ASCR Update

March 30, 2010

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Leadership Computing

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- With ARRA funds, ORNL's Cray XT5 was upgraded from 2.3 GHz quad-core processors to 2.6 GHz 6-core processors.

- Increases system peak performance to 2.3 Petaflops

- Increases allocable hours by 50% (from 1 billion to 1.5 billion hours)

- Upgrade was done in steps, keeping part of the system available

OLCF

NERSC Hopper Phase-1
Accepted

Early User Period: November, 2009 – February, 2010

- Over 10 million hours delivered to DOE users

- Over 100 different projects used Hopper

- 590 users have accessed the system

Breakdown of Computing Hours
Usage by DOE Office

Pie chart: BES 58%, ASCR 20%, BER 8%, FES 7%, HEP 5%, NP 2%

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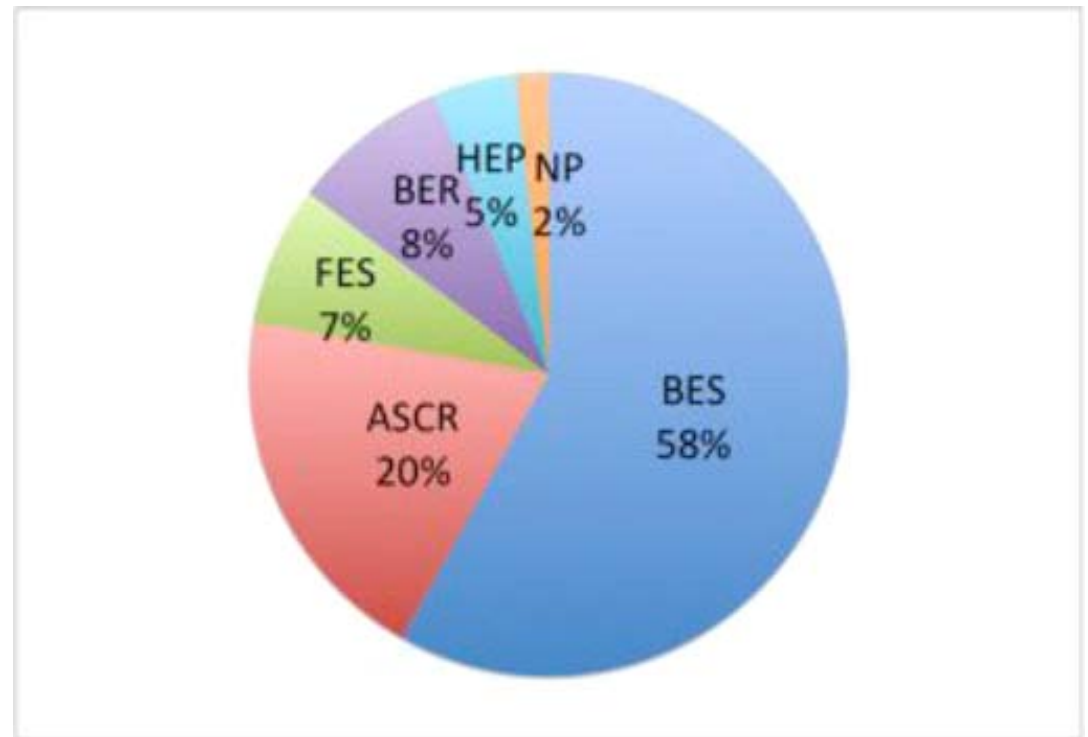
- **Applied Math**
  - Advancing Uncertainty Quantification (UQ) in Modeling, Simulation and Analysis of Complex Systems -- $3M / year for 3 years to fund 2-6 awards, closes April 26, 2010
    - Development of highly scalable approaches for uncertainty analysis in the modeling and simulation of complex natural and engineered systems.

