

---

David Appelhans  
**Massively Parallel Domain Decomposition Multigrid**

1115 35th St Apt A  
Boulder  
CO 80303  
`dappelha@gmail.com`  
Toby Jones  
Tom Manteuffel

This talk presents results on a domain decomposition multigrid method that builds a patchwork global solution from overlapping processor grids that do not communicate during a V-cycle. Typical domain decomposition parallel multigrid implementations exchange information along processor boundaries on each grid level; however, modern supercomputer architecture continues to add more computational power while communication remains expensive. This necessitates a new breed of numerical algorithms that are designed to minimize communication from the start, even at the expense of more on-processor computation. The method presented in this talk leverages the power of ACE adaptive mesh refinement and weighted FOSLS by specifying a weighted functional that emphasizes a processors domain and falls off with distance. By using this weighted functional with ACE, a grid is adaptively generated that focuses on the processor domain while still allocating grid points to areas outside the processor domain where the functional is large. The solutions from each processor are then patched into a global approximation and the process can be iterated.