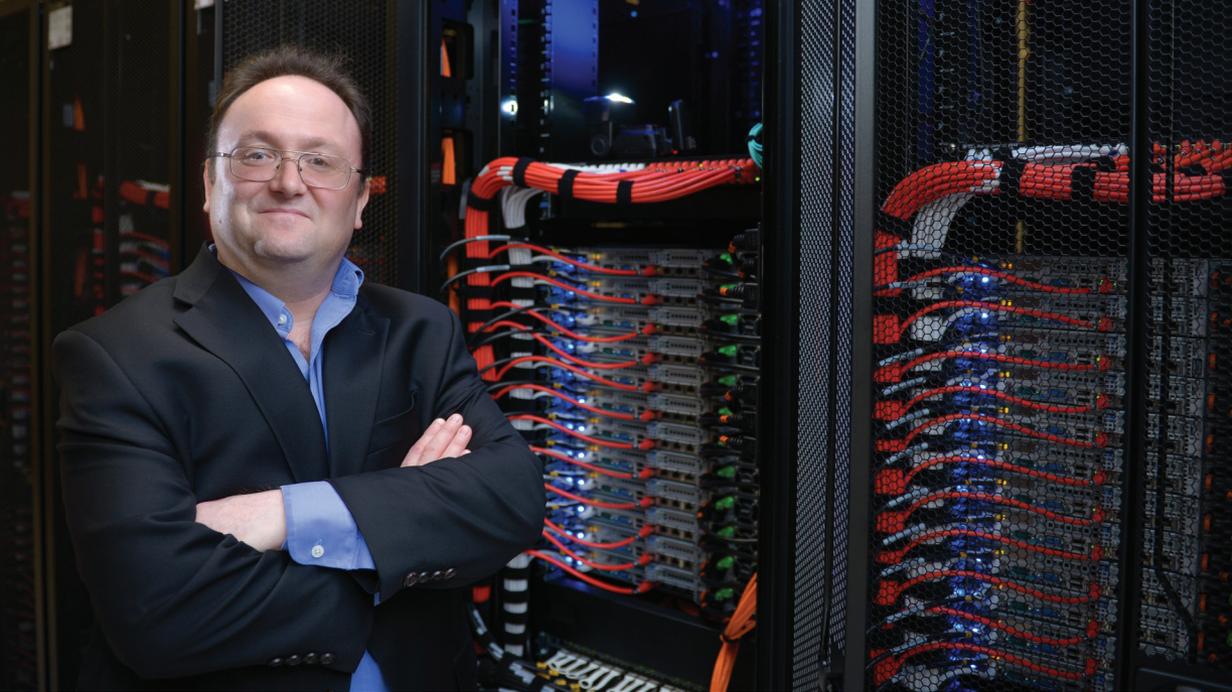


Research IT

A DIVISION OF OU
INFORMATION TECHNOLOGY



INFORMATION
TECHNOLOGY



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Research IT: A Division of OU Information Technology



THE OU SUPERCOMPUTING CENTER FOR EDUCATION & RESEARCH (OSCER)

is a multidisciplinary center that provides supercomputing education, expertise and resources to OU undergraduate students, graduate students, staff and faculty, as well as their off-campus collaborators. If you have large, computing-intensive problems that need heavy number crunching, OSCER is the answer.



INFORMATICS, a joint effort between University Libraries and IT, focuses on using large-scale data for Science, Technology, Engineering, Mathematics, Humanities, Business and Media research. If your investigations involve producing, managing and/or analyzing large data collections, we have professionals for hire whose expertise spans a broad range of strategies and technologies for turning data into knowledge and knowledge into insight.



THE OKLAHOMA PETASTORE is a large-scale storage facility, with a capacity of multiple Petabytes (millions of GB) of disk and multiple PB of tape. Research teams pay for media (tape cartridges and disk drives) only, with all other costs covered by a National Science Foundation grant and OU.



THE OU RESEARCH CLOUD (OURCLOUD) is a collection of real hardware for deploying virtual computers. Research teams pay for their virtual computers and required software, at much lower financial, labor and expertise cost than maintaining their own private resources.



IRADS makes top-tier radar data from the National Weather Center available to government and corporate clients.



Who's Using Research IT?

