Unidata Community Equipment Awards Cover Sheet

Proposal Title:
Enhancement of Meteorology Technology at PSU

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1. Project Summary

The Judd Gregg Meteorology Institute (JGMI) at Plymouth State seeks to provide an enhanced learning experience by upgrading existing servers and laboratory workstations for use by undergraduate and graduate students and the Unidata community. The new systems will enable students to engage in an enriched educational experience by utilizing Unidata software applications to interact with an ever expanding array of meteorological and environmental datasets. IDV, McIDAS, and GEMPAK will be utilized from each workstation for visualization and manipulation of the data by students and faculty while completing coursework and research projects. A new THREDDS/ADDE server will provide quick access to Plymouth State students as well as providing a resource for other institutions.

To fulfill University mission outreach requirements, and to encourage greater widespread usage of the IDV application, it is proposed that the equipment obtained by the equipment grant would also be used to host a regional IDV Workshop during the summer of 2008. Participants would come from agencies such as the NWS, NHDOT, NHDES, CREELL, Christa McAuliffe Planetarium as well as other schools in the New England region such as Lyndon State, UMass Lowell, UNH, Western Connecticut State, SUNY Albany, and other K-12 institutions.

2. Project Description

2.1 Equipment Details

24 Dell Optiplex GX 745 Desktop PCs will allow replacement of existing systems which are over five years old. Existing systems are not able to adequately handle the requirements of IDV and other applications which have led to student frustration. Each workstation will have a Pentium® D Processor 945 (3.20GHz, 2X2M, 800MHz FSB)), 2 GB DDR2 Non-ECC SDRAM, 533 mhz and 80 GB of disk space. Configuration includes DVD writeable drive to allow students to archive data. In order to conserve costs, it is envisioned that existing monitors (capable of 1280x1024 resolution) will be retained. Current systems will be repurposed for email/word processing/web browsing workstations for our growing population of graduate students and other departmental areas which require minimal computational power.

A dedicated server for THREDDS/ADDE functionality will allow access to data products at Plymouth State as well as providing redundancy for other Unidata THREDDS/ADDE servers. A Dell PowerEdge 2950 with Red Hat Enterprise Linux 4, two Dual Core Intel® Xeon® 5130 4MB Cache 2.00GHz processors, 8 GB 667 MHz RAM, six 250 GB 7200 rpm SATA disk drives, PERC 5/I RAID controller, and gigabit Ethernet NIC. The server is rack mountable and will connect to an existing KVM console; no monitor or input devices are required.

2.2 Overall goals of the project

The project aims to increase awareness and usage of Unidata products by students, faculty, and the community at large. Although students and faculty already utilize workstations to generate meteorological products, analyses, and datasets, in many cases, they are utilizing imagery from other websites and are not actively utilizing IDV. It is envisioned that with new workstation/server hardware, students and faculty will be able to integrate some of the three dimensional capabilities of IDV and generate their own imagery for coursework and research. The educational value of students interacting with data to generate their own products rather than simply obtaining a preprocessed product is immeasurable.

One of the challenges in integrating IDV into the classroom is ensuring competency by those tasked with instructing students on the use of the application. Through a regional Unidata workshop hosted by Plymouth State, faculty and other interested parties from around New England can learn about the software and how to utilize it for a variety of tasks. It is hoped that presentations will provide instructional details on how to use IDV as well as allowing for the exchange of ideas from experienced IDV users.

Another challenge in using IDV is quick access to the datasets. Students have expressed frustration when using IDV due to insufficient memory and bandwidth resources. This project aims to alleviate the problem by providing robust workstations to visualize the data, as well as a locally based ADDE server to prevent network bottlenecks. The ADDE server will also allow other Unidata institutions in the region an alternative access point for datasets, thus lessening server load at other sites.

