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GaspiLS: SCALABILITY FOR CFD AND FEM SIMULATIONS

Fraunhofer-Institut für Techno- und Wirtschaftsmathematik ITWM

Fraunhofer-Platz 1
67663 Kaiserslautern
Germany

Contact
Dr. Daniel Grünewald
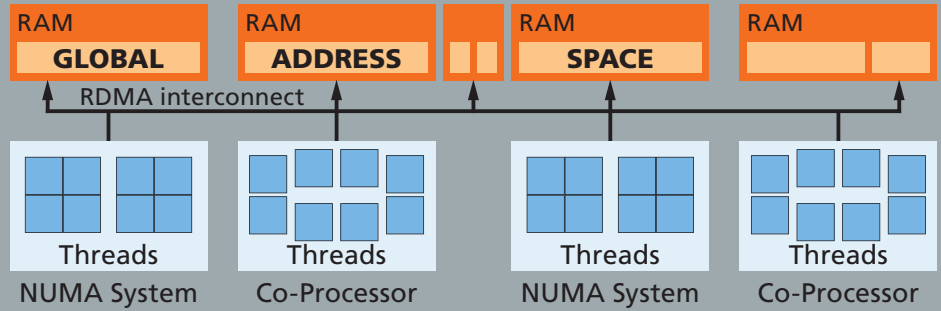Phone +49 631 31600-45 19
gruenewald@itwm.fraunhofer.de

Dr. Franz-Josef Pfreundt
Phone +49 631 31600-44 59
pfreundt@itwm.fraunhofer.de

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

What is GaspiLS?

- GaspiLS: Gaspi Linear Solver Library

- (P)CG, BiPCGStab, GMRES

- Jacobi, ILU, ILUM

- C++ Interface

- Templated scalar types

- Easily extendable/Standard API

- Industry proven in CFD and FEM simulations

- MPI interoperable

- Open-source GPLv3

Advantages of GaspiLS

- Superior performance and scalability

- Inherits the Gaspi/GPI-2 programming paradigm

- Efficient SpMVM kernel

- Hybrid-parallel implementation

- GPI-2: Optimal overlap of communication and computation

- Task based parallelization: Optimal load balance

Boost your simulation

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

- GPI-2 accelerated

- Efficient

- Scalable

- Multicore

RAM	RAM		RAM		RAM	
GLOBAL	**ADDRESS**		**SPACE**			

RDMA interconnect

Threads	Threads	Threads	Threads
NUMA System	Co-Processor	NUMA System	Co-Processor

**How does GaspiLS achieve scalability?**

The key requirements for scalability are an optimal overlap of communication and computation and a perfectly balanced load.

For that, GaspiLS incorporates the shift in programming paradigm which is stimulated by the GPI-2 API. GaspiLS follows a hybrid SPMD execution model where one process using several threads is executed on every single NUMA domain. Potential global synchronization points are readily disentangled to a multi-threaded data-dependency driven task parallelism which allows for a perfectly balanced load.Every thread can compute and communicate.

GaspiLS is using an internal splitting of the matrix into contributions having exclusive dependencies to local or remote vector entries. A maximum overlap of communication and computation is achieved by updating the local parts along the transfer of the remote vector entries. A subsequent update of the remote parts completes the operation. The lightweight runtime system of GPI-2 is minimally-intrusive and allows for optimal overlap of communication by computation.

As such, GaspiLS achieves perfect scalability and provides optimal efficiency for your CFD or FEM simulation.

Superior performance and scalability

Intel Xeon E5-2680 v2, 2.80 GHz
ideal - - - -
GaspiLS ——●——
PETSc 3.7.2 ——●——
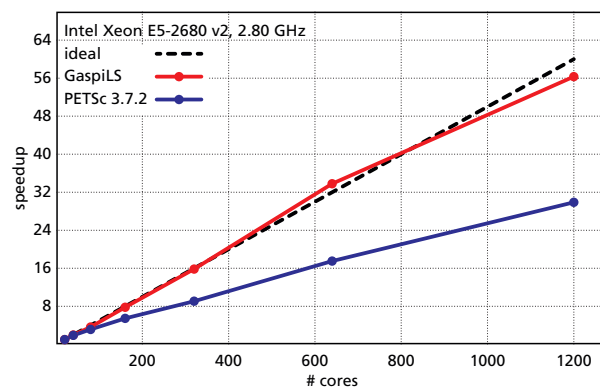
Jacobi preconditioned Richardson, 3D Poisson equation (2nd order FD discretization), cubic grid (359^3)

GaspiLS – the GPI-2 based sparse linear solver library
Download at www.gaspils.de