The New York Times https://www.nytimes.com/2016/06/21/technology/china-tops-list-of-fastest-computers-again.html

China Wins New Bragging Rights in Supercomputers

By John Markoff
June 20, 2016

See how this article appeared when it was originally published on NYTimes.com.

SAN FRANCISCO — A new list of the world's fastest supercomputers provides more evidence that the once-yawning technology gap between the United States and China is closing.

China dominates a biannual ranking of the world's 500 fastest supercomputers, called the Top500, that was published on Monday. Not only does China have the world's fastest machine for the seventh consecutive time, it has the largest number of computers among the top 500 — a first for any country other than the United States.

Also for the first time, the world's fastest supercomputer uses Chinese-made microprocessor chips instead of chips from Silicon Valley's Intel.

Supercomputers are viewed in scientific circles as an indicator of national technology leadership, and they are vital for research in areas ranging from the development of new weapons and medicines, to the design of cars and consumer products. American computing experts and business executives have warned for years that leadership in supercomputing is vital to a range of national interests.

“Today even consumer detergent bottles are designed with supercomputers,” said Eric D. Isaacs, a physicist and provost of the University of Chicago. “The Chinese are getting good at building these computers, and it’s a competitive issue now for U.S. industry and national security.”

The United States primacy on the Top500 list has slipped for a number of reasons. Government support for supercomputing has been slowed by long-running debates on the level of federal spending on basic scientific research, as well as opposition to funding for industrial innovation that is not directly related to national security.

In the private sector, companies like Google, Microsoft, Facebook and Amazon invested billions of dollars in cloud-computing centers that don’t focus as much on solving scientific problems.

And last year, the United States blocked the sale of a number of advanced microprocessors to China over concerns they were being used in nuclear weapon development, which most likely accelerated the development of China’s own technology, said Jack Dongarra, a University of Tennessee computer scientist who helped create the list of the world’s fastest computers in 1993.

The Top500 list is maintained by Dr. Dongarra and Erich Strohmaier, a physicist at Lawrence Berkeley National Laboratory. Individual computing centers report descriptions and performance to them twice a year.

In 2001, there were no Chinese supercomputers on the Top500. Now, China has 167 systems on the list compared to 165 from the United States. China also leads a more obscure category — total processing power, or the combined computing speeds of all of its supercomputers on the list.

The fastest machine, the Sunway TaihuLight System, was installed this year at the National Supercomputing Center in Wuxi, in China’s Jiangsu province.

Despite those achievements, Intel still provided the chips for 91 percent of the machines on the list. And China is still catching up with the United States in state-of-the-art technologies, like software and the networking that links the thousands of chips in a modern supercomputer.



The Sunway TaihuLight was ranked in the latest Top500 list as the fastest supercomputer in the world. It uses Chinese-made microprocessors. Li Xiang/Xinhua, via Associated Press

But that could soon change. Officials at the Semiconductor Industry Association, a trade group, said the Chinese government has an ambitious $150 billion program to acquire as well as develop new technologies in various kinds of chips.

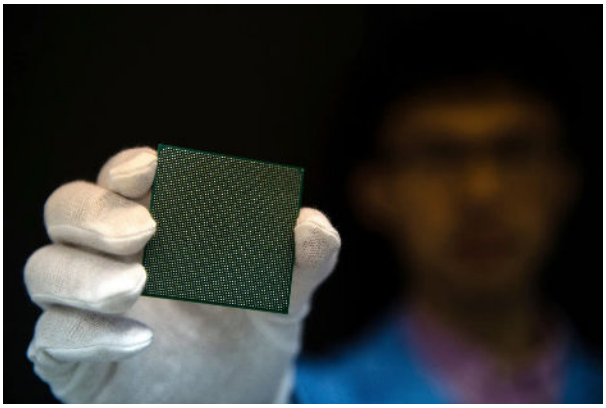
After years of neglect, the United States does appear to be taking the competitive threat seriously, said John Neuffer, president of the S.I.A. “It’s an opportunity for us to double down on supercomputing and get ourselves back on track,” he said.

Last year, the Obama administration began a new effort to develop a so-called “exascale” supercomputer that would be 10 times faster than today’s fastest supercomputers. (An exaflop is a quintillion — one million trillion — mathematical instructions a second.) Computer scientists have argued that such machines will allow more definitive answers on crucial questions such as the danger posed by climate change.

Until President Obama signed the National Strategic Computing Initiative last July, the construction of the fastest American supercomputers had largely been driven by the nation's Stockpile Stewardship and Management program, which was created in 1995 to simulate the testing and maintenance of nuclear weapons.

While the Chinese have perfected the manufacture of traditional supercomputers pioneered by American companies like IBM and Cray, the United States may focus on new, more efficient supercomputers that might lead to machines intended for challenges like artificial intelligence, according to Larry Smarr, a physicist who directs the California Institute for Telecommunications and Information Technology at the University of California, San Diego.

One of the design challenges of the fastest computers is their vast power consumption. The world's fastest supercomputer in China, which could fill a large warehouse, requires the same electric power needed to run roughly 15,000 homes. An exascale supercomputer will very likely require more than twice that amount of power, or roughly the amount of power produced by the Copper Mountain Solar Facility, the largest producer of solar power in the United States.



A processor used in the Sunway TaihuLight.
Li Xiang/Xinhua, via Associated Press

At the same time, even if the United States is able to design an exascale computer within the next decade, the Chinese could get there first. According to Dr. Dongarra, the Chinese government is committed to reaching the exascale goal by the end of this decade.

Because of funding shortages and technology challenges, “there has been a delay in getting the exascale launched in the U.S., and as a result, we’re further behind than we should be,” he said.

The Sunway supercomputer in Wuxi is a marvel of Chinese manufacturing prowess, Dr. Dongorra noted. The computer is based on 10.6 million processor “cores” spread across 40,960 microprocessors that work together. The chips are relatively slow individually — about the speed of the processor in Apple’s iPhone 6.

The Sunway machine does have its shortcomings. It has older memory-chip technology, meaning it is limited in the speed with which it can move data in and out of each processor when compared with the most powerful American supercomputers. And the new Chinese supercomputer is still based on American-made optical network technology that is used to connect the thousands of microprocessor chips.

Despite the fact that the Chinese now have the most supercomputers on the list, the United States still dominates the top 20, with 10 machines. There are now 105 supercomputers in Europe. Japan has 29 systems on the list, down from 37 systems in November.

Several American scientists compared what is going on now to the 1980s, when they worried that the nation was losing ground to Japanese supercomputers.

“Scientists might be saying, ‘I have to go to China to run my computations,’” said Dr. Smarr.

A version of this article appears in print on , Section B, Page 1 of the New York edition with the headline: China Crowds Top Computer List