

March 2015 Progress Report

Summary

Cyberinfrastructure is broadly defined as the human and technological support framework for advanced data acquisition, data storage, data management, data integration, data mining, data visualization, data curation and other computing and information processing services within the research environment.

MU's CI Council continued to work diligently throughout 2014 to understand the CI needs of researchers at MU and to assure research CI investments are coordinated, focused, and leveraged where possible. The University of Missouri is becoming a leader in research CI, and is gaining renown for our faculty leadership through the CI Council. MU is one of only a handful of leading universities who have the highest speed (100 gigabits per second) connections to Internet2 – the Internet dedicated to research and education. Advanced Layer 2 Services provide MU researchers scalable and flexible global access to an open exchange network where the most demanding data-intensive investigations can be conducted. MU researchers can build short or long-term Layer 2 circuits between endpoints on the Internet2 Network and beyond. The Advanced Layer 2 Services are described in this publication: Backbone of 21st Century Research. Looking ahead, momentum is building, and increased faculty participation is welcome – particularly in refining MU's CI plan and in communicating the availability of existing resources – at the campus level and beyond.

Background

Formed in January, 2013, MU's CI Council is comprised of faculty and staff representing all MU Schools and Colleges. MU's CI Council provides input and guidance on the cyberinfrastructure needed to support the wide variety of research and discovery activities across the University of Missouri. The group meets monthly and welcomes interested visitors. The input of CI members is critical for planning required strategic investments and ongoing support for cyberinfrastructure, as well as the services and resources provided by the Division of IT's Research Support Computing organization.

Progress Towards Goals

MU's Campus Cyberinfrastructure Plan

- MU's Campus Cyberinfrastructure Plan
- One of the first actions of MU's CI Council was to engage in an inclusive planning process that culminated with presentations and discussion at the inaugural CI Day on October 10, 2013. In December 2013 the Council adopted MU's first CI plan.
- The campus CI plan was instrumental in securing National Science Foundation (NSF) funding. See also the "Increased Funding for CI" section below for more details.
- MU's CI plan helped guide the campus request for Major Research Instrumentation, which brought \$600,408 of research computing gear to campus as well as 30% MU matching funds.
- The CI Council recognized the need for a "living" plan that can support relevant funding requests. For example, a focused version of MU's CI Plan and the Details Behind the Plan document was assembled specifically for a February 2014 proposal to NSF's Campus Cyberinfrastructure – Infrastructure, Innovation and Engineering (CC*IIIE) program. This is one of the few funding opportunities for salary funding for researcher support in the use of CI. MU was awarded \$399,775.

Enhancing Communications

- In December, 2014, the Council expanded their monthly meeting agenda to include "researcher conversations" where a researcher or research team is invited to briefly share relevant information about their research and discuss with their current and future CI needs.
- Dr. Timothy Middelkoop, Director of Research Computing Support Services, created a Research Computing News.
- Acknowledging CI Council valuable input, the Division of IT's website includes Research Computing as a top level service.
- The Division of IT created a web page for the CI Council and works to keep the MU CI Resources Guide up-to-date.
- MU's second CI Day is scheduled for March 3, 2015. As with MU's first CI Day, event archives will be shared in MOspace at mospace.umsystem.edu/xmlui/.
- In partnership with the DNA Core Facility, established MU's first Data Retention Policy.
See: biotech.missouri.edu/dnacore/corepolicies.html.

Increase Funding for CI

- Campus administration expressed the intention to increase funding for research CI, including: \$500,000 for disk storage plus \$1 million in one-time funds, and increased rate funding of \$500,000 per year for four years to eventually add \$2 million per year of ongoing funding.
- The Campus CI Plan was the guiding force for the January MRI proposal (\$717,104).
- CI council outcomes directed MU's portion of the UM-System funding request for research computing (MU portion \$90,000 recurring and \$500,000 one-time).

- The Campus CI Plan was required for NSF CC*IIE proposal (Calyam, PI – \$399,775 for 2 years). A focused version from the approved plan and the Details Behind the Plan document was created specifically for this funding proposal.
- Improved the quality of data PIs provide about research computing when they submit a proposal.
- Federal funding rules are changing and more research computing costs will be allowable as a direct cost of the project rather than only through reimbursement of facilities and administration costs.

