China’s Tianhe-2 Supercomputer Maintains Top Spot on 42nd TOP500 List

MANNHEIM, Germany; BERKELEY, Calif.; and KNOXVILLE, Tenn.—Tianhe-2, a supercomputer developed by China’s National University of Defense Technology, retained its position as the world’s No. 1 system with a performance of 33.86 petaflop/s (quadrillions of calculations per second) on the Linpack benchmark, according to the 42nd edition of the twice-yearly TOP500 list of the world’s most powerful supercomputers. The list was announced Nov. 18 at the SC13 conference in Denver, Colo.

Titan, a Cray XK7 system installed at the Department of Energy’s (DOE) Oak Ridge National Laboratory, remains the No. 2 system. It achieved 17.59 Pflop/s on the Linpack benchmark. Titan is one of the most energy efficient systems on the list consuming a total of 8.21 MW and delivering 2.143 gigaflops/W.

Sequoia, an IBM BlueGene/Q system installed at DOE’s Lawrence Livermore National Laboratory, is again the No. 3 system. It was first delivered in 2011 and achieved 17.17 Pflop/s on the Linpack benchmark.

Fujitsu’s K computer installed at the RIKEN Advanced Institute for Computational Science (AICS) in Kobe, Japan, is the No. 4 system with 10.51 Pflop/s on the Linpack benchmark.

Mira, a BlueGene/Q system installed at DOE’s Argonne National Laboratory, is No. 5 with 8.59 Pflop/s on the Linpack benchmark.

The new entry in the TOP10 is at No. 6—Piz Daint, a Cray XC30 system installed at the Swiss National Supercomputing Centre (CSCS) in Lugano, Switzerland and now the most powerful system in Europe. Piz Daint achieved 6.27 Pflop/s on the Linpack benchmark. Piz Daint is also the most energy efficient system in the TOP10 consuming a total of 2.33 MW and delivering 2.7 Gflops/W.

Rounding out the TOP10 are Stampede at the Texas Advanced Computing Center of the University of Texas, Austin, which slipped to No. 7; a BlueGene/Q system called JUEQEN installed at the Forschungszentrum Juelich in Germany is No. 8; No. 9 is taken by Vulcan, another IBM BlueGene/Q system at Lawrence Livermore National Laboratory; and No. 10 is the third system in Europe, the SuperMUC, installed at Leibniz Rechenzentrum in Germany.
The total combined performance of all 500 systems on the list is 250 Pflop/s. Half of the total performance is achieved by the top 17 systems on the list, with the other half of total performance spread among the remaining 483 systems.

Other highlights from the November 2013 TOP500 List, which can be found at www.top500.org, include:

- In all, there are 31 systems with performance greater than a petaflop/s on the list, an increase of five compared to the June 2013 list.
- The No. 1 system, Tianhe-2, and the No. 7 system, Stampede, are using Intel Xeon Phi processors to speed up their computational rate. The No. 2 system Titan and the No. 6 system Piz Daint are using NVIDIA GPUs to accelerate computation.
- A total of 53 systems on the list are using accelerator/co-processor technology, unchanged from June 2013. Thirty-eight (38) of these use NVIDIA chips, two use ATI Radeon, and there are now 13 systems with Intel MIC technology (Xeon Phi).
- Intel continues to provide the processors for the largest share (82.4 percent) of TOP500 systems.
- Ninety-four percent of the systems use processors with six or more cores and 75 percent have processors with eight or more cores.
- The number of systems installed in China has now stabilized at 63, compared with 65 on the last list. China occupies the No. 2 position as a user of HPC, behind the U.S. but ahead of Japan, UK, France, and Germany. Due to Tianhe-2, China this year also took the No. 2 position in the performance share, topping Japan.
- The last system on the newest list was listed at position 363 in the previous TOP500.

Geographical observations

- The U.S. is clearly the leading consumer of HPC systems with 265 of the 500 systems (253 last time). The European share (102 systems compared to 112 last time) is still lower than the Asian share (115 systems, down from 118 last time).
- Dominant countries in Asia are China with 63 systems (down from 65) and Japan with 28 systems (down from 30).
- In Europe, UK, France, and Germany, are almost equal with 23, 22, and 20 respectively.

About the TOP500 List

The first version of what became today’s TOP500 list started as an exercise for a small conference in Germany in June 1993. Out of curiosity, the authors decided to revisit the list in November 1993 to see how things had changed. About that time they realized they might be on to something and decided to continue compiling the list, which is now a much-anticipated, much-watched and much-debated twice-yearly event.

The TOP500 list is compiled by Hans Meuer of the University of Mannheim, Germany; Erich Strohmaier and Horst Simon of Lawrence Berkeley National Laboratory; and Jack Dongarra of the University of Tennessee, Knoxville.