

## Leadership Computing

# Argonne Leadership Computing Facility Dedicated

The Argonne National Laboratory celebrated the dedication of the Argonne Leadership Computing Facility (ALCF) during an April 21st ceremony at the lab. Argonne operates the ALCF for the DOE Office of Science as part of the larger DOE Leadership Computing Facility strategy. DOE leads the world in providing the most advanced civilian supercomputers for science.

"I am delighted to see this realization of our vision to bring the power of the Department's high-performance computing to open scientific research," said DOE Under Secretary for Science Dr. Raymond L. Orbach. "This facility will not only strengthen our scientific capability but also advance the competitiveness of the region and our nation." Early results run the gamut from determining the origins of the universe and dark energy, to better understanding the molecular mechanism of Parkinson's disease to help focus the search for treatment ("Modeling the Molecular Basis of Parkinson's Disease," *SciDAC Review*, Winter 2007, p52). They are exciting examples of what's to come.

Dr. Orbach, Dr. Patricia Dehmer, the DOE Office of Science Deputy Director for Science Programs, and Dr. Michael Strayer, the DOE Associate Director of Science for Advanced Scientific Computing Research, attended the ALCF dedication, along with Congresswoman Judy Biggert (figure 1).

Argonne continues to be a leading force in high-performance computers. Two years prior to the establishment of the ALCF in 2006, Argonne and Lawrence Livermore National Laboratory began working closely with IBM to



**Figure 1.** From left to right, Congresswoman Judy Biggert, Under Secretary for Science Dr. Ray Orbach, and Argonne Lab Director Robert Rosner.

develop a series of computing systems based on IBM's Blue Gene platform. Argonne and IBM sponsor the international Blue Gene Consortium to share expertise and software for the IBM Blue Gene family of computers.

Argonne started with a small Blue Gene/L in early 2005, and the newest Blue Gene/P system has a performance capability of 556 teraflops. Key strengths include a low-power, system-on-a-chip architecture that dramatically improves reliability and power efficiency. The Blue Gene systems also feature a scalable communications fabric enabling science applications to spend more time computing and less time moving data between CPUs. Together with DOE's other Leadership Computing Facility at Oak Ridge National

Laboratory, which has deployed a large Cray supercomputer, computational scientists have platforms that provide capabilities for breakthrough science.

"The ALCF has tremendous computing ability, making it one of the country's pre-eminent computing facilities," said Argonne Director Dr. Robert Rosner. "The research results generated by the ALCF will be used to develop technologies beneficial to the U.S. economy and address issues that range from the environment and clean, efficient energy to climate change and healthcare."

#### Further Information

Blue Gene Consortium  
<http://www.bgconsortium.org/>

## Annual Meeting

## SciDAC 2008 Meeting in Seattle to Offer Expanded Program

The 2008 annual meeting of the SciDAC community, to be held July 13–17 in Seattle, WA, will build upon the successful format of past meetings and add new program components to further encourage the exchange of ideas.

For the first time in the SciDAC meeting series, one afternoon session will feature dual tracks, with one series of talks focusing on Data Management and Data Analytics for Applications and the second addressing issues in Moving Applications to Extreme Parallelism. Other sessions will address applications in fusion energy, nuclear energy, accelerator physics, life sciences, astrophysics, materials sciences, climate modeling, applied mathematics, and computer science.

"One of the main goals of the meeting is to encourage attendees to interact with others outside their own discipline area and we think the two tracks we have chosen will foster those inter-

actions," said Rick Stevens, Associate Lab Director for Computing and Life Sciences at Argonne National Laboratory and general chair of the SciDAC 2008 conference.

The keynote address will be given by Dr. Hermann Lederer of the computing center of the Max Planck Institute for Plasma Physics near Munich, Germany. Dr. Lederer will discuss the growth of computational science in Europe and the accompanying expansion of leadership-class computing facilities

In addition to the keynote address, the conference program will feature some 50 technical presentations over four days, and 40 research posters presented during two evening sessions. The Sunday evening reception will also feature research posters by graduate students from DOE's Computational Science Graduate Fellowship program.