- **Computer Science**
  - X-Stack Software Research -- $10M / year for 3 years to fund 4-5 awards, closes April 2, 2010
    - Development of a scientific software stack that supports extreme scale scientific computing, from operating systems to development environments.
  - Advanced Architectures and Critical Technologies for Exascale Computing -- $5M / year for 3 years to fund 4-5 awards, Closed March 26, 2010
    - Design of energy-efficient, resilient hardware and software architectures and technology for high performance computing systems at exascale.
  - Scientific Data Management and Analysis at the Extreme Scale -- $5M / year for 3 years for 10-15 awards, Closed March 18, 2010
    - Management and analysis of extreme-scale scientific data in the context of petascale computers and/or exascale computers with heterogeneous multi-core architectures.

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- **Next Generation Networks FOA**
  - High-Capacity Optical Networking and Deeply Integrated Middleware Services for Distributed Petascale Science -- $3.5M / to fund 3-8 awards, Closes April 23, 2010
    - Advanced networking/middleware projects in two technical areas: 1) intelligent Terabits (Tbits/s) optical networks and 2) deeply integrated middleware services.

ASCR FY 2012 Budget Briefing

ASCR FY 2011 President's Request Budget Summary

	FY 2009 Appropriation	FY 2010 Appropriation	FY 2011 President's Request	Delta FY10 to FY11 Req.
Advanced Scientific Computing Research				
Applied Mathematics	45,161	44,792	45,450	+ 658
Computer Science	30,782	46,800	47,400	+ 600
Computational Partnerships (includes SciDAC)	59,698	53,293	53,297	
Next Generation Networking for Science	14,732	14,321	14,321	+ 4
SBIR/STTR	—	4,586	4,623	-- + 37
Total, Mathematical, Computational, and Computer Sciences Research	*150,373*	*163,792*	*165,091*	*+1,299*
High Performance Production Computing (NERSC)	53,497	55,000	56,000	+ 1,000
Leadership Computing Facilities	116,222	123,168	158,000	+34,832
Research and Evaluation Prototypes	10,387	16,124	10,052	- 6,072
High Performance Network Facilities and Testbeds (ESnet)	28,293	29,722	30,000	+ 278
SBIR/STTR	—	6,194	6,857	+ 663
High Performance Computing and Network Facilities	*208,399*	*230,208*	*260,909*	*+30,701*
Total, Advanced Scientific Computing Research	**358,772***	**394,000**	**426,000**	**+32,000**

* Total reduced by $10,048,000: $8,972,000 of which was transferred to the Small Business Innovation Research (SBIR) program and $1,076,000 of which was transferred to the Small Business Technology Transfer (STTR) program.

FY11 Budget Request Highlights

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- Maintain FY10 increases in Applied Mathematics and Computer Science to prepare for challenges of future architectures, huge datasets, and multi-disciplinary science.

- Continue focus on Computational Partnership teams on transforming critical DOE Applications to be ready for running at scale on multicore computers

- Fulfill obligations at computing facilities (leases) and to DARPA HPCS program.

- Begin site preparation for ALCF-2 upgrade to be installed in 2012-2013.

- Support NERSC-6 operations.

- Support ESnet deployment of 100Gbps technologies to meet growing science requirements.

- ## Sonia Sachs, Computer Science

Sonia has a Ph.D. in Electrical Engineering and Computer Science from the University of California at Berkeley. Her career spans over thirty years and her research contributions include formal specification and verification of control and distributed computing systems, simulation modeling, computer networks, embedded systems, and collaborative computing.

- ## Richard Carlson, Collaboratories/Middleware

Richard has a MS-EE degree from the Illinois Institute of Technology. He has over 25 years of experience in the design, construction, and operation of high-performance IP networks to support large-scale DOE science initiatives. He previously worked as a network engineer for Internet2 where he focused on end-to-end performance issues and interacted closely with the HENP science community. Prior to that he spent 2 years as a DOE program manager with responsibly for the basic network research activities and the DOE NGI program.

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- **Betsy Riley, Argonne Leadership Computing Facility**

Betsy Riley spent over 35 years at ORNL where she moved from providing programming support for tokamak magnet design to setting corporate directions in computer graphics, and establishing the ORNL VizLab. In 1993, she joined the Center for Computational Sciences (CCS) as Manager of User Services, helping to define the nature and character of one of the first DOE Leadership Computing Facilities.

