HPC CHALLENGE

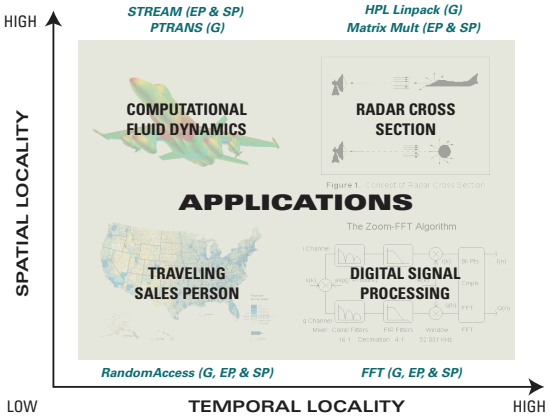
PROJECT GOALS

- Provide performance bounds in locality space using real world computational kernels
- Allow scaling of input data size and time to run according to the system capability
- Verify the results using standard error analysis
- Allow vendors and users to provide optimized code for superior performance
- Make the benchmark information continuously available to the public in order to disseminate performance tuning knowledge and record technological progress over time
- Ensure reproducibility of the results by detailed reporting of all aspects of benchmark runs

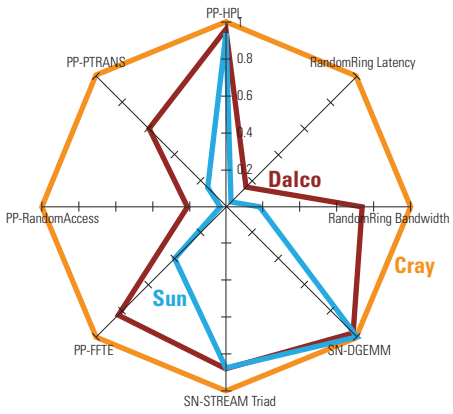
FEATURE HIGHLIGHTS OF HPCC 1.4.1

- New variants of RandomAccess that use Linear Congruential Random Number Generator
- New order of tests makes HPL run last so users may abort execution early if necessary
- Initialization of the main array of RandomAccess is no longer timed
- Global reduction is used for error calculation in MPI FFT to achieve more accurate error estimate
- Updated documentation
- New initialization and finalization routines allow proper setup of external software/hardware components without changing the rest of the HPCC testing harness.
- Fixed memory leaks in G-RandomAccess and FFT driver routines.
- Better interface to 64-bit versions of FFTW such as Intel's MKL.

LOCALITY SPACE OF MEMORY ACCESS IN APPLICATIONS



KIVIAT CHART WITH RESULTS FOR THREE DIFFERENT CLUSTERS

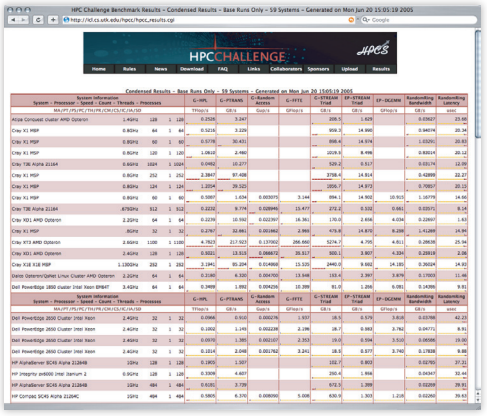


Dalco Opteron/QsNet Linux
Cluster AMD Opteron
64 procs – 2.2 GHz
1 thread/MPI process (64)
QsNetII
11-04-2004

Cray XD1 AMD Opteron
64 procs – 2.2 GHz
1 thread/MPI process (64)
RapidArray Interconnect System
11-22-2004

Sun Fire V20z Cluster AMD Opteron
64 procs – 2.2 GHz
1 thread/MPI process (64)
Gigabit Ethernet, Cisco 6509 switch
03-06-2005

HPCC RESULTS' PAGE



SUMMARY OF HPCC AWARDS

CLASS 1: Best Performance

- Best in G-HPL, EP-STREAM-Triad per system, G-RandomAccess, G-FFT
- There will be 4 winners (one in each category)

CLASS 2: Most Productivity

- One or more winners
- Judged by a panel at SC11 BOF
- Stresses elegance and performance
- Implementations in various (existing and new) languages are encouraged
- Submissions may include up to two kernels not present in HPCC
- Submission consists of: code, its description, performance numbers, and a presentation at the BOF

