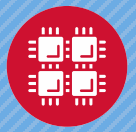
OSC Updates



Agenda

- Available Services
- OSC’s Impact
- Future Plans
- Engage with OSC

Calls to Action

Make use of **AVAILABLE SERVICES**

Learn about **OSC'S IMPACT**

Help shape **FUTURE PLANS**

Find ways to **ENGAGE WITH OSC**

Visit osc.edu/fallsug21 for specifics!

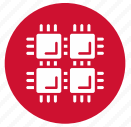
Available Services

Case Study: Fighting Crop Rot

Ohio Supercomputer Center resources help the search for a genetic answer to the Phytophthora sojae water mold that causes root and stem rot.

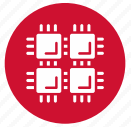
Commonly Used Services

- General Compute
- GPU Compute
- Big Mem Compute
- Data Storage
- Training
- Classroom Projects



Less Commonly Used Services

- Protected Data Service
- R Shiny
- Custom Gateways / Portals
- Consulting Services
- Software Installation / Workflows / Optimization / Troubleshooting



System Status

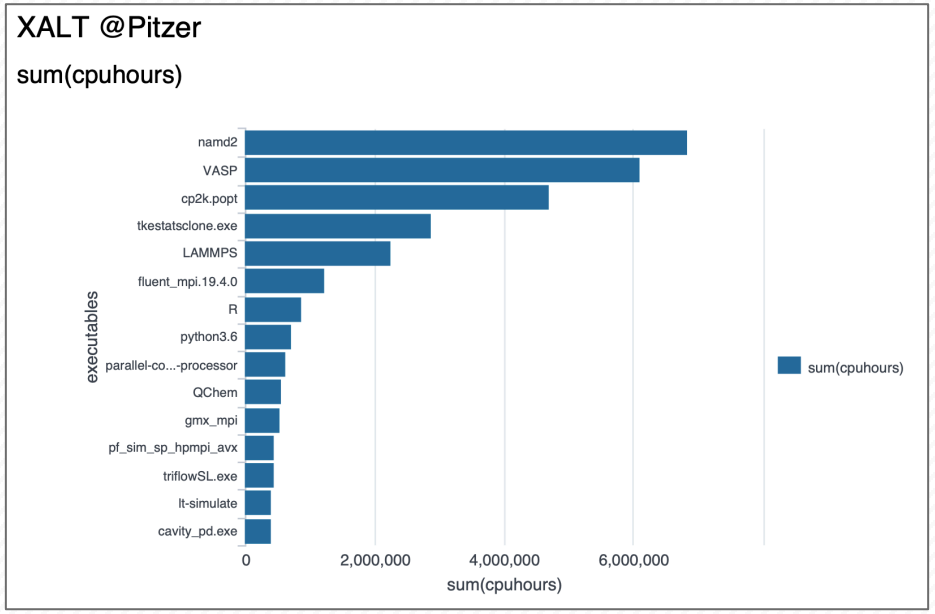
FY2021

COMPUTE	Owens	Pitzer	Pitzer Expansion
Date	2016	2018	2020
Cost	$7 million	$3.4 million	$4.3 million
Theoretical Perf.	~1.6 PF	~1.3 PF	~2.6 PF
Nodes	824	260	398
CPU Cores	23,392 Intel Broadwell	10,560 Intel Skylake	19,104 Intel Cascade Lake
RAM	~120 TB	~ 70.6 TB	~ 93.7 TB
GPUs	160 NVIDIA Pascal P100	64 NVIDIA Volta V100	102 NVIDIA Volta V100
TOTALS	**Cost($14.7 M) Perf.(~5.5 PF) Nodes(1,482) Cores (53,056) RAM(~284 TB) GPUs(326)**		

