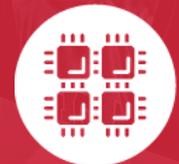


HOME	900 TB	10 GBps
PROJECT	3.4 PB	50 GBps
SCRATCH	1 PB	100 GBps

OWENS



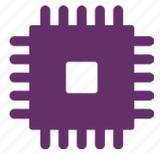
# Ohio Supercomputer Center

JESSE OWENS  
ADVOCATE  
Ohio Supercomputer Center



# How OSC Serves Clients

## Core Services



**52,480**  
Cores



**31**  
Training  
Events



**324**  
GPU's



**1,481**  
Software  
Packages



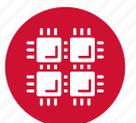
**26 PB**  
Shared  
Storage



**350**  
Support  
Webpages

## Other Featured Services

- 11 Web Gateways
- 146 Custom Software Environments
- 6 Virtual Machines
- 10 Containers
- 57 Office Hours
- 16 Protected Data Projects
- 18 Campus Champions
- 46 Kubernetes Instances
- 12 Custom OnDemand Dashboards/Apps



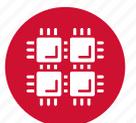


# System Status

<b>COMPUTE</b>	<b>Owens</b>	<b>Pitzer</b>	<b>Pitzer Expansion</b>	<b>Ascend</b>	<b>TOTALS</b>
Year Acquired	2016	2018	2020	2022	
Cost	\$7 million	\$3.4 million	\$4.3 million	\$1.8 million	\$16.5 million
Theoretical Perf.	~1.6 PF	~1.3 PF	~2.6 PF	~2.0 PF	~7.5 PF
Nodes	824	260	398	24	1,506
CPU Cores	23,392 Intel	10,560 Intel	19,104 Intel	2,304 AMD	55,360
GPUs	160 NVIDIA	64 NVIDIA	102 NVIDIA	96 NVIDIA	422 GPUs

<b>STORAGE</b>	<b>IBM TAPE</b>	<b>IBM ESS</b>	<b>NetApp</b>	<b>TOTALS</b>
Year Acquired	2016 – 2021	2020, 2022	2021	
Cost	\$0.8 million	\$3.9 million	\$0.7 million	\$5.2 million
Capacity	23.5+ PB (x2)	~16 PiB	~1.8 PiB	~17.8 PiB or ~20 PB

<b>SOFTWARE</b>
\$400,000 per year
1,481 software packages

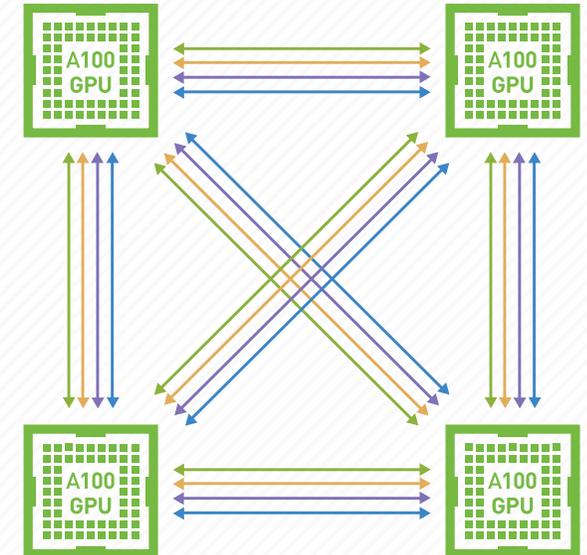




# Ascend GPU Cluster

## 24 quad-GPU compute nodes to meet demands for GPU resources

- Dell XE8545 servers, each with
  - Two AMD 7643 processors @ 2.3GHz, 48 core per processor
  - 1TB memory
  - Four NVIDIA A100 GPUs with 80GB memory each
    - >8TB/s aggregate GPU memory bandwidth per server
    - HGX/SXM4 packaging with full NVLink, 300GB/s uni-directional inter-GPU links for memory coherence
  - 12.8TB NVMe internal storage (new feature)
  - Mellanox/NVIDIA 200Gb HDR InfiniBand
- Adds ~2 PF peak performance, 96 GPUs, 2304 processor cores



## In full production as of December 2022

- Significant tool for researchers with AI/ML, BD/DA, and traditional simulation
- Efforts are ongoing to migrate GPU users to the cluster

**OSC priced Ascend at the existing Pitzer / Owens price point, resulting in no change in pricing compared to previous years**





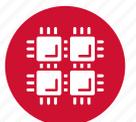
# C22 Update: Now C23!

