

## DOE Program to Support Gifted Scientists

The Department of Energy Computational Science Graduate Fellowship (DOE CSGF) program was developed over ten years ago to meet the nation's growing need for computationally sophisticated science and technology workers. As this need continues to rise into the 21st century, the DOE CSGF program becomes even more important.

As part of its science and national security missions, the DOE supports a broad spectrum of basic and applied research in science and engineering. High-performance computing is an integral part of many of these research activities, which include vigorous programs in climate change, combustion, DNA sequencing, fusion energy, health issues, materials sciences, nuclear stockpile stewardship and non-proliferation, protein structures, and resource recovery. Because of its continuing needs in high-performance computing, DOE has a special interest in encouraging the development of the next generation of leaders in computational science.

The highly competitive DOE CSGF program provides a monthly stipend, along with payment of all the fellows' tuition and fees at a United States university. Students are required to follow a program of study that demonstrates breadth through academic achievement in a scientific or engineering discipline, computer science, and applied mathematics. An advisory committee evaluates and approves a program of study that meets the goals of both the students and the fellowship program.

Fellows complete a three-month practicum at a DOE laboratory and participate in an annual fellowship conference. The conference provides a forum for fellows to present their research and an opportunity to attend presentations by the nation's leading computational scientists. This year the annual conference was held in Washington, DC.

The 17 new fellowship awardees for the 2007–2008 year were selected from nearly 400 qualified applicants. The online applications for 2008–2009 DOE CSGF awards will be available in October at: <http://www.krellinst.org/csgf/application>

For more information on the DOE CSGF, please contact the fellowship administrator, the Krell Institute (515-292-4103; <http://www.krellinst.org/csgf>), or email the fellowship coordinator, Rachel Huisman, at: [rachel@krellinst.org](mailto:rachel@krellinst.org)

## Partnership Leads to Network Upgrade

DOE's Office of Science (SC) and Internet2 recently announced that the first segment of a next-generation, nationwide network has gone live. This segment, which connects the Washington, D.C. area to New York and Chicago through a partnership between Internet2 and DOE's Energy Sciences Network (ESnet), marks a key step in significantly upgrading network services to thousands of scientific researchers across the country and around the world. The first complete national ring of the ESnet4 network will be rolled out segment by segment from the east to the west coast. It is expected to be fully operational by September 2007.

"The launch of this first segment of ESnet4 represents a significant step toward a state-of-the-art optical network that is a critical component supporting the United States' scientific leadership," said Dr. Raymond L. Orbach, DOE Under Secretary for Science. "Not only does this new architecture provide greater bandwidth and higher reliability for DOE researchers, but it also underscores the support of DOE's Office of Science to the entire U.S. university community."

The collaboration between ESnet and Internet2 brings together two advanced networks with a combined 30 years of experience in providing network support to thousands of researchers worldwide. ESnet, operated by Lawrence Berkeley National Laboratory (LBNL), connects more than 20 DOE laboratories and

provides networking to more than 50,000 DOE laboratory staff and scientists, as well as to 18,000 researchers from universities, other government agencies, and private industry. ESnet directly serves major SC facilities including particle accelerators, supercomputing centers, and massive scientific data storage systems.

"Since announcing our partnership in August (2006), we have made steady progress toward deploying our new optical infrastructure on which ESnet4 is being built and are pleased to put the first major segments into production," Doug Van Houweling, Internet2's CEO, said. "The new ESnet4 network will allow university and lab researchers participating in a broad range of scientific research to leverage their institutions' existing Internet2 network connection to access the ESnet4 infrastructure and its wide range of Office of Science facilities."

Once completed, ESnet4 will be the most advanced high capacity nationwide network available to support the efforts of the DOE research community. By providing reliable high bandwidth access to DOE laboratories and other major research facilities, ESnet4 will help U.S. researchers and scientists and their international collaborators use large-scale instruments to advance the scientific mission of the SC.

### Further Reading

<http://www.es.net/>

<http://www.internet2.edu/>

### Town Hall Meetings

## E3 Initiative for the Exascale Future

Scientists and engineers from around the country have attended three town hall meetings hosted by DOE's Simulation and Modeling at the Exascale for Energy, Ecological Sustainability, and Global Security (E3) initiative. At these meetings, participants discussed the future research possibilities offered by exascale supercomputers capable of a million trillion calculations per second and more. Computer scientists will need to push the boundaries of computer architecture, software algorithms, and data management to make way for these revolutionary new systems.

The first town hall meeting was held in April at Lawrence Berkeley National Laboratory (LBNL). More than 270 participants were present at the second town hall meeting, held on May 17–18 at Oak Ridge National Laboratory (ORNL). Dr. Thomas Zacharia, ORNL's Associate Laboratory Director for Computing and Computational Sciences, noted that current supercomputers like the Leadership Class Cray systems at ORNL have demonstrated significant scientific advances in chemistry, materi-

als science, climate, combustion, astrophysics, and fusion. Participants focused on issues of global importance to ensure that such advances will continue.