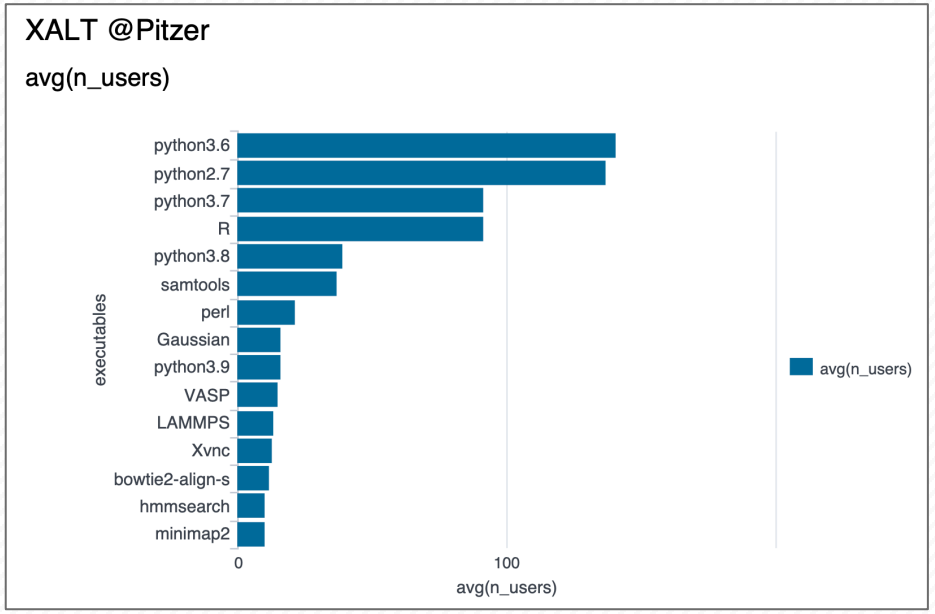
STORAGE	NetApp	DDN	IBM ESS	IBM TAPE
Year Acquired	2016	2016	2020	2016 – 2018
Cost	$0.4 million	$2.9 million	$1.7 million	$0.6 million
Capacity	0.8 PB	4.8 PB	8.6 PB	10+ PB
TOTALS	**Cost($5 M) Disk Capacity(14.2 PB)**			

Software Resources and Use (Jan – Jun 2021)

Top 15 packages on Pitzer by CPU hours



Top 15 packages on Pitzer by number of users



- Recent Projects
  - Software for analysis of CryoEM images: Relion, CryoSparc, Scipion
  - Workflow tools for genomics/bioinformatics pipelines: nextflow, cromwell
  - Software packages for the OSU Neuroimaging Data Archive
  - Custom R and python environments for Classrooms
- Software purchases and renewals:
  - StarCCM+, Schrodinger, Comsol
  - $26K for application software license renewals/maintenance in Q3 & Q4 of FY 21

Virtual Computer Lab Support

- Custom OnDemand dashboard at class.osc.edu
- Installing specific software packages as requested
- Streamlining student account creation
- Scheduler reservations as needed
- Introduction to supercomputing for classroom
- 25 active classes this semester

OSC's Impact

Case Study: Generating Clean Energy

First Solar, the largest solar panel manufacturer in the Western Hemisphere, utilizes OSC to optimize semiconductor properties for its Ohio-made cadmium telluride (CdTe) solar panels.

Client Services

FY2021

32 Ohio Universities

39 Companies

25 Non-Profits and Government Agencies

97 Other Educational Institutions

5,756 Clients

967 PIs

13% faculty/staff
77% students
10% other

249 college courses used OSC

22 Training Opportunities

419 Trainees

Client Services

FY2020/FY2021 Differential

30/32 Ohio Universities
Up 7%

41/39 Companies
Down 5%

15/25 Non-Profits & Gov't
Up 67%

53/97 Other Educational Institutions
Up 83%

4,833/5,756 Clients
Up 19%

75/249 Ohio Higher-Ed Courses
Up 232%

15/22 Training Opportunities
Up 47%

304/419 Trainees
Up 38%

Ohio Higher-Ed using OSC

FY2021

Ohio Higher-Ed Courses using OSC

FY2021

5,565 enrollees, 249 courses, 77 departments, 20 universities

Institution	Students	Courses	Dept.'s
Air Force Institute of Tech.	1	1	1
Bluffton University	10	1	1
Bowling Green State U.	69	6	3
Cedarville University	14	1	1
Cleveland State University	57	5	3
Kent State University	74	14	3
Kenyon College	55	4	1
Miami University	53	4	3
Ohio State University	4140	154	35
Ohio University	54	7	3

