

Annual Project Report for Award 0636361
Report Period - Start Date: 01-01-2007 | End Date: 12-31-2007

Activities and Findings

Describe the major research and education activities of the project.

Describe the major findings resulting from these activities.

Describe the opportunities for training and development provided by your project.

Describe outreach activities your project has undertaken.

The vision for the NSF CI-TEAM Implementation Project entitled “CyberInfrastructure for Remote Sensing of Ice Sheets” is to equip the current and next generation of traditionally, underrepresented minority scientists, engineers and educators with the knowledge and skills necessary to conduct interdisciplinary research in areas including cyberinfrastructure, remote sensing, engineering and modeling related to glaciers and ice sheets. This project is a significant step forward in providing the necessary virtual training environment and grid computing power that the students and scientist associated with the NSF S&T Center for Remote Sensing of Ice Sheets (CReSIS) require.

Primary program accomplishments for year one include both virtual environment training activities for faculty and students related to CI and CReSIS science. There has been significant involvement of undergraduates, graduate students, K-12 and faculty in the CReSIS and CI seminars and workshops via the virtual classroom. Also important was initial configuration of the ECSU GRID for education and training.

The first cohort of students was identified from the Association of Computer and Information Science/Engineering Departments at Minority Institutions (ADMI). These students participated in the 2007 ADMI conference workshops held in Atlanta Georgia and also participated in an 8 week workshop held on the campus of ECSU during summer 2007. The students in this cohort a) learned the fundamentals of GRID computing, documented and created a four-node GRID; b) participated in seminars focused on CReSIS science including GIS and Its Applications, Radar: SAR and INSAR, UAV Design I, Introduction to Ice Sheets and Glaciers, and MATLAB training.

Cohort I worked with the GRID manager during summer 2007 to setup a documentation platform for a Condor-based GRID to be established at Elizabeth City State University. The task assigned to the ECSU TeraGrid team for the Summer of 2007 was to setup a documentation platform for a Condor-based grid. This documentation platform was a Linux based web server that utilized Web 2.0 standards to create a virtual documentation web portal. Documentation is critical to communicate with the users, and with those who maintain the systems.

The web server created utilized an Ubuntu Linux kernel with an Apache web server, a

MySQL Database, a PHP scripting package, and a Media Wiki web interface. This particular setup is called a LAMP server. LAMP is the acronym for Linux (<http://www.linux.org/>), Apache (<http://www.apache.org/>) MySQL (<http://www.mysql.com/>), and PHP (<http://www.php.net/>) which are all open source applications. The combination of these LAMP applications allows for Media Wiki to function. The documentation server is now being used to record how to setup a Condor-based GRID system.

With regards to the Grid, access is being implemented through web and research portals for use of computational and data resources. The portals will be customized with educational and science inter-faces while still allowing access to large amounts of data. The virtual classroom configuration consist of a Polycom 8000S system (<http://www.polycom.com/>) with 14-kHz wideband audio, 2 channels of 14-kHz audio, stand-alone audio conferencing phone, IP (H.232 and SIP) interfaces and Global Management System collaborative communications. For receiving at the partner institutions, VIAVideo for desktop PCs have been provided to ADMI institutions to allow point-to-point connectivity. ConferenceXP by Microsoft (<http://research.microsoft.com/conferencexp/>) is also offered as an option for ADMI institutions.

Please review and as appropriate, revise the following information you have reported as your major findings:

Nothing significant to report at this time however, a copy of the Summer 2007 student research paper entitled Installation and Implementation of a LAMP Documentation Server is attached. (<http://nia.ecsu.edu/ureoms2007/teams/grid/GRIDTeamPaper2.pdf>)

Training and Development

1. Faculty development activities have included the following:

- a) STELLA® is a software package for building and simulating models of dynamic systems and processes. Using a set of building block icons, the developer can construct a map of a process. This allows the user a practical way to dynamically visualize and communicate how complex systems and ideas really work. Faculty from the following institutions participated: Delaware State University, Virginia State University, Elizabeth City State University, Spelman College, and Norfolk State University.



<http://cerser.ecsu.edu/07events/070320dls/stella.html>

- b) Fall 2007 virtual training workshops are scheduled as follows in conjunction with the CI-TEAM project at the University of Oklahoma. CReSIS faculty and students are participating in the following workshops:

Wed Aug 29 3:00pm: Overview: What the Heck is Supercomputing?