From May 31–June 1 the final town hall meeting on Simulation E3 was held at Argonne National Laboratory (ANL). Dr. Kenneth Judd of the Hoover Institute at Stanford University spoke on "Potential Applications of Exascale Computing in Economics." With one of the objectives of the town hall meetings being identification of exciting new applications areas for future ultra-scale computing, Dr. Judd's discussion of computational economics as a discipline offering numerous opportunities (such as market design analysis) and numerous challenges (such as high-dimensional integration and high-dimensional functions) was an important event.

### Further Reading

<http://www.er.doe.gov/ascr/Misc/Energy-ecology-security-initiative.pdf>

## Conference

# Over 300 Participate in SciDAC 2007 in Boston

The third annual SciDAC Conference took place on June 24–28 at Boston's Westin Copley Place. Over 300 registered participants, including domain scientists, applied mathematicians, computer scientists, computer system vendors, program managers, and support staff, attended 36 plenary talks as well as poster sessions involving 76 invited presenters. SciDAC 2007's schedule also featured informal poster receptions, working breakfasts and lunches, and even a "Right-brain Night" showcasing both reverent and irreverent artistic statements by computational scientists as inspired by their work. In addition, 115 participants—mostly doctoral students and post-docs—gathered on June 29 at Massachusetts Institute of Technology (MIT) for a full day of tutorials on the use of SciDAC software. Eleven SciDAC-sponsored research groups presented their software at an introductory level in both lecture and hands-on formats that included live runs on a local BlueGene/L.

The program of SciDAC 2007 followed the pattern established by previous meetings in San Francisco (2005) and Denver (2006). The Boston venue permitted outreach to a number of universities in the immediate region and throughout southern New England, including SciDAC campuses of Boston University, Harvard, and MIT, as well as a dozen others, including most of the Ivy League. Altogether, 55 universities, 20 laboratories, 14 private companies, five agencies, and four countries were represented among the conference and tutorial workshop participants. Approximately 47% of the conference participants were from government laboratories, 37% from universities, 9% from federal program offices, and 7% from industry.

Worldwide, no scientific agenda is pushing the petascale frontier—and looking to what lies beyond—as vigorously as SciDAC. This fact was very much on display at SciDAC 2007. In one panel, for instance, leaders of a series of



**Figure 1.** On the left, SciDAC 2007 participants share science and snacks at a poster session. On the right, conference chair and SciDAC PI, Dr. David Keyes of Columbia University, speaks during the opening session.



town hall meetings on exascale simulation for energy and environment (E3) considered future approaches to whole-system modeling in a variety of DOE scientific areas related to energy, environmental sustainability, and global security. In another panel, computer vendors were invited to comment on the prospects for delivering exascale computing systems.

Though a logistically complex conference, SciDAC 2007 was kept on track by the exceptional talent of the organizational staff. The extra effort made by presenters to package their leading-edge science in a form accessible to colleagues from other disciplines as well as

to their fellow specialists ensured an extremely productive conference, and will foster enhanced communication and accelerated scientific progress. SciDAC 2007 also owes much of its success to Dr. Michael Strayer, Associate Director for the Office of Advanced Scientific Computing Research (OASCR) and Director of SciDAC, who envisioned the meeting three years ago as a highly visible manifestation of the fruits of SciDAC, and who continues to sustain it with his enthusiasm.

#### Further Reading

<http://www.scidac.gov/Conference2007/>  
<http://www.iop.org/EJ/toc/1742-6596/78/1>

#### Applied Mathematics Research

## PI Meeting Encourages Communication, Collaboration

In May, the DOE's Office of Advanced Scientific Computing Research (OASCR) held a meeting at the Lawrence Livermore National Laboratory (LLNL) Terascale Simulation Facility for Principal Investigators (PIs) in the Applied Mathematics Research (AMR) Base Program. The purpose of the two and a half day gathering was to provide an opportunity for new and continuing PIs to meet each other, learn about each other's work, and explore the possibility of engaging in collaborations.

The meeting included plenary talks, breakout sessions, and poster sessions in order to exchange technical information in selected theme areas, which this year were: Numerical Methods for Partial Differential Equations (PDE), Linear/Nonlinear Solvers, Optimization, and Multiscale. There was also a panel presentation on Future Architectures and a forum for open discussion with AMR program managers. It is anticipated that a series of these meetings will be

held, each to be hosted by a different institution, which will highlight various selected theme areas of interest to the AMR community.

Additional information about the May 2007 meeting, including abstracts, can be found online ("Further Reading," below).

#### Further Reading

<http://www.er.doe.gov/ascr/WorkshopsConferences/AppMathPIMeet.html>