

World's Fastest Computer Used For Science, Not Bombs

Duncan Mansfield, Associated Press Writer

KNOXVILLE, Tenn. (AP) — At least for the moment, the world's fastest supercomputer is devoted to solving scientific questions that may save the planet — climate change, renewable energy, new medicines — rather than advances in nuclear weapons that might blow it up.

The Oak Ridge National Laboratory's high-performance Jaguar XT5 computer, built by Seattle-based Cray Inc., was named Monday as the fastest on the planet in the latest semiannual TOP500 list of the world's most powerful supercomputers.

After a \$19.9 million upgrade funded with federal economic stimulus money, Jaguar posted a performance speed of 1.759 petaflops or quadrillions of calculations per second.

That dropped previous No. 1 Los Alamos National Laboratory's IBM Roadrunner system in New Mexico to No. 2 with a speed of 1.04 petaflops.

Jaguar's stablemate at Oak Ridge, named Kraken, was ranked No. 3 with a speed of 831.7 teraflops or trillions of calculations per second. That makes the National Science Foundation-funded, Cray-built supercomputer owned by the University of Tennessee and the National Institute for Computational Sciences the top "academic" supercomputer in the world.

The U.S. Department of Energy owns both Jaguar and Roadrunner, but uses them for different purposes. Jaguar is an "open science" tool for peer-reviewed research on a wide range of subjects. Roadrunner is devoted to the complex and classified evaluation of U.S. nuclear weapons.

"That tells you that science is really important, particularly for tackling some of the biggest challenges that we are facing today," said Thomas Zacharia, the Oak Ridge Lab's deputy director for science and technology.

"When you make these big trillion-dollar bets on energy, it needs to be informed by the best climate science," he said. "This machine is at the intersection of better climate change science and energy technology policy."

Computer scientist Jack Dongarra at the University of Tennessee, who compiles the TOP500 list with colleagues at the University of Mannheim in Germany and the Lawrence Berkeley National Laboratory, noted this is not the first time an "open science" machine has led the list.

"No, the Japanese Earth Simulator was an 'open science' machine and was on the

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Published on Industrial Maintenance & Plant Operation (<http://www.impomag.com>)

Top500 for a number of years," he said.

Ray Orbach, a former DOE undersecretary for science, said the DOE's National Nuclear Security Administration has supercomputers in development that will likely leapfrog Jaguar in the next ranking. He believes they rightly "should be" faster considering their purpose.

"The real issue is whether the United States is in front (of other nations) because high-end computing is so important for industry and science," said Orbach, now director of an energy institute at the University of Texas in Austin.

In 2002, the Japanese Earth Simulator was 100 times faster than anything in the United States, said Orbach, adding he never dreamed of reaching petaflop speed by 2009 when he helped set the course five years ago for what has become a dramatic increase in U.S. computing capability — roughly doubling in speed ever 9 months.

The questions scientists are hoping to solve with these machines run the gamut from the origins of the universe to the science of soap bubbles.

The National Oceanic and Atmospheric Administration, for instance, is using the Oak Ridge computers to develop high-resolution models to predict climate change on a regional scale. The University of Tennessee and the Oak Ridge Lab are studying the interaction of enzymes in plant cell walls to develop a new generation of ethanol. And Argonne National Laboratory and Oak Ridge Lab are developing new algorithms for fast reactors that would produce smaller amounts of nuclear waste.

Meanwhile, demand for Jaguar continues to build. Some 1 billion processor hours have been awarded to researchers on Jaguar in 2010, less than half of the amount requested.

"Science is moving more toward higher levels of complexity," said Arden Bement, director of the National Science Foundation. "Now, in some cases because of the difficulty involved in solving these grand challenges, one almost has to have a visual conception because the brain can't process so many bits of information."

The models and simulations created by these supercomputers lets "you get closer to the truth," he said.

David Millhorn, the University of Tennessee executive vice president for research and economic development, said the location of the world's No. 1 and No. 3 fastest machines at the UT-managed Oak Ridge Lab could be a boon for the university.

"It means the university will play a role in helping solve and find answers to the most complex problems we have facing us right now that will be done with computational approaches," he said. "It puts us on the roadmap. I don't think UT has ever been in that position before."

"This is just the latest in a series of successes for the University of Tennessee as it progresses toward achieving world-class research status," Tennessee Gov. Phil

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Bredesen said in a statement. "The combined resources of UT and its partners in Oak Ridge are positioning Tennessee as a global epicenter for supercomputing."

Besides Jaguar and Kraken, Oak Ridge hosts the No. 15, No. 29 and No. 376 fastest computers on the TOPO500 list.

Source URL (retrieved on 12/24/2014 - 10:10pm):

<http://www.impomag.com/news/2009/11/worlds-fastest-computer-used-science-not-bombs>