NX Thermal/Flow Distributed Memory Parallel

NX CAE

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, NX™ Thermal/Flow DMP enables high performance computing (HPC) by leveraging hardware systems configured as multi-processor desktop or multi-node cluster. One license of NX 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.

Leverage high-performance computing
NX solutions for thermal and flow analysis are supported by an efficient computational fluid dynamics (CFD) architecture. The NX Flow solver can run in parallel, using either a fully-coupled or fractional step scheme. The NX Thermal solver features parallel computation of radiation view factors in addition to solver multi-threading via a shared memory parallel (SMP) approach for supported modules. Together these attributes allow efficient computation of complex fluid/thermal behavior in a wide range of applications.
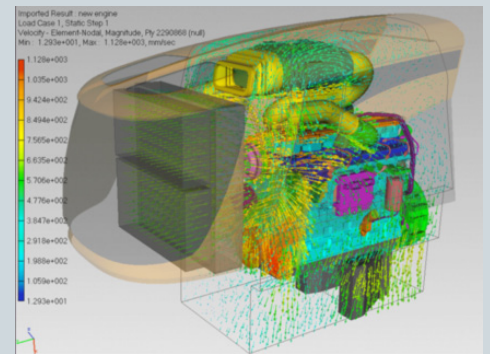
Parallel solver technology allows for efficient solution of a wide range of thermal/flow problems.

The following products include high-performance computing capabilities for up to eight cores on a single workstation:
- NX Advanced Flow
- NX Advanced Thermal
- NX Electronic Systems Cooling
- NX Space Systems Thermal

NX

Answers for industry.

SIEMENS

NX Thermal/Flow DMP

The NX 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 NX Thermal and NX Flow. NX 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.
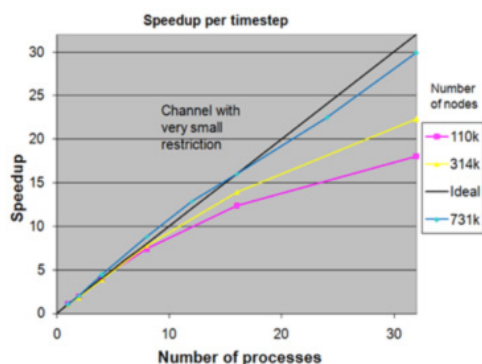
Parallel flow solver

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 NX 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 processing of view factor calculations

NX Thermal/Flow DMP unlocks distributed memory (MPI) based parallelization for highly-scalable computation of view factors and radiative heating, accelerating solve times for complex problems involving radiation.

Domain decomposition

NX 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.
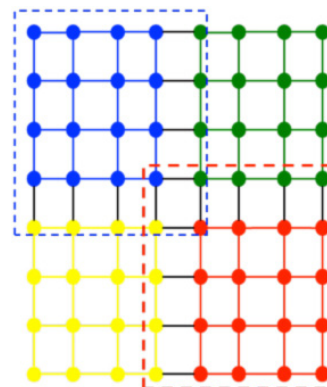
Domain decomposition divides computational domain into various subdomains.