

UND Division of Research - Cyberinfrastructure (CI) Plan

The proposed CI plan was developed by the University Research Council IT Subcommittee in support of the research enterprise at UND. It is anticipated that a National Science Foundation solicitation for CI multi-jurisdictional proposals will require that a CI Plan be in place for award consideration. It is anticipated that the Proposed CI Plan for the research enterprise will become part of a broader plan encompassing all elements of computational resources at UND. This document is provided for informational purposes only.

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Priority Action Area – A (Workforce Development and Support Staff)

Goal One: Offer UND students opportunities to be qualified participants in the nation's CI workforce.

Action Plan:

1. Establish a cross-departmental Cyberinfrastructure undergraduate minor to encourage students from all academic disciplines to serve as CI practitioners.
 - a. Computational Specialization
 - b. Digital Arts Specialization
 - i. CGI Special Effects and Animation
 - ii. Scientific Visualization
 - c. Video Game Development Specialization
2. Establish a scientific computing graduate program that will supply grad student teaching assistants who can provide CI tutoring and serve as instructors for courses offered by the CI minor.
3. Offer introductory CI computer course for incoming freshman that instructs on the basics of using Internet technologies
4. Offer advanced 400/500 level CI course.
5. Incorporate the use of external HPC resources such as the TeraGrid in courses where appropriate.
6. Develop marketing plan that highlights UND CI research opportunities in order to recruit graduate students in all academic disciplines who wish to apply CI techniques and technologies in their plans of study and research agendas.
7. Seek funding to establish specific CI graduate assistantships that include:
 - a. Tuition Waivers
 - b. Stipends

Goal Two: Attract and retain talented staff members who have the skill sets necessary to provide hardware administration and software support for CI-based research and education.

Action Plan:

1. Encourage staff members to participate in CI academic programs
2. Establish research and staff positions to support CI minor and scientific computing graduate program.
3. Assure that CI position descriptions accurately reflect the skills and education required to ensure a higher market salary.
4. Seek funding for CI staff positions

Goal Three: Attract and retain faculty with a background in the use of CI techniques and technologies for research and education as appropriate.

Action Plan:

1. Encourage departments to assess their CI needs by identifying the role that CI plays in their research and education programs.
2. Include CI experience as a criterion in faculty recruitment, tenure, and promotion processes as appropriate.
3. Encourage faculty to participate in CI academic programs as appropriate.
4. Encourage faculty and staff to collaborate with off-campus institutions, labs, and virtual organizations.

Goal Four: Design a CI workforce development program for UND faculty and staff.

Action Plan:

1. Offer incentive programs to encourage faculty and staff to self-study in areas of CI. Such programs might include:
 - a. Course buyouts
 - b. Professional development grants
 - c. Coverage of CI organization membership fees.
 - d. Recognition Awards
2. Offer funding for faculty and staff to attend CI conferences and workshops.
3. Offer a short course on CI for any person with a relationship to UND – faculty, staff, student, or private sector partner.

Priority Action Area – B (Hardware - Computing)

Goal One: Provide High Performance Computing resources to all faculty, staff, graduate and undergraduate students.

Action Plan:

1. Update, expand or replace the Computational Research Center cluster hardware as required to meet faculty and graduate student research needs.
2. Purchase a shared memory multiprocessor supercomputer to be used by faculty and graduate students in their research to run software applications that require this hardware environment.
3. Encourage and assist faculty and graduate student researchers to apply to NSF and other funded high performance computing centers for computing time.
4. Establish a HPC cluster for students that exploits the unused computational cycles of general-use machines.

Goal Two: Maintain proper environment and facilities for sustaining HPC resources.

Action Plan:

1. Establish climate control policies that are favorable to the efficient operation of computational and visualization systems.
 - a. Proper HVAC settings for maintaining cool environments
 - b. Access to uninterrupted power sources.
 - c. Ensure that campus data center policies allow for adequate physical access by vetted personnel whose projects utilize these facilities.
2. Promote use of energy efficient hardware systems whenever possible.
3. Seek research opportunities in the area of energy efficient HPC architecture and design.

