

Abstract Submitted
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Adaptation of a Multi-Block Structured Solver for Effective Use in a Hybrid CPU/GPU Massively Parallel Environment DAVID GUTZWILLER, Numeca USA, MATHIEU GONTIER¹, Numeca International, ALAIN DEMEULENAERE², Numeca USA — Multi-Block structured solvers hold many advantages over their unstructured counterparts, such as a smaller memory footprint and efficient serial performance. Historically, multi-block structured solvers have not been easily adapted for use in a High Performance Computing (HPC) environment, and the recent trend towards hybrid GPU/CPU architectures has further complicated the situation. This paper will elaborate on developments and innovations applied to the NUMECA FINE/Turbo solver that have allowed near-linear scalability with real-world problems on over 250 hybrid GPU/GPU cluster nodes. Discussion will focus on the implementation of virtual partitioning and load balancing algorithms using a novel meta-block concept. This implementation is transparent to the user, allowing all pre- and post-processing steps to be performed using a simple, unpartitioned grid topology. Additional discussion will elaborate on developments that have improved parallel performance, including fully parallel I/O with the ADIOS API and the GPU porting of the computationally heavy CPUBooster convergence acceleration module.

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