Over 1000 students, staff and faculty in over 20 departments in the Colleges of Arts & Sciences, Atmospheric & Geographical Sciences, Business, Earth & Energy, Engineering and Medicine. We have users at 23 institutions across Oklahoma, plus over 200 collaborating users across the US and worldwide.

The Benefits

EXTERNAL FUNDING:

Research IT has facilitated over \$450M in total external funding (on over 250 grants), over \$200M of it to OU (Return On Investment of about 7 to 1), with roughly 1/7 of OU Norman's total externally funded research expenditure enabled by Research IT since 2002.

RESEARCH PRODUCTIVITY:

Research IT has enabled over 2000 publications, dissertations and theses.

EDUCATION:

OU's unique "Supercomputing in Plain English" education initiative has taught the fundamental concepts of advanced computing to over 2000 people since 2001, not only at OU, but also via videoconferencing to 362 other institutions in 51 US states & territories as well as 17 other countries. Research IT has also hosted workshops, seminars & training opportunities led by other organizations, not only from national leaders in advanced computing education, but also from vendors of products and services needed by our user community.



What Makes Research IT Unique?

We focus on teaching advanced computing to scientists and engineers—from high school students to professors – who don't have a lot of computing experience.

TEACHING:

"Supercomputing in Plain English" workshops teach the basic ideas through analogies, stories and concepts, not jargon or technical details. Prerequisite: 1 semester of programming.

RESEARCH:

We work directly with dozens of science and engineering groups on campus, helping them to apply the concepts learned in the workshops to their specific research projects.



Getting Started with Research IT

In your web browser (for example, Internet Explorer, Firefox, Chrome), go to:

www.oscer.ou.edu

Click on **ACCOUNTS** and follow the instructions. We usually can resolve account requests in one or two business days.

COMPUTING TIME ALLOCATIONS: OSCER doesn't use an allocation system. Once you log in to our resources, you have unconstrained computing time, but our batch schedulers typically give higher priority to users who haven't gotten much runtime lately. If you have a compelling special requirement, contact us (**support@oscer.ou.edu**).

STORAGE ALLOCATIONS: On the PetaStore, you pay for your own media (tape cartridges and/or disk drives).

OU RESEARCH CLOUD (OURCLOUD): Contact us (**hneeman@ou.edu**) for details and pricing.

INFORMATICS: Contact Mark Stacy (**markstacy@ou.edu**) to learn how to work with OU's Informatics professionals.



OU IT's Research IT: Resources



SUPERCOMPUTER: LINUX CLUSTER FROM DELL ("SCHOONER")

CPU CORES: 10,224 Intel Xeon CPU cores, mostly 2.3 GHz ("Haswell")

- Peak speed: 348.4 TFLOPs (trillions of calculations per second)
- Fastest supercomputer in Oklahoma history

NVIDIA TESLA K20M ACCELERATORS (20): ~23 TFLOPs, 100 GB RAM

INTEL XEON PHI 3151P ACCELERATORS (24): ~24 TFLOPs, 192 GB RAM

RAM: 24,352 GB, 2133 MHz

HARD DISK: Datadirect Networks Lustre parallel filesystem of ~300 TB useable, modest speed RAID's totaling ~145 TB useable

INTERCONNECTS: Infiniband FDR10 (Mellanox) 3:1 oversubscribed

(bandwidth 13.33 Gbps, latency ~1 microsec) and GigE/10G Ethernet (Dell)



OKLAHOMA PETASTORE: Thanks to a National Science Foundation Major Research Instrumentation grant, OU maintains a very large scale storage archive, consisting of a disk system capable of multiple Petabytes (PB), with 530 disk drives (total capacity of ~840 TB), and a tape library of initially 2859 tape cartridge slots (over 4 PB under the current LTO-5 tape format), able to grow to as many as ~22,600 slots (~34 PB at LTO-5, ~56 PB at the upcoming LTO-6). Faculty purchase their own storage media (disk drives and tape cartridges), and other costs are paid by the grant, OU's Chief Information Officer (CIO), and/or OU's Vice President for Research (VPR).



HIGH PERFORMANCE NETWORKING: OU is a member of Internet2. Oklahoma's statewide education, research and government network, OneNet, has connected OU's Norman campus and Oklahoma State U's Stillwater campus to Internet2's national 100G backbone. Research IT leads Oklahoma's NSF CC-NIE grant for high performance networking statewide, which is working on developing a "Science DMZ" for high speed "friction-free" research networking across several institutions and out to the rest of the country and the world.



