Unidata Community Equipment Award Proposal

Submitted to:
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B. Project Summary

The objective of this proposal is to bring real-time observations and datasets via modern interactive meteorological processing and display software to students at Madison Area Technical College (MATC). Equipment requested in this proposal will enable students across the eight campus sites of MATC to benefit from software systems similar to those used in the meteorological field. This proposal comes from a college that is outside the traditional institutions active within the Unidata community. MATC is, however, an institution actively engaged in teaching in the geosciences with more than 155 students per semester and an additional 25 students per summer semester in weather and climate introductory courses in the Department of Physical Sciences in the Arts and Sciences Center. This represents an enrollment increase of over 250% in the past two years. The project goal is to engage students by having them work with and use real-time meteorological data as an integral part of the curriculum of the weather and climate courses. This effort is a part of a multi-step, on-going modernization of the introductory weather and climate courses at MATC. Other planned and currently taught courses will also benefit from the hardware purchased under this proposal and the meteorological software and datasets used on them.

This effort will have direct benefit in the existing classroom settings. It will also expand the Unidata community to include a non-traditional, large technical college and add another participant to the Internet Data Distribution (IDD) network. This project broadens the Unidata community to include students that are non-traditional for it. Students will have the opportunity to utilize tools and real-time data that would not otherwise be available to them.

C. Project Description

1. Equipment requested

This proposal requests four computer systems. One system will be primarily used for data acquisition and data serving. It is proposed that this system will run Unidata's Local Data Manager (LDM) software to acquire real-time meteorological datasets over the Internet Data Distribution (IDD) system. This same system will function as a data server as well with an Abstract Data Distribution Environment (ADDE), Open-source Project for a Network Data Access Protocol (OpenDAP), etc. servers installed on it. This system will serve data to client systems used in classroom and computer labs around the college. This first system proposed is a Mac Pro computer system running the Mac OS X operating system with Quad-core Xeon Intel processor, 8 Gb of memory, 3.64 Tb of disk space, and standard display.

A second system will have a dual purpose. Its primary utilization will be in the classroom, in each class meeting of the face-to-face version of the weather and climate course. Real-time weather data will be used as an integral part of course work and will employ Unidata tools such as Man computer Interactive Data Access System (McIDAS-X) and Integrated Data Viewer (IDV). The system's secondary job will be to serve as a backup for the primary acquisition and data serving system, in case of failure or downtime for repair or maintenance. This second system is also a Mac Pro computer system running the Mac OS X operating system with Quad-

core Xeon Intel processors, 8 Gb of memory, 3.64 Tb disk space, and large display. These two systems will be located at the main campus in Madison where they will also provide overhead display in a classroom which typically hosts the largest class sizes for the weather and climate course, 40 to 50 students per class.

The third and fourth systems require portability. The remaining five campus sites have taught these courses using a method that combines Interactive Television (ITV) distance learning with face-to-face instruction. Since the instructor travels to remote sites during the semester, a Mac Pro laptop system is requested for mobile use. This third proposed system will also run the Mac OS X operating system with Intel Core 2 Duo processor, 4 Gb of memory and 320 Gb of disk space. This system will also be able to be attached to existing equipment for display in the variety of classrooms it will serve.

Recently, MATC has offered its weather and climate course as an on-line course offering. This development accents the critical need for having the instructor build and provide a complete environment for students to experience a full weather and climate course. The fourth computing systems will be utilized to aid in the facilitation of this online class. Students, who are expected to engage in 3 hours of on-line class time per week, will benefit from on-line weather discussions focused around real-time weather events that will be displayed using the proposed hardware.

2. Project Goals

This project is designed to enable current active members of the Unidata community (Lazzara and Lindstrom) to continue and expand their active participation in order to enhance the educational aspect of the community process. This is accomplished by utilizing Unidata equipment to teach a large number of community college students at Madison Area Technical College (MATC), thereby directly addressing the first Special Consideration for the 2009 Unidata Awards.

The project will be housed at MATC, a large two-year community and technical college in Madison, Wisconsin. The college serves 45,000 students per year in a wide range of academic, technical, adult literacy, and workforce development offerings. Minority students represent 12.5% of all degree students and 30% of all students. The vast majority of MATC students are first generation college students. The college sends most of its transfer students to the University of Wisconsin-Madison (UW-Madison), the flagship university in the state. MATC is the largest source of transfer students to UW-Madison where many students enter scientific, technical and engineering programs. This project will enable students considering transfer to have a unique and cutting-edge experience of data-gathering and analysis in a rapidly growing area of student interest.