## Process

- User community survey
- Three separate meetings of the SUG HW committee
- Meetings with individual researchers and stakeholders
- Vendor NDA briefings
  - Three technology suppliers: Intel, AMD, NVIDIA
  - Four OEMs
- Feedback from similar centers
- Feedback from ODHE, OSU OTDI, and OSU purchasing

## Plan

- Deploy GPU cluster for near-term capacity (Ascend GPU cluster)
- Delay C23 for next-generation processors and GPUs, 2023 availability
  - Combine multiple biennia capital funds for C23, target budget is \$8.4M
- Switch to a three-year cadence for major systems
- Determine RFP schedule based on technology schedules and capital budget timing
- Issue RFP for C23 Spring 2023
- Run Owens concurrently with C23 for no gap in capacity



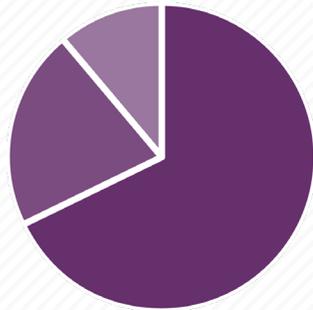


# Clients

## Individuals



**6,927** Individual Accounts



- 68%** Students
- 21%** Faculty/Staff
- 11%** Other

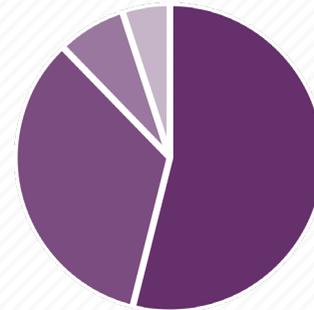


**+2,094** Since FY20

## Organizations



**908** Organizations



- 54%** Open OnDemand Orgs
- 34%** Other
- 7%** Ohio Academic
- 5%** Other Ohio Orgs