Increasing Funding for CI

- The Division of IT created a new full-time position – Director, Research Computing Support Services and hired Timothy Middelkoop. Two additional hires are currently pending for Research Computing Support Services.
- Since the beginning of our planning process, campus administration has allocated \$500,000 in one-time funds to increase research data storage capacity, and \$750,000 in recurring funds to enhance technology and staffing for research support.
- MU's Campus CI Plan was the guiding force for a Major Research Instrumentation (MRI) proposal (Shyu, PI). The National Science Foundation awarded MU \$600,408 to acquire high performance computing gear to support data-intensive research with hybrid cloud computing. As of March, 2015, the equipment has been specified, bid, ordered, and installed.
- The Campus CI Plan also helped guide Prasad Calyam's NSF CC*IIE proposal, which resulted in a \$399,775 award to MU. The project will establish two CI engineering positions (one funded by NSF, one by the Division of IT) who will use various research projects at MU as case studies to understand and meet today and tomorrow's research CI needs. These CI engineers will participate in national and international collaborations to define and implement models of research CI support. MU is developing models that are dynamic, flexible and effective, including people and training as well as hardware and software. When the project ends, the Division of IT will provide ongoing funding.

Related article: ***NSF Grants \$1 Million to MU to Expand Supercomputer Equipment and Expertise for Big Data Analytics at MU.***

Responding to MU Researcher's Most Critical Needs

Much of the CI Council's first year of activity was focused on gathering and understanding the CI needs of MU researchers, including conducting surveys, meeting with focus groups, and gathering information from the 180 participants who attended CI Day on October 10, 2013. Research data storage and more High Performance Computing (HPC) capacity emerged as the top priorities for MU campus investments. In 2013, the Division of IT moved quickly to implement Box, which provided MU faculty, staff, and students with 50 GB of disk storage. While this met some of the data storage needs, it is clear that a range of data storage options with a variety of services and charges was necessary. As detailed below, there have been significant increases in disk storage for research data. Researcher input is welcome as the CI Council prepares a policy to direct its use.

Acquisitions and Improvements to Hardware

- **Increases in High Performance Computing (HPC) capacity:** MU's HPC system (known as "Lewis") is undergoing a significant upgrade. The first phase is in place and consists of 20 Advanced Clustering Technology nodes with 128 GB of RAM and 24 Haswell cores for a total of 480 cores and 2560 GB of RAM, which will replace the aging Dell 1850/1950 dual processor nodes. This system has both QDR Infiniband networking for parallel computation (MPI) and 10 Gigabit Ethernet network connections for storage, including access to the new General Purpose Research Storage system containing over 1 petabyte of new research data storage. Thanks to the NSF's 2014 MRI, this system includes 12 additional compute nodes. Also in 2014, the SGI "Clark" system was replaced by four Dell C8000 systems with 24 cores, 256 GB of RAM, and 12TB of local disk scratch storage. These investments will integrate with existing systems and form the bases for future expansion.
- **Increases in Research Disk Storage:** 2014 purchases also included significant increases in data storage dedicated to research data. This new General Purpose Research Storage will be available to all MU researchers. One petabyte of EMC/Isilon disk storage will facilitate researcher collaboration and data collection across campus (for Windows and Linux machines) and data analysis using the Lewis HPC cluster. An allocation of 20 GB of private and project storage will be available at no cost, and additional storage will be available for a fee. This new General Purpose Research Storage is an addition to the one petabyte of storage directly connected to Lewis, and the HPC network scratch which consists of 110 TB EMC storage array managed by the IBRIX distributed file system.

Proposed Master's Degree in Data Science and Analytics

One of the Recommended Actions of MU's CI Plan is to "... work to establish data analytics learning and workforce development opportunities, such as certificate programs and master's degrees." In February 2014, Chi-Ren Shyu was the PI on a proposal that received \$80,000 of Mizzou Advantage funding to develop six courses and develop online delivery for four existing courses. While Provost and Chancellor leadership changes caused a temporary delay, the degree program proposal is in process and in the next few months, we hope to secure final approval for the new interdisciplinary masters degree.

CI Council members represent each of MU's Schools and Colleges. For questions or concerns about MU's CI Council, email: ***MUCIDAY@missouri.edu***.