XSEDE: An Advanced and Integrated Set of Digital Resources for Science and Engineering

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XSEDE TEOS team
XD Solicitation/XD Program

• eXtreme Digital Resources for Science and Engineering (NSF 08-571) -- Extremely Complicated
  – High-Performance Computing and Storage Services
    • aka Track 2 awardees
  – High-Performance Remote Visualization and Data Analysis Services
    • 2 awards; 5 years; $3M/year
    • proposals due November 4, 2008
  – Integrating Services (5 years, $26M/year)
    • Coordination and Management Service (CMS)
      – 5 years; $12M/year
    • Technology Audit and Insertion Service (TAIS)
      – 5 years; $3M/year
    • Advanced User Support Service (AUSS)
      – 5 years; $8M/year
    • Training, Education and Outreach Service (TEOS)
      – 5 years, $3M/year
XSEDE Vision

The eXtreme Science and Engineering Discovery Environment (XSEDE):

enhances the productivity of scientists and engineers by providing them with new and innovative capabilities

and thus

facilitates scientific discovery while enabling transformational science/engineering and innovative educational programs
Science requires diverse digital capabilities

- XSEDE is a comprehensive, expertly managed and evolving set of advanced heterogeneous high-end digital services, integrated into a general-purpose infrastructure.

- XSEDE is about increased user productivity
  - increased productivity leads to more science
  - increased productivity is sometimes the difference between a feasible project and an impractical one
XSEDE’s Distinguishing Characteristics - Governance

• World-class leadership
  – partnership is led by NCSA, NICS, PSC, TACC and SDSC
    • CI centers with deep experience
    • NICS (National Institute for Computational Sciences) is a joint project of UT-Knoxville and Oak Ridge National Lab.
    – partners who strongly complement these CI centers with expertise in science, engineering, technology and education

• Balanced governance model
  – strong central management provides rapid response to issues and opportunities
  – delegation and decentralization of decision-making authority
  – openness to genuine stakeholder participation
    • stakeholder engagement, advisory committees
  – improved professional project management practices
    • formal risk management and change control
How we engage stakeholders

• Collection of stakeholder needs:
  – surveys, ticket mining, ...
  – focus groups, usability panels, ...
  – interviews, shoulder surfing, ...

• Prioritization of identified need and derived requirements
  – User Requirements Evaluation and Prioritization (UREP) Working Group

• Assessing plans and deployments
  – through a variety of stakeholder-focused, facilitated workshops

• Representation in the management of XSEDE
  – XSEDE Advisory Board (XAB)
  – User Advisory Committee
  – Service Providers Forum
  – TEOS Advisory Committee (overlaps XAB)
Requirements Management

• XSEDE requirements are formally managed
  – traceability from statements of need through delivered capabilities
  – provides several paths for XSEDE users to influence requirements
  – integrated with change management processes to ensure controlled evolution
  – integrated with testing processes to ensure continuous improvement
TEOS Partners

- Indiana University
- I-STEM (U.Illinois)
- NCSA
- NICS
- OSC
- PSC
- Purdue University
- Rice University
- Shodor
- SURA
- TACC
- UC Berkeley
Opportunities in Supercomputing

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NSF support of high-performance computing

• First RFP and awards for supercomputing centers made in 1985.
  – Followed panel recommendations and unsolicited proposals from Illinois, UC-San Diego

• Time on resources is Free for U.S. based researchers.

• Allocated much like large, shared scientific instruments, through a peer-review process.

• Specific set-asides for educational and other purposes.
Free Resources for U.S. Researchers

• Compute Resources (listed next)
• Human Resources, or Extended Collaborative Support Services (ECSS)
  – Over 20 full-time equivalent staff spread around the country.
  – Includes several computational scientists locally at NICS at UT-Knoxville.
  – Can be requested by new users as well as experienced users.
Current XSEDE Compute Resources

- **Kraken @ NICS**
  - 1.2 PF Cray XT5
- **Ranger @ TACC**
  - 580 TF Sun Cluster
- **Lonestar (4) @ TACC**
  - 302 TF Dell Cluster
- **Forge @ NCSA**
  - 150 TF Dell/NVIDIA GPU Cluster
- **Trestles @ SDSC**
  - 100TF Appro Cluster
- **Steele @ Purdue**
  - 67 TF Dell Cluster
- **Blacklight @ PSC**
  - 36 TF SGI UV (SMP)
- **Dash @ SDSC**
  - 5 TF Appro Distributes SMP cluster
Current XSEDE Visualization and Data Resources

**Data Analysis & Visualization**

- Nautilus @ UTK
  - 8.2 TF SGI/NVIDIA SMP
  - 960 TB disk
- Longhorn @ TACC
  - 20.7 TF Dell/NVIDIA cluster
  - 18.7 TB disk
- Spur @ TACC
  - 1.1 TF Sun cluster
  - 1.7 PB disk

**Storage**

- Albedo
  - 1 PB Lustre distributed WAN filesystem
- Data Capacitor @ Indiana
  - 535 TB Lustre WAN filesystem
- Data Replication Service
  - 1PB iRODS distributed storage
- HPSS @ NICS
  - 6.2 PB tape
- MSS @ NCSA
  - 10 PB tape
- Ranch @ TACC
  - 70 PB tape
- HPSS @ SDSC
  - 25 PB tape
Current XSEDE Special Purpose Resources

• Condor Pool @ Purdue
  – 150 TF, 27k cores

• Keeneland @ GaTech/NICS
  – developmental GPU cluster platform
  – Production level machine July 2012

• FutureGrid
  – Experimental/development distributed grid environment
How do You get time?

• Go to: https://www.xsede.org/web/guest/allocations

• Pay particular attention to ‘Startup’ and ‘Education’ allocations.

• For standard allocation requests, human help is available.

• Invite your comments on the Allocation web pages.
XSEDE Training, Education & Outreach

• Prepare the current and next generation of researchers, educators and practitioners.
• Create a significantly larger and more diverse workforce in STEM.
• Inculcate the use of digital services as part of their routine practice for advancing scientific discovery.
Training

• Live, synchronous and asynchronous delivery
• List of events posted on web site
• Span introductory (MPI, OpenMP, CUDA) to advanced topics (parallel I/O, performance tuning, visualization)
• Address domain specific needs
• Roadmap for training - a sequence of topics and training materials
  – http://hpcuniversity.org/roadmap/
National student opportunities

- XSEDE 2012 Conference
  https://www.xsede.org/web/xsede12/students

- SC12 Conference
  http://sc12.supercomputing.org/content/student-volunteers

- Subscribe or bookmark the XSEDE TEOS blog to see other local & national opportunities
  https://www.xsede.org/education-outreach-blog
Campus Champions

• Over 100 institutions; ~150 individuals
  – Champions serve as a bridge from their campuses to local users of XSEDE resources
  – Champions share information via frequent calls, and stay connected with XSEDE staff.
  – XSEDE’12 program for Champions
  – XSEDE values feedback from Champions
Current Campus Champion Institutions (unclassified) – 50
Current Campus Champion Institutions (EPSCoR states) 34
Current Campus Champion Institutions (Minority Serving Institutions) -- 7
Current Campus Champion Institutions (both EPSCoR and MSI) – 5
Our reach will forever exceed our grasp, but, in stretching our horizon, we forever improve our world.