**+669** Since FY20





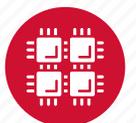
# Ohio Higher Education Clients

38 Organizations | 5,916 Individuals

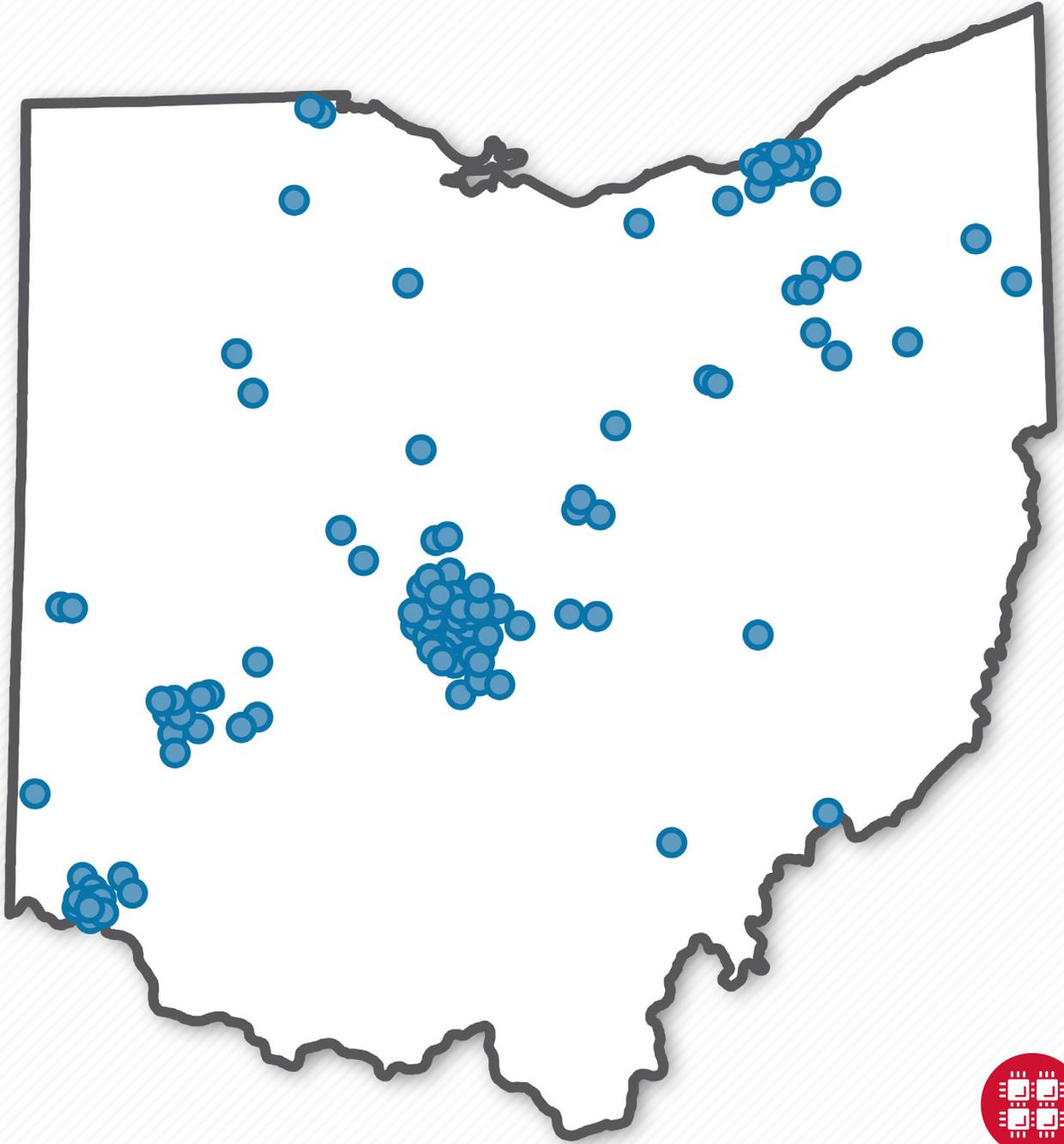
Air Force Inst. of Tech.	7
Akron	32
Baldwin Wallace	2
Bluffton	8
Bowling Green State	98
Capital	2
Case Western Reserve	40
Cedarville	5
Central Ohio Technical	1
Central State	6
Cincinnati	350
Cleveland State	86
Columbus State	1

Dayton	36
Denison	3
Heidelberg	1
John Carroll	2
Kent State	153
Kenyon	20
Marietta	9
Miami	194
Mount Union	4
Muskingum	7
MV Nazarene	7
Oberlin	1
Ohio Dominican	1

Ohio Northern	4
Ohio	131
Ohio State	4,287
Ohio Wesleyan	6
Otterbein	6
Stark State	17
Toledo	145
Wittenberg	12
Wooster	21
Wright State	125
Xavier	15
Youngstown State	71



