

## Abstract

### **Looking Back Over the Last Year in HPC**

The last year has seen dramatic advances and some significant changes in high performance computing. After three years, the Earth Simulator has been replaced as the fastest computer in the world by the IBM Blue Gene/Lite. This marks not only a new threshold of computing but the entry of a new stage in system architecture: *High Density Computing*, which will become a major new impetus in realizing extremes in performance as we move ever closer to 1 Petaflops before the end of this decade. High density computing involves significant improvements in packaging with multicore chips, permitting far more function units and threads of control on a single die without major design changes to the processor core architectures. While the very high end engages a mix of system types, commodity clusters including Beowulf-class systems continue to increase their market penetration becoming the single dominant type of system. These and other advances in architecture have been matched with improvements in software tools for programming and system management. Progress in integrating geographically distributed systems through web services and grid methodologies is making for more effective community environments. And new programming languages like UPC, Co-Array Fortran, and the experimental Chapel are emerging to push effectiveness of large systems for a broader range of applications even as recent MPI-2 implementations become widely used. These and other advances that have occurred over the last year and promise to impact the evolution and capability of high performance computing will be described and their implications discussed during the annual event at ISC 2005.