Institution	Students	Courses	Dept.'s
Stark State College	36	3	1
University of Akron	15	2	2
University of Cincinnati	760	28	7
University of Dayton	18	3	2
U. of Mount Union	7	1	1
University of Toledo	50	3	3
Urbana University	2	1	1
Wittenberg University	16	2	2
Wright State University	98	4	2
Xavier University	36	5	2

Client Scholarship & Savings

2015–2020 and FY2021

1,167 Publications cited OSC

Estimated annual cost savings

- $5.2M Ohio Higher-ed
- $1.6M Non-academic
  (includes Other Education, Non-profit/gov, Commercial)

39% of articles in top 10% of journals

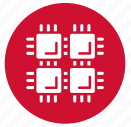
151 Funding Agencies Acknowledged

$23.1M in leveraged capital investments

Cite OSC

- Webpage with details on how to cite OSC available under the Research menu item
- Can cite either OSC in general or specific clusters
- Available in BibTex and EndNote formats

Ohio Supercomputer Center. 1987. Ohio Supercomputer Center. Columbus OH: Ohio Supercomputer Center. http://osc.edu/citation.



Open OnDemand in the News

Azure HPC OnDemand Platform: Cloud HPC made easy.

By xpillons

Published 07-12-2021 07:01 AM 1,099 Views

As many customers are looking at running their HPC workloads in the cloud, onboarding effort and cost are key consideration. As an HPC administrator, in such process you try to provide a unified user experience with a minimal disruption, in which the end users and the cluster administrators can retrieve most of their on-premises environment while leveraging the power of running in the cloud.

The ***Specialized Workloads for Industry and Mission*** team that works on some of the most complex HPC customer and partner scenarios has built a solution accelerator **Azure HPC OnDemand Platform** (aka **az-hop**) available in the Azure/az-hop public GitHub repository to help our HPC customers onboard faster. **az-hop** delivers a complete HPC cluster solution ready for users to run applications, which is easy to deploy and manage for HPC administrators. **az-hop** leverages the various Azure building blocks and can be used as-is, or easily customized and extended to meet any uncovered requirements.

Based on our experience, from years of customer engagements, we have identified some common principles that are important to our customers and designed **az-hop** with these in mind:

- A pre-packaged HPC Cluster easy to deploy in an existing subscription, which contains all the key building blocks and best practices to run a production HPC environment in Azure,
- A unified and secured access for end users and administrators, so each one can reuse their on-premises tools and scripts,
- A solution to integrate applications under the same unified cloud experience,
- Build on standards, common tools and open blocks so it can be easily extended and customized to accommodate the unique requirements of each customer.

CloudyCluster & GCP: Introducing HPC VM Pre-Tuned Images

Feb. 8, 2021 - Today, we're excited to announce the release of version 3.1.1 of CloudyCluster on Google Cloud Platform, leveraging a CentOS 7-based Virtual Machine (VM) image optimized for high performance computing (HPC) workloads. This new release is designed with a focus on tightly-coupled MPI workloads. **Read the full blog here-->**

