University of Cincinnati
FACILITIES, EQUIPMENT AND OTHER RESOURCES

University of Cincinnati
The University of Cincinnati (UC) is a major, comprehensive, state-supported public research and teaching university with an enrollment of more than 44,000 students. In 2015, the Carnegie Commission ranked the University of Cincinnati in the R1 category, classified as “Doctoral Universities – Highest Research Activity” (Carnegie, 2015) and, as an institution with a rich history in discovery and innovation, UC is frequently ranked as one of America’s top public research universities. Last year, UC and its research affiliates received nearly $400 million in research funding, and the university is the largest employer in the Cincinnati region, with an economic impact of more than $3 billion.

University of Cincinnati Office of Information Technology (UCIT)
The UC Office of Information Technology (UCIT) is the university’s centralized IT services provider. UCIT partners with students, faculty, and staff to deliver innovative and efficient real-world solutions that support the academic and research priorities of the university. UCIT operates as an interdependent organization aligned to partner with IT colleagues across campus, and provides services in strategic areas of focus including Business Operations, Client Services, E-Learning, Enterprise Shared Services, and IT Innovations & Partnerships.

Ohio Supercomputer Center (OSC) partnership
UC researchers connect to the OSC via the Ohio OARNet network. The unique partnership between UC and OSC/OARNet has been established as an excellent resource for high performance computing cycles. UC will be one of the first universities in Ohio to utilize the new ‘condo’ model for compute resources that OSC will be offering – the condo will be administered by OSC hardware administrators and software will be installed by OSC staff. UC participated in the RFP evaluation team for the newest cluster at OSC which has been funded for $12M by the State of Ohio.

The education team from OSC offers an introductory workshop each term for new OSC users at the University of Cincinnati and has begun offering a second workshop which is more in-depth for the power users. These workshops have been well attended and continue to form a community of computational researchers, integrating UCIT into the development of researcher’s skills. OSC has an XSEDE champion who assists in educating UC HPC users in the resources available from XSEDE as well. The new OSC Champion program will further integrate the University of Cincinnati with discipline specific experts at UC, removing barriers to using the local, regional and national resources. OSC currently operates four major systems which are available for UC researchers:

- **Owens Cluster**: A 23,392-core HP Intel Xeon E5-2680 v4 machine
  - 28 cores per node and 128 GB of memory per node
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- 16 nodes have 1.5 TB of memory and 48 cores, for large Symmetric Multiprocessing (SMP) style jobs
- 160 nodes have NVIDIA Pascal P100 GPUs
- Theoretical system peak performance 750 teraflops (CPU only)
- **Ruby Cluster**: A 4,800-core HP Intel Xeon machine
  - 20 cores per node and 64GB of memory per node
  - One node has 1 TB of memory and 32 cores, for large SMP style jobs
  - 20 nodes have NVIDIA Tesla K40 GPUs
- **Oakley Cluster**: An 8,300-plus core HP Intel Xeon machine
  - 12 cores per node and 48 GB of memory per node (8 nodes have 192 GB of memory)
  - One node has 1 TB of memory and 32 cores, for large SMP style jobs
  - 64 nodes have 2 NVIDIA Tesla M2070 GPUs
- **GPU Computing**: All OSC systems now support GPU Computing. Specific information is given on each cluster's page.
  - Oakley: 128 NVIDIA Tesla M2070 (two each on 64 nodes)
  - Ruby: 20 NVIDIA Tesla K40
  - Owens: 160 NVIDIA Pascal P100

**OARnet**
The Ohio Academic Resources Network (OARnet) was created in 1987 by the Ohio Board of Regents, through legislation by the Ohio General Assembly. OARnet was founded to provide Ohio researchers "online" access to the high performance computing resources of the Ohio Supercomputer Center, established in Columbus earlier that same year. Today, the OARnet network consists of more than 1,850 miles of fiber-optic backbone, with more than 1,500 miles of it operating at ultrafast 100 Gbps speeds. The network blankets the state, providing connectivity to Ohio's colleges and universities, K-12 schools, public broadcasting stations, academic medical centers, government agencies, and partnering research organizations. Beyond being a nationally recognized statewide infrastructure, OARnet specializes in promoting efficiencies and shared services throughout Ohio's public institutions, providing worldwide connectivity through Internet2 tie-ins, and bridging dozens of international sites with high-definition telepresence.
UCIT Research & Development Office
The UCIT Research & Development strategic focus is to facilitate IT-enabled research and knowledge creation by connecting researchers with technical expertise, resources, training, and state-of-the-art IT services. The Research and Development office director actively collaborates with researchers, administration and industry partners by leading the IT Governance Research and Development topical committee.

IT Governance – Research and Development Topical Committee
The Research and Development (R&D) topical committee is one of five committees that make up the IT Governance structure. All five committee chairs sit on the IT Council which is made up of major leadership of the university. The IT Governance structure is a part of the UC Integrated Decision making process which is responsible for the identification and prioritization and funding recommendations for all UC initiatives.

