles
- **Reduce** physical prototyping and testing costs
- **Increase** productivity and reliability
- **Design** machines with higher performance