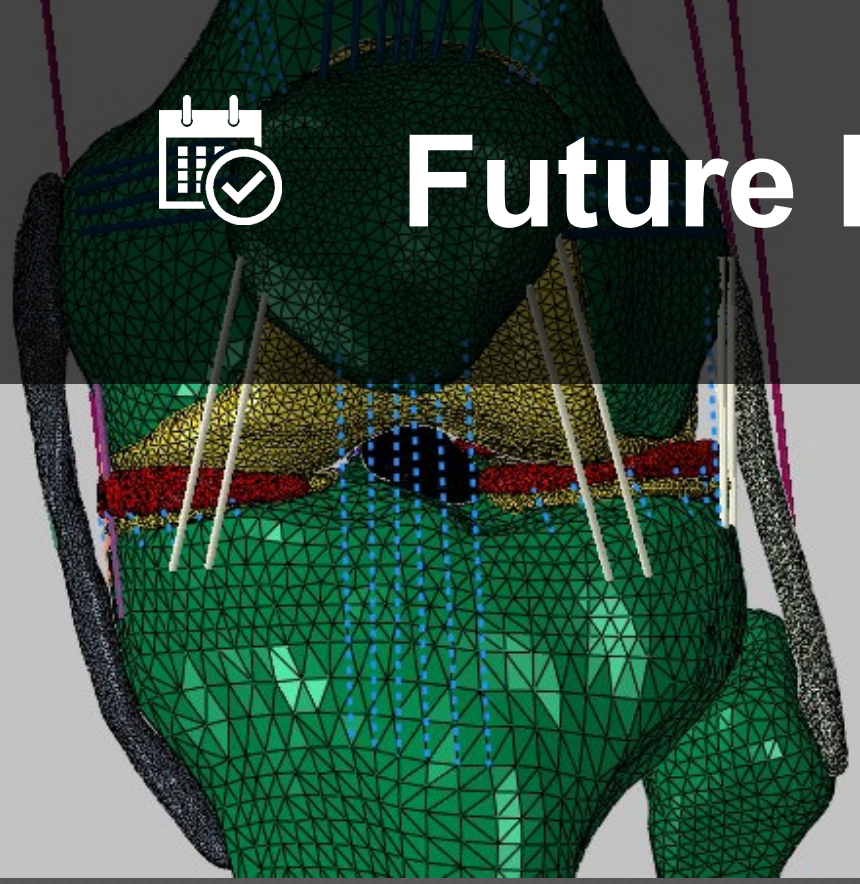
INTERACTIVE RESEARCH COMPUTING

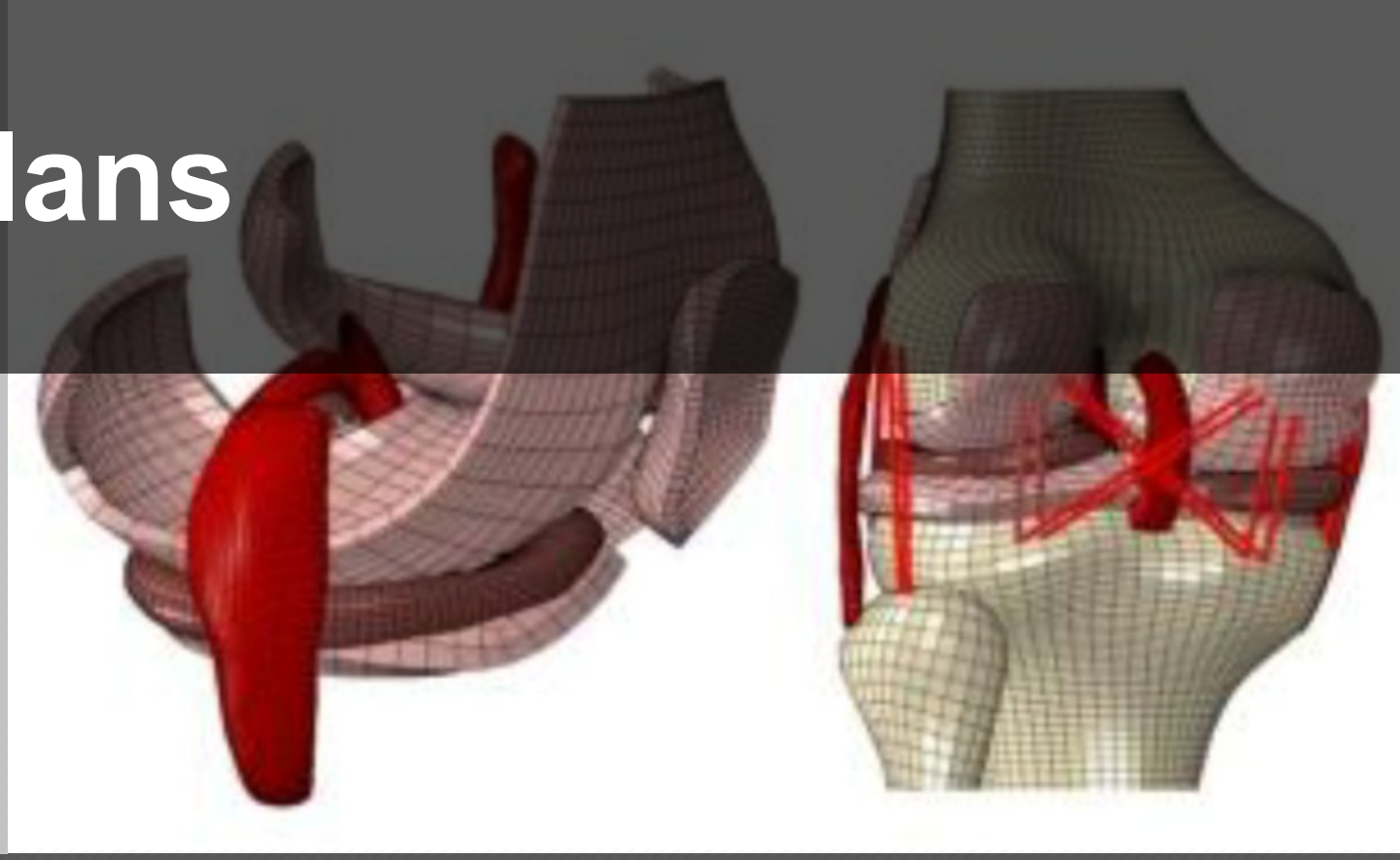
With the latest release of CloudyCluster, users can now take advantage of the GUI developed by **OSC** and the cloudyCluster Team. This new inclusion offers non-computer scientists a pathway to cloud-based HPC tools, without having to utilize the CLI. Upload and Download files with a file browser-like interface. You can now: draft job scripts with the built-in Job Script tool, spin-up new computing instances with or without a variety of GPU Acceleration, and have them tear down automatically after your specified work window. The current release includes JupyterLab with Jupyter Notebooks in Python 3 for true interactive code testing.

