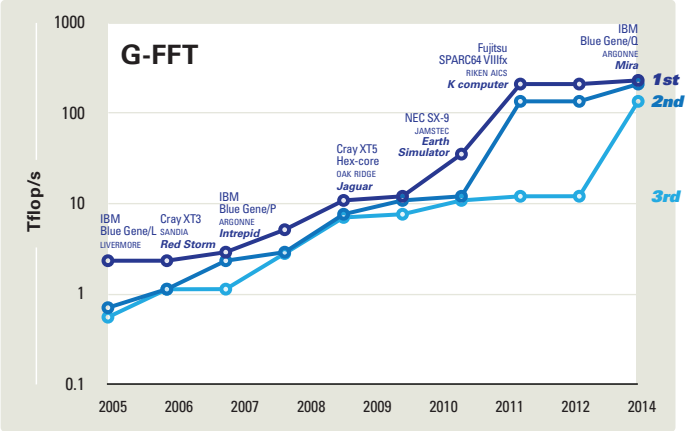
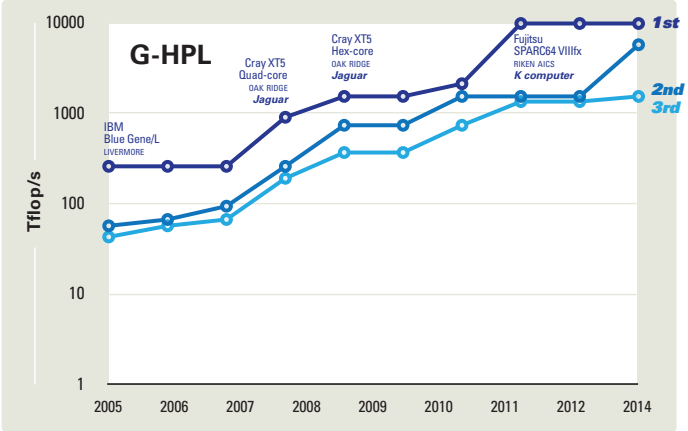
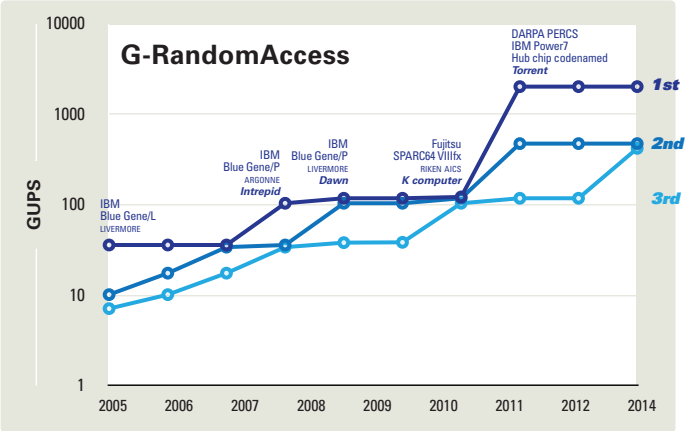
INNOVATIVE COMPUTING LABORATORY

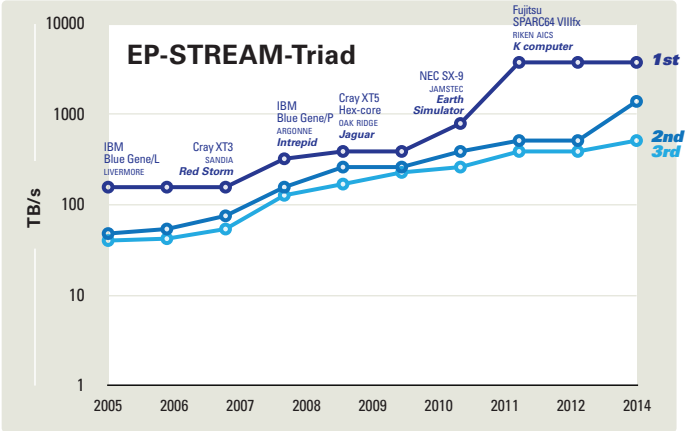
# HPC CHALLENGE

## HPCC AWARDS CLASS 1: PERFORMANCE




## HPCC BENCHMARKS

### HPL

This is the widely used implementation of the Linpack Toward Peak Performance 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 a 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 vectors.

### 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.

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# 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

## SUMMARY OF HPCC AWARDS

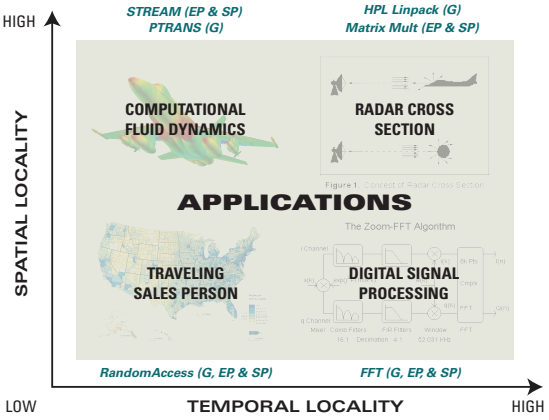
**CLASS 1: Best Performance**

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

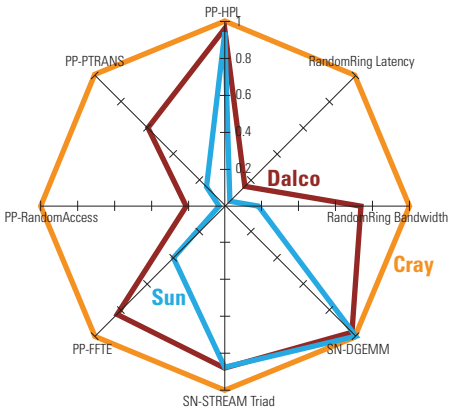
**CLASS 2: Most Productivity**

- One or more winners
- Judged by a panel at SC14 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

## LOCALITY SPACE OF MEMORY ACCESS IN APPLICATIONS




## KIVIAT CHART WITH RESULTS FOR THREE DIFFERENT CLUSTERS

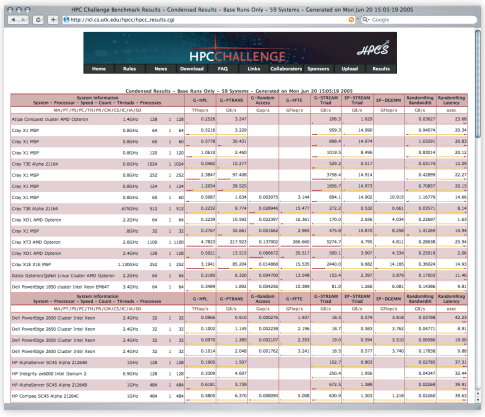



**Dalco** Opteron/QsNet Linux Cluster AMD Opteron
64 procs – 2.2 GHz
1 thread/MPI process (64)
QsNetII
11-04-2004

**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



## FEATURE HIGHLIGHTS OF HPCC 1.4.3

- Increased the size of scratch vector for local FFT tests that was missed in the previous version (reported by SGI)
- Added Makefile for Blue Gene/P contributed by Vasil Tsanov
- Released in August 2013

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