Staff Departures

- George Seweryniak, retiring March 31, 2010
- Lali Chatterjee became Director of Office of SC Communications and Public Affairs

New Staff Postings

- Director, Facilities Division, Job Announcement # 10-SES-SC-HQ-002 (jam) on USAJobs.gov, Closes May 3, 2010.

- **Application areas**
  - Applied Math
  - Computer Science
  - Computational Science Applications
  - Network Environment Research
- **464 Letters of Intent Received as of 8/17/2009 for ASCR application areas**
  - 148 Applied Math
  - 119 Computer Science
  - 148 Computational Science
  - 49 Network Environment Research
- **369 Applications Received for ASCR application areas**
  - 8 were forwarded to SC program offices
  - 3 withdrew
  - 4 declined as out of scope
  - Reviewed remaining 354 proposals
    - 60 from labs
    - 294 from universities
- **Seven Early Career Awardees selected**

- **Youssef Marzouk**, Massachusetts Institute of Technology, Applied Math (Uncertainty, Stochastic and Complex Systems)
  - PhD from MIT in 2004, graduate work supported by Hertz Foundation Fellowship; named Truman Fellow at Sandia National Laboratories
  - Project title: "Predictive Modeling of Complex Physical Systems: New Tools for Uncertainty Quantification, Statistical Inference, and Experimental Design"
    - Develop numerical methods that deal with problems with existing uncertainty quantification methods and demonstrate new methods on problems in combustion and subsurface flow.

- **Anil Vullikanti**, Virginia Polytechnic Institute and State University, Applied Math (Data and Discrete System Analysis)
  - PhD from India Institute of Science, 1999; post-doc at Max-Planck Institute and Los Alamos National Laboratory; staff LANL
  - Project title: "Diffusion on Complex Networks: Algorithmic Foundations"
    - Develop algorithms and simulation tools for complex systems, such as the electrical power grid, ad hoc wireless networks, social networks and epidemics.

- **Patrick Chiang**, Oregon State University, Computer Science (Hardware and Power Management)
  - PhD from Stanford University in 2007
  - Project title: Sustainable Silicon - Energy-Efficient VLSI Interconnect for Extreme-Scale Computing
    - Energy-efficient, very large scale integration (VLSI) interconnect circuits

- **Michelle Strout**, Colorado State University, Computer Science (Programming Languages/ Models/Environments & Compilers)
  - PhD from University of California, San Diego in 2003; Enrico Fermi Post Doc at ANL; NSF CAREER awardee
  - Project Title: "Separating Algorithm and Implementation via program Model Injection (SAIMI)
    - Create C++ and Fortran libraries and OpenMP preprocessors that will separate implementation details from algorithms.

- **Grigory Bronevestky**, Lawrence Livermore National Laboratory, Computer Science (Operating Systems and Fault Tolerance)
  - PhD from Cornell University in 2007; post doc at Lawrence Livermore National Laboratory
  - Project title: "Reliable High Performance Peta- and Exa-Scale Computing"
    - Develop statistical models that describe fault propagation through system modules and abstraction layers, synthesizing these models to create a full system model.

- **Kalyan Perumalla**, Oak Ridge National Laboratory, Computer Science (Programming Languages/Models/Environments and Compilers)
  - PhD from Georgia Tech
  - Project title: "ReveR-SES: Reversible Software Execution Systems – A New Paradigm in Ultra-scale Computing
    - Paradigm shift to address challenges associated with extreme scale computing.
      - Computations allowed to make mistakes and have the ability to dynamically detect and correct mistakes later through development of reversible software execution systems.