CloudyCluster online documentation-->

Open OnDemand Project-->

Future Plans





Case Study: Reducing Season-Ending Injuries

University of Toledo researchers are working to reduce ACL injuries in athletes by simulating strains on the ligament to improve risk assessment protocols.

Strategic Plan

Process

- Interviews with several peer institutions
- Performed SWOT analysis
- Generated strategies / objectives / key results

Outputs

- Strategic benchmarking report
- Updated mission and vision statements
- SWOT analysis
- Four strategy areas:
  Client Engagement | Services | Finances | Internal Operations
- Objectives and key results for FY27 (OSC's 40th anniversary)

Compute and Storage Projects

- Owens HPC cluster replacement
  - User requirements gathering through survey and meetings
  - Completed NDA briefings with key technology vendors
  - Working on design and RFP
- Replace storage for user "home" directories
  - Design finalized, capital purchase process started
  - Capacity, performance, and resilience improvements
- Leverage OH-TECH DR datacenter space in Cleveland
  - Key servers and storage replicated
  - All backups of OSC and OSC user data replicated
  - Tape library onsite, other components on order
  - Resume work on research data archive – long-term storage for large data sets
- Improve services for "containers" and VMs
  - More ways to run at OSC
  - RStudio tutorial successfully used a Kubernetes cluster at OSC

Planned Improvements to Client Portal

- FY22 includes a major revision and release, which introduces some core functionality improvements around cost control and billing
- Primary user experience should remain unchanged, but we will be positioned to make large user-facing changes in FY23

Engage with OSC

Case Study: Genetic Research

Ohio State researchers are using OSC to build the ‘Phylogatr’, a database that connects thousands of genetic repositories together for improved research access using the Shiny R programming language.

Photo courtesy Ohio State College of Arts and Sciences

Supercomputing for anyone, anywhere!

