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Simcenter STAR-CCM+ meshing solutions

Reduce time-to-market through an automated CAD-to-mesh process

Benefits
- Achieve robust design exploration and faster time-to-market using an adaptable, automated pipeline of CAD-to-mesh operations
- Reach engineering decisions faster with high-quality meshes for any dirty CAD assemblies with surface wrapping and comprehensive volume meshers
- Increase simulation throughput with parallel volume meshing and local surface remeshing
- Provide fast and accurate handling of complex moving geometries using robust overset meshing and morphing capabilities
- Reduce engineering time with advanced model-driven adaptive mesh refinement techniques

Summary
There is a continuous drive to incorporate greater realism in engineering simulations to better understand product behavior earlier in the design cycle. To achieve this, a high-fidelity representation of both geometry and physics is required for the analysis. Both have a direct impact on and are facilitated by effectively generating the computational mesh. To quickly build high-quality, run-ready meshes, users must be able to:

- Reduce time preparing initial geometry
- Mesh geometries with tens of thousands of complex parts easily and quickly
- Address meshing requirements unique to specific applications
- Easily and automatically incorporate design changes in the meshing process

Offering comprehensive solutions
Simcenter™ STAR-CCM+™ software, which is part of Xcelerator, the comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software, offers comprehensive meshing solutions to address engineering analysis challenges. It allows you to easily and efficiently prepare and generate meshes for the most complex geometries and offers the ultimate balance between user control and automation. Simcenter STAR-CCM+ provides:

- *Productivity:* Reduced engineering and meshing time with an easy-to-use pipelined workflow delivered from a single, integrated user interface
- *Accuracy:* Geometric fidelity and maximum accuracy per central processing unit (CPU) time for complex applications using robust and scalable meshing algorithms
- *Mesh motion and adaptation:* Optimal cell count and solution accuracy using industry-leading, model-specific adaptive mesh refinement (AMR) along with robust overset and morphing tools for handling complex moving bodies

Productivity
Using Simcenter STAR-CCM+ enables a flexible approach to mesh generation with a user-definable pipeline of operations:

- Robust and automatic process from initially preparing geometry to generating volume mesh
- Capabilities accessed through an easy-to-use, standalone and integrated user interface
- Facilitates automatic parameter studies and intelligent design exploration
- Efficient and scalable parallel volume meshing algorithms that can help harness the full power of high-performance computing (HPC) resources and expedite the overall mesh generation process for any application

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# Simcenter STAR-CCM+ meshing solutions

Accuracy

Achieve highly accurate simulations using Simcenter STAR-CCM+ via several powerful meshers, enabling you to create the best mesh for your simulation:

- *Surface wrapper:* Robust surface preparation tool that can handle poor quality and complex computer-aided design (CAD) geometries, generating a closed, manifold and nonintersecting surface

- *Polyhedral mesher:* Unstructured, general-purpose mesher for complex geometries, ensuring mesh conformance between parts and enhancing conjugate heat transfer (CHT) simulation accuracy

- *Trimmed mesher:* Predominantly hexahedral mesh for general purpose robust and efficient meshing

- *Tetrahedral mesher:* Unstructured and primarily used for computational solid mechanics (CSM) and computational rheology, ensuring mesh conformance between different parts

- *Prism layer mesher:* Used with core volume mesh to easily and automatically create prismatic cells next to wall surfaces to accurately capture the boundary layer

- *Dedicated meshing tools:* Robust dedicated meshers that can generate prismatic elements to tackle thin and swept geometries

Mesh motion and adaptation

- *Morphing:* Robustly account for displacement and deformation of moving boundaries in a transient analysis

- *Overset meshing:* Avoid cumbersome remeshing with dynamic overlapping of meshes in applications with complex moving bodies

- *AMR:* Easy-to-use mesh adaptation methods based on user-defined criteria and/or model-specific criteria for free-surface and reacting flows along with overset mesh driven criteria
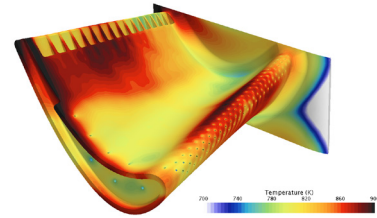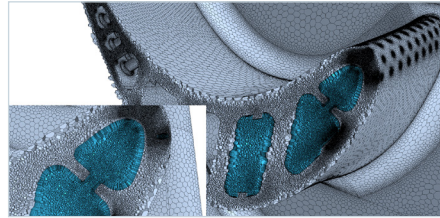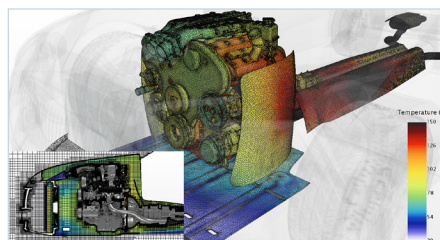

Robust volume mesh for turbine blade cooling study (left) and accurate conjugate heat transfer simulation results (right).
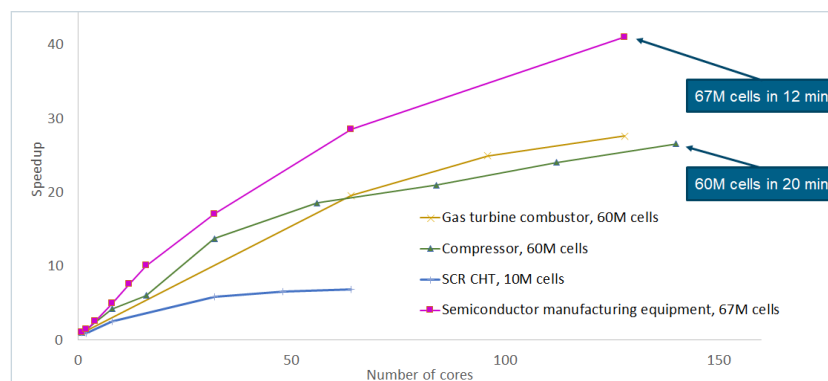
Speed-up of the parallel polyhedral mesher for various applications.
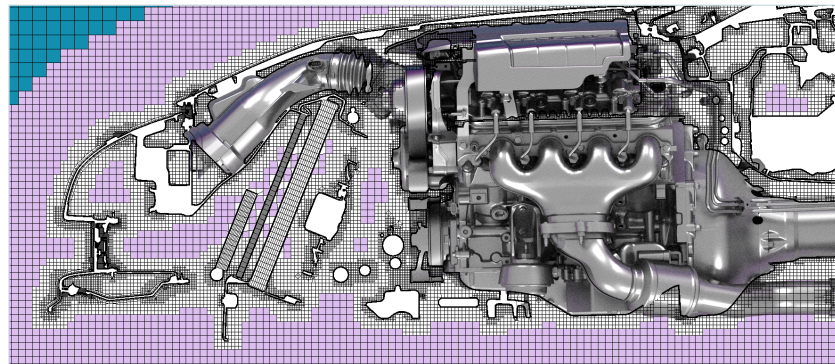
Plane section showing trimmer volume mesh around under-hood parts in a passenger vehicle.

Combination of polyhedral, trimmer and thin meshers for solid and fluid regions in a vehicle thermal management study.

Siemens Digital Industries Software
siemens.com/software

Americas   +1 314 264 8499
Europe   +44 (0) 1276 413200
Asia-Pacific +852 2230 3333