In a departure from past SciDAC conference poster sessions, "electronic posters" will be on display Monday night. "We have seen how regular posters generated extensive discussions at previous SciDAC meetings so we decided to expand on that and incorporate the SciDAC efforts to advance visualization and analytics," Stevens explained. "We're looking forward to an evening of compelling visualizations and animated discussions." A separate venue has been outfitted with more than 30 video screens to accommodate the visualizations submitted by attendees.

More than 300 researchers from North America, Asia, and Europe are expected to attend the 2008 SciDAC meeting, which will be held at the Olympic Fairmont Hotel in downtown Seattle.

#### Further Information

<http://hpcrd.lbl.gov/SciDAC08/index.html>

Conference

## Computer Science PI Meeting

More than 100 principal investigators in Computer Science supported by the Office of Advanced Scientific Computing Research (ASCR) gathered in Denver March 31–April 2 to learn more about each other's work, explore opportunities for collaboration, and discuss future high-performance computing research needs.

Expanding the scope of the Computer Science based program to include programs in laboratories and distributed computing, the meeting featured two days of presentations and an evening poster session that fostered lively discussions. Dr. Fred Johnson, acting director of the Computational Science Research and Partnerships Division in ASCR, and Dr. Stephen Scott of Oak Ridge National Laboratory served as co-chairs for the meeting.

"It has been a few years since we had a Computer Science PI meeting and it was clear that researchers needed to have a broader understanding of the high-performance software stack that's out there," Dr. Johnson said. "We also wanted the PIs to learn more about the work of others so they can leverage those efforts and at the same time see how their own work fits into the bigger picture. The feedback we received encouraged us to hold such meetings more frequently."

In addition to featuring presentations in the areas of programming models, scalable systems software, performance tools, visualization, data management/analytics, distributed data infrastructure/collaboratories, and application development frameworks, the agenda also allowed time for presentations on applications. "We invited researchers from the applications side who are major consumers of cycles at DOE computing facilities so that they could provide insight and set the stage for discussions by addressing software challenges from an applications perspective," Dr. Johnson said.

Among the scientists discussing their applications were Dr. John Daly of Los Alamos National Laboratory, Dr. Robert Harrison, chemist at Oak Ridge National Laboratory, Dr. Nathan Barton, engineer at Lawrence Livermore National Laboratory, and Dr. Jacqueline Chen, combustion researcher at Sandia National Laboratories.

On Monday night, attendees had an opportunity to view 30 research posters and talk with poster presenters. Tuesday evening was focused on breakout sessions organized around the meeting topics. Breakout groups reported back to the meeting as a whole on Wednesday as part of a high-end computing strategic planning session.

### Further Information

[http://www.hpcsw.org/pi\\_meeting/index.shtml](http://www.hpcsw.org/pi_meeting/index.shtml)

Argonne Leadership Computing Facility

## Computer Scientist, Grid Pioneer Selected to Lead ALCF into Production

The biggest challenge facing the Argonne Leadership Computing Facility (ALCF) today is transitioning the ALCF organization and the 100 teraflops IBM Blue Gene/P into steady-state operations to support projects selected in DOE's Innovative and Novel Computational Impact on Theory and Experiment (INCITE) program. At the same time, it is upgrading Blue Gene/P to 500 teraflops and expanding the input/output and storage systems. The newly appointed ALCF project director and acting division director, Dr. Peter Beckman, will assume responsibility for guiding the ALCF through these challenges. Dr. Beckman, who was the ALCF's chief architect, will also recruit additional staff and users to the ALCF.

Blazing a path is not new to Dr. Beckman. As Director of Engineering for the TeraGrid, he designed and deployed the world's most advanced Grid system for linking production HPC for the National Science Foundation. After the TeraGrid became fully operational, he developed research teams focusing on petascale high-performance operating systems, fault tolerance, system software, and the SPRUCE

urgent computing framework which supports critical HPC applications on many of the nation's supercomputer centers.

Dr. Beckman has more than a decade of experience in large-scale computing and project management. He has worked in systems software for parallel computing, operating systems, and Grid computing for 20 years in universities, labs, and industry.