# Ohio Organizations



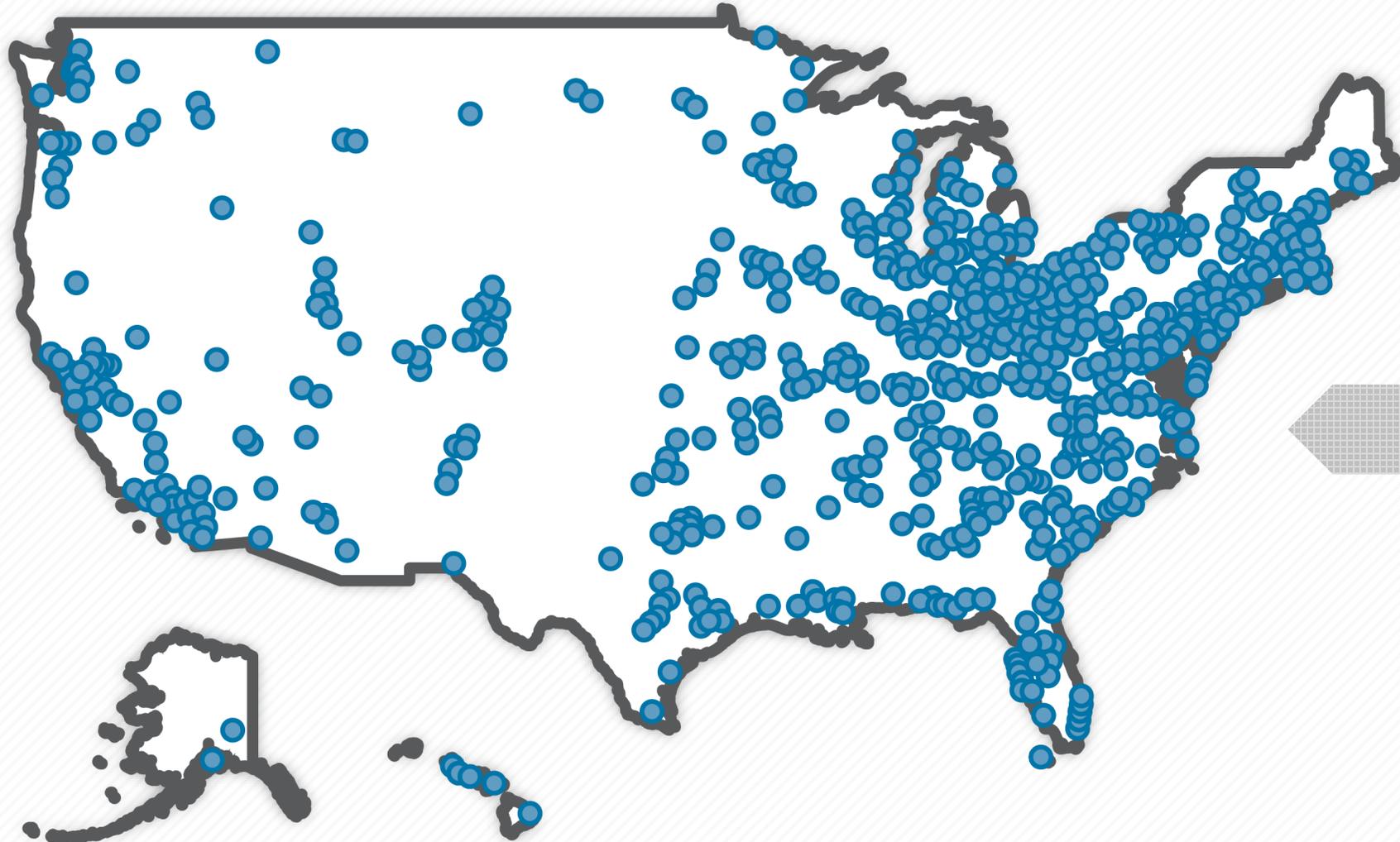
- 64** Ohio Academic
- 32** Ohio Industry
- 15** Ohio Nonprofit/Gov
- 6** Open OnDemand