- **Christiane Jablonowski**, University of Michigan, Computational Science (Climate)
  - PhD from University of Michigan in 2004, post-doc position at NCAR;
  - Project title: "Introducing Enabling Computational Tools to the Climate Sciences: Multi-Resolution Climate Modeling with Adaptive Cubed-Sphere Grids".
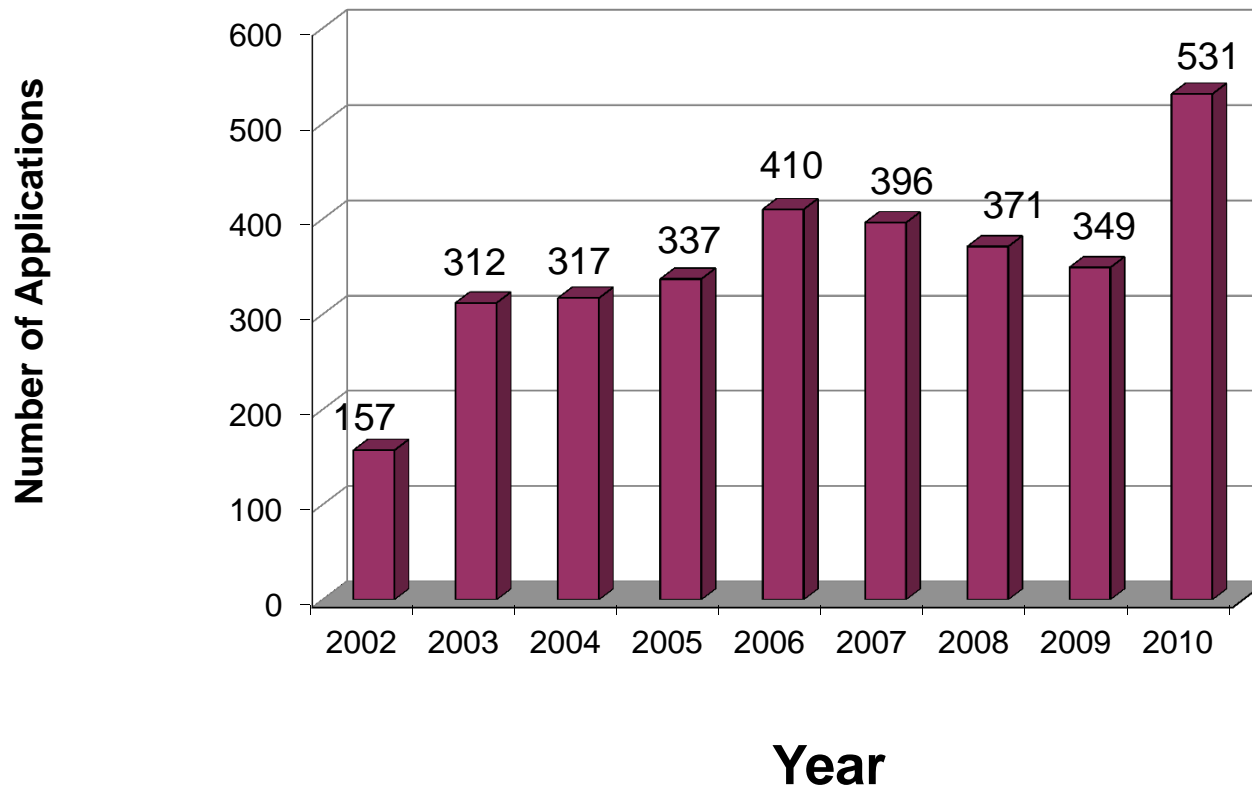   - Develop an atmospheric general circulation model using adaptive mesh refinement

