**GaspiLS: SCALABILITY FOR CFD AND FEM SIMULATIONS**

**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.
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

![Graph showing speedup vs. number of cores for different solvers and processors.](image)

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