Ohio academic institutions

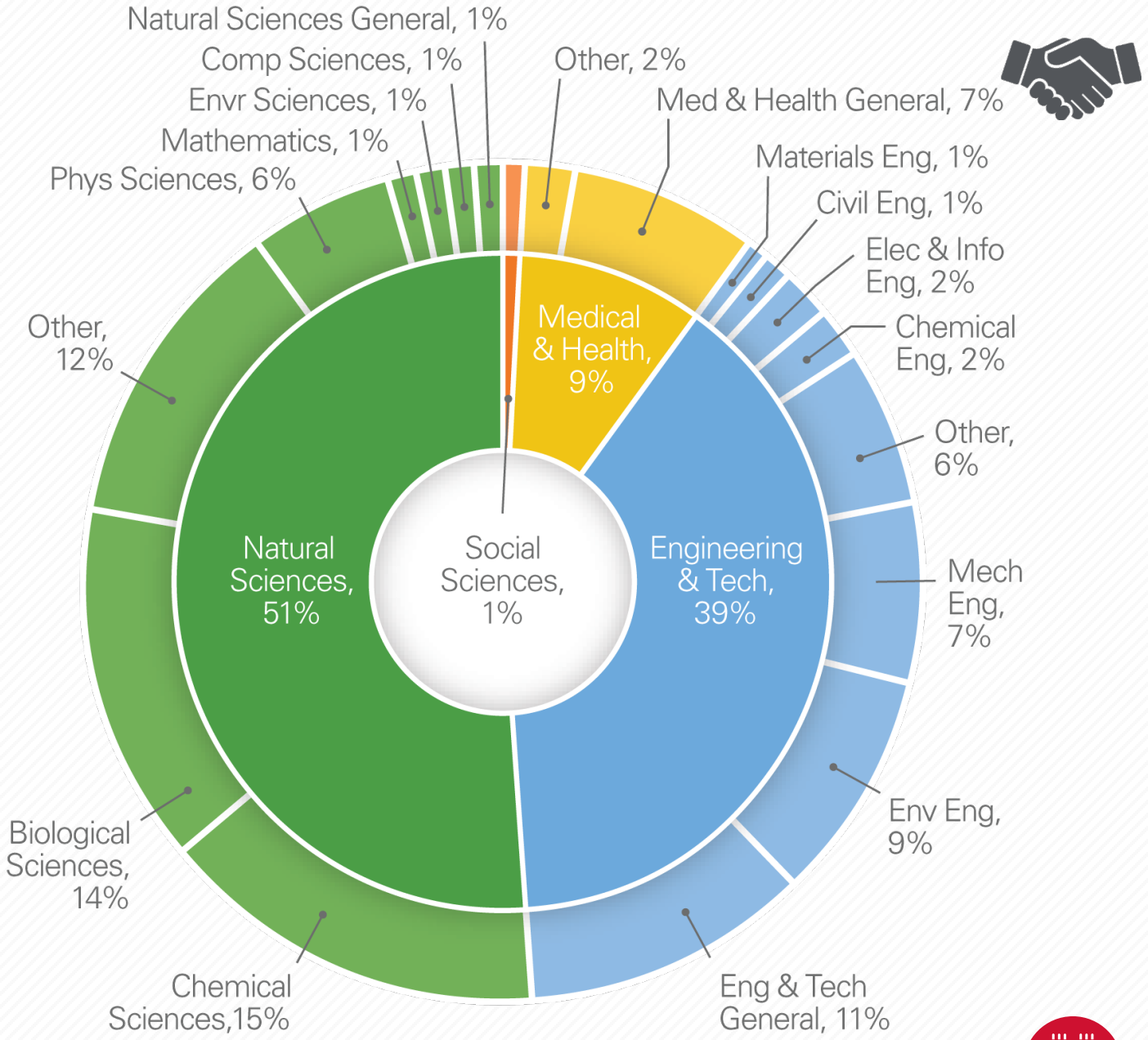
- Faculty
- Postdocs
- Research scientists
- Grad students
- Instructors

Commercial, nonprofit & more

- Business and industry
- Nonprofit organizations
- Government agencies
- Hospitals and health care
- Organizations outside of Ohio

Usage by Field of Study*

FY2021



*Fields of study are self-reported and classified based on "Revised Field of Science and Technology (FOS) Classification in The Frascati Manual" found here https://www.oecd.org/science/inno/38235147.pdf

Training Activities

Recent Topics

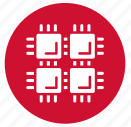
- Introduction to Supercomputing
- Batch System
- Globus Workshop
- Optimization and Performance Tuning
- Hands-On Introduction to Supercomputing
- RNA-Seq Data Analysis Workshop

