

Oak Ridge Leadership Computing Facility Snapshot

The Week of April 19, 2010

Oak Ridge Leadership Computing Facility Gets a Visit from the secretary of energy

Steven Chu stops by the world's fastest supercomputer during 2-day visit to Oak Ridge

On March 23 Secretary of Energy Steven Chu toured the Oak Ridge Leadership Computing Facility (OLCF) at Oak Ridge National Laboratory (ORNL). The stop was part of a 2-day visit to Oak Ridge to dedicate a new uranium storehouse at the Y-12 National Security Complex and announce a noncompetitive extension of the contract to operate ORNL.

Chu's tour of the OLCF included stops at the world's fastest supercomputer, the Cray XT5 known as Jaguar, and the EVEREST PowerWall, a state-of-the-art visualization and data interpretation facility. The secretary autographed Phoenix, a decommissioned Cray X1E also signed by dignitaries including George W. Bush and Al Gore.

Accompanying Chu on his tour of the OLCF were Tennessee Governor Phil Bredesen, U.S. Representatives Lincoln Davis (D-TN) and Zach Wamp (R-TN), and ORNL Director Thom Mason. Leading the tour and providing information about the facility and its goals were Associate Laboratory Directors Jeff Nichols and Martin Keller, visualization expert Ross Toedte, National Center for Computational Sciences (NCCS) Director Jim Hack, and NCCS Director of Science Doug Kothe.

At the completion of the OLCF tour, Chu addressed several hundred contractors and staff members in the ORNL Conference Center. Before a talk on climate change and renewable energy, he announced a 5-year extension of the contract to operate ORNL by UT-Battelle, a partnership between the University of Tennessee (UT) and Battelle Memorial Institute. This is the second 5-year renewal awarded to UT-Battelle since it began operating ORNL in 2000. "We looked at how UT-Battelle was managing its contract and concluded that we didn't need to go into a competition because [ORNL is] being managed so very well," Chu explained.

Other ORNL stops included the construction site of the Chemistry and Materials Laboratory, made possible with American Recovery and Reinvestment Act funding, and the Spallation Neutron Source, provider of the most intense pulsed neutron beams in the world. This was Chu's first visit to ORNL since he became secretary of energy in January 2009.

OLCF Completing Chilled Water Upgrade

New 12" line gives center capacity, flexibility

Big science is hot, literally. Take the world's fastest computer, Jaguar, a Cray XT located at the OLCF, for instance.

This king of the high-performance computing jungle generates as much as 7.3 megawatts of heat as it runs the simulations that are helping researchers to solve some of our most daunting

energy challenges, from fusion reactor design to cellulosic ethanol to superconducting materials.

Keeping Jaguar, and the other systems housed at Oak Ridge National Laboratory, cool requires massive amounts of chilled water. In accordance with the growth of the OLCF facility, an upgrade to the existing chilled water loop system has just been completed. The upgrade will add a new 12-inch supply and return line to the existing chilled water line loop in the OLCF's Computer Science Building (CSB) for greater cooling capacity. Specifically, the new supply line provides enough chilled water to remove 5 megawatts of heat, or about two-thirds of Jaguar's total cooling requirement.

The purpose of the upgrade is three-fold: it will give the OLCF the ability to further segment the room that houses the center's supercomputers as necessary; it will allow maintenance of the CSB's central energy plant, where the chillers are housed, without disrupting the systems currently running simulations; and the new cooling capability will provide greater redundancy with the chilled water system, immediately benefitting a new supercomputing system planned for the CSB this summer.

The new water lines were seamlessly integrated into the existing system without impacting the ongoing cooling of the computers. Because all of the systems located in the CSB are in such high demand, the OLCF could not afford to shut any of the production systems down for even a second despite the obvious benefits of the upgrade.

In order to pull this off, the OLCF used a technology known as a "hot tap," a method that isolates targeted areas of the chilled water system by freezing pipe sections with liquid nitrogen. This in turn stops the flow of chilled water and allows new lines to be tapped into without draining the entire system, requiring a much shorter outage for the chillers and the overall system.

All in all, the upgrade will give the OLCF's chilled water system a total cooling capacity of 23 megawatts.

"As the OLCF continues to grow, and as new systems are installed at the OLCF, the need for cooling will continue to grow," said OLCF Director of Operations Jim Rogers. "This new upgrade gives us more flexibility when it comes to cooling, an invaluable resource at the world's most powerful computing complex."

ORNL Adds High-Capacity Data Storage Library

HPSS helps address supercomputer's storage needs

As the power of supercomputers housed at ORNL skyrockets, the amount of data they generate is also growing rapidly.

In response the OLCF recently installed a new High Performance Storage System (HPSS) tape library to accommodate additional growth within the HPSS archive. With a footprint of

24 feet by 6 feet, the library will eventually hold up to 10 thousand trillion bytes of data (10 petabytes)—roughly equivalent to the size of 6 million downloaded movies.

The library went into service April 14 with 16 tape drives. It can hold up to 64 drives, each capable of moving 120 megabytes of data per second, for a total bandwidth of over 7 gigabytes a second.

It is the first of two new tape libraries planned for ORNL, joining three older libraries to serve ORNL leadership systems such as Jaguar, operated by the OLCF and ranked number one in the world, and Kraken, operated by the National Institute for Computational Sciences and ranked number three in the world.

According to ORNL's Kevin Thach, two of those earlier libraries are full, and the third will be full by the end of 2010. The library that went into service April 14 will most likely be full sometime in mid-2011.

"We're roughly doubling in size each year," Thach explained. "This time next year we expect to be at 20 petabytes."

INCITE Manager Participates in Key Summit

Julia White shares expertise with leaders in high-performance computing

The Innovative and Novel Computational Impact on Theory and Experiment (INCITE) program manager, Julia White, attended the High-Performance Computing (HPC) World consortium in Bologna, Italy, February 25–26 as a representative of the OLCF's and Argonne National Laboratory's INCITE programs.

HPC World is a consortium of six major players in HPC—Italy, Spain, Germany, the United States, New Zealand, and France—with the goal of creating a model of best operating practices, including allocation of time on HPC resources. White was one of the few external members invited to the event.

"The consortium is looking at other successful programs and defining best practices," White said. "The INCITE program has been very successful—INCITE allocations on the DOE leadership-class systems are among the largest awards of computer time made anywhere in the world—and we have an incredibly rigorous and competitive proposal and review process."

The first HPC World consortium took place at the SC09 supercomputing conference in Portland, Oregon, which White also attended. Arrangements to attend future meetings are being made, including one in Barcelona in June.