



Chinese HPC with Homegrown Processors Takes Number 1 Spot in TOP500 List

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IDC's Quick Take

The latest [TOP500 list](#) of the world's most powerful computers was released this week at the [ISC 2016](#) conference in Frankfurt, Germany, and China continues to hold the number 1 spot for the sixth list in a row but this time with a new system, the Sunway TaihuLight, which uses a Chinese-designed many-core processor, a first for China. China has spent more than a decade working to produce HPC systems based on Chinese processors, and an appearance at number 1 with a system that uses exclusively Chinese-origin processors is a testament to the country's commitment and, indeed, growing technical prowess in the field; ultimately, the true value of this system will be revealed as Chinese developers work to effectively harness the raw computational capabilities and unique architectural features of both this new chip and the system in which it resides to address a wide range of important HPC-based applications.

News Highlights

The latest TOP500 list of the world's most powerful computers was released this week at the ISC 2016 conference in Frankfurt, Germany, and China continues to hold the number 1 spot for the sixth list in a row but this time with a new system, the Sunway TaihuLight. The system was developed by Beijing's National Research Center of Parallel Computer Engineering and Technology, and it is installed at the National Supercomputing Center in Wuxi. In reaching this top spot, the TaihuLight, with a theoretical peak performance of over 120 petaflops, achieved 93 petaflops on the LINPACK benchmark, almost three times faster than the previous top system, the Tianhe-2, another Chinese HPC, developed by China's National University for Defense Technology. The Tianhe-2, which uses primarily United States-based processors, now falls to the number 2 spot. In addition:

- For the rest of the top 10 system — none new to the list — only four were installed in the United States and one each in Japan, Switzerland, Germany, and Saudi Arabia.
- This marks the first time since the inception of the TOP500 that the United States is not home to the largest number of systems.

In a first for the Chinese, the new Sunway system is based on a Chinese-built many-core processor, the SW26010, designed by Shanghai High Performance IC Design Center. Heretofore, Chinese HPCs relied almost exclusively on United States-based processors. The only other major Chinese processor-based HPC was the predecessor to the TaihuLight, the Sunway BlueLight, which used a Chinese-designed 16 core chip. The BlueLight made its first appearance on the November 2011 list at number 14. For this most recent list, almost all other HPCs on the new list use United States-based Intel processors.

- The new TaihuLight system consists of over 10.6 million individual cores, more than three times the number in the Tianhe-2 and seven times more cores than any U.S. system ever built.

- The total system is organized into 40,960 nodes, and for each processor chip or node, there are four core groups and each of these groups has 65 cores — 64 computing cores designed for high-performance floating point calculations and 1 management core that oversees the operations of the other cores.
- The system has 32GB of DDR3 memory per node that must be shared across the more than computational 260 cores.
- At this time, there was limited details provided about the system's interconnect, although the system uses InfiniBand interconnect chips as a base for its custom interconnect.

IDC's Point of View

China has spent more than a decade working to produce an indigenously built system based on Chinese processors, and an appearance at number 1 on the TOP500 list with a system that uses exclusively Chinese-origin processors is a testament to the country's commitment and, indeed, growing technical prowess in the field. Clearly, this new machine is well designed and constructed to maximize its performance on basic, albeit some limited, benchmark tests, like LINPACK. In addition:

- The real value of this system and, indeed, of the current ability of the Chinese to advance the state of the art in HPC computing design and use will be revealed as Chinese developers work to effectively harness the raw computational capabilities and unique architectural features of both this new chip and the system in which it resides to address a wide range of applications.
- Target applications for the Sunway are to include advanced manufacturing, earth system modeling and weather forecasting, life science, and big data analytics.
- Sunway developers have made available some early and impressive results from applications on the system that have been run successfully on over 8 million cores achieving a 30–40 petaflops sustained performance rate.
- However, this turns out for the Sunway machine, the Chinese have sent a clear message to the world with this system that they are committed to developing leading-edge HPCs and that they will be working hard to ensure that they can rely on a base of indigenous technology to support that vision.

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