Upcoming Events

- (Dec 1) Introduction to Supercomputing
- (Oct 19) Hands-On Introduction to Supercomputing
- (Nov 10) Batch Systems
- (Oct 20) Introduction to Data Analysis with R
- (Oct 28) Webinar: MATLAB and NVIDIA with OpenOnDemand

Research Partnership

- Letters of commitment/support to show access to sufficient resources for the project.
- Boilerplate descriptions of computing and storage facilities and data retention policies.
- Quotes for services such as: dedicated computing resources, large scale storage, HPC consulting.
- Opportunities for Outreach/Broader Impact activities with OSC's K12 summer educational programs.
- Expertise such as: scientific software development, web software development and virtual environments by collaborating as co-investigators or senior personnel.
- Review of proposals for research computing infrastructure or research software development.



Collaboration Letters

Letters in FY21

- Total Submitted: 21
- Funding Agencies**:** NSF (12), NIH (7), NIST (1), PCORI (1)
- PI's University**:** OSU (9), Univ. Toledo (2), Cleveland State (2), Miami University (1), University of Dayton(1), OSUWMC(1), Purdue University(1), Lawrence Tech University(1), Lonestar Education and Research Network(1), Baylor(1)
- PI's Department: Mathematics; Food, Agriculture and Biological Engineering; Biology; Cancer Biology & Genetics; Computer Science and Engineering; Mechanical and Aerospace Engineering; Biomedical Informatics; Cognitive and Behavioral Brain Imaging; Electrical and Computer Engineering; Other

Current Research Collaborations

Full Title	Lead PI Institution	Sponsor
Improved understanding and scaling of biologically relevant dynamic soil properties at the MLRA scale.	OSU	USDA
Collaborative Research: Frameworks: Designing Next-Generation MPI Libraries for Emerging Dense GPU Systems	OSU	NSF
CCAS: A comprehensive collaborative center for aeronautical sciences based on a versatile proactive paradigm	OSU	DoD
CyberTraining: CIU: Computational and Data Science Literacy Curriculum Exchange	OSC	NSF
EarthDEM:High-Resolution, Time-Dependent Topography of a Changing Earth	U. of Minnesota	NSF
MRI: RADiCAL: Reconfigurable Major Research Cyberinfrastructure for Advanced Computational Data Analytics and Machine Learning*	OSU	NSF
XSEDE 2.0: Integrating, Enabling, and Enhancing National Cyberinfrastructure with Expanding Community Involvement	U. of Illinois	NSF
Framework: Software NCSI - Open OnDemand 2.0: Advancing Accessibility and Scalability for Computational Science through Leveraged Software Cyberinfrastructure	OSC	NSF
High Performance Computing Modifications to GPS	OSU	GM
Collaborative research: Aggregating and Repurposing Phylogeographic Data	OSU	NSF
AI Institute for Intelligent CyberInfrastructure with Computational Learning in the Environment (ICICLE)	OSU	NSF
CyberTraining: Pilot: An Artificial Intelligence Bootcamp for Cyberinfrastructure Professionals	OSC	NSF
CAREER: The Common Attentional and Dynamical Properties of Decision Making*	OSU	NSF
CAREER: Observing the Physics of Star Formation in Galaxies*	OSU	NSF

Post-SUG Survey

THE OHIO STATE UNIVERSITY

Dear Statewide User Group Conference Registrant:

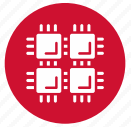
Please help us by taking a few minutes to *anonymously* provide feedback for our Statewide Users Group Conference. **We want to make sure we meet your expectations.**

Thank you for giving us the opportunity to better serve you by taking this survey.

Sincerely,

HPC Client Services
Ohio Supercomputer Center

OSC will ship branded merchandise to all survey participants!



