Japanese Supercomputer Is Crowned World's Speediest

In the race for the most powerful computers, Fugaku, a Japanese supercomputer, recently beat American and Chinese machines.

By Don Clark
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China and the United States are locked in a contest to develop the world's most powerful computers. Now a massive machine in Japan has topped them both.

A long-awaited supercomputer called Fugaku, installed in the city of Kobe by the government-sponsored Riken institute, took first place in a twice-yearly speed ranking that was released on Monday. The Japanese machine carried out 2.8 times more calculations a second than an IBM system at Oak Ridge National Laboratory in Tennessee, which Fugaku bumped to second place in the so-called Top500 list.

Another IBM system, at Lawrence Livermore National Laboratory in California, slid to third place in the ranking from second, while systems in China moved to the fourth and fifth spots from third and fourth.

Supercomputers have become a symbol for both technical and economic competitiveness. The room-size systems are used for complex military and scientific tasks, including breaking codes, modeling climate change and simulating new designs for cars, weapons, aircraft and drugs. Riken has said Fugaku is already being used to help study, diagnose and treat Covid-19.

Japan remains a relatively small player in supercomputing. China placed 226 systems in the latest Top500 list; the U.S. total was 114, though they accounted for a greater share of aggregate computing power.

But Japan has a long history of pushing the state of the art in computing. A prominent example is the K Supercomputer, its predecessor at Riken, which took the No. 1 spot on the Top500 list in 2011 before being displaced the next year by a system at Livermore.

“The predecessor was just a knockout,” said Steve Conway, a veteran analyst of the supercomputer market who is a senior adviser at the firm Hyperion Research. “People are expecting this to be very good also.”

Horst Simon, who has studied Fugaku as deputy director of research at Lawrence Berkeley National Laboratory in California, called it a “very remarkable, very admirable” product. But it may not last long as the world’s fastest supercomputer in view of forthcoming Department of Energy systems at Oak Ridge and Livermore and likely advances in China, he said.

Fugaku, another name for Mount Fuji, required some lofty spending. The six-year budget for the system and related technology development totaled about $1 billion, compared with the $600 million price tags for the biggest planned U.S. systems.

The machine may also make waves because of its computer chips. Fujitsu, Riken’s partner in developing Fugaku, chose to design processors using the basic technology at the heart of billions of smartphones. It licensed designs from Arm, a company long based in Britain that is now owned by the Japanese conglomerate SoftBank.

By contrast, most supercomputers use microprocessors that evolved from the chips that Intel and Advanced Micro Devices first sold for PCs. The most powerful machines have been accelerated using more specialized chips, such as the Nvidia graphics processors used to run video games and, more recently, artificial intelligence applications.

Arm licensees have tried for years to gain a foothold in data centers without much success. But the cloud service operated by Amazon has begun aggressively promoting Arm-based offerings.

Christopher Bergey, senior vice president of Arm's infrastructure business, predicts more gains in high-performance computing. For one thing, the longtime supercomputer maker Cray, recently bought by Hewlett Packard Enterprise, plans to sell systems based on Fujitsu's Arm-based chips.

Fugaku "is the culmination of almost 10 years of investment and work," Mr. Bergey said. "It's a pretty exciting time."

The Top500 list, compiled by researchers in the United States and Germany, is being released to coincide with a supercomputing event that is ordinarily held in Frankfurt but that is going virtual this year because of the coronavirus pandemic.

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