MAR12-2011-009204

Abstract for an Invited Paper
for the MAR12 Meeting of
the American Physical Society

Scalable DAG-Based PDE Frameworks for Multi-Scale Multi-Physics Problems[1]

MARTIN BERZINS, SCI Institute University of Utah, Salt Lake City, Utah

The task-based approach to software and parallelism is well-known and has been proposed as a potential candidate, named the silver model, for exascale software. This approach is not yet widely used in the large-scale multi-core parallel computing of complex systems of partial differential equations. The central idea is to use a Directed Acyclic Graph (DAG) based approach to express the structure of the underlying software. The aim of this talk is to explore the usefulness of DAG based approaches, using recent developments in the parallel Uintah software framework for partial differential equations to assess how well the DAG type approach works on present-day large-scale architectures for complex multi-physics multiscale applications up to 200K cores. As a result of these investigations, a preliminary and tentative evaluation of the DAG type approach for PDE software infrastructures will be given. The conclusion is that these approaches show great promise for petascale but that considerable algorithmic challenges remain.

[1]Support from NSF PetaApps and DOE NETL and INCITE is acknowledged