OSC supports DoD's efforts to scale radar tomography analysis efforts to larger supercomputers

The Air Force Research Laboratory, Sensors Directorate, Advanced Radar Waveforms & Processing Branch recently installed a remote testing facility to gather data for radio frequency (RF) tomography technology. Because the quantity of collected data would increase exponentially once the testing site was operational, the military analysts turned to Ohio Supercomputer Center experts for assistance in adapting existing RF analysis programs to the military's high performance computing systems.

The AFRL research team already used Star-P, a commercial software platform, to seamlessly convert to parallel the programming codes written in MATLAB, a different commercial software program. However, the team members had used only Star-P on their in-laboratory Altix computer. By studying results with different sizes of problems on increasing numbers of processors, OSC staff evaluated the potential effectiveness of using Star-P for the tomography code on much larger military supercomputers.

"OSC provided valuable information about how to use Star-P to shorten time between field experiments, direction regarding the structure for existing parallel programs, and ways to shorten the time to develop a deployable system," said Kevin Magde, AFRL Sensors Directorate, Advanced Radar Waveforms & Processing Branch. "While the RF tomography effort is in relatively early stages, its eventual capability will have tremendous impacts on Department of Defense surveillance operations worldwide." ■

Project lead: Bracy Elton, Ph.D., OSC
Research title: Usability & scalability of a Star-P/MATLAB application for ultra narrow band tomography on HPC system
Funding source: Department of Defense High Performance Computing Modernization Program

Keeping pace with the world's fastest supercomputers

In the near future, the world's fastest supercomputers will incorporate millions of processing elements, a substantial increase in scale over the high performance computing systems in use at leading research centers today. At the same time, however, the rates at which users can access data storage devices, such as hard disks, are not increasing at the same rate.

In fact, the overall ability of file systems to input and output data within these high performance computers is not keeping pace with the increases in raw compute power. Even commercial file systems used on the largest cluster computers — designed for competitiveness in the larger business market — are being stretched to address the demands of the most powerful systems.

Research scientists at the Ohio Supercomputer Center are part of a team researching this issue for the Department of Energy, which, incidentally, owns and operates several of the world's most powerful supercomputers.

"A comprehensive software solution is needed to bridge the gap between processing trends and I/O systems so that leadership-class machines can most efficiently leverage the available storage resources," the DOE grant proposal states.

The team will create a software package that will operate on the IBM Blue Gene, Cray XT, Roadrunner and Linux cluster platforms and function on a variety of file systems. The package will be designed as open-source software and be available online. ■

Project leads: Rob Ross, Argonne National Laboratory, & James Nunez, Los Alamos National Laboratory
Research title: Common HEC I/O forwarding scalability layer
Funding source: U.S. Department of Energy