# Individual Account Locations

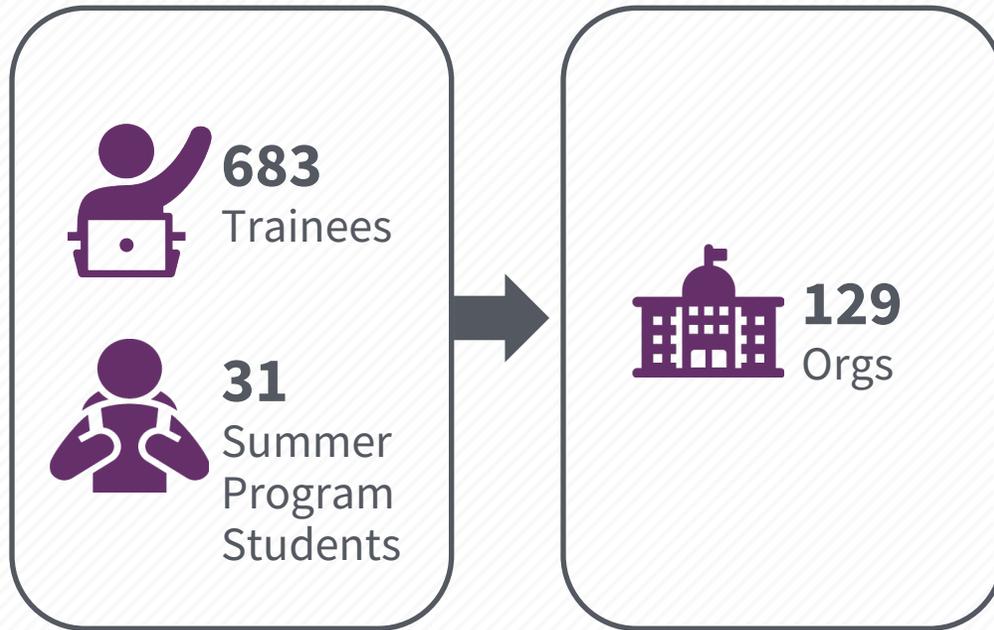
50 States



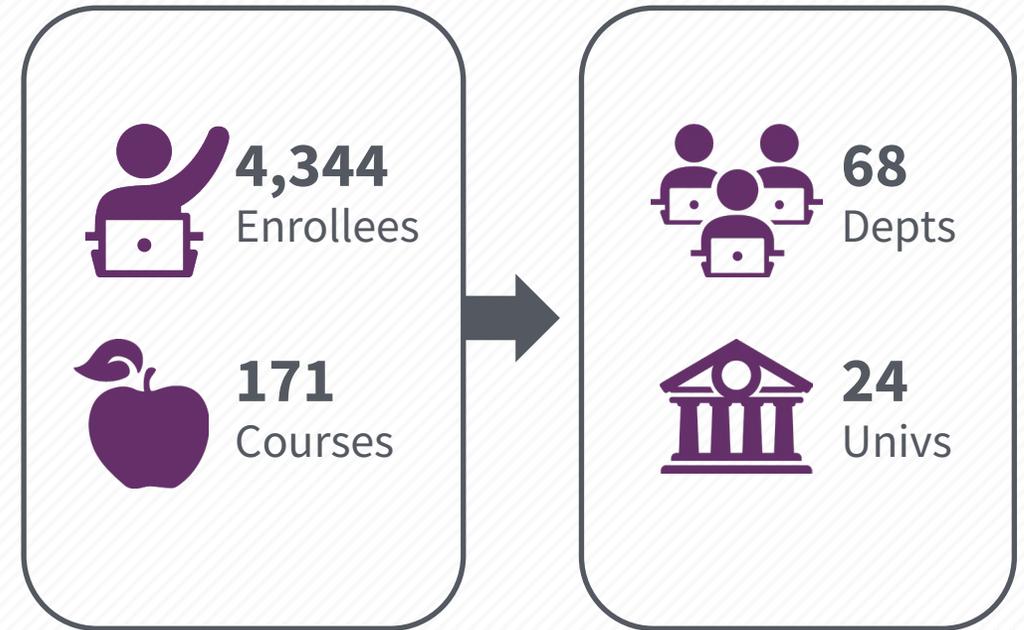


# Workforce Development

## Hosted by OSC



## Facilitated by OSC





# Training Highlights

## Remote / Asynchronous

- Batch System at OSC
- Introduction to OSC
- NVIDIA Genomics Webinar: Parabricks
- Parallel R at OSC
- RNA-Seq Data Analysis
- Simple Linear Regression with R

## On-site / Hybrid

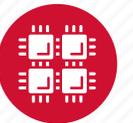
- MATLAB Machine Learning





# Virtual Computer Lab Support

- Custom OnDemand dashboard at [class.osc.edu](http://class.osc.edu)
- Installing specific software packages as requested
- Streamlining student account creation
- Scheduler reservations as needed
- Introduction to supercomputing for classroom
- 34 active classes Spring semester





# Ohio Higher Education Courses

68 Departments | 171 Courses | 4,344 Enrollees

Organizations	Dept	Courses	Enrollees
Air Force Institute	1	1	3
Akron	1	1	2
Bluffton	1	1	6
Bowling Green	1	4	51
Cedarville	1	1	2
Cincinnati	6	12	254
Cleveland State	2	3	56
Dayton	1	1	11
Heidelberg	1	1	1
Kent State	3	10	182
Kenyon	1	1	29
Marietta	1	3	13

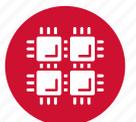
Organizations	Dept	Courses	Enrollees
Miami	4	6	217
Mount Union	1	1	16
Muskingum	1	1	8
MV Nazarene	1	1	1
Ohio	6	6	43
Ohio State	26	102	3,223
Stark State	2	2	18
Toledo	3	3	47
Wooster	1	1	13
Wright State	1	3	90
Xavier	1	3	19
Youngstown	1	3	40





