TESTIMONIAL

"In research, GaspiLS's high scalability helps us to reduce the time to solution of our demanding pore-scale simulations."

Mauricio Araya, Shell

Boost your Simulation!

Existing applications can easily leverage the superior performance and scalability of GaspiLS. An interface that is conceptually compatible with Trilinos/PETSc and the MPI interoperability features of GPI-2 allow for a smooth transition from your legacy application.

LEARN MORE

Visit the GaspiLS website at **www.gaspils.de** and sign up for our newsletter, or download the GaspiLS library to evaluate it using your own simulation problem.

Fraunhofer-Institut für Techno- und Wirtschaftsmathematik ITWM

Fraunhofer-Platz 1
67663 Kaiserslautern
Germany

Contact
Dr. Daniel Grünewald
Phone: +49 (631) 316 00-45 19
gruenewald@itwm.fraunhofer.de

Dr. Franz-Josef Pfreundt
Phone: +49 (631) 316 00-44 59
pfreundt@itwm.fraunhofer.de

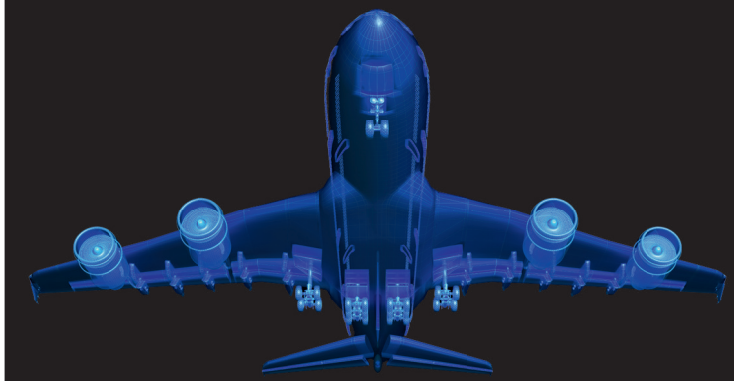
www.gaspils.de
www.itwm.fraunhofer.de

hpc_flyer_GaspiLS_Exascale Era_EN

Fraunhofer ITWM

FRAUNHOFER INSTITUTE FOR INDUSTRIAL MATHEMATICS ITWM

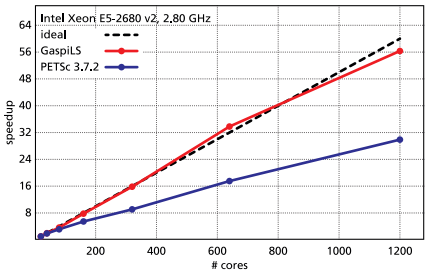
GaspiLS – A LINEAR SOLVER FOR THE EXASCALE ERA



PERFORMANCE AND SCALABILITY

The need for scalability is driven by the hardware trend of increased parallelism. Scalability quantifies the additional benefit generated by adding extra resources to a computational problem. In case of optimal scalability, this benefit is 100 % and only optimal scalability can guarantee full resource utilization. GaspiLS delivers superior performance and scalability which means:

- Time to solution can be practically reduced as much as required by adding extra resources
- There is practically no limit on the modeling complexity and its enormous memory footprint, as memory is simply accumulated across nodes
- There is no need for expensive resources. Instead of high-end fat nodes, use a bunch of cheap commodity hardware nodes.
- Optimal energy efficiency because hardware is used to capacity and never sits around idle.



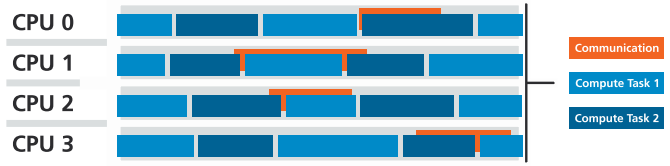
Jacobi preconditioned Richardson, 3D Poisson equation (2nd order FD discretization), cubic grid (359^3)

ABOUT GaspiLS

GaspiLS is a scalable linear solver library for the exascale age and is industry proven in CFD and FEM simulations. Its easily extendable standard API is compact yet powerful for parallel computations and allows for smooth transitions from legacy applications in little to no time.

GaspiLS comes with a collection of iterative solvers (Richardson, (P)CG, BiPCGStab, GMRES) and preconditioners (Jacobi, ILU(0), MILU), which can be easily expanded by adding custom solvers and/or preconditioners.

GaspiLS inherits the Gaspi/GPI-2 programming model and leverages its unique advantages to achieve optimal overlap of computation and communication.



A hybrid-parallel implementation for scalability results in a much better surface to volume ratio and the task based parallelization yields optimal load balancing. The design is multi-threaded with thread-safe matrix assembly and fully threaded matrix finalization.

GaspiLS is open-source GPLv3 and available on gaspils.de

ADVANTAGES

GaspiLS achieves its superior scalability and performance by striving for 100 percent resource utilization:

- Dynamic load balancing avoids idle resources.
- Removing synchronization points wherever possible prevents aggregation of imbalances.
- Overlapping of computation and communication avoids aggregation of communication latencies.
- A hybrid-parallel implementation speeds up collective operations and reduces the inter-process communication overhead.
- Explicit distinction between local and remote entries within a single matrix row allows to optimize overlap of local compute and communication of remote vector entries.

GPI2-accelerated: efficient, scalable, multicore!