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RIKEN
University of Tsukuba
Fujitsu Limited

K computer No. 1 in Three HPC Challenge Award Benchmarks

Japanese supercomputer earns high marks in total performance for second year running

Tokyo and Tsukuba, Japan, November 14, 2012 – RIKEN, the University of Tsukuba, and Fujitsu today received top ranks in three of the four benchmarks at the 2012 HPC Challenge Awards (*1) for the performance of the K computer (*2). The awards were announced on November 13 in Salt Lake City at SC12, the International Conference for High Performance Computing, Networking, Storage and Analysis. The first-place rankings were received in the following three benchmarks used for evaluating the all-around performance of a supercomputer: (1) Global HPL, which measures the floating point rate of execution for solving a linear system of equations; (2) STREAM, which measures sustainable memory bandwidth and the corresponding computation rate for simple vector kernels; and (3) FFT, which measures the floating point rate of execution of double precision complex one-dimensional Discrete Fourier Transform. With this, the K computer demonstrated, for the second consecutive year, high performance as a general-purpose supercomputer.

The HPC Challenge benchmarks are benchmark programs designed to evaluate the overall performance of supercomputers in terms of processing performance in 28 tests derived from frequently used computational patterns in the field of scientific computation.

The K computer, which was developed jointly by RIKEN and Fujitsu as a part of the High-Performance Computing Infrastructure (HPCI) initiative led by Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT), was opened to shared use in September 2012. The University of Tsukuba contributed extensively to increasing the computational speed for the Global FFT benchmark.

The top three rankings achieved on the four benchmarks for the HPC Challenge Class 1 Awards for 2012 are as follows:

Global HPL	Performance (TFLOP/s)	System	Institutional Facility
1st place	9,796	K computer	RIKEN
1st runner up	1,534	Cray XT5	ORNL
2nd runner up	1,344	IBM Power 775	IBM Development Engineering
Global RandomAccess	**Performance (GUPS)**	**System**	**Institutional Facility**
1st place	2,021	IBM Power 775	IBM Development Engineering
1st runner up	472	K computer	RIKEN
2nd runner up	117	IBM BG/P	LLNL
EP STREAM (Triad) per system	**Performance (TB/s)**	**System**	**Institutional Facility**
1st place	3,857	K computer	RIKEN
1st runner up	525	IBM Power 775	IBM Development Engineering
2nd runner up	398	Cray XT5	ORNL
Global FFT	**Performance (TFLOP/s)**	**System**	**Institutional Facility**
1st place	205.9	K computer	RIKEN
1st runner up	132.7	IBM Power 775	IBM Development Engineering
2nd runner up	11.9	NEC SX-9	JAMSTEC

With the understanding that its use would be widely shared by researchers and engineers inside and outside RIKEN from the very start, the development of the K computer has proceeded with the aim of creating a supercomputer that combines superior computational performance with the versatility that enables it to run applications for a wide range of fields. The HPC Challenge results demonstrate the versatility of the K computer and the all-around high performance levels it delivers as a supercomputer.

Additional Information

- HPC Challenge Benchmark: http://icl.cs.utk.edu/hpcc/index.html
- The Development of the Next-Generation Supercomputer: http://www.nsc.riken.jp/index-eng.html
- RIKEN Advanced Institute for Computational Science: http://www.aics.riken.jp/en/
- Center for Computational Sciences, University of Tsukuba: http://www.ccs.tsukuba.ac.jp/CCS/eng/
- Fujitsu's website on the K computer: http://www.fujitsu.com/global/about/tech/k/

Glossary and Terms

1. HPC Challenge Awards

The HPC Challenge Awards consist of the Class 1 benchmark performance competition and the Class 2 “Most Productivity” awards for the most “elegant” implementation of computationally intensive kernels. The Class 1 awards consist of the following four benchmarks, each of which evaluates the performance of key system components (CPU computational performance, memory access performance, network transmission performance).

- Global HPL: operating speed in solving large-scale simultaneous linear equations
- Global RandomAccess: random memory access performance in parallel processing
- EP STREAM (Triad) per system: memory access speed under multiple loads
- Global FFT: total performance of Fast Fourier Transform

2. K computer

The K computer, which was jointly developed by RIKEN and Fujitsu, is part of the High-Performance Computing Infrastructure (HPCI) initiative led by Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT). The K computer's availability for shared use began in September 2012. The “K” in K computer comes from the Japanese Kanji character "Kei" which means ten peta or 10 to the 16th power. In its original sense, "Kei" expresses a large gateway, and it is hoped that the system will be a new gateway to computational science.

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About RIKEN

RIKEN is Japan's flagship research institute devoted to basic and applied research. Over 2500 papers by RIKEN researchers are published every year in reputable scientific and technical journals, covering topics ranging across a broad spectrum of disciplines including physics, chemistry, biology, medical science and engineering. RIKEN's advanced research environment and strong emphasis on interdisciplinary collaboration has earned itself an unparalleled reputation for scientific excellence in Japan and around the world. For more information, please see: http://www.riken.jp/

About University of Tsukuba

The University of Tsukuba aims to establish free exchange and close relationship in both basic and applied sciences with educational and research organizations and academic communities in Japan and overseas. The

university makes a contribution to the world through its educational system that seeks to make the most of students' creativity and individuality http://www.tsukuba.ac.jp/english/ http://www.ccs.tsukuba.ac.jp/CCS/eng/

About Fujitsu
Fujitsu is the leading Japanese information and communication technology (ICT) company offering a full range of technology products, solutions and services. Over 170,000 Fujitsu people support customers in more than 100 countries. We use our experience and the power of ICT to shape the future of society with our customers. Fujitsu Limited (TSE:6702) reported consolidated revenues of 4.5 trillion yen (US$54 billion) for the fiscal year ended March 31, 2012. For more information, please see http://www.fujitsu.com.