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Progress in Computational Co-Design of a Scale-bridging Plasma Simulation Algorithm for Emerging Architectures DANA KNOLL, WILL TAITANO, BHUVANA SRINIVASAN, JOSH PAYNE, BILL DAUGHTON, LUIS CHACON, AL MCPHERSON, DAVID DANIEL, LANL, COCOMANS TEAM — Los Alamos National Laboratory has recently initiated a new project on the topic of Computational Co-design of Multi-scale Algorithms in the Natural Sciences (Co-CoMANS). We define computational co-design and the synergistic interaction of Application, Algorithms and Architectures to produce a new class of physics simulation capability. One of our focus application areas is plasma physics, and one of the goals of the project is to demonstrate a paradigm shift in plasma kinetic simulation on emerging, heterogeneous computer architectures. We are developing moment-based scale-bridging algorithms with the goal of enabling system scale simulation with self-consistent kinetic effects. In this presentation we will discuss progress on 1) The overall scale-bridging algorithm, 2) Our IMEX solver approach to the full two-fluid moment system, 3) Performance profiling of our implicit electromagnetic particle push on a many-core + GPU node, and 4) Performance profiling of our overall scale-bridging algorithm in a multi-node many-core+GPU environment.

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