After receiving a Ph.D. in computer science from Indiana University in 1993, he helped create the Extreme Computing Laboratory at Indiana University. In 1997, Dr. Beckman joined the Advanced Computing Laboratory (ACL) at Los Alamos National Laboratory, where he founded the ACL's Linux cluster team and organized the Extreme Linux series of workshops and activities that helped catalyze the high-performance Linux computing cluster community. In industry, Dr. Beckman has served as vice president of Turbolinux's worldwide engineering efforts, managing development offices in the United States, Japan, China, Korea, and Slovenia. Dr. Beckman joined Argonne National Laboratory in 2002.



**Figure 2.** Intrepid, the 100 TF IBM Blue Gene/P at ALCF.

Hardware

## ALCF Intrepid 100 TF BG/P Now Live

Intrepid (figure 2), a 100 teraflops (TF) IBM Blue Gene/P (BG/P) system, became available for production use in April at the Argonne Leadership Computing Facility (ALCF). The system is designated primarily for scientific and engineering computing. By far, most of the usage is for 2008 DOE INCITE awardees.

Intrepid has 8,196 quad-core nodes (32,768 processors) and 16 terabytes of memory. BG/P compute nodes are each connected to multiple inter-node networks, including a high-

performance, low-latency 3D-torus, a highly scalable collective network, and a fast barrier network. GPFS provides a robust and stable home directory file system as well as the parallel input/output data file system. The system's peak performance is 111 TF.

Intrepid will undergo a significant upgrade for 2009, reaching 40,960 quad-core nodes (163,840 processors) and 80 terabytes of memory. Peak performance is projected to be 556 teraflops.

## Awards

## ORNL Team Wins DOE Secretary's Achievement Honor Award

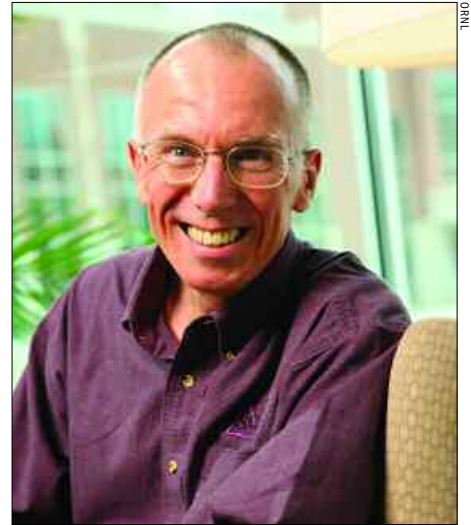
Dr. Gilbert G. Weigand (figure 3) of Oak Ridge National Laboratory's (ORNL) Computing and Computational Sciences Directorate has received the inaugural James R. Schlesinger Award from Secretary of Energy, Dr. Samuel Bodman. The Secretary lauded Dr. Weigand for his "passion for excellence along with his ability to foster and implement the practices and values that are necessary for the protection of our nation."

Dr. Weigand is credited with conceiving and implementing DOE's Accelerated Strategic Computing Initiative (ASCI), which combined government programs and national laboratories to build the world's best high-performance supercomputers. High-performance computing and simulation at the ASCI level are now employed in all areas of science and engineering.

Dr. Schlesinger, who was present for the award ceremony, was the first Secretary of

Energy. The Schlesinger Award is the highest award in the newly established Secretarial Honor Awards Program and the highest non-monetary award bestowed by the agency.

Another team from ORNL was honored by Secretary Bodman for its support of the Department of Energy's national security mission. Dave Felde and Ron Miskell of the Nuclear Science and Technology Division; Jon Kreykes, Jim Sumner and Duane Starr of the Global Initiatives Directorate; and Alan Parker of the Legal Directorate were selected by the Secretary to receive the Secretary's Achievement Award, which recognizes significant achievements on behalf of the department. The team from the Office of Intelligence and Counterintelligence was recognized for its work in DOE's nuclear non-proliferation programs "to mitigate the risk of nuclear proliferation and international terrorism."