GRANT PROPOSALS: Research IT facilitates new grant proposals in multiple ways:

- Letters of commitment for access to OSCER resources.
- Detailed descriptions of facilities, resources, services and physical data management.
- Project-specific text on Cyberinfrastructure issues.
- Where appropriate, personnel can participate as Co-PI, Senior Personnel or consultant.



The **ONEOKLAHOMA STEM MENTORSHIP PROGRAM**, also funded by a National Science Foundation grant, is designed to increase the number of Oklahoma students pursuing degrees in critical job areas across all Science, Technology, Engineering and Mathematics (STEM) disciplines.

Since Fall 2010, IT professionals from OU and other institutions have conducted over 100 events for 39 institutions in every part of the state of Oklahoma. We have presented on IT topics ranging from security, networking, web and software development, database management systems, system administration, system engineering and support, and now we're going to start covering other STEM disciplines as well. So far, over 1600 students at 3 comprehensive PhD-granting universities, 13 regional colleges and universities, 7 community colleges, 13 career techs and 3 high schools have benefited from the program.





ONE OC II

OneOklahoma Cyberinfrastructure Initiative

Researchers at colleges and universities statewide can engage in greater computing- and data-intensive research with better speed, efficiency and reliability because of a \$1.17M research network upgrade completed in 2013 and now a \$500K network upgrade now underway.

Funded by a National Science Foundation grant, the Oklahoma Optical Initiative has benefitted academic and research institutions across the state, including the University of Oklahoma, Oklahoma State University, OneNet (Oklahoma's education, research and government network), the University of Tulsa, Langston University, the Samuel Roberts Noble Foundation, Bacone College, the College of the Muscogee Nation, Comanche Nation College and Pawnee Nation College.

The initiative has delivered improved network reliability, robustness, availability and bandwidth to Oklahoma's researchers. The initiative upgraded network connectivity for supercomputers at OU and OSU to over 100 Gigabits per second (Gbps), a twentyfold increase.

The OneOklahoma Cyberinfrastructure Initiative has already reached a total of over 100 institutions and organizations: over 50 academic and almost 50 non-academic. For OU researchers, this change translates to transformative capability in areas such as weather forecasting, high energy physics, ecology, machine learning, energy, and many others.



INFORMATION TECHNOLOGY

A Leader in Research
Cyberinfrastructure among
EPSCoR Jurisdictions

Red states & territories indicate EPSCoR¹ jurisdictions



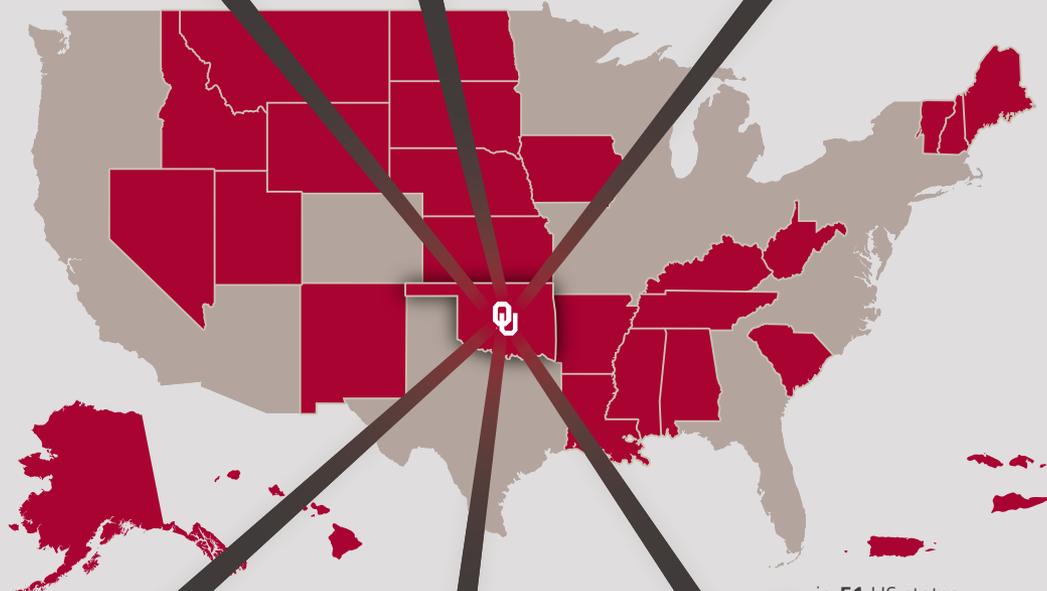
Top 5 in the Number of Top 500 Lists
for Fastest Supercomputers²