2.3 Benefits to research, education,

The equipment will provide a significant resource to undergraduate and graduate students in meteorology at Plymouth State. Improving server/workstation resources will provide enhanced experiences for students working in the following courses and research areas:

Weather/Severe Weather: These are courses taken primarily as a science requirement by liberal arts majors. Students have access to a lab with laptop computers where they interact with meteorological data. By improving server facilities, students could open prepared IDV bundles or generate their own datasets to more easily interact with the data.

Synoptic Meteorology I/II: Students are introduced to various meteorological visualization software packages including IDV, Gempak GUI programs (nmap2, nsharp, and garp) and FX-Net. Students spend a significant amount of lab time preparing forecasts with students primarily using on-line forecasting resources (ie, the web). Equipment improvements will allow students to more easily use IDV to create bundles to demonstrate synoptic situations in class rather than using maps generated from other sources. Ideally, with equipment improvements, IDV will be used to better visualize

derived quantities such as divergence, deformation, and ageostrophic flow, as well as for constructing and understanding understand cross-section and time-height diagrams.

Tropical Meteorology/Air Quality: In these special topics courses, students work individually or in groups to analyze current and archived data to calculate tropical cyclone statistics, to determine favorable conditions for tropical cyclone development and to explain/forecast national and regional air quality, as appropriate for the course. Students are already using products from a variety of web sites, the new equipment will allow students to better visualize data and make customized products for use in class discussions and assignments. Students also use the computers to research current topics relevant to the material being discussed in class.

Hydrology Courses: Several graduate courses in hydrology are currently offered with topics including watershed management and planning, snow hydrology, applied hydrogeology and water resources field methods. Students have experienced challenges in visualizing datasets. New equipment will allow students to integrate IDV into course projects and increase interdisciplinary collaboration between hydrological and meteorological sciences.

Seminar/Practicum Courses: All students are required to take at least one seminar or practicum course which help students develop oral presentation skills. Students in these courses use the computers to prepare presentations and products for usage and distribution in map discussions, television and radio broadcasts/podcasts, and web based settings. The ability to use IDV to display data in 3 dimensions will greatly enhance the students' ability to share meteorological information.

Satellite/Radar Meteorology: These graduate level courses provide students the opportunity to learn about the various technologies associated with NEXRAD, GOES and POES satellites. The radar course could be improved by having the ability to store more level II data on our servers and using IDV to create radar cross sections and 3D displays. New equipment will also be able to better handle the anticipated data increase associated with the next generation of GOES.

Mesometeorology: Students will be able to use IDV generate isentropic cross-section analyses to help pinpoint the location and vertical structure of a surface front and also the forecast positions/evolution based on forecast model data. Similarly, jet features can also be studied. Important three-dimensional aspects of many of the associated features can also be displayed with IDV. Students will also be able to better visualize radar displays using IDV with Level II data for mesoscale severe weather outbreaks.

Research: As mentioned above, in addition to their classroom use and use with particular out of class assignments, these workstations are used extensively in both graduate and undergraduate research. Graduate students use these workstations extensively to conduct their thesis research as do undergraduates completing senior research or independent study projects. Students typically present research findings at regional and national conferences, including the annual meeting of the American Meteorological Society.

JGMI faculty and students are engaged in numerous research projects. Each project utilizes workstation and server resources. Areas currently under investigation include

- Impacts of winter weather on New Hampshire's highways and the New England State transportation departments (partners w/NETC)
- development of a MOS-like product for temperature and wind forecasting at Plymouth Municipal Airport
- Forecasting the sea breeze at Logan airport (partners w/NWS Gray)
- Forecasting strong northeasterly winds in the Gulf of Maine (partners w/NWS Gray)
- The effect of upland and near-stream geomorphology on hyporheic exchange (partners w/Hubbard Brook Experimental Forest/USDA)
- Convective Wind Forecast Improvements at Kennedy Space Center/Cape Canaveral Air Force Station (partners w/NASA)
- AIRMAP research (partners w/University of New Hampshire and NOAA ESRL)
- Regional Environmental Study of Predictability and Occurrences of Northeast Utilities System Emergencies (partners w/Public Service of New Hampshire)
- Visualization and analysis of Suomi data
- Road Weather Information System Validation Study (partners w/NHDOT)

All of these research focus areas would greatly benefit from the ability to access data more efficiently from improved workstation/server resources.

