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# On scalable space-time balancing domain-decomposition solvers

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The usual approach to transient problems is to exploit sequentiality in time, and solve one space problem every time step. This approach has recently been re-considered, motivated by the forthcoming exascale supercomputers with billions of cores. This sequential approach has a clear problem, parallelization cannot be exploited in time. Many key computational engineering problems, e.g., turbulent flow simulations, involve thousands to millions of time steps, and a scalable parallel solver in space leads can lead to unacceptable computation times in these problems. On the other hand, space parallelization always saturates at some point and to efficiently exploit the forthcoming exascale platforms one needs to exhibit further concurrency and less synchronization. In this situation, the development of space-time solvers is an excellent approach because deals with all time steps at once and exhibits much more concurrency than space-only solvers. In this presentation, we will introduce a new type of (non)linear space-time solvers for the solution of finite element systems arising from the discretization of transient problems, based on the novel extension of balancing domain decomposition methods to space-time, and show numerically the scalability of the proposed schemes on a set of academical problems, based on a highly scalable overlapped multilevel task implementation.