

AstroBEAR2.0 and its Performance on Blue Gene/Q

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Abstract

AstroBEAR is an Adaptive Mesh Refinement(AMR), multi-physics parallel code for astrophysics. AMR remains at the cutting edge of computational astrophysics. AMR simulations adaptively change resolution within a computational domain to ensure that the most important features of the dynamics are simulated with highest accuracy. By allowing quiescent regions to evolve with low resolution, AMR simulations achieve order of magnitude increases in computational speed. Current AMR simulations require algorithms that are highly parallelized and manage memory efficiently. Here we present both the AMR and parallelization algorithm used in the AstroBEAR 2.0 code. We also present the strong scaling test and optimization results of AstroBEAR on our flagship, the new Blue Gene/Q at CIRC.

Adaptive Mesh Refinement

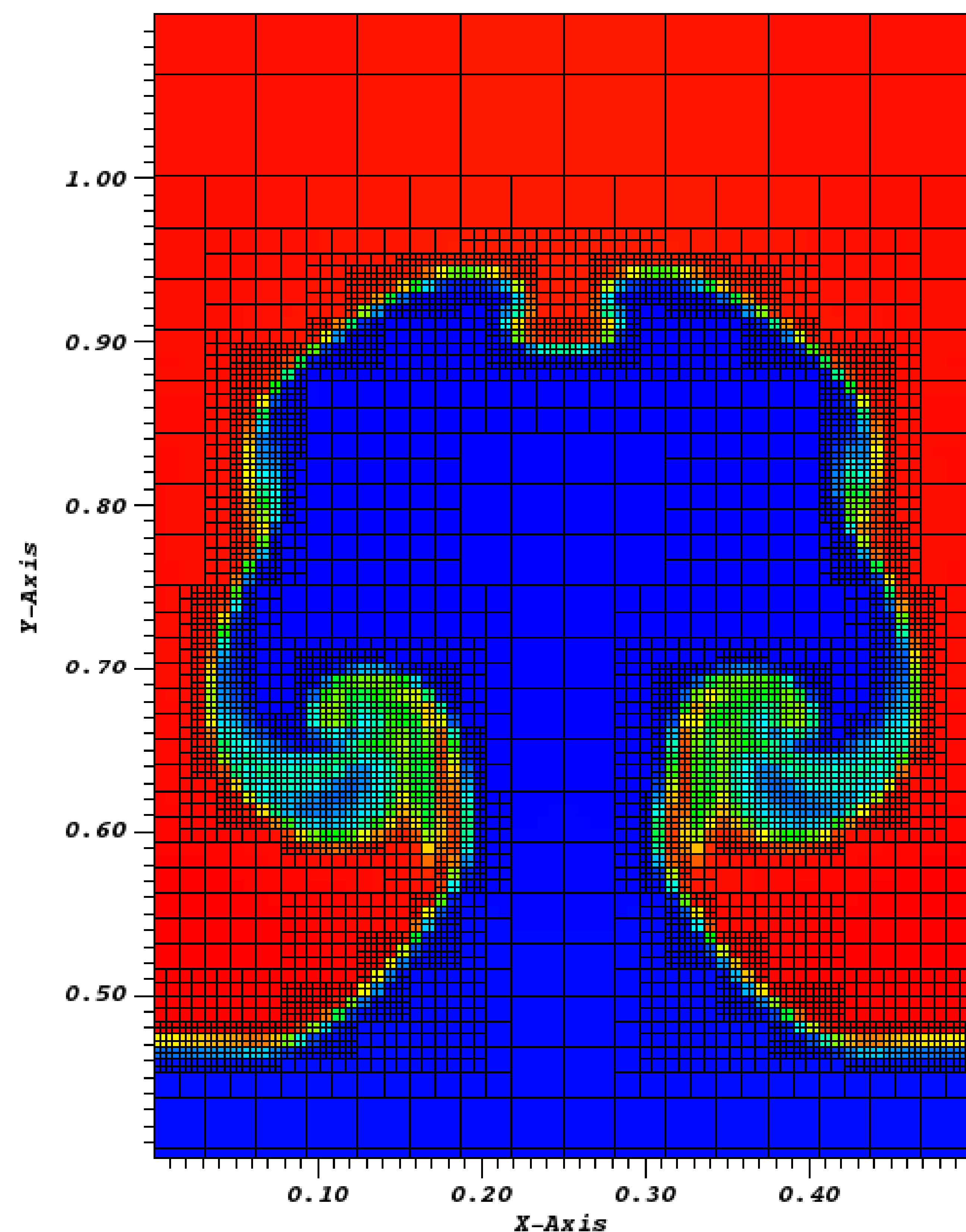


Figure 1: 2-level adaptive mesh refinement

