Center offers the critical services that facilitate discovery, innovation



"Our clients' most valuable resource is their time. We allow them to spend less time on infrastructure and more time on their research."

David Hudak, Ph.D.

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OSC Overview

Since the creation of the Ohio Supercomputer Center (OSC) in 1987, the center's staff has provided critical services that allow Ohio researchers, professors and students to achieve new levels of success, from empowering amazing scientific discoveries to partnering on remarkable industrial innovations. The center provides its clients with a wide array of invaluable assistance, from high-end supercomputing and storage, to domain-specific programming expertise, to intuitive and effective resource interfaces and school-to-college-to-workforce education and training.

Our mission is to empower our clients, partner strategically to develop new research and business opportunities and lead Ohio's knowledge economy. David Hudak, Ph.D., director of supercomputing services, offers some perspective on how OSC is supporting that mission:

Capacity

We work with researchers who need computational and storage capacities that far outstrip what they can expect from machines in their offices or departments. There are many benefits in having access to a state-of-the-art, modern computer center that deploys large-scale systems that are professionally maintained and monitored. However, the bottom line is for researchers to be able to focus on their science and not on whether they've installed the latest software, what happens to their computers when the building loses power or any other operational issues. Our clients' most valuable resource is their time, and we provide sophisticated solutions that allow them to spend less time on infrastructure and more time using the infrastructure to do their research.

Reliability

We've built an extremely reliable and exceedingly usable high performance computing environment here at OSC. We have a production software stack that is meticulously developed and maintained by more than a dozen in-house experts. Regular maintenance windows allow us to refresh applications so clients have access to the latest, most reliable software in their fields. We're focused on issues like security updates, performance improvements and improved usability; there's a tremendous amount of work that goes into making our production environment as good as it is. I am grateful to our outstanding team for all their efforts.

Services

We offer clients domain-science expertise in computational science, as well as scientific fields like computational chemistry, numerical analysis, computer science, finite element analysis and computational fluid dynamics. We're also strengthening our ability to assist clients with their needs in data analysis, supporting such initiatives as Ohio State's Discovery Themes, the University of Cincinnati's business analytics program and Case Western Reserve University's data science and analysis programs.

Our clients are scientists with deep levels of expertise in their own fields of study—chemistry, physics, biology, pharmacology and so on—not HPC engineering. On top of that, our practitioners, more often than not, are graduate students who work for the scientists for a year or two—a very short learning curve. We're making our experts more available so they can provide customized solutions that bring that scientific work into our production environment and help clients get the most they can out of our services.



OSC leadership: (left to right) Basil Gohar, Steven Gordon, Karen Tomko, Alan Chalker, Pankaj Shah, David Hudak, Douglas Johnson and Brian Guilfoos

There's also hardware customization, as we're always looking for the right balance between specialization and commodity hardware. For example, we offer big-memory machines (one terabyte RAM) for those experiments and those codes that simply require a terabyte of RAM that cannot be split across multiple nodes. Also, we have nVidia K40 GPU accelerators and Intel Xeon Phi coprocessors in the Ruby Cluster, in addition to the nVidia K20 GPUs in the Oakley Cluster. If we don't have some particular feature that a researcher needs, I'd love to have a conversation to better understand that need and find out if others across the state have the same need.

Access

As I said, a researcher's most valuable resource is his or her time. OSC OnDemand was our first large-scale initiative at the production level aimed at making HPC easier to use; we are trying to redesign and simplify the interfaces with our computing systems. With myOSC, we're making a single location for managing all administrative functions. This way, if a client needs to work on a project, they go to OSC OnDemand; if they have to file a proposal, need to check status on a ticket or register for a training classes, they go to myOSC.

Organizational Focus

Over the last couple of years, we've reorganized the entire supercomputer services staff. The overall goal was to scale and sustain operations and improve the reliability and service levels we provide to our clients. We now have a scope and mission for each of four production teams: HPC Systems (led by Doug Johnson), HPC Client Services (led by Brian Guilfoos), Scientific Applications (led by Karen Tomko) and Web & Interface Applications (led by Basil Gohar). With just a few strategic hires left to make, we're well on our way to forming the team that can provide a potent blend of services and support of the highest quality.

CAPACITY

ISSUE:

Researchers need high-capacity computation and storage

SOLUTION:

OSC provides access to state-of-the-art large-scale systems

RELIABILITY

ISSUE:

Researchers want a highly dependable HPC environment

SOLUTION:

OSC represents an extremely reliable and usable HPC center



ISSUE:

Researchers are seldom HPC experts, yet require HPC resources

SOLUTION:

OSC offers deep staff expertise and a wide range of HPC solutions

OSC Impact July 2014 – June 2015



Research projects & new projects by institution, OSC 2014-2015





Critical Partnerships

The Ohio Supercomputer Center—renowned statewide, nationally and internationally for its ability to bring valuable contributions to collaborative efforts—plays a significant role in numerous critical partnerships. A couple of examples demonstrate this deep commitment: a coalition to investigate and combat harmful algae blooms and an initiative to deliver vital computational services to biomedical informatics researchers.

In 2015, following a three-day "no-drink" municipal water advisory to the 500,000 citizens of Toledo, Ohio, Department of Higher Education Chancellor John Carey organized his agency's Lake Erie R&D Initiative to find ways to effectively counter the harmful algae blooms plaguing Ohio lakes. Carey brought together research labs from a group of colleges and universities already engaged in water quality studies, several state agencies with a vested interest in a successful solution and scientists from NASA Glenn Research Center.

The Ohio Supercomputer Center is providing solutions for big data storage and warehousing for labs at the partnering research institutions: Bowling Green State University, Central State University, University of Cincinnati, Defiance College, Heidelberg University, Kent State University, The Ohio State University and University of Toledo.

OSC engineers adapted the AweSim industrial engagement program's simple, web-based dashboard interface to facilitate collaboration on data analysis for field biologists working on the problem. In addition, colleagues at OARnet recently installed a peering service that connects their statewide network with NASA's, allowing vast amounts of data to flow between the universities and the research center. In addition to the challenges blue-green algae presents to water treatment facilities, these toxins present a serious threat to those communities that depend upon activities, such as tourism and most forms of water sports.

In Columbus, the Biomedical Informatics Department (BMI) within the College of Medicine at The Ohio State University Wexner Medical Center (OSUWMC) leads a robust and expansive informatics research, development, service and training program. This important, gamechanging research depends heavily upon powerful and responsive computational resources.

OSC staff members are assisting BMI researchers in transitioning from several small, in-house computational cluster systems to the more sustainable and powerful infrastructure of OSC's Ruby and Oakley HPC systems. For the past few years, OSC has been providing system administrative and user support for the aging BMI systems, mirroring the BMI genomics databases, installing and supporting software required for analysis of genetic data of human disease and running PhemoLIMS, a lab notebook.

BMI efforts are complemented by the operations of OSUWMC's CTSA-funded Center for Clinical and Translational Science, an NCI-designated Comprehensive Cancer Center, and a recent \$1 billion expansion of OSUWMC. BMI research is further impacted by investments from the university's \$400 million Discovery Themes Initiative, which will bring in 500 new senior faculty members over the next 10 years to augment identified areas of research strength at the university.

OSC engages in numerous critical partnerships, incuding an effort to transition biomedical informatics (inset) researchers to high performance computing systems and an initiative to combat harmful algae blooms in Ohio waters.

(Inset) Photo credit: Department of Biomedical Informatics at The Ohio State University. (Below) Photo credit: The National Oceanic and Atmospheric Administration (2012).

