Towards Vectorised Block Krylov Parallel in Time Methods

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High order methods have shown great potential to overcome performance issues of simulations of partial differential equations (PDEs) on modern hardware, still many users stick to low-order, matrix-based simulations. While they are easy to implement, they are inherently memory bound due to a low arithmetic intensity. Hence, they do not benefit from the high level of concurrency of modern hardware architectures.

In this talk we present a new approach for the simulation of instationary PDEs that allows to partially mitigate the performance problems. By reformulating the original problem we derive a parallel in time (PinT) time integrator that increases the arithmetic intensity and introduces additional structure into the problem.

Based on a system for multiple time steps we will formulate a matrix equation that can be solved using vectorised solvers like Block Krylov methods. The structure of this approach makes it applicable for a wide range of linear and nonlinear problems.