Goal Three: Increase data storage capacity in support of increased learning and research usage.

Action Plan:

1. Assess storage needs.
 - a. Archiving Research Data
 - b. Digital Repositories
 - c. Searchable web databases
2. Coordinate multiple efforts to increase storage.
 - a. 24hr staff support
 - b. Select and fund shared storage facility
3. Identify tools necessary for easy access and retrieval of information.
4. Investigate off-campus resources with other organizations.

Goal Four: Maintain a repository for the purposes of maintaining and sharing research computer code.

Action Plan:

1. Identify off-campus code repository resources
2. Implement local repository services as necessary

Goal Five: Provide access to visualization systems for data analysis in the form of stereowalls and streaming to the web.

Action Plan:

1. Identify need
2. Implement software solutions for Computational Research Center stereowall projection system
3. Investigate methods for piping data from HPC environment to web-page display of data.

Priority Action Area C – (Hardware – Networking)

Goal One: High-bandwidth (multi-gigabit) participation in national and international research and education networks.

Action Plan:

1. Complete Northern Tier connectivity to gigapops at Chicago and Seattle.
2. Complete Northern Tier connectivity from Manitoba to South Dakota border.
3. Develop a long-term funding strategy to maintain the network. .

Goal Two: Increase the research lab/office network to multi-gigabit capacity.

Action Plan:

1. Identify use cases that demand 10 gigabit bandwidth.
2. Implement plan that includes multi-gigabit capability as needed and redundant equipment for reliability.

Goal Three: Extend campus-wide network capacity to redundant gigabit connectivity

Action Plan:

1. Identify locations that do not currently meet this criterion.
2. Seek funding to implement extended network capability.

Goal Four: Mobility across campus

Action Plan:

1. Identify locations that are not currently served by wireless connectivity.
2. Seek funding and implement additional wireless locations for full campus-wide coverage.

Priority Action Area D – Software

Goal One: Make off-the-shelf CI software packages available to all faculty, staff, and students.

Action Plan:

1. Identify campus-wide CI software needs.
2. Negotiate purchase of campus-wide licenses where economically feasible.
3. Develop support and training for software.
4. Market the availability of software.
5. Explore streamlining software purchase process.

Goal Two: Provide support for implementing custom code on current institutional computational systems where economically feasible.

Action Plan:

1. Maintain appropriate build environments
2. Hire and/or train appropriate support staff
3. Convert code to modern computer languages when beneficial.
4. Implement required free libraries on computational systems
5. Purchase commercial libraries for computational systems.
6. Market available resources.

Goal Three: Make available to faculty, staff, students, and campus partners a variety of visualization authoring and display software for: 3D rendering, video playback, and interactive environments.

Action Plan:

1. Purchase commercial 3D-authoring, rendering, and display software.
2. Purchase software development kits for constructing interactive visualization environments.
3. Develop information and training activities.
4. Market available resources.

Priority Action Area E – Regional Economic Development

Goal One: Attract and develop businesses to the region that require a trained CI workforce, high-bandwidth networking, and advanced computing and storage resources.

Action Plan:

1. Develop national marketing program to showcase the economic benefits of locating businesses near the university.
 - a. Access to CI trained workforce of UND graduates.
 - b. Access to cutting edge CI research facilities and domain experts.
2. Establish a zero-carbon data center that provides research and education opportunities to UND students and graduates, and services the CI needs of businesses seeking to reduce costs and manage their impact on the environment.

Goal Two: Develop a regional CI outreach program that informs the public on UND CI activities.

Action Plan:

1. Encourage departments to develop outreach programs that showcase UND CI activities to the public.
2. Promote departmental CI outreach programs in a manner that presents UND CI activities as beneficial economic and educational assets.
3. Use UND CI outreach program for recruiting students to careers in cyberinfrastructure technologies.
4. Highlight the role of CI when disseminating research results.