Wed Sep 5 3:00pm: The Tyranny of the Storage Hierarchy

Wed Sep 12 3:00pm: Instruction Level Parallelism

Wed Sep 19 3:00pm: Stupid Compiler Tricks

Wed Sep 26 3:00pm: Shared Memory Multithreading

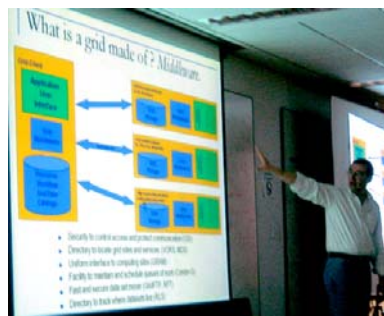
Wed Oct 10 3:00pm: Distributed Multiprocessing

Wed Oct 17 3:00pm: Multicore Madness

Wed Oct 24 3:00pm: High Throughput Computing

Wed Oct 31 3:00pm: Grab Bag: Scientific Libraries, I/O, Visualization

- c) Support was provided for two staff to attend the 2007 Midwest Grid Workshop at Northwestern University. This was a two-day weekend workshop program in grid computing and its application to scientific data analysis. The aim of the workshop was to provide a basic foundation in distributed computing and valuable hands-on training in computing techniques. The workshop introduced essential skills that are needed in the natural and applied sciences, engineering, and computer science to conduct and support scientific analysis in the emerging grid computing environment.



2. Graduate, Undergraduate and K-12 training

The project supported participation of graduate students, undergraduate students and middle school students both Cyberinfrastructure and CReSIS related seminars and training events as described below:

- a) Open Grid Forum 19 (OGF19) was held in Chapel Hill, North Carolina at The Friday Center on the campus of the University of North Carolina at Chapel Hill. Jeff Wood, graduate student at Elizabeth City State University (ECSU) attended OGF19 as part of a minority serving institutions grant to OGF. Various meetings were held on topics



Ian Chang-Yen (left)
University of Louisiana
at Lafayette

Jeff Wood (right)
Elizabeth City
State University

from Grid software to standardization and working groups. Software such as Condor, Semantics, Globus and others were demonstrated by the groups developing the software. A complete listing of the workshops along with documentation can be found at <http://www.ogf.org/OGF19/schedule/>. Highlights are available at <http://nia.ecsu.edu/ur/0607/070129grid/ogf19.htm>

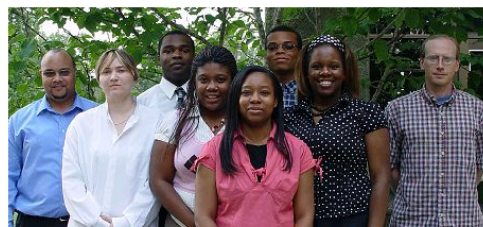
- b) On March 21, 2007 students taking part in the You be the Polar Scientist Spring Seminar Series gathered in the Information Technology Center Video Conference Room. Student took part in an interactive seminar with Dr. Seppo A. Korpela of The Ohio State University who's seminar was entitled "Peak Oil." Dr. Korpela is a professor of mechanical engineering whose interests focus on worldwide oil depletion and natural gas depletion in North America. He serves on the editorial boards of two journals and on the advisory board of the Association for the Study of Peak Oil, USA.



- c) During the April 11, 2007 CReSIS Spring Seminar, students took part in an interactive seminar with Dr. Robert Bindschadler, of the NASA Goddard Space Flight Center, who presented Ice Sheets on the Edge: A Golden Age for Glaciology. Dr. Robert Bindschadler is the Chief Scientist of the NASA's Hydrospheric and Biospheric Sciences Laboratory. He is a Senior Fellow of the Goddard Space Flight Center, a Fellow of the American Geophysical Union and a past President of the International Glaciological Society. <http://cerser.ecsu.edu/cresis/events/2007ybbs/april11.html>

- d) On May 9, 2007, Dr. Don Worster of The University of Kansas rounded out the CReSIS Spring Seminar Series. ECSU undergraduates, faculty, and local middle/high school students attended Dr. Worster's seminar entitled Feeling the Heat. Dr. Worster discussed the significance of global climate change for the southern Great Plains. The available projections suggest a hotter, drier future for that region, bringing back conditions that gave us the tragic Dust Bowl of the 1930s. Dr. Worster currently holds the Hall Distinguished Professorship Chair in American History at the University of Kansas. Dr. Worster graduated from KU in 1963 (B.A.) and 1964 (M. A.). Subsequently, he did graduate work in American history and literature at Yale University and earned his Ph.D. there in 1971. <http://cerser.ecsu.edu/cresis/events/2007ybbs/may9.html>

- e) An eight week summer program was conducted for undergraduate students from ECSU and ADMI institutions. Leveraging funds from the Office of Naval Research, twenty students participated in the summer program. Students from Mississippi Valley State University, Norfolk State University, Winston Salem State University, Elizabeth City State University, Fayetteville State University, Jarvis Christian College, and St. Augustine's College participated. Each



Cyberinfrastructure Grid Team

student was assigned to a specific research team, where he/she worked closely with the faculty. In addition, seminars, lunch meetings, and social functions were organized to facilitate undergraduate interaction. Highlights are available at <http://nia.ecsu.edu/ureoms2007/index.html>. CReSIS and Cyberinfrastructure related research projects conducted during the summer included:

- *Creation of a Flexible and Scalable Distributed Computing Infrastructure Using OpenGRID Project Standards.*
- *Antarctic Firn Annual Emissivity Trends at the Ski-Hi Automatic Weather Station from in-situ and SSM/I Brightness Temperatures.*
- *Sub-glacial topography and ice discharge of the Greenland Ice Sheet*
- *Hardware Modeling and Machining for UAV - Wideband Radar*

Outreach Activities

What outreach activities have you undertaken to increase public understanding of, and participation in, science and technology?