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Computational Science Graduate Fellowship
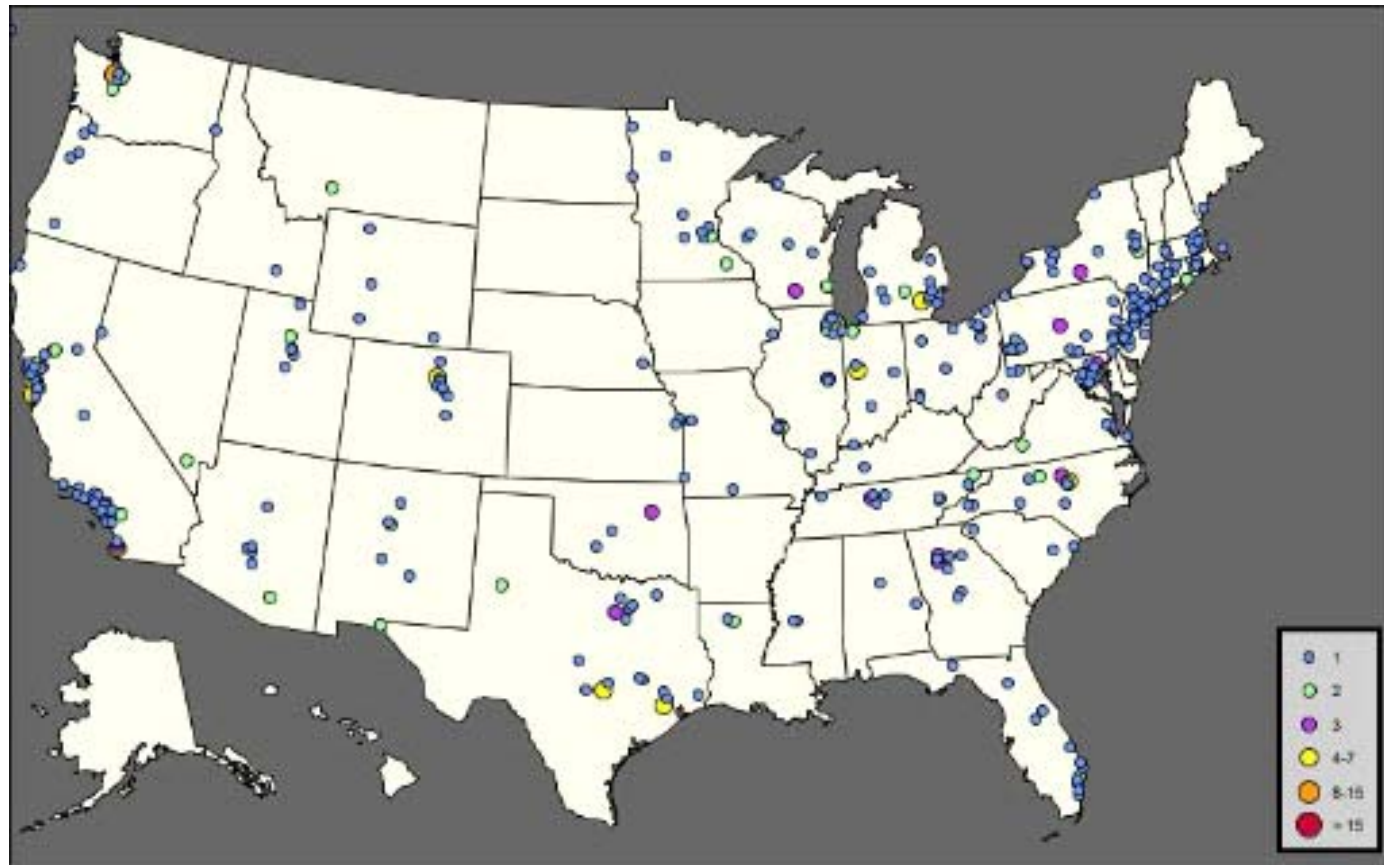## Applications Received

Number of Applications 2002-2010

Number of Applications (y-axis)
Year (x-axis)

Year	Number of Applications
2002	157
2003	312
2004	317
2005	337
2006	410
2007	396
2008	371
2009	349
2010	531

2010 CSGF Applications Received
(permanent addresses plotted below)

Workshops

Past

- Exascale Cross-cutting workshops
  - Architecture and Technology (12/09)
  - Architecture, Applied Mathematics and Computer Science (2/10)
- Heterogeneous Multicore Consortium 1/10

- **Upcoming**
  - Applied Mathematics Principal Investigators Meeting, May 3-5 in Berkeley, CA
  - Applied Mathematics Committee of Visitors, May 11-12, Linda Petzold Chair
  - Data Management, Analysis & Visualization PI Meeting: Focus on Impact of Exascale Architectures & Preparing for Co-Design Process, Tentatively scheduled for August 17-19, in Santa Fe, NM
  - Best Practices Workshop on Power TBD