Petabytes of
inexpensive storage



100 Gbps
incoming network



1000+ users

at **362**
institutions



in **51** US states
& territories and
17 other countries



2000+
people served

Oldest annual supercomputing
symposium in an EPSCoR jurisdiction **#1**



**Supercomputing
in Plain English**

¹http://www.nsf.gov/od/ia/programs/epscor/nsf_oia_epscor_index.jsp

²since Nov. 2002 among EPSCoR jurisdictions that don't have federally funded national supercomputing centers, <http://www.top500.org>



INFORMATION TECHNOLOGY *supporting research at OU for over 12 years*

REACH

50+ academic institutions supported



20+ departments supported



1500+ students participated in the Oklahoma IT Mentorship Program



3500+ attendees at 14 Oklahoma Supercomputing Symposia



RESULTS

350+ funded projects



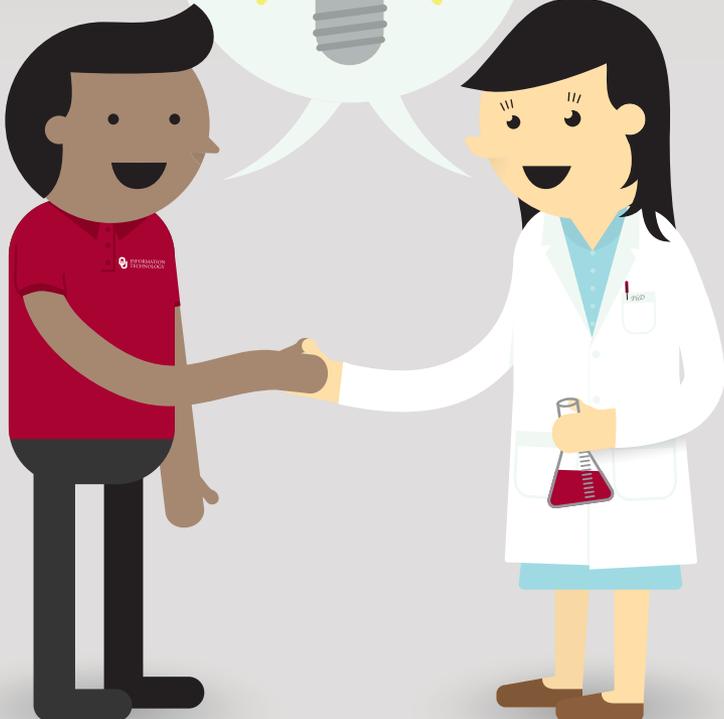
7:1 return on investment



2000+ publications facilitated



\$200M+ externally funded research at OU



"OSCER's computing resources have been crucial to my research program, having facilitated over a dozen grants totaling more than \$1M and over 30 of my publications, which helped me get tenure."

Prof. Peter Attar

OU Aerospace & Mechanical Engineering

"Thanks to OSCER's computing resources, OU's High Energy Physics group has had one of the most productive US academic computing sites in the worldwide ATLAS and D0 collaborations."

Prof. Pat Skubic

OU Physics & Astronomy

"With the Oklahoma PetaStore, I've had no problems and great archival performance."

Kevin Thomas

OU Center for Analysis & Prediction of Storms

"I have high confidence that when we place large, important climate datasets in the hands of OU IT for storage and distribution to our customers, we are in good hands."

Prof. Renee McPherson

South Central Climate Science Center
OU School of Geography & Environmental Sustainability

"Thank you for the OSCER tour... My students really enjoyed it, and many considered it the best research tour we've been on this semester."

Prof. Susan Schroeder

OU Department of Chemistry & Biochemistry

"In terms of the social engineering, what OSCER has done in Oklahoma is way ahead of where we are in California. The spirit of cooperation and level of institutional buy-in is inspiring."

Prof. Michael Norman

Director, San Diego Supercomputer Center