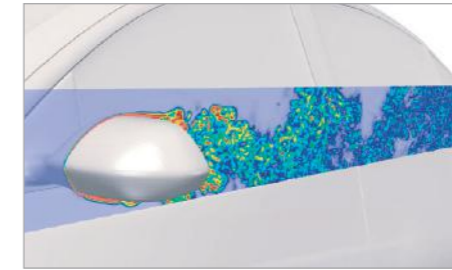
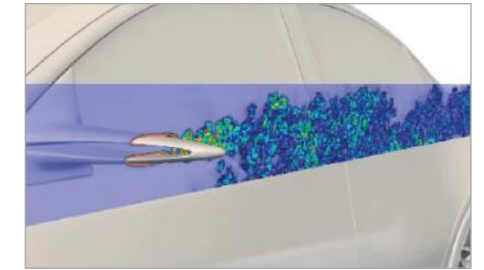


Intuitive case setup in the Altair® Virtual Wind Tunnel



Unconventional design ideas - such as using a rear-view camera mirror - can be evaluated



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 Boltzmann Method
- Integrated, robust volume meshing for fast design changes
- Efficient Multi-GPU implementation for transient overnight analyses
- Tailor-made solution for external aerodynamics

**Benefits**

With Altair® ultraFluidX, highly resolved transient aerodynamics simulations can be performed overnight on a single server. The benefits in detail are:

**Fast and easy case setup**

Thanks to seamless integration into the Altair® Virtual Wind Tunnel, setting up an external aerodynamics simulation becomes trivial. Templates can be derived quickly for different vehicle classes, making the workflow less prone to errors.

**Minimum preprocessing effort**

Profit from the “Drag and Drop” nature of this Lattice Boltzmann implementation. Low surface mesh requirements, support for intersecting and penetrating parts, together with a fully automated volume mesh generation in the solver, make part replacements easier than in the physical wind tunnel. Evaluating hundreds of configurations to satisfy legal regulations becomes feasible.

**Short turnaround times enabling overnight runs**

The Lattice Boltzmann Method is a perfect fit for massively parallel architectures like GPUs, and sets the stage for unprecedented turnaround times. Overnight runs on single servers become possible by utilizing state-of-the-art GPU optimized algorithms, while delivering the fidelity of a transient LES aerodynamics simulation.

**Significant cost savings**

Conventional simulation approaches need thousands of CPU cores to achieve the turnaround times of Altair® ultraFluidX. Our GPU based solution increases throughput while reducing hardware and energy cost.

**Run transient**

Bluff body aerodynamics, and especially vehicle aerodynamics, are highly unsteady by nature. With Altair® ultraFluidX well-resolved transient LES simulations become affordable. No need to press transient physics in a steady-state corset anymore.

**Industry Applications**

Altair® ultraFluidX was tailor-made for highly resolved investigations of external aerodynamics, including the following selected applications:

**Ground transportation vehicles in a wide range of operating conditions**

Determine aerodynamic forces and moments (e.g., drag, lift, roll, pitch, yaw) and investigate transient three-dimensional flow structures to understand the fluid dynamics of your vehicle. Potential targets of the CFD analysis include the minimization of aerodynamic drag to reduce fuel consumption as well as the balance of front and rear lift and the investigation of the crosswind behavior to improve driving stability.

**Individual Customer Applications**

Use Altair® ultraFluidX for your own, individual use cases. Examine the transient flow field of different designs, e.g., analyze buildings and whole cities in a large scale wind tunnel, or study the impact of local design changes on the aerodynamic performance, like assessing the impact of local small-scale geometry changes on the flight trajectories of a soccer ball.

**Capabilities**

Altair® ultraFluidX brings you faster pre-processing, advanced GPU technology for minimum simulation time, and intuitive post-processing.

**Model Preparation**

Since ultraFluidX is offered as part of the Altair® HyperWorks™ suite, the challenge of getting CAD models simulation-ready can be efficiently addressed with Altair® HyperMesh. Altair®’s market-leading pre-processor includes some highly automated capabilities specifically developed for external aerodynamics modeling, such as wrapping technology, automated gap and hole filling, and high-fidelity surface meshing.

**GPU Computing**

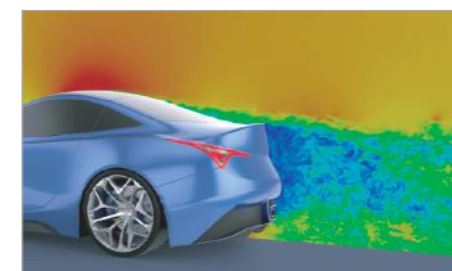
GPU computing provides a significant performance advantage and power savings with respect to their more cumbersome CPU counterparts. GPU revolution in scientific and engineering computing is rapidly progressing and ultraFluidX is one of the pioneering commercial software packages which utilizes this technology, bringing significant speed to the overall product development.

**Analysis of Results**

Transient aerodynamics analyses often produce Gbytes of results data, which need to be processed in order to be useful for design improvements. Altair®’s powerful client-server parallel architecture enables interactive CFD postprocessing even for large datasets. Automated report generation can be easily Product Highlights implemented and customized.

**Hardware Requirements**

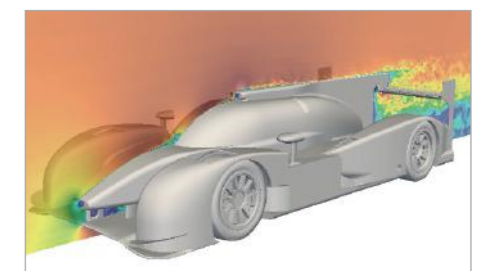
The Altair® ultraFluidX team recommends NVIDIA Tesla V100, P100 accelerators, as they are well-established GPU cards for scientific computing in data centers and ultraFluidX has thoroughly been tested on them.



High accuracy for complex flow structures



Overnight transient simulation on NVIDIA GPUs



Ultra-fast simulation is key for motorsport applications