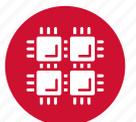
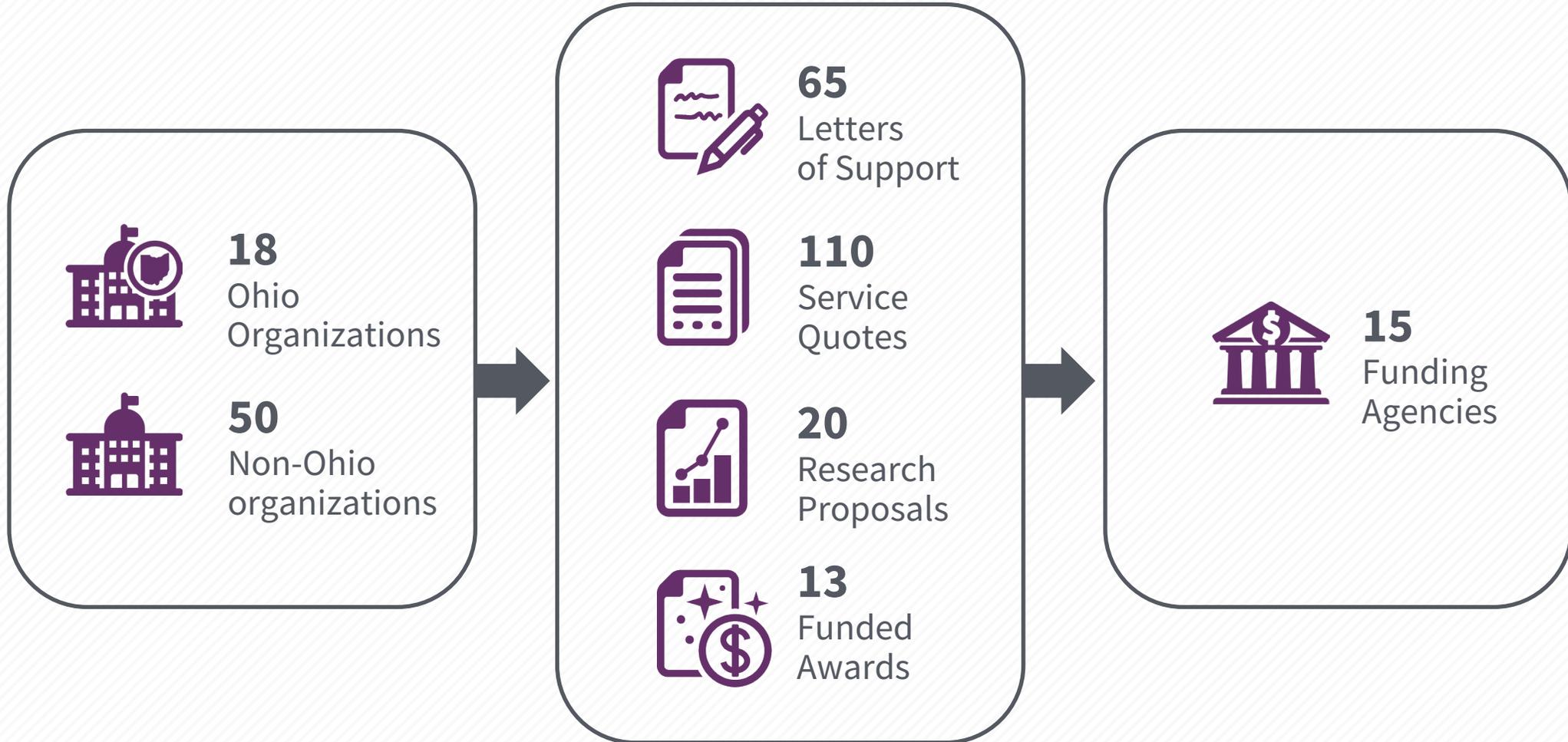
# Research Partnership

- **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.