**Figure 3.** Dr. Gilbert Weigand of ORNL, recipient of the James R. Schlesinger Award.

## Award

## Berkeley Lab's Dr. Vern Paxson Receives ACM Grace Murray Hopper Award for Research Characterizing the Internet

Dr. Vern Paxson, a network researcher at Lawrence Berkeley National Laboratory, has been awarded the Association for Computing Machinery's (ACM) Grace Murray Hopper Award for his work in measuring and characterizing the Internet.

"His innovative techniques are used to assess new communications concepts, improve network performance, and prevent network intrusion," according to the ACM. "They provide both the research community and Internet operators with the tools to improve the operation of this increasingly diverse, decentralized communications infrastructure."

The award is presented annually to the outstanding young computer professional of the year, selected on the basis of a single recent major technical or service contribution. The candidate must have been 35 years of age or less at the time the qualifying contribution was made. The Grace Murray Hopper Award includes a \$35,000 prize, with financial support provided by Google.

Dr. Paxson, who is a member of Berkeley Lab's Advanced Computing for Science Department, is also affiliated with the International Computer Science Institute and recently joined the faculty at the University of California-Berkeley. The award recog-

nizes his work in the mid-1990s, primarily his Ph.D. dissertation, which "[laid] the groundwork for the exciting resurgence in research in Internet measurement during the last ten years," according to the award citation.

In announcing the award, the ACM noted that "Paxson's research on Internet measurement brought the scientific process to the measurement of the Internet's behavior and the conditions under which it operates, raising the practice of Internet measurement to a higher level. Through a series of highly influential papers, Paxson's findings revealed the mismatches between reality and the common assumptions made in analytical and simulation models. By combining the extensive collection of data from many locations with sophisticated statistical techniques, he provided a wealth of useful information about the nature of the Internet and ways to improve its operation."

Dr. Paxson was named an ACM Fellow in 2006. His 1996 research paper titled "End-to-end routing behavior in the Internet" won the first "Test of Time" award given by ACM's Special Interest Group on Data Communication (SIGCOMM). The award, presented in 2006, is given to the most influential networking paper published 10-12 years before.

His current research continues to focus on Internet measurement as well as network intrusion detection and large-scale Internet attacks.

"The fact that so many people today take the speed and the reliability of the Internet for granted is due in large part to Dr. Paxson's early career research into accurately measuring just how traffic moves from point to point on this network of networks," said Dr. Michael Strayer, Associate Director of the Office of Advanced Scientific Computing Research in DOE's Office of Science, which funds network research at Berkeley Lab and other national laboratories. "This prestigious award is fitting recognition of Dr. Paxson's key role in advancing our understanding of the Internet, which is increasingly critical to our global scientific and economic competitiveness."

Dr. Paxson is also well known for his leadership in the development of Bro, an intrusion detection system for monitoring and tracing network attacks. He received his M.S. and Ph.D. degrees from the University of California-Berkeley.

### Further Information

Grace Murray Hopper Awards  
<http://awards.acm.org/hopper/>

## Cyber Security

# Using Science to Protect Science

Protecting an organization's information resources and assets often seems like a never-ending series of adding patches and shoring up defenses. Viruses, worms, botnets, zero day attacks, and phishing attacks combine to create a daily assault on any organization. Managing layered defenses and helping users grasp the dangers—and to follow what often seem to be tedious security policies—is a tremendous investment and for many organizations amounts to a generally defensive, rather than proactive, posture.

Can we envision a different scenario in which cyber security is proactive rather than predominantly reactive? To consider the question, researchers from DOE's national laboratories and leading universities have organized a grassroots effort to examine strategies toward applying science and multidisciplinary collaboration to meet the challenges presented by the cyber threat. The aim of this effort is to approach cyber security with the same principles that the DOE community has successfully used to address the biggest science problems of our day: scientific analysis and the power of multidisciplinary collaboration, and to identify long-term research activities that could transform the future of cyber security.

