

Simcenter 3D Thermal/Flow Distributed Memory Parallel

Leverage high-performance computing

Simcenter 3D solutions for thermal and flow analysis are supported by an efficient computational fluid dynamics (CFD) architecture. The Simcenter 3D Flow solver can run in parallel, using either a fully-coupled or fractional step scheme. The Simcenter 3D Thermal solver features parallel computation of radiation view factors and the entire thermal model. Together these attributes allow efficient computation of complex fluid/thermal behavior in a wide range of applications.

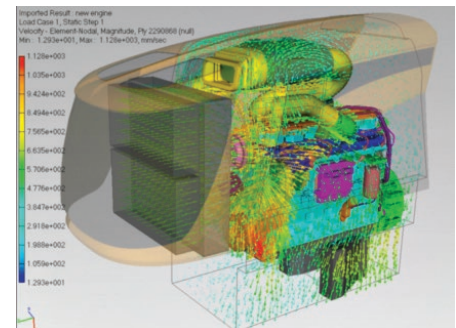
Simcenter 3D

Benefits

- Greatly improve your solution speed for a wide range of problems
- Maximize the value of your hardware investments
- Enjoy the flexibility of solving on a single machine or across a distributed network or cluster
- Benefit from domain decomposition technology for large models

Summary

Using distributed memory architecture, Simcenter™ 3D Thermal/Flow DMP enables high performance computing (HPC) by leveraging hardware systems configured as multi-processor desktop or multi-node cluster. One license of Simcenter 3D Thermal/Flow DMP, together with the prerequisite solver licenses, can be used to spawn a solve over as many processors as available. All software restrictions (or limitations) on the maximum number of cores are eliminated with the purchase of this add-on, allowing solve speeds to scale up or down based on the number of available cores, not the number of available licenses. Cores may be co-located on a single work station, distributed over a local area network, or exist within a standalone computational cluster. Domain decomposition techniques are also included for solving large-scale thermal models.

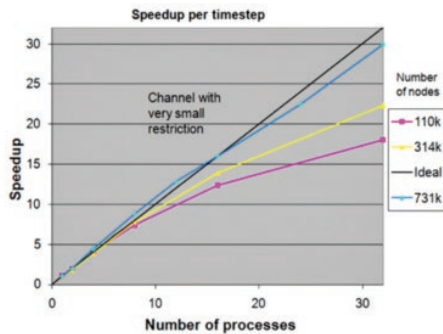


Solution speedup as a function of available processors and number of nodes in the model.

The following products include high-performance computing capabilities for up to eight cores on a single workstation:

- Simcenter 3D Advanced Flow
- Simcenter 3D Advanced Thermal
- Simcenter 3D Electronic Systems Cooling
- Simcenter 3D Space Systems Thermal

Simcenter 3D Thermal/Flow DMP



Solution speedup as a function of available processors and number of nodes in the model.

The Simcenter 3D Thermal/Flow DMP add-on removes all restrictions on the number of solver processes for the products named above, while also enabling parallel processing inside Simcenter 3D Thermal and Simcenter 3D Flow. Simcenter 3D Thermal/Flow DMP includes support for distributed computing over a local area network or through a dedicated cluster of compute nodes. The add-on effectively allows the deployment of as many solver processes as your hardware will permit on a single simulation run.

Parallel flow solver

The parallel flow solver was developed to increase the computational efficiency of coupled thermal/flow problems. The flow solver utilizes a fully coupled pressure-velocity scheme in which the mass and momentum equations are iterated simultaneously until convergence is attained at every time step or steady-state iteration. This is the default solution and is best suited to steady-state problems or transient simulations

featuring large time steps. A highly stable and accurate solution can be expected with this solution. However, it is recommended that transient problems with small time steps are solved with the available fractional solution scheme. The latter provides a more stable solution for this type of problem and requires less memory while being slightly faster than the fully coupled scheme.

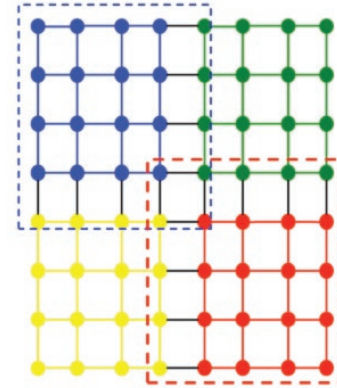
The Simcenter 3D Thermal/Flow DMP add-on allows you to take full advantage of the parallel flow solver by allowing the solution on an unlimited number of solve processes.

Parallel thermal solver

Simcenter 3D Thermal/Flow DMP unlocks distributed memory (MPI) based parallelization for highly scalable computation of view factors, radiative heating and solution of the thermal model. Thus accelerating solve times for complex problems involving multiple modes of heat transfer.

Domain decomposition

Simcenter 3D Thermal/Flow DMP further enhances computing speed and the efficiency of resolving large-scale thermal problems by domain decomposition. The technique involves splitting up the computational domain into numerous subdomains, with each being handled by a separate compute node. These compute nodes can co-exist on a single workstation, or be distributed across a network or computational cluster. Information passes back and forth across the boundaries of the various subdomains to complete the global solution.



Solution speedup as a function of available processors and number of nodes in the model.

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