“Solvers for Coupled Problems on High Performance Computers”

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The demand for accurate and reliable numerical simulations of complex phenomena is increasing exponentially across a broad range of scientific and engineering applications. Problems like modeling fractal formation in macroscopic elasto-plasticity, simulation of biological systems, flow and transport in fractured formations, fluid-structure interaction are extremely challenging and require specific knowledge to address them. However, despite of the differences, there is always the need to discretize the underlying partial differential equations (PDEs) to approximate the continuous problems in an algebraic system of equations whose solution is obtained numerically.
In large scale simulations, the solution of linear systems of equations is often by far the most time-consuming part of the entire simulation process, taking ofen more than the 90% of the total computational time.
Addressing the request for larger simulations of multiphysics problems, involving billions of unknowns, requires the development of both technology and physics aware solution algorithms able to exploit modern HPC hardware.
The focus of this session is exploring the most recent methodologies available for efficiently solving coupled problems on massively parallel platforms providing researchers as well as practitioners a survey of the potentiality of HPC in real world multiphysics applications.