Solving Petascale Turbulent Combustion Problems With the Uintah Software

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Abstract

The Uintah Software is a general purpose software framework for solving fluid-structure interaction problems. In this talk we consider the application of Uintah to the turbulent combustion problems that arise from modeling large scale clean coal boilers that are nearly 100m tall and involve a variety of challenges including thermal radiation and linear solves.In order to solve problems at this scale it is necessary to use petascale computing and to be able to port the code to both present and future architectures. Uintah's novel programming model and runtime system makes this possible as does the use of a low-level performance portability layer Kokkos developed by Edwards et al. at DOEs Sandia Laboratory. This combination of approaches makes it possible to solve these problems in a scalable way by using some of the largest computers available today and to begin to do design on the form of the boiler to help make it as efficient as possible. This is joint work as part of the Utah PSAAP2 Center and involving about twenty of so of its members.

References

1. A. Humphrey and D. Sunderland and T. Harman and M. Berzins. . Radiative Heat Transfer Calculation on 16384 GPUs Using a Reverse Monte Carlo Ray Tracing Approach with Adaptive Mesh Refinement. Accepted - The 17th IEEE International Workshop on Parallel and Distributed Scientific and Engineering Computing (PDSEC 2016), 2016. .