The R&D committee membership includes the Office of Research’s AVP of Strategic Initiatives and Implementation, the UC Research Institute’s (UCRI) Chief Executive Officer (represents industry partnerships with UC researchers), Associate Deans of Research from major research colleges, computational researchers and faculty from UC’s College of Medicine, College of Engineering, College of Arts and Sciences, and Digital Humanities. Research IT staff who support HPC in the division of Biomedical Informatics, Cincinnati Children’s Medical Center High Performance Computing (HPC) center, and the College of Engineering Mechanical and Aerospace HPC clusters represent their research partners’ cyberinfrastructure needs on the committee. Undergraduate and graduate student researchers from the STEM disciplines are important members as well, identifying and recommending the potential use of emerging technologies and trends.

Cisco WebEx Web-Based Conferencing Tool
The University of Cincinnati provides access to WebEx to all university students, faculty, and staff for online meetings and collaboration. WebEx is a web-based conferencing tool that allows students and faculty to host a variety of events, from small group meetings or virtual office hours to large webinars and conferences of up to 2,640 concurrent users. Participants have the ability to share files, documents, videos, and have access to a shared whiteboard.

UCScienceNet (UCSN)
UCScienceNet (UCSN), a 100Gb Science DMZ, modeled after ESnet, incorporates PerfSONAR for monitoring and tuning network performance, enables software-defined networking and OpenFlow capabilities, and provides high-throughput capacity required to achieve STEM research goals and enable multiple disparate high-speed big data transfers across a comprehensive, integrated, cyberinfrastructure.
UCSN consists of hardware deployed specifically for aggregation of high-speed networking. This hardware has characteristics of high-throughput with minimal latency to ensure rapid delivery of large scientific data sets. The hardware employs bandwidth scalable from 40Gb depending on research requirements and 100Gb delivery from the aggregation layer outward to Internet 2 and National Research and Education Networks (NREN).

UCSN, servicing five research intensive locations, provides a friction-free network, creating a true Science DMZ to address the limitations of the existing commodity network. UCIT in partnership with the Office of Research, provided funding to add additional endpoints to UCSN expanding benefits of a high-speed network to researchers not connected during the initial deployment of UCSN, expanding the University of Cincinnati Research Ecosystem.

This expansion will require the deployment of Cisco Nexus 3000 switches deployed in strategic research areas. The Nexus 3000 will provide scalable 40Gb back to the research core. It will also provide 10Gb to the high performance computing equipment, which today is limited to 10/100Mb.

**University of Cincinnati Libraries**
The University of Cincinnati Libraries empower discovery, stimulate learning and inspire the creation of knowledge by connecting students, faculty, researchers and scholars to dynamic data, information and resources. Over the past three years, UCIT Research and Development and the UC Libraries Informationists have worked together to provide the Introduction to OSC workshops each term. The Langsam Library computer classroom and east campus’s Health Sciences Library’s Dr. Stanley B. Troup Learning Space provide excellent workshop space with up to date workstations and space for up to 32 students in each lab. The library uses a sophisticated, web-based registration system which is easily found on their UC Libraries Workshops and Calendar of Classes website.

**UC Commodity Network**
The University of Cincinnati Campus Core Network (UCNet) provides IPv4 and experimental IPv6 network connectivity for the main UC campus and three regional campuses. The core of the campus network is built on twenty-one Cisco 6500 series routers with dual gigabit fiber links providing interconnect between redundant core routers. UC has one external peer provided by OARnet, which is a shared connection for commodity Internet and Internet2 traffic. Current provisioning is 3.5 GB for commodity Internet and 800mb for Internet2 traffic.

UCNet serves approximately 80 buildings throughout campus. Each floor of a building, serviced by its own VLAN, is connected back to a distribution core router via dual fiber uplinks. UCNet currently supports over 1000 VLANs, each a /24 IPv4 network and one /48 IPv6 network, which is still in an experimental stage.
UCNet is a centrally managed network, and the network infrastructure is designed to provide 100Mbps Ethernet ports to the community and 100/1000 Mbps Ethernet ports to devices servicing the community at large, such as centrally located servers providing resources to the entire community.

**UC Data Center**
The UC Data Center, managed by UCIT Enterprise Shared Services, provides 6700 square feet of space for enterprise shared services, research systems, and UC co-locators. A Data Center Infrastructure Management (DCIM) system was recently added, bringing state-of-the-art management and monitoring to the data center. The data center’s internal network capacity has been upgraded, providing high-speed data transfers between enterprise storage and the university's core systems at 10Gb/s.

**UCIT Compute and Storage**
The UCIT Enterprise Shared Services division offers a variety of compute and storage resources to the UC research and education community. Compute services include managed physical and virtual servers, data center hosting for co-locators, and hosting for applications and web services. Service administrators work with requestors to develop solutions to optimize the use of resources based on project requirements. Highly scalable, world-class enterprise storage includes 513 TB of total capacity disk storage, with various performance and backup levels offered based on the needs of the individual, group, or application.

**UCIT Office of Information Security**
The UCIT Office of Information Security collaborates with and serves the university community by enabling protection of information assets and supporting the academic and research objectives of the university as identified in their relevant core security functions below.

- Lead the Information Security and Compliance Governance Committee to pursue and establish information security best practices that enable the university to meet its core mission
- Establish university information security policies, standards, procedures, and guidelines to facilitate availability, integrity, and confidentiality of data
- Integrate with the university's on-boarding program to educate new hires on information security essentials
- Provide specialized training programs to meet various compliance needs
- As requested, perform security reviews of enterprise technology services and vendor vetting prior to implementation
- Perform regular system vulnerability assessments and communicate results to asset custodians