# Research Partnerships





# Partnership Highlights

## Topics

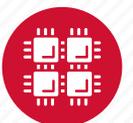
- Scaling dynamic soil properties
- Workforce preparedness
- Dynamics of mumps reemergence
- Hurricane damage assessment
- Predictive cognitive functioning for models of Alzheimer's disease
- Epilepsy-on-a-chip

## Partners

- Air Force Research Laboratory (AFRL)
- Bowling Green City Schools
- Dayton Islamic Schools
- GE Research
- Memorial Sloan Kettering Cancer Center
- Southeastern Universities Research Association

## Funding Agencies

- General Motors
- National Aeronautics and Space Administration
- National Institute of Allergy and Infectious Diseases
- National Institute of Standards and Technology
- National Oceanic and Atmospheric Administration

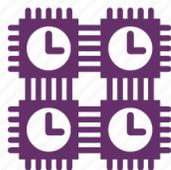




# What is OSC's Impact



**286.1 Million+**  
Core Hours  
Consumed



**1.4 Million+**  
GPU Hours  
Consumed



**87%**  
of Jobs Started  
Within 30 Minutes



**99.5%**  
Service  
Availability



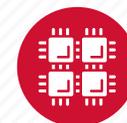
**40 PB**  
Total Data Stored



**10 PB**  
Data Transferred



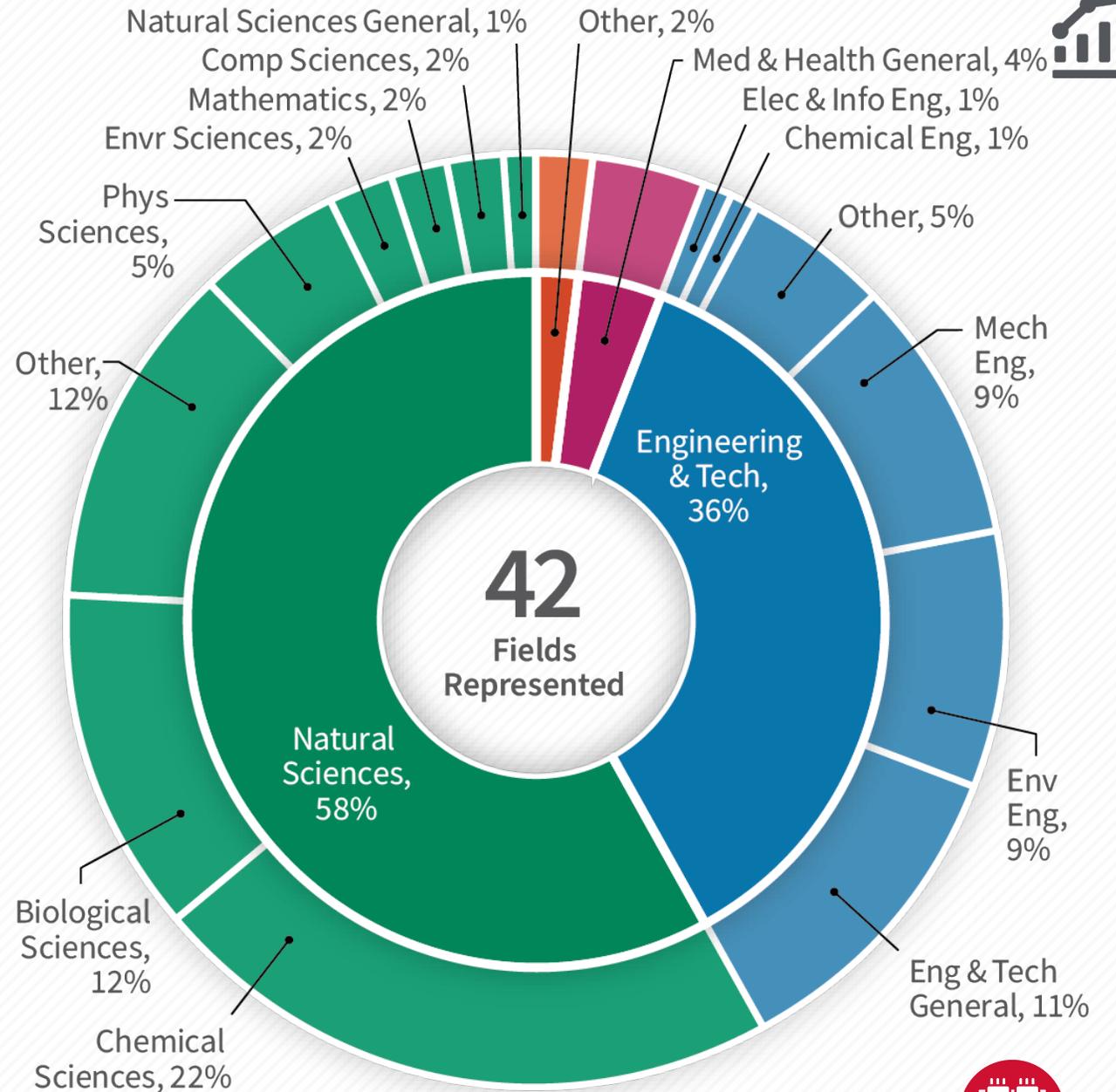
**1,481**  
Maintained Software  
Package Versions