Distributed Tree

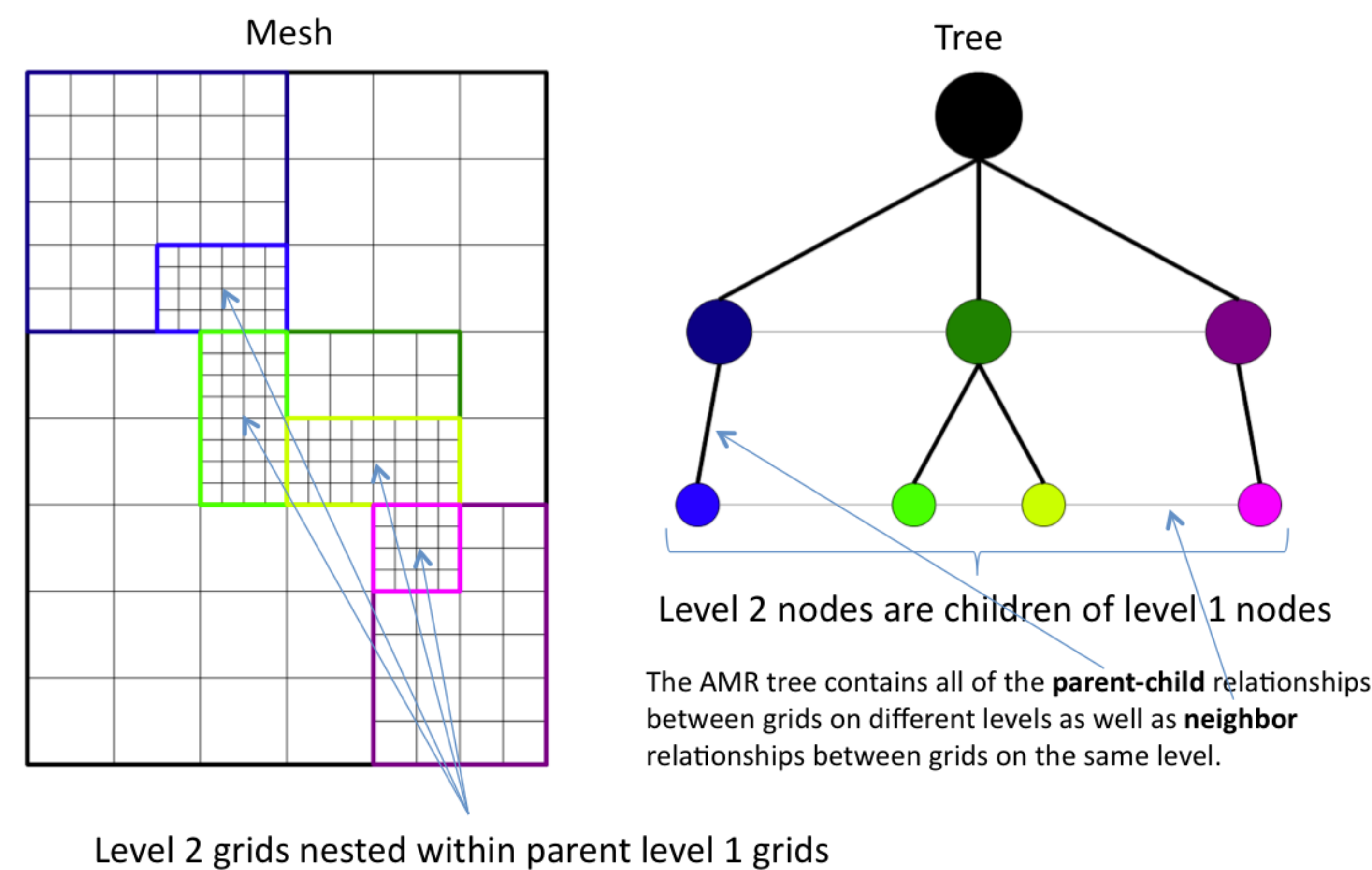


Figure 2: Distributed Tree in AstroBEAR2.0

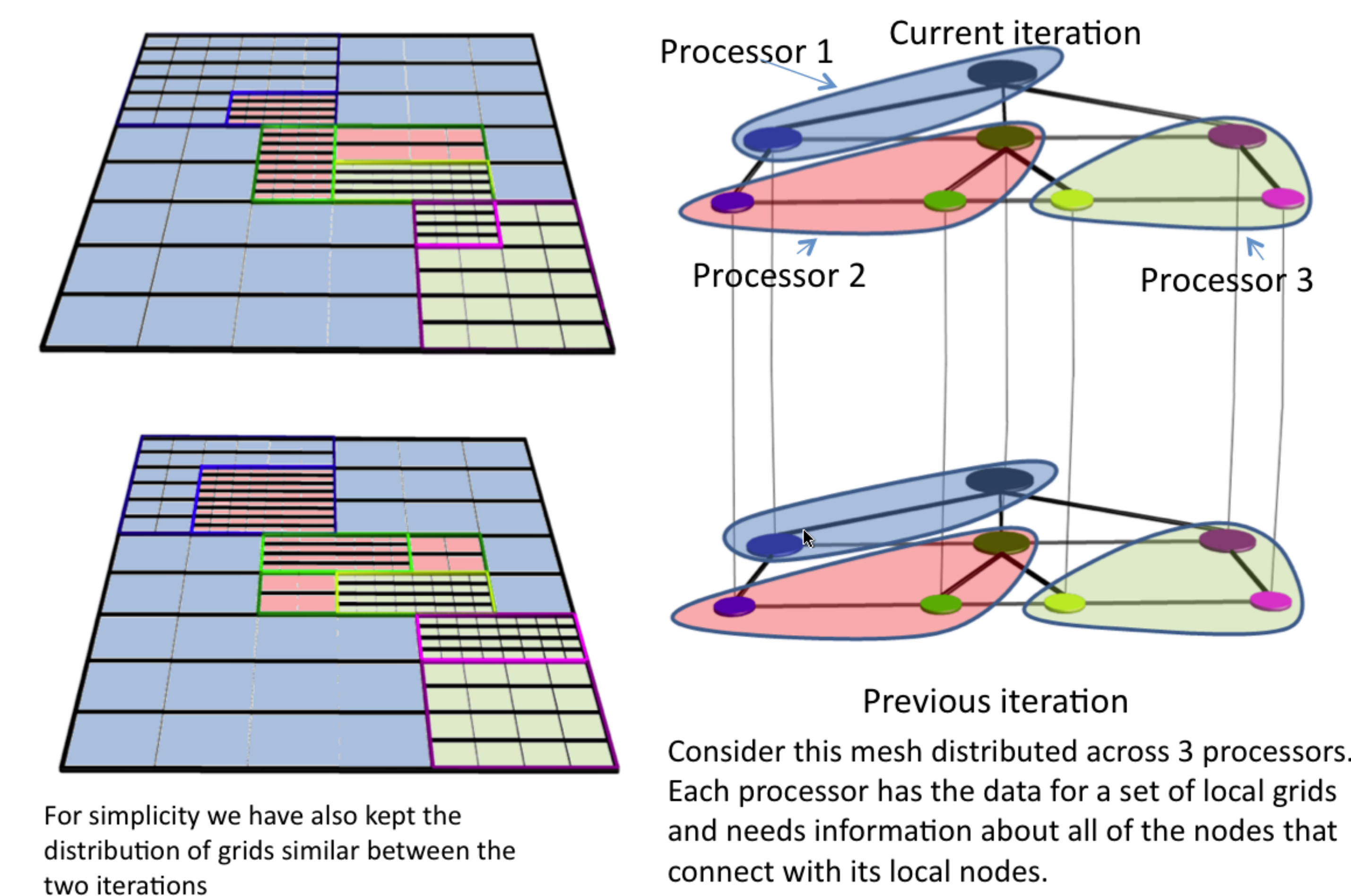


Figure 3: Cellulose speedup on BlueHive

Scaling Test Results on Blue Streak



Figure 4: Blue Streak

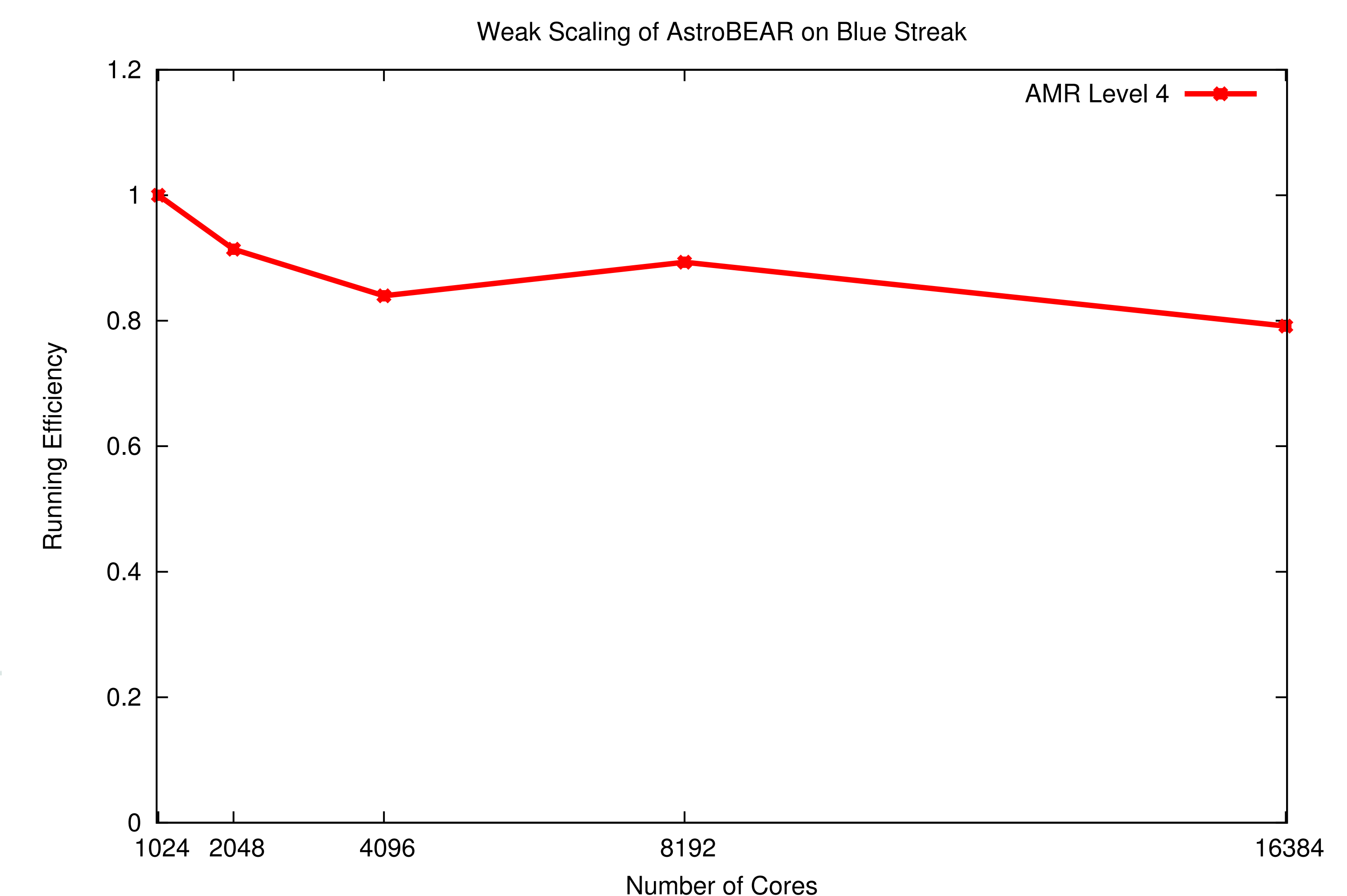


Figure 5: Scaling Test of AstroBEAR2.0 on Blue Streak