By using the equipment in distance-learning and online modes, the project will also promote new approaches to classroom instruction in meteorology. This equipment will support our quest to help students improve their knowledge and understanding of weather and climate. We also hope to be a community participant as an active user of the IDD, and when possible, to serve the larger Unidata community. Although a community college, MATC has a long history of active collaboration with researchers at UW-Madison, and has been awarded millions of dollars of

competitive federal grants from agencies such as the National Science Foundation and the US Department of Education.

3. Project Benefits

There are three chief benefits to this project which relate directly to Review Criteria 6, 2 and 3.

a. Benefits to education (Criteria 6)

This effort will have direct benefit in the existing classroom settings, especially as the weather and climate courses are undergoing a modernization effort. These systems and the software and data they will offer will be used at routine class meetings, targeted lectures and in future applications. In routine class meetings, real-time significant weather data displays, often set up by students, will be the focal point for the first segment of class meetings. Review of real-time significant weather events engages students, brings to life textbook learning, and provides a vehicle to introduce topics. Instructors and students will engage in weather discussions/briefings that allow all students to be drawn into the discussion by relating their own recent experiences or through features that they observe in the displays. The weather displays will be set-up by instructors and students, with an increasing emphasis on student use as students progress in the course. Past practice has shown that these experiences are highly motivating for students and give them an introduction to what further studies in the field would entail as well as offering a realistic look at the work and career of a meteorologist.

A targeted use of the display systems and data is exemplified in the weather forecasting lecture portion of the weather and climate course where students use real-time weather data to make a real-time weather forecast. Paper copies of data have traditionally supported this lecture, but with the added computing and real-time information, more data can be interrogated by the students with a diminished need for paper copy. These systems will give students flexibility in the sorting and organization of the data, which is one of the learning objectives of this activity. Utilizing the hardware, software and data will allow for such a targeted use to become a more integral part of the weather and climate course in other areas.

Finally, these enhanced capabilities will enable future revisions of the weather and climate course curriculum as well as support the addition of other related introductory level courses in demand by students. Additional introductory courses currently under consideration include introduction to climatology, weather for pilots/aviation weather, and oceanography among others.

b. Contribution to the Unidata community capabilities (Criteria 2)

This proposal offers two contributions to the Unidata community: expanding participation by a non-traditional, large technical college and adding another participant to the Internet Data Distribution (IDD) network. MATC, although located in the same city as the University of Wisconsin-Madison, is a large technical, vocational and community college serving a broad area

of South Central Wisconsin. This proposal aims to have the college join the Unidata community, bringing data and capabilities to students that are and will be an important segment of the working population. Expanding the Unidata community to a diverse population of undergraduate students is a key goal of this project.

The use of the proposed equipment in the community college environment also expands the educational environments in which Unidata equipment is utilized, thereby increasing the knowledge-base of the Unidata community. This equipment will be utilized both in face-to-face environments as well as in hybrid courses with significant online and ITV components (or a possible combination of all three). This significantly expands the environments in which this equipment can be utilized.

Finally, although MATC is not accustomed to high volume data flow, it is possible to have the proposed participation in the Unidata community include an emergency fail-over site in times of Internet outages for the IDD network. We intend, therefore, to play a role, as appropriate, in improving the robustness of the IDD system.

c. Broadens the Unidata community scope and capabilities (Criteria 3)

This project broadens the Unidata community to include an institution and body of students that are non-traditional for the Unidata community. Students will have the opportunity to utilize tools and real-time data that would not otherwise be available to them. Currently, the Unidata community has strengths in meteorology and atmospheric science departments around North America and beyond. This project offers the opportunity for Unidata's efforts to extend to students who are learning about weather and climate outside departments of meteorology and atmospheric sciences. By funding this project, Unidata's community reach can extend to non-meteorology majors, enabling a broader class of students to benefit from the investment that Unidata and its funding agency, the National Science Foundation, have made in tools and real-time data sets. In return, this project will make available to the Unidata community the instructional strategies and experiences gained in teaching a diverse student population in both a face to face environment as well as online and using ITV or other hybrid combination. This information will be shared either in the Unidata newsletter or website. This will broaden the capabilities of all members of the community.

4. Relationship to existing computing facilities at MATC

This effort will be supportable and is a natural fit with MATC's existing computing facilities. Macintosh systems are used heavily in both the Department of Physical Sciences as well as the Art Department at MATC. In addition, usage of software systems such as IDV and McIDAS-X would also be possible in other computing facilities around the college including multiple PC laboratories at all campus sites and especially at the MATC Truax library, which offers both PC and Macintosh system for student use.