Outreach: Plymouth State is the only higher education institution in the state of New Hampshire with a meteorology program. As such, the facilities play host to numerous visits from K-12 school groups, open houses, teacher workshops and other events with regional, national, and global interest. For example, workstations were used in 2005 and 2006 for the Pakistani Teachers Institute. As part of the project, JGMI would host a regional IDV workshop to extend the reach of IDV to a new population of users.

Additionally, JGMI maintains a website (http://vortex.plymouth.edu) which contains a variety of text and graphics products for public consumption. It is envisioned that additional server facilities may allow for the transition of more of the graphics production from legacy WXP code to IDV, McIDAS and Gempak.

2.4 Relationship to existing facilities & resources

JGMI has existing server facilities which ingest and archive IDD data (including NEXRAD Level 2 data) in real time. Presently, this includes a NOAAPORT satellite receive system which utilizes LDM for data ingest and relay to our other servers. Plymouth State currently has Internet II connectivity to allow for fast transfers to/from other Unidata institutions. Facilities also include a dedicated server room with adequate HVAC and UPS facilities, as well as an existing rack with plenty of space for additional server hardware.

The existing classroom/laboratory is already equipped with 24 seats for workstation access, including power and internet connectivity at each site. Additionally, there is space for a presentation workstation at the front of the room which is connected to a ceiling mounted LCD projector.

The proposed equipment will fulfill most projected hardware requirements for the next five years. Previously, computer equipment was mostly obtained with congressional earmark funds procured by Senator Judd Gregg. Due to a variety of factors, this funding source is now severely limited. While there are a number of ongoing research projects, due to the nature of the research performed, these typically do not have a mechanism for major infrastructure upgrades to existing workstations and servers

3. Budget

	Quantity	Unit Cost	Total
Dell Optiplex GX 745 Workstation 3.2 Ghz Processor 2 GB RAM 80 GB Hard Disk DVD±RW Optical Drive No Monitor	24	$1,200	$28,800
Dell Poweredge 2950 Server Two Dual Core Xeon 2.0 Ghz Processors 8 GB RAM Six 250 GB SATA Hard Disks RAID Controller Red Hat Enterprise Linux 4 No Monitor, input devices	1	$7,500	$7,500
TOTAL			$36,300
PSU Cost Match			$16,300
TOTAL UNIDATA EQUIPMENT REQUEST			$20,000

The technology manager for the Judd Gregg Meteorology Institute will be the primary point of contact for all matters regarding proposed hardware. Tasks related to the project include (but are not limited to) the following:

- Remove all existing computer hardware from laboratory. Repurpose and reimage workstations as required.

- Negotiate specifications/pricing directly with ITS/Dell as required. Obtain quotes, handle all paper work, coordinate with purchasing, ITS, etc.

- Receive and assemble all hardware. Create and maintain master software image to deploy across all systems. Install all Unidata software applications as required. Provide ITS with necessary backups, passwords, etc as required.

- Maintain all operating system and antivirus updates on an ongoing basis as required by ITS. Assign static IP addresses on subnets as appropriate.

- Organize 2008 Unidata Regional Workshop. Coordinate reservations, catering, etc. with departmental administrative assistant. Contact potential speakers, organize agenda, prepare equipment for demonstrations, create temporary user accounts, etc.

4. Project Milestones

July 2007: Order server

August 2007: Receive and configure server

September – December 2007: Test server using existing client workstations

November 2007: Begin IDV Workshop Planning. Reserve space, contact potential speakers

February 2008: Order new workstations

March 2008: Receive and deploy new workstations (Spring Break)

March 2008: IDV Workshop Registration Deadline

June 2008: Host Regional IDV Workshop