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# US$4m centre to develop software for multithreaded supercomputing

*By Liz Tay*
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Applications

**The U.S. Department of Defense (DoD) has established a new research centre as an aim to develop software for a new breed of multithreaded supercomputers.**

A US$4m joint project of U.S. government organisations, universities, and Cray, the newly-established Center for Adaptive Supercomputing Software will research data-intensive applications ranging from internet security and power grid stability to complex biological networks.

Applications will be built on the ability of multithreaded supercomputers to access data in parallel, using processors that enable multiple, simultaneous processing compared with the linear and slower approach of conventional systems.

In traditional supercomputers, each processing chip is given a certain amount of memory to use for its computations. Processor-memory units are linked over a network, and performance improvements come with more and faster processors and sleek network connections.

The Cray XMT multithreaded system, which will be used at the centre, operates differently.

By lumping all the memory together and allowing each processor to freely access a much larger communal memory pool, the multithreaded supercomputer allows each processor to perform multiple computations simultaneously.

The Cray XMT, is scalable to be able to handle hundreds of thousands of threads -- portions of a program that can run independently of and concurrently with other portions of the program -- in shared memory.

"The processors are doing useful work all the time, so the computer can be faster," explained Daniel Chavarría, a computational scientist at the Department of Energy's Pacific Northwest National Laboratory, which is leading the project.

"Traditional supercomputers are not well suited for certain kinds of data analysis, so we want to explore this advanced architecture," he said.

Multithreaded machines also are expected to consume less power than their conventional supercomputing counterparts.

Although the Cray has not yet been tested, other multithreaded machines have shown reduced energy usage compared to traditional architectures.

Already, the multithreaded supercomputers like the Cray XMT have been used to run power grid software at speeds 10 times those of conventional machines and discover genes implicated in breast cancer using a massively multithreaded algorithm.

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