With regards to outreach activities which increase public understanding of, and participation in, CI and CReSIS related events, both a two week summer program for middle school students was conducted and one distinguished lecture which was open to the public.



The project is committed to recruiting, retaining and educating students within a diverse, multidisciplinary research team that focuses on topics related to global climate change and remote sensing. Equally important is our goal to reach out to K-12 students, their teachers and the general



public. We want to give them resources to learn more about CI, the Polar Regions and understand how they are studied, so all members of society can better comprehend why changes in Polar Regions could impact everyone in the world.

Highlights are available on <http://cerser.ecsu.edu/cresis/cmosp2007/>. Outreach activities involved participants in both CI and CReSIS related activities. During the two-week summer 2007 program middle school students:

- *Learned about Remote Sensing and Satellite Imagery
- *Took scientific measurements in the fields of atmosphere and hydrology
- *Learned about the Polar Regions
- *Collaborate with scientists and faculty
- *Use HTML and JavaScript to document their experience on the WWW



The Spring 2007 IEEE-GRSS Distinguished Lecture Series was held in the Center of Excellence in Remote Sensing Education and Research (CERSER) on Tuesday March 20, 2007. Dr. Robert Bindshadler, Chief Scientist of the NASA's Hydrospheric and Biospheric Sciences Laboratory at NASA's Goddard Space Flight Center presented "Understanding the West Antarctic Ice Sheet from Space: Beyond Dogsleds and Frozen Toes." Over 50 people participated in the distinguished lecture which was open to the public. Highlights are available on <http://cerser.ecsu.edu/07events/070320dls/07dls.html>



Contributions

Now we invite you to explain ways in which your work, your findings, and specific products of your project are significant. Describe the unique contributions, major accomplishments, innovations and successes of your project relative to:

***the principal discipline(s) of the project;**

Project has created partnerships and training opportunities that extend the capabilities of Polar Scientist within the Center for Remote Sensing of Ice Sheets (CReSIS) to conduct field operations and to process SAR data. In addition, several accounts have established for CReSIS scientist on the TeraGrid.

***other disciplines of science or engineering;**

Nothing significant to report at this time.

***the development of human resources;**

The project staff is actively involved in creating a virtual training environment and educational portals designed specifically for student use. Training events and seminars supported by this project have provided opportunities for underrepresented graduate students, undergraduate students and middle school students to become engaged in both remote sensing of ice sheet research effort and CI.

To date twenty students have participated in the summer 8 week training; fifteen students participated in the ADMI 2007 CI workshops; eight HBCU faculty have

participated in visualization training; fifty students and faculty participated in distinguished lectures; and six staff have participated in TeraGrid training events.

***the physical, institutional, or information resources that form the infrastructure for research and education; and**

The project has produced a small-node grid for educational purposes. We are currently in the process of creating educational portals designed specifically for student use and a second set of portals designed for use by CReSIS researchers.

***other aspects of public welfare beyond science and engineering, such as commercial technology, the economy, cost-efficient environmental protection, or solutions to social problems.**

Nothing significant to report at this time.

Objectives and Scope

A brief summary of the work to be performed during the next year of support if changed from the original proposal.

No changes to the work to be performed.

Information about Partnership

"CI-TEAM Demonstration: Cyberinfrastructure Education for Bioinformatics and Beyond" \$249,974 12/01/06 - 11/30/08 OCI-0636427

A High Performance Computing Workshop Series entitled "Supercomputing in Plain English" was provided by the University of Oklahoma CI-Team project as content for the virtual classroom. (<http://www.oscar.ou.edu/education.php>)

Publications

Cyberinfrastructure for Remote Sensing of Ice Sheets Paper

Dr. Linda Hayden, Dr. Geoffrey Fox, and Dr. Prasad Gogineni
TeraGrid 2007 Conference, Madison, Wisconsin
<http://cerser.ecsu.edu/citeam/teragrid07.pdf>

Development of Educational Partnerships Dedicated to Remote Sensing of Ice Sheets Cyberinfrastructure

Dr. Linda Hayden, Elizabeth City State University

David Braaten, Ph.D. University of Kansas

IGARSS Partnership Paper

<http://cerser.ecsu.edu/citeam/igarrs07cyberinfrastructure.pdf>

Installation and Implementation of a LAMP Documentation Server

Summer 2007 Undergraduate Research Experience Grid Team

<http://nia.ecsu.edu/ureoms2007/teams/grid/GRIDTeamPaper2.pdf>

**Antarctic Firn Annual Emissivity Trends at the Ski Hi Automatic Weather Station
from in-situ and SSM/I Brightness**

Summer 2007 Undergraduate Research Experience

<http://nia.ecsu.edu/ureoms2007/teams/firn/firnpaper.pdf>