5. Relationship to department computing resources and plans

This effort fits within the current department computing plans including an on-going upgrade in computing in the Department of Physical Sciences at MATC. Currently, the physical sciences area includes 30 Macintosh laptop systems traditionally used in physical sciences laboratory work. These computers have the power to run basic McIDAS-X and IDV sessions. This pool of systems will be increased in the near future. The systems that this proposal would acquire will provide the horsepower to serve these client systems for student laboratory and classroom use. The four computers of this proposal represent 6.7% of the total computers in the Department of Physical Sciences.

D. Budget

1. Budget justification

This proposal requests funds for four computer systems. Funds needed for installation, training staff, etc. will be provided via internal MATC resources. It is important to note that Macintosh systems have been chosen as they meet the requirements for the intended uses, integrate with other departmental resources, and are a supported platform by the college. The college has one full-time Macintosh computer specialist who will serve as a technical advisor to this project. Once installed the computers will become part of the computer "refresh" program and will be automatically upgraded every three years.

2. Budget

Computer System #1 (LDM/Server system)

Mac Pro computer running Mac OS X
Quad-core Xeon Intel processor (2.66 GHz processor)
8 Gb of memory
3.64 Terabytes of disk space (one standard 640 Gb disk, plus three 1 Tb disks)
Flat panel display (17 inch Apple display)
Cost: $2,960

Computer System #2 (In-classroom/Backup LDM/Server system)

Mac Pro computer running Mac OS X
Two Dual-core Xeon Intel processors (2.66 GHz processor)
8 Gb of memory
3.64 Terabytes of disk space (one standard 640 Gb disk, plus three 1 Tb disks)
Flat panel display (24 inch Apple display)
Cost: $3,759

Computer System #3 (On-line/Mobile Classroom)

Mac Pro Laptop running Mac OS X (17 inch)
Intel Core 2 Duo processor (2.66 Ghz processor)
4 Gb of memory
320 Gb of disk space
Cost: $2,850

Computer System #4 (Mobile Classroom)

Mac Pro Laptop running Mac OS X (17 inch)
Intel Core 2 Duo processor (2.66 Ghz processor)
4 Gb of memory
320 Gb of disk space
Cost: $2,850

Miscellaneous

Cables and adapters for hooking up to existing external/overhead display devices
Cost: $200

Total Cost of Equipment: $12,619
MATC Indirect Rate (12.7%): $1,603

Total Request to Unidata Community Equipment Program: $14,222

E. Project Milestones

We propose to meet the following milestones as a part of this project over the next year:

1. Equipment purchase

As soon as this proposal is awarded, equipment acquisition will be initiated and completed as soon as possible, by working with the manufacturer and MATC purchasing and technical services groups. The aim is to have the equipment purchased delivered and available within 60 days from the start of the grant.

2. Equipment installation

The second phase of the project will be installation of the systems. The Mac Pro systems will be installed at the MATC Truax campus in their designated locations: one for classroom use in the Weather and Climate classroom and one providing the main LDM/IDD system in the physical sciences area where it can be supported by physical sciences lab coordinator and the college's

technical services group. The Mac Book laptop systems will be trial tested at the various MATC campus locations, including basic setup for interfacing to the smart classrooms and overhead display systems. It is expected that all four installations, which include the critical networking, will be completed in a period of roughly 30 to 60 days.

3. Equipment test and use

With the basic setup and installation of the system accomplished, the next important step will be the installation of Unidata software and testing of that software. Little difficulty is expected with the installation of McIDAS-X, IDV or the LDM software. This step will also involve the installation of the client systems such as McIDAS-X and IDV on the other departmental and perhaps other college systems for students to access. Emphasis on this step will be on testing the LDM software, especially in joining the IDD network. The acquisition and flow of the meteorological data will be critical in this phase, and will of course include complete end-to-end tests of data acquisition through to display. This testing will conclude in the fall semester of 2009 and the equipment will be ready for classroom use in the spring of 2010.

4. External support

This project will leverage funding and existing resources available within the college to train the physical sciences lab coordinator and other caretakers of these systems (via internal training funds from the college and/or direct training by the proposing authors who are trained in the use of appropriate Unidata software technologies). The physical science lab coordinator will be able to monitor these systems routinely on a daily basis, even on non-teaching days, with equipment already available from the college. MATC and the department of physical sciences are committed to this effort in support of the weather and climate courses and in turn, the associate degree of applied science and liberal arts degree programs at the college.

There are no dependencies that would hinder the implementation of this project.

5. Progress reports

This project will meet and supersede the requirements for progress reports. The minimum requirement calls for a brief report in the form of an article for the Unidata Program Center for publication in the Unidata Newsletter to the Unidata community. We will also offer interim progress reports to the Unidata Program Office. We will work with the MATC student community to publish a related article in MATC's award-winning college student newspaper. This will allow the local MATC community to be informed of the exciting developments of this project and promote interest in the courses that will benefit from this project