SAMG-MPP: parallel linear solvers for large-scale high-performance computing

SAMG-MPP: scalable and versatile

Parallel scalability is a mandatory feature for nowadays large-scale computer-aided engineering CAE workloads. This holds in particular for the linear solver, which often forms the inner core of any finite difference (FD), finite element (FE), or finite volume (FV) based simulation.

SAMG-MPP provides highly parallel algebraic multigrid (AMG) dedicated to the solution of large linear systems on distributed memory computers up to 1000s of cores. Where other methods are limited by increasing memory and communication footprints as the number of processors grows, the lean structures of SAMG-MPP allow for an efficient usage of these additional computational resources in order to achieve another computational speed-up.

> „
> **SAMG has become our standard solver in transient CFD applications. SAMG's speed and parallel efficiency are absolutely essential for fast and reliable development processes in our daily work."**
>
> Dr.-Ing. Alexandra Mutzke, Volkswagen AG

SAMG-MPP: application and performance
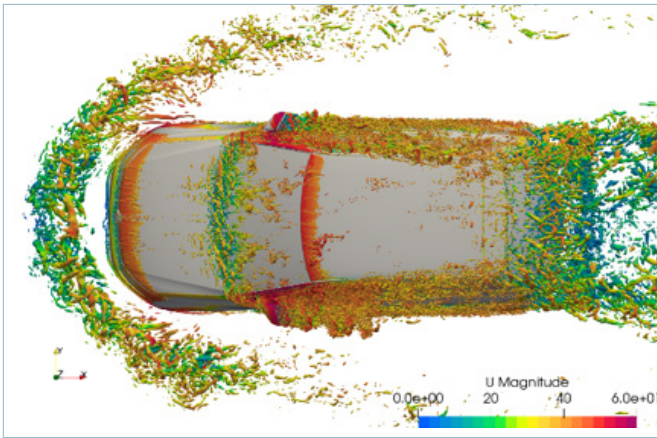
Highly refined aerodynamics simulation (courtesy of Volkswagen AG)

A key application of SAMG-MPP is the solution of pressure correction systems in large-scale computational fluid dynamics (CFD) simulations. This part of the overall CFD solver is the most challenging concerning parallel scalability, and conventional linear solvers form a bottleneck to the overall performance. In the automotive industry, SAMG-MPP is successfully used as a replacement for other linear solvers like OpenFOAM®'s built-in GAMG solver.
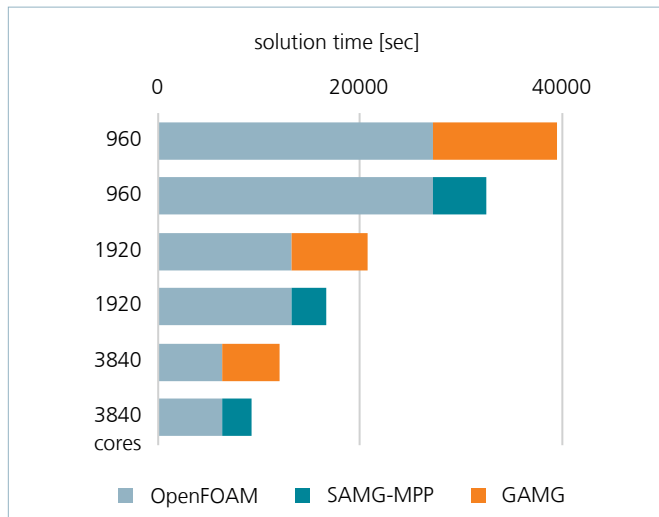

Solution time comparison of SAMG-MPP to OpenFOAM's built-in GAMG solver

Prerequisites and product portfolio

SAMG-MPP is available as a "plug-in" library for Linux, Windows, and MacOS. Parallelism by MPI, OpenMP, or a mix is implemented. SAMG-MPP is especially dedicated to being run on HPC clusters with 1000s of cores.

Licenses are flexibly tailored to the customer's needs. Please contact our distributor, scapos AG.

The portfolio is structured around the mandatory "SAMG-Core"; SAMG-MPP is one of the optional extension "modules". SAMG-MPP itself requires a separate license.
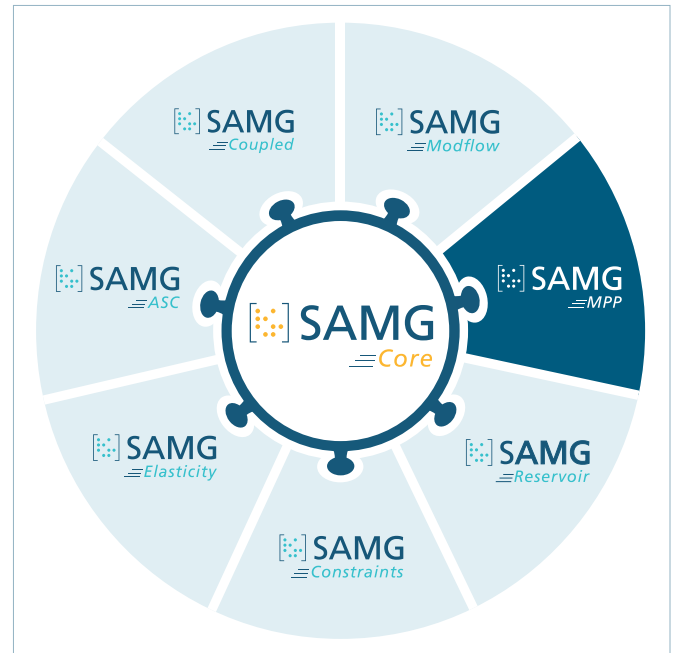
This portfolio is permanently further developed to feature the state-of-the-art multigrid approaches.

In addition, we offer consulting to tailor the configuration of SAMG-MPP to the customer's needs and to achieve the best performance for your application.

Contact

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