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Progress Towards a Rad-Hydro Code for Modern Computing Architectures LA-UR-10-02825 J.G. WOHLBIER, CCS-2, LANL, R.B. LOWRIE, CCS-2, B. BERGEN, CCS-7, M. CALEF, CCS-2 — We are entering an era of high performance computing where data movement is the overwhelming bottleneck to scalable performance, as opposed to the speed of floating-point operations per processor. All multi-core hardware paradigms, whether heterogeneous or homogeneous, be it the Cell processor, GPGPU, or multi-core x86, share this common trait. In multi-physics applications such as inertial confinement fusion or astrophysics, one may be solving multi-material hydrodynamics with tabular equation of state data lookups, radiation transport, nuclear reactions, and charged particle transport in a single time cycle. The algorithms are intensely data dependent, e.g., EOS, opacity, nuclear data, and multi-core hardware memory restrictions are forcing code developers to rethink code and algorithm design. For the past two years LANL has been funding a small effort referred to as Multi-Physics on Multi-Core to explore ideas for code design as pertaining to inertial confinement fusion and astrophysics applications. The near term goals of this project are to have a multi-material radiation hydrodynamics capability, with tabular equation of state lookups, on cartesian and curvilinear block structured meshes. In the longer term we plan to add fully implicit multi-group radiation diffusion and material heat conduction, and block structured AMR. We will report on our progress to date.

J.G. Wohlbier
CCS-2, LANL

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