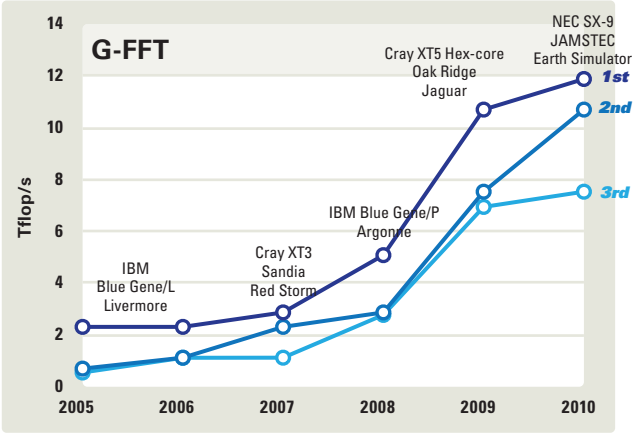
FIND OUT MORE AT **http://icl.eecs.utk.edu/hpcc/**

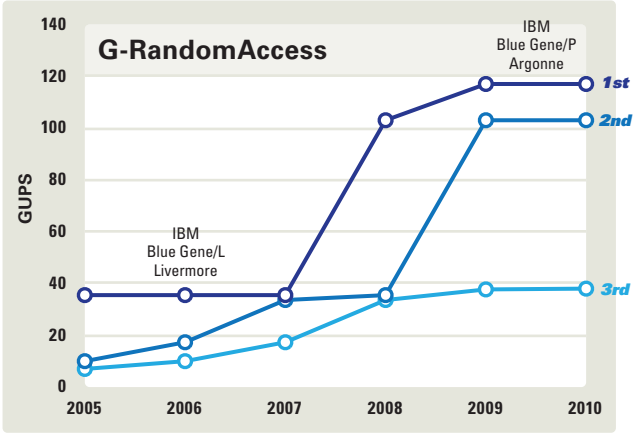
SPONSORED BY

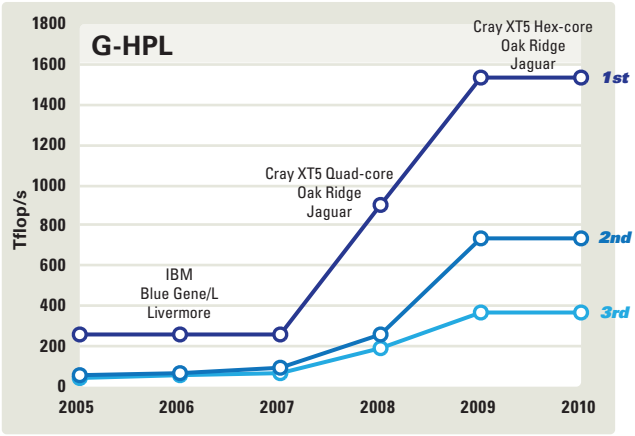
DARPA · DOE · NSF · IDC Analyze the Future · INNOVATIVE COMPUTING LABORATORY THE UNIVERSITY of TENNESSEE UT · CITR CENTER FOR INFORMATION TECHNOLOGY RESEARCH

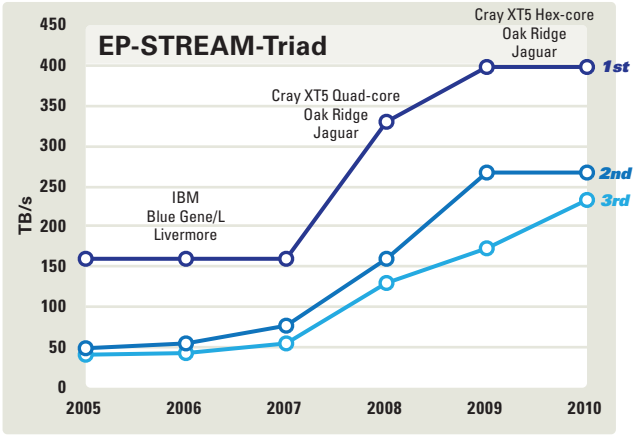
HPC CHALLENGE

HPCC AWARDS CLASS 1: PERFORMANCE









HPCC BENCHMARKS

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.

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.

DGEMM
Measures the floating point rate of execution of double precision real matrix-matrix multiplication.

FIND OUT MORE AT **http://icl.eecs.utk.edu/hpcc/**

SPONSORED BY

DARPA · DOE · NSF · IDC Analyze the Future

INNOVATIVE COMPUTING LABORATORY
THE UNIVERSITY of TENNESSEE UT

CITR
CENTER FOR INFORMATION TECHNOLOGY RESEARCH