THE UNIVERSITY of WISCONSIN MADISON

OFFICE OF RESEARCH AND SPONSORED PROGRAMS

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University Corporation for Atmospheric Research

PI: Wayne Feltz

Unidata Community Equipment Awards Program

This proposal has been administratively approved on behalf of the Board of Regents of the University of Wisconsin System and is submitted for your consideration. Please keep our office advised as developments occur with regard to this application.

The appropriate programmatic and administrative personnel of each institution involved in this grant application are aware of the sponsor's grant policy and are prepared to establish the necessary inter-institutional agreement(s) consistent with that policy.

All costs cited conform to established institutional policies and procedures. Our DHHS Negotiated Rate Agreement can be found at http://www.rsp.wisc.edu/rates/rates.pdf. Website: http://www.rsp.wisc.edu/

A final agreement is contingent upon the successful negotiation of terms and conditions acceptable to the University of Wisconsin-Madison.

We ask that you use the University's above-referenced proposal number in any future correspondence.

Questions regarding administrative matters should be directed to:

PreAward Services by email: preaward@rsp.wisc.edu or by phone: (608) 262-3822.

Questions regarding the technical nature of this application should be directed to:

The Principal Investigator.

21 N. Park Street, Suite 6401
Madison, WI 53715-1218

Phone 608/262-3822
Fax 608/262-5111
http://www.rsp.wisc.edu

A Proposal to the

Unidata Community Equipment Awards Program

Proposal Title:	*Increasing AWIPS II Capabilities at the University of Wisconsin*
Date:	15 March 2013
Principal Investigator Name:	Wayne Feltz
Title:	Associate Scientist
Institution:	Cooperative Institute for Meteorological Satellite Studies Space Science and Engineering Center University of Wisconsin at Madison
Telephone number:	608-263-4942
FAX number:	608-262-5974
Street Address:	1225 W. Dayton Street Madison, WI 53706
Email address:	wayne.feltz@ssec.wisc.edu

Signature of PI: Wayne J. Feltz

University of Wisconsin Official: Nick Novak

Title: Managing Officer

Telephone number: 608-262-3822

FAX number: 608-262-5111

Email address: preaward@rsp.wisc.edu

Signature of University Official:

Increasing AWIPS II Capabilities at the University of Wisconsin

A proposal to the Unidata Community Equipment Awards Program

Project Summary

The Cooperative Institute for Meteorological Satellite Studies (CIMSS) located on the campus of the University of Wisconsin is a widely recognized leader in satellite meteorology. Extensive digital data repositories and computing resources complement CIMSS' science prowess. CIMSS ingests and stores data from both national and international science missions, and shares this data with its many partners. Furthermore, CIMSS maintains a strong educational component to its mission, not only through working with faculty and graduate students in the University's Department of Atmospheric and Oceanic Sciences, but also through engaging external entities, such as the National Weather Service (NWS).

In 2005, CIMSS began a project to not only train NWS forecasters on how to use satellite imagery and products, but also deliver new products from experimental satellite missions. This required formatting the imagery and products into a transmittable file that could be easily stored and displayed in the Advanced Weather Interactive Processing System (AWIPS), which is the sole operational software tool employed at the NWS forecast offices nationwide.

By many measures, this has been a successful activity. Not only has CIMSS data reached over 70 NWS sites across the country since the inception of the project, data originating at CIMSS has been documented to influence hundreds of forecast decisions at NWS sites to date. Recently, CIMSS has expanded efforts to support NWS sites and academic institutions in Alaska and Hawaii.

In order to further the project in support the next generation of AWIPS, AWIPS II, additional computing resources are necessary. While the user interface is similar, AWIPS II and its predecessor are completely difference systems. Not only does CIMSS need to support its feed of imagery and products in legacy AWIPS during the multi-year deployment of AWIPS II, it also needs to actively develop plug-ins to support new data and forecasting methods for use with AWIPS II. