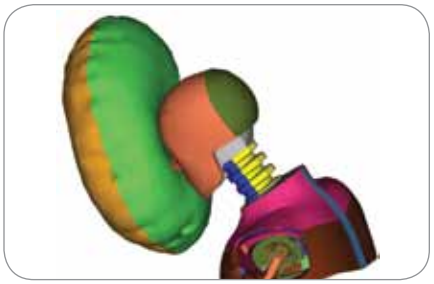
Altair® RADIOSS®

The Standard behind Structure Safety

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



Safety and Crash Evaluation

Blast and Ballistic Analysis

Scalability, Quality and Robustness
RADIOSS' advanced multi-processor solution (Hybrid Massively Parallel Processing) has enabled the best scalability in the industry for large, highly non-linear structural simulation. The use of Advanced Mass Scaling (AMS) and intelligent single precision calculation option increases simulation speed by orders of magnitudes while retaining the same accurate results. AMS provides an advanced and competitive solution for quasi-static problems in the case of implicit non-linear simulations with convergence problems due to high non-linearity in the contacts, complex material behaviors and rupture modeling.

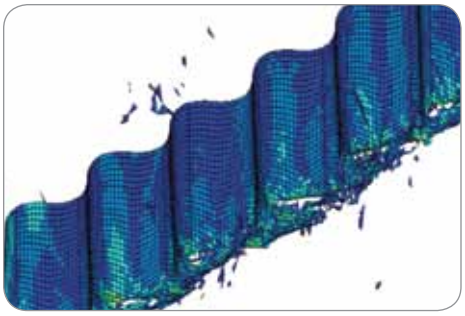
With RADIOSS' multi-domain approach, detailed and accurate analysis can be achieved without decreasing the global time step or increasing overall simulation time. Special provisions in the implementation guarantee full repeatability of results regardless of the number of computer cores, nodes or threads used in parallel computation. Numerical scattering of results is highly minimized.

Industry Standard for Crash, Occupant Safety and Impact Analysis
For over 20 years, RADIOSS has established itself as a leader and an industry standard for crash, safety and impact analysis. The number of customers continues to increase at an impressive rate to include over 900 companies worldwide, with 40% of these customers in the automotive industry. RADIOSS is ranked as the 5-star worthy crash code. Automotive and aerospace companies value the contribution RADIOSS makes in understanding and predicting design behavior in complex environments such as automotive and aerospace crash and impact simulations.

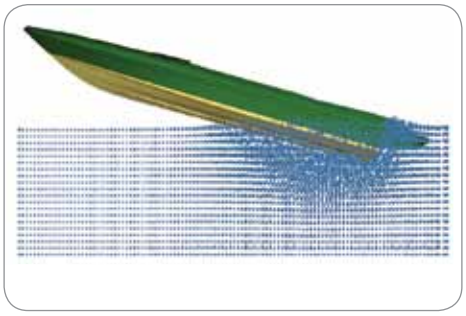
RADIOSS has direct access to a large library of finite element dummy, barrier and impactor models to perform vehicle occupant safety simulation. It provides the most comprehensive and high quality toolset in the industry through partnerships with leading crash and safety testing facilities and model providers. In addition, Altair's HyperCrash modeling environment provides outstanding support for automotive crash and safety simulation with RADIOSS.

Most Comprehensive Material and Rupture Libraries
RADIOSS has the most comprehensive material and rupture libraries with more than 300 combinations. A comprehensive collection of linear and non-linear material, failure and rupture models is provided for modeling complex events. Correlated material laws and failure criteria include definitions for concrete, foam, rubber, steel, composites, biomaterials, and more. Multiple failure criteria may be applied to any material. Crack propagation can be followed using an XFEM method.

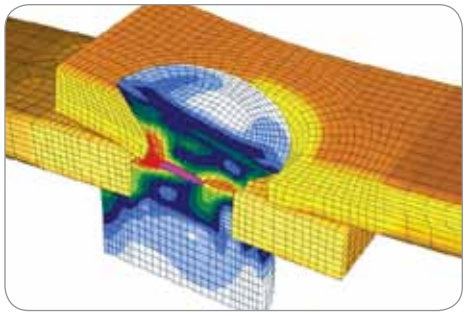
Advanced Multiphysics Simulation
Besides Finite Element technology, RADIOSS is also equipped with other technologies such as Euler, Arbitrary Lagrangian Eulerian (ALE), Smoothed-Particle Hydrodynamics (SPH) and the Finite Volume Method (FVM). With Euler, ALE and SPH formulations, RADIOSS enables Fluid-Structure Interaction (FSI) simulation taking into account multiple fluids. The innovative Finite Volume Method enables full FSI simulation of airbags in full car models with accuracy and speed.



Non-Linear Explicit Analysis on Composites



Smoothed-Particle Hydrodynamics (SPH) Analysis



Correlated Material Law and Rupture Model Library

Optimization Ready
Integration with HyperWorks environment makes RADIOSS a powerful design tool. Aside from modeling and visualization, RADIOSS models are ready for optimization. Advanced design optimization and robustness studies can be performed easily through Altair's OptiStruct and HyperStudy products to improve design performance. RADIOSS' high scalability, quality and robustness are essential for successful numerical optimization.

High Performance Computing
With a sophisticated customer base who values performance, reliability, safety and innovation, the RADIOSS team is committed to supporting the most up-to-date, advanced computing architectures and integrating new technologies to improve performance, scalability and usability. RADIOSS is leading the industry in understanding many of the state-of-art coprocessor's potential for powering complex simulation software applications and environments.

Features and Capabilities

Analysis Types
- Non-linear explicit dynamic structural analysis
- Non-linear implicit structural analysis
- Explicit Computational Fluid Dynamics (CFD)
- Euler and Arbitrary Euler-Lagrangian (ALE) formulation
- Smoothed-Particle Hydrodynamics (SPH)
- One-step (inverse) and incremental sheet metal stamping analysis

RADIOSS' application areas include simulations of crash safety, drop and impact, blast and hydrodynamic impact, fluid structural interaction, terminal ballistics, forming and composite mapping.

Elements
- Full and under-integrated elements:
  - Thin and thick shells, 3 to 8 nodes
  - Hexa with 4 to 20 nodes, tetrahedron solids
  - Bar and beam elements
- Crash beams, rigid bodies, joints, general springs and dampers, ...

Contact Interfaces
- Kinematic tied contacts with rupture
- Penalty tied contacts
- ALE/Lagrangian contacts
- CEL (Euler/Lagrangian) contacts
- Library of penalty formulation contacts

Material Laws and Rupture Criteria
- Library of Material Laws for
  - Steel, high strength steel, soil, rocks, concrete
  - Composite and ceramics
  - Hyper elastic laws (rubber, ...)
  - Hydrodynamic laws
- Library of Rupture Criteria
  - Energy and plasticity based
  - User defined
  - Johnson Cook, Tuler Butcher, Chang and Chang, Tsai Wu, Puck, Hashin
- Equation of State (EOS)
  - JWL, Lee Tarver, Homquist, P-Alpha

Boundary Conditions
- Lagrangian structures
- Fluids (inlet, outlet)

Dummies
- Frontal impact dummies: Aero HII 50%, Humanetics_Express HIII5% and 50%
- Side impact dummies: ES2 and SID-IIs families from Humanetics, 5 and 50% WorldSid
- Rear impact dummy: BIORID IIg
- Child dummies: Hybrid, P, Q families and Crabi 12 months mainly developed with Humanetics
- Pedestrian impactors: head, legs, standing dummy, FlexPli (Humanetics)
- Human dummy model: Humos2, leg and foot models

Barriers
- Frontal barriers: ODB, PDB V8XT TRL_full shell and solid modelings
- Side barriers: NHTSA, Progress Aemdb, IIHS SUV (Cellbond) shell and solid modeling
- Rear barriers: RCAR and US Rear FMVSS 310
  - RCAR IIHS low impact
  - US Rear impact barrier FMVSS 310

Supported Platforms
- Windows (32 and 64)
  - XP
  - Vista
  - Windows 7
- Linux (64 bit)
  - RedHat, SUSE, SLES
  - Intel Xeon Phi
  - NVIDIA Fermi C2070 and M2090 (RADIOSS Implicit Iterative Solver)

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