New supercomputer supports intelligence, surveillance, and reconnaissance research & development

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by Derek Kaufman
88th Air Base Wing Public Affairs

8/27/2009 - **WRIGHT-PATTERSON AIR FORCE BASE, Ohio** -- Desch, one of the world's most powerful supercomputers, will be dedicated during a ribbon-cutting ceremony here August 31.

The Air Force's newest supercomputer, built by Silicon Graphics Incorporated, is named after Dayton engineer Joseph Desch, who led a team which built a computing machine during World War II to decipher messages encrypted using the Nazi Enigma code.

The "Desch" is a custom-designed SGI Altix ICE 8200 that has been optimized and will be dedicated exclusively to support real-time translation of synthetic aperture radar data into high-resolution 3-dimensional video images from the Gotcha radar system being developed by the Air Force Research Laboratory here.

"The goal is to provide an extremely high-fidelity, all-weather intelligence, reconnaissance and surveillance capability that can observe activity over an entire city," said Dr. Dave Jerome, director of the AFRL's Sensors Directorate at Wright-Patterson.

In development for several years, the Gotcha radar was first tested in 2006, looking at a 1-kilometer sized city section. The new computing capability will enable conversion of Gotcha's real-time radar data into a 400 megapixel image every second over a circle of about five kilometers, Dr. Jerome said. Gotcha is part of AFRL's portfolio of research efforts to provide enhanced ISR capabilities to future joint warfighters.

Desch is an SGI Altix platform with 2,048 Intel Nehalem processors, 3 terabytes of random access memory, 87 terabytes of fast storage, and 16 gigabits per second data communication between processors, said Tom Majumder, Sensor's Directorate engineer. Majumder and fellow researcher Dr. Mike Minardi work in the Automatic Target Recognition Division developing the Gotcha radar system.

Desch has been benchmarked at 23 trillion floating point operations per second, currently making it number 308 on the official list of the 500 fastest computers in the world, Dr. Minardi said.

The $2.2 million Desch system is paired with a dedicated smaller companion SGI Altix 450 system which uses a shared memory architecture, optimized to speed translation of Desch's high-resolution images into a virtual mosaic that users can manipulate. Gotcha program manager Minardi said the smaller system - nicknamed "Bombe" after the World War II decoding machines designed by Joseph Desch - significantly enhances processing efficiency and real-time imagery output.

The system was funded by the DOD High Performance Computing Modernization Program.

The AFRL's Desch supercomputer will be housed alongside the "Eagle" (SGI Altix 3700), "Falcon" (Hewlett Packard XC Opteron) and "Hawk" (SGI Altix 4700) supercomputers in the DOD Supercomputing Resource Center at Wright-Patterson's Area B. The computing power of each of those systems is shared virtually among various DOD and other government users for a variety of tasks, ranging from aircraft design and simulation to protecting submarines from underwater explosions.

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