EPSCoR Research Infrastructure Improvement Program: Inter-Campus and Intra-Campus Cyber Connectivity (RII C2) in Idaho

Principal Investigator: Von P. Walden, Idaho EPSCoR Project Director

Project Summary

Idaho is very rural, with most of the population concentrated into a few metropolitan areas. Despite this, the State has been quite proactive in making the Internet available to a broad-base of constituents. The Idaho Regional Optical Network (IRON) plays a significant role in providing a high-performance network within Idaho, providing up to 10 Gbps and connectivity to commodity Internet, Internet2, and the National Lambda Rail, which connect Idaho to organizations that engage in collaborative research. IRON's role in Cyberinfrastructure is consistent with the existing Science and Technology Plan, which is supported by the Office of the Governor and the State Legislature. The University of Idaho and Boise State University are Charter Associates of IRON and have excellent Internet connectivity. Idaho State University partners with the Utah Education Network for access to Internet2 and the National Lambda Rail. IRON also plays a significant role in the Idaho Education Network (IEN), which will connect public schools and libraries to high-speed, broadband access, with plans to have 80 high schools connected by early 2010.

There are, however, significant gaps in cyber connectivity and broadband access at two-year, four-year, and rural institutions that traditionally perform less research. High performance data storage, computing, and telecommunications capabilities vary widely at these institutions. High bandwidth and rapid connectivity with low latency to national, regional, and state resources are a high priority. The RII C2 program provides a unique opportunity to fill these gaps and to provide community and undergraduate colleges with advanced connections to research and research-based education that will accelerate learning, discovery, and economic development in rural and under-served communities. Relatively small RII C2 investments at a few key institutions will benefit 16,000 students at these colleges. These particular students are a great target audience for Science, Technology, Engineering and Mathematics (STEM) outreach, since many of them are attending these institutions to receive technical degrees.

Idaho's RII C2 proposal focuses on: 1) broadening participation in Cyberinfrastructure, 2) facilitating better data management, 3) connecting a more diverse audience to research and research-based education, and 4) leveraging connections to Idaho's K-12 system. The project will support long-term, sustainable cyber connectivity and broadband access capabilities between and within academic institutions within the State of Idaho by investing in a variety of diverse and unique networking improvements at multiple locations. The proposed investments will significantly broaden the cyber-enabled partnerships among Idaho's publically-funded academic institutions, the Idaho Regional Optical Network (IRON), the Idaho Education Network (IEN), and the Idaho National Laboratory (INL). Each of these improvements has documented commitments for long-term sustainability after the end of the RII C2 project. The proposed improvements include:

- A new direct fiber-optic connection between North Idaho College and the University of Idaho Harbor Center in Coeur d'Alene that will significantly improve inter-campus connectivity and open the door for NIC connection to the IRON. These improvements will also bring better connectivity to a development district in Coeur d'Alene;
- 5-fold near-term improvement in connection speed at Lewis-Clark State College in Lewiston via new services provided by RII C2-enabled connection to IRON, providing future potential for Gbps connection speed;
- Intra-campus network upgrades at the College of Southern Idaho in Twin Falls to increase desktop connectivity speeds to 1 Gbps, provide capability to connect network segments at 10 Gbps to the backbone, and increase wireless network speeds to 300 Mbps;
- A direct fiber-optic connection between the Center for Advanced Energy Studies (CAES) in Idaho Falls, which houses an advanced visualization system, and the high performance computing facility at the Idaho National Lab. This connection addresses latency issues and offloads the High Performance Computing connection from IRON to make more bandwidth available to CAES;

- A joint UI/INL faculty appointment for a data architect to contribute to a Design Architecture of statewide and regional Research Data Management System being developed by UI. This will leverage other EPSCoR RII investments and further facilitate a mechanism for researchers and collaborators at diverse institutions across to share their data, to provide public access to data, and support for tools to enhance data interoperability with regional and national CI initiatives;

- Installation of video-conferencing equipment at participating colleges to facilitate research and research based education collaborations and live coursework delivery to Idaho's high schools through the Idaho Education Network. This builds upon IEN plans to install Tandberg equipment at all high schools in Idaho and will contribute to the development of Idaho's future workforce;

In particular, the management structure of this project will: 1) create better communication between statewide Cyberinfrastructure experts (from IRON and IEN) and the academic community and 2) facilitate better outreach in education and research between the university system and the network of colleges and high schools in Idaho. The inter-campus and intra-campus connectivity will broaden both individual and institutional participation in STEM research and education activities within Idaho and within the Tri-State Consortium of Idaho, Nevada, and New Mexico. All of Idaho's RII activities will work in concert to better disseminate research results to more diverse audiences and institutions. Stronger connections to colleges will also provide opportunities to involve and serve populations of both Native American and Hispanic students.

Intellectual Merit: The proposed RII C2 project will facilitate synergy among Track-1 and Track-2 NSF EPSCoR Research Infrastructure Improvement activities related to the theme of "*Water Resources in a Changing Climate".* The work proposed here encapsulates a significant effort in Idaho to identify gaps in connectivity and bandwidth within the State. Idaho EPSCoR recognizes the importance of Cyberinfrastructure in the State and the role it plays in allowing access to new knowledge and educational materials to a wide range of students, educators, researchers, and stakeholders. The proposed work significantly leverages existing resources within the State, specifically the Idaho Regional Optical Network (IRON) and the Idaho Education Network (IEN). By making relatively small investments in key areas along with proper leveraging, the networking landscape becomes much more complete. In addition, the critical need for data architecture expertise will be met within this project; the proposed faculty position will allow for creative academic activity in the areas of data management, efficient network design, algorithm development and data system interoperability. The long-term commitments to these proposed investments by various institutions across Idaho demonstrates a recognition that Cyberinfrastructure will transform how research is conducted and how results are disseminated and communicated. The increased access to interactive visualization, databases of environmental observations and modeling results, and data-sharing will lead to a high level of collaboration among institutions.

Broader Impacts: The proposed activity will actively promote teaching, training, and learning through investments in Cyberinfrastructure. The activities will provide better physical infrastructure, as well as better overall coordination, for connecting a broad range of audiences to the research being conducted on climate change and water resources in Idaho. The proposed work specifically addresses the issue of broadening institutional participation in the RII Track 1 and Track 2 activities. The institutions that will receive funding from the proposed work (colleges) have a high potential to reach diverse populations of both Native American and Hispanic populations, which are specifically targeted in the outreach efforts under Idaho's RII Track 1 project. The proposed management structure addresses how to facilitate better communication between two main groups: experts in statewide Cyberinfrastructure and those responsible for educational outreach activities. The RII C2 college coordinators are also involved in synergistic activities such as Idaho IDeA Network of Biomedical Research Excellence outreach. The proposed RII C2 investments in networking equipment will greatly enhance the ability of colleges within Idaho to access a wide range of resources, including observational and modeling data sets and new web-based tools for data exploration and visualization. The project also invests in video-conferencing equipment that is compatible with existing equipment recently purchased by the RII Track 1 grant and the Idaho Education Network (IEN). The data management plan for Idaho's RII project will create centralized archives of data related to climate change and water resources in Idaho. These will be a valuable resource for many local, regional, and national constituents, including academic institutions, state and federal agencies, stakeholders, K-12 schools, and the general public.