"In order to truly transform cyber security we are exploring new perspectives by bringing together not only mathematicians, computer scientists, and operational cyber security field researchers but also scientists from disciplines not traditionally involved in cyber security such as biologists, physicists, and cognitive psychologists" said Dr. Deborah Frincke, cyber security chief scientist at Pacific Northwest National Laboratory and one of the organizers of the effort. Others leading the movement to develop new approaches include Charlie Catlett of Argonne National Laboratory, Dr. Brian Worley of Oak Ridge National Laboratory, Don Petravick of Fermilab, and Ed Talbot of Sandia National Laboratories.

The first public event hosted by the grassroots community was a Town Hall meeting, held February 11–13 at Argonne National Laboratory. Participants discussed biological models for redesigning self-protecting systems, considered fundamental mathematical principles needed to obtain knowledge and insight from petascale, heterogeneous data, and discussed questions such as whether the transformations that Deming sparked in manufacturing could offer valuable lessons in cyber security. Through an emphasis on scientific principles, and by leveraging the best thinking of a broad range of researchers, the community discussed research strategies for new ways to design, manage, and protect systems, so that future security activities will

enable even broader collaboration in support of the DOE mission.

The organizers recognize that building a community takes time, and are actively seeking involvement from additional labs and universities. "A key goal is to assess what the DOE complex is already doing well, identify important gaps, then determine where a cyber security R&D program can make the biggest impact," said Catlett

Catlett indicated that as the group grows, an important goal is to reach out to other government agencies to study best practices and share expertise. Members of the group will also tap their connections with other organizations. By drawing on expertise from the science labs and the defense labs as well as universities, the grassroots community hopes to strengthen connections between the open science cyber security research community and those who primarily work in classified areas.

"The goal is to permit researchers to work synergistically even when some aspects of the problem space are sensitive, and to produce results that are scientifically valid, while safeguarding classified aspects," Dr. Frincke said. "We need to involve the best minds in seeking solutions rather than limit ourselves, which is why we are partnering with academia as well as DOE and other government agency scientists."

Though the community is not officially funded, the effort has received encouragement from DOE's Office of Advanced Scientific Computing Research (ASCR) and Under Secretary for Science, Dr. Raymond L. Orbach. The community anticipates possible direct funding for cyber security research through ASCR in fiscal year 2009.

To map out the current research landscape, the group has produced several initial white papers, and made them available for comment and participation on an open-access community wiki. A second Town Hall meeting is planned for June 30–July 2 at Oak Ridge National Laboratory. Interested members from DOE, universities, industry, and other government agencies are welcome and encouraged to attend. Registration information for Town Hall 2 will soon be available on the wiki, or through Brian Worley.

## Further Information

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Community Wiki  
<https://wiki.cac.washington.edu/display/doi>

Dr. Brian Worley  
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**Figure 4.** Dr. Paul Messina, interim director of science at ALCF.

Argonne Leadership Computing Facility

## Interim Director of Science Named

Dr. Paul Messina (figure 4) has been named interim director of science at the Argonne Leadership Computing Facility (ALCF). He will guide the ALCF science teams using the IBM Blue Gene/P system and help them achieve the best science output obtainable. Dr. Messina most recently served as distinguished senior computer scientist at Argonne National Laboratory and as adviser to the director general at CERN (European Organization for Nuclear Research).

During his illustrious career, Dr. Messina served as director of California Institute of Technology's (Caltech) Center for Advanced Computing Research. He led the Computational and Computer Science component of Caltech's research project funded by the Academic Strategic Alliances Program of the Accelerated Strategic Computing Initiative. He also acted as director of Caltech Concurrent Supercomputing Facilities at Caltech; he was the assistant vice president for scientific computing, and faculty associate for scientific computing, Caltech. Furthermore, Dr. Messina was the principal investigator for TeraGrid, an open scientific discovery infrastructure combining leadership-class resources at 11 partner sites to create an integrated, persistent computational resource. At Argonne, he held a number of positions, ranging from computer scientist to director of the Mathematics and Computer Science Division.

Dr. Messina has also served on many review and advisory committees in high-performance computing and grid computing. He has been a member of the Board of Directors of the Global Grid Forum where he chaired its advisory committee for several years.