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**Using Manycore and Accelerated Architectures to  
Improve Performance of Robust Structured Multigrid  
Methods**

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Multigrid methods have long been used as efficient solvers for a large class of discrete differential equations. Recently, parallel multigrid solvers have been primarily implemented within an MPI model, with scalability to thousands of cores. With manycore GPU architectures gaining popularity, there is an increased desire to extend multigrid solvers to these architectures. In these environments, algebraic multigrid methods can be cumbersome due to their reliance on indirect addressing. In contrast, structured-grid methods, such as Dendy's Black Box Multigrid (BoxMG), achieve efficiency for heterogeneous problems with only direct addressing. We will discuss parallelization of BoxMG on a variety of architectures, and outline the implementation of accelerated BoxMG using OpenCL. By minimizing the data transfer between the CPU and GPU, we will show that significant performance improvements can be achieved over serial BoxMG, close to the bounds predicted by Amdahl's Law.