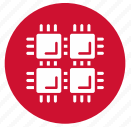
How to Get Help

Refer to **osc.edu/fallsug21** for more information about anything we discussed today

OSC offers Virtual Office Hours every other week – you can sign up for a half-hour session by visiting the Upcoming Events section on OSC's website or emailing oschelp@osc.edu

Campus Champions – local campus, college, or department resources for research computing. For more information about the program, reach out to oschelp@osc.edu

Feel free to email oschelp@osc.edu with questions about services, collaborations, or ideas you want to explore



OSC Brochures

Accelerate your teaching and research

Cluster computing

Tackle data-intensive projects of greater size and complexity at faster speeds and lower costs on the Ohio Supercomputer Center (OSC)'s cutting-edge high performance computing (HPC) clusters. Easily and reliably access all systems through the OnDemand user portal in a web browser, no software installation required.

Data storage

Securely house hundreds of terabytes on OSC's regularly backed-up large-capacity data storage servers. Confidently store sensitive data with Protected Data Service (PDS) solutions that meet strict security requirements, including personal and research health information and export-controlled data.

Software and support

Access more than 200 actively maintained and ready-to-use open source and licensed research software packages with OSC. Work with expert staff to tackle coding problems, reduce runtimes, develop analysis tools and collaborate on research. Commercial clients may be required to provide their own licenses for certain applications.

Learn more at osc.edu/services

Ohio Supercomputer Center

Ohio Academic Price Sheet

High Performance Computing Services	Standard Nodes		Big Memory Nodes		Add-on GPU
	per node hr	per core hr	per node hr	per core hr	per GPU hr
Owens Cluster	$0.08	$.003*	$0.19	$0.004*	+ $0.045
Pitzer Cluster	$0.12		$0.32		
Pitzer Expansion	$0.14		$0.19		

*Current subsidies allow for reduced costs. Original per core hour cost is $0.014. Costs subject to change.

Monthly billing is based on usage of nodes/cores to the nearest minute.

Data Storage & Transfer Services	Price per TB per month
Home directories, parallel scratch and network transfer	$0
Project storage (high performance, high availability file system, includes backup)	$1.60

Monthly billing is based on the allocated storage quota to the nearest half TB.

Consulting Services	Price per 4 hour block
Advanced tech support (e.g. software development, code optimization, etc.)	$400

Academic Usage Credits	Discount	Coverage
Faculty credit	First $1,000	Completely subsidizes 90% of faculty users
Classroom projects	100%	No cost for classroom projects

Ohio Supercomputer Center
An OH·TECH Consortium Member

1224 Kinnear Road, Columbus, Ohio 43212
614-292-9248 | osc.edu

Not for further distribution

Advancing Ohio's knowledge economy

Empower. Partner. Lead.

By centralizing Ohio's supercomputing services at the Ohio Supercomputer Center (OSC), the state's higher education and industry communities gain cutting-edge capabilities at unmatchable value. OSC delivers flexible, secure and reliable computational power and comprehensive client support at a fraction of the cost of similar commercial services or smaller standalone systems.

High performance computing at OSC benefits every Ohioan: Students from middle school to graduate school engage with OSC's educational initiatives, faculty conduct groundbreaking research with hands-on support from expert computational scientists, and businesses throughout the state gain a competitive advantage from affordable, on-demand supercomputing.

A unique public asset

Integrated hardware, software and consulting

- All under one roof
- Reducing clients' capital outlays
- Enabling groundbreaking innovation
- Scalable, secure and on-demand

Client Communities

4,833 researchers

30 Ohio universities

41 companies and other universities

68 non-profits and gov't agencies

75 Ohio higher ed courses

304 trainees

Ohio Supercomputer Center
An OH·TECH Consortium Member

osc.edu

Highlighting Clients Research

Researcher Recognition Form

Have you or someone you know used OSC resources to tackle a unique or notable research project? If so, please take some time to fill out the form below highlighting your work or your colleague's work for the chance to be featured. OSC plans to use these submissions in various publications that discuss the multitude of ways that HPC resources are used to advance research.

Submitter's information

Name *

Email address *

Institution *

Are you submitting this form to recognize someone else? *

- ○ Yes
- ○ No

Project title *

Calls to Action

Make use of **AVAILABLE SERVICES**

Learn about **OSC'S IMPACT**

Help shape **FUTURE PLANS**

Find ways to **ENGAGE WITH OSC**

Visit osc.edu/fallsug21 for specifics!

Questions?