

HPC CHALLENGE

<http://icl.cs.utk.edu/hpcc/>

Jack Dongarra and Piotr Luszczek of the Innovative Computing Lab (ICL) at the University of Tennessee Knoxville announced the new release of a benchmark suite—the HPC Challenge Benchmarks—at SC2004 in Pittsburgh, November 12, 2004 at a panel session. But work on the benchmark started more than a year earlier with the first result submissions dated November 5, 2003. March 2004 marked two important milestones for the benchmark: 1 Tflop/s was exceeded on HPL test and the first submission with over one thousand processors was recorded. FFT test was introduced in version 0.6 in May 2004 and the first submission was recorded in July the same year. As of early October 2005, the fastest system in the database obtained nearly 1 Tflop/s in the Global FFT test (three orders of magnitude increase over time). At the same time, the fastest (in terms of HPL) system is listed at position 11 on June's edition of TOP500 list, but the result recorded in the HPCC database is four percentage points higher in terms of efficiency. The system is only nine times slower than TOP500's number one entry. Finally, Global RandomAccess number is approaching 2: up three orders of magnitude from the early submissions. Even more exciting results will be unveiled during the HPCC Awards BOF at SC|05.

Jack Dongarra described the goals of the HPC Challenge Benchmarks: "The HPC Challenge Benchmarks will examine the performance of HPC architectures using kernels with more challenging memory access patterns than just the High Performance Linpack (HPL) benchmark used in the TOP500 list. The HPC Challenge Benchmarks are being designed to augment the TOP500 list, provide benchmarks that bound the performance of many real applications as a function of memory access characteristics—e.g., spatial and temporal locality, and provide a framework for including additional benchmarks." While not quite yet up to par with TOP500 in terms of HPL performance, HPCC already offers a far richer view of today's High End Computing (HEC) landscape and gives an unprecedented array of performance metrics for various analyses and comparison studies.

HPL

This is the widely used implementation of the Linpack TPP benchmark. It measures the sustained floating point rate of execution for solving a linear system of equations.

STREAM

A simple benchmark test that measures sustainable memory bandwidth (in GB/s) and the corresponding computation rate for four vector kernel codes.

RandomAccess

Measures the rate of integer updates to random locations in large global memory array.

HPCC has received exposure in numerous news outlets including Business Wire, Cnet, eWeek, HPCwire, and Yahoo!. The website receives over 100,000 hits per month and the source code download rates exceed 1,000 downloads per year. A different kind of publicity comes from the acquisition procedures as supercomputer centers around the world choose HPCC for their required performance testing from bidding vendors.

June 2005 marked the release of version 1.0 of the benchmark code and announcement of the HPCC Awards competition. In summary, the competition has two classes of submission; Class 1: Best Performance and Class 2: Most Productivity. The former invites submissions from large HPC installations around the globe and will award four winners (\$500 each) in four categories. The latter invites mostly source code submissions in various languages and stresses the productivity aspect of programming languages and HEC architectures. A single winner will be awarded \$1500. The competition is sponsored by HPCwire and the results will be announced during a BOF session at the SC|05 conference in Seattle, WA. Additional information on the awards competition can be found on the HPCC Awards website: <http://www.hpccchallenge.org/>

Development of the HPC Challenge Benchmarks is being funded by the Defense Advanced Research Projects Agency (DARPA) High Productivity Computing Systems (HPCS) Program. Robert Graybill is the HPCS program manager. "We are interested in not only improved performance, but also ease of programming. These two combined are what will give us the productivity that the national security community needs. The HPCS program is developing activity and purpose benchmarks to allow developers and users to accurately evaluate emerging HPC systems. The HPC Challenge Benchmarks are the first major release of the activity or performance oriented benchmarks."

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PTRANS

Implements parallel matrix transpose that exercises a large volume communication pattern whereby pairs of processes communicate with each other simultaneously.

FFT

Calculates a Discrete Fourier Transform (DFT) of very large one-dimensional complex data vector.

b_eff

Effective bandwidth benchmark is a set of MPI tests that measure the latency and bandwidth of a number of simultaneous communication patterns.