# Usage by Field of Study

## Highlights

- Nano-technology
- Media and Communications
- Languages and Literature
- Economics and Business
- Animal and Dairy Science
- Psychology and Cognitive Sciences
- Agricultural Biotechnology
- Arts





# Client Annual Savings



**\$7.6M**

Ohio Higher Ed



**+\$2.8M**

Since CY20



**\$2M+**

Non-academic

(includes Other Education,  
Nonprofit/Govt, Commercial)



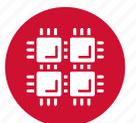
**+\$423K**

Since CY20



**\$24.6M+**

Leveraged Capital  
Investments





# Current Contracting Options

## Institutional Master Contract

- Post-paid in response to regular billing

## Individual Contract

- Post-paid OR Pre-paid to set a budget ceiling

## No Contract

- Pre-paid to set a budget ceiling

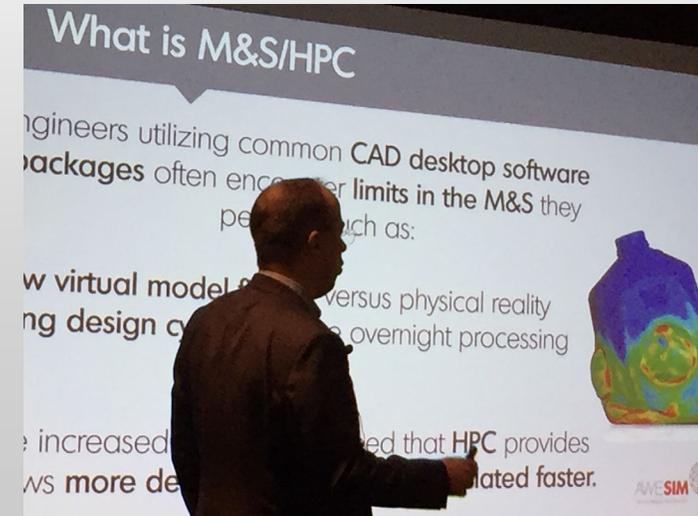
**Open to discussing other options as needs arise**



# Education & Training Opportunities at the **Ohio Supercomputer Center**

UPDATED REGULARLY AT [osc.edu](http://osc.edu)

- **“Introduction to Supercomputing at OSC”** – Held every other month, next session is May 5<sup>th</sup>!
- Other software training webinars, HPC association events, and SUG Conferences twice yearly
- **“Virtual Office Hours”** appointments with OSC Client Services staff
- **“Classroom Project Resource Guide”**
- [osc.edu](http://osc.edu) / *Resources – Available Software* (150+ programs)
- [osc.edu](http://osc.edu) / *Access OSC – Service Costs*
- [oschelp@osc.edu](mailto:oschelp@osc.edu)



# OSC Campus Champions Program

The Ohio Supercomputer Center's (OSC) **Campus Champions Program** is composed of high-performance computing (HPC) advocates at academic institutions across the state. Campus Champions serve as local proponents for access and utilization of OSC resources on their campuses. They also receive their own project accounts with no-cost access to a range of OSC services, giving them an additional resource in their own toolkits.

Campus Champions help OSC by:

- Promoting the availability of OSC resources to researchers at their institutions
- Onboarding new researchers to project accounts to test out OSC resources
- Identifying researchers' specific needs to help OSC create personalized training sessions

If you would like to help your colleagues get connected with HPC resources, please contact us at [oschelp@osc.edu](mailto:oschelp@osc.edu).





# Highlighting Client 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 \***





**THANK YOU FOR YOUR TIME AND CONSIDERATION!**

Chase Eyster  
Business Development Manager  
**Ohio Supercomputer Center**

1224 Kinnear Road  
Columbus, Ohio 43212

**(419) 631-3692 Cell**

**(614) 688-0971 Office**

[ceyster@osc.edu](mailto:ceyster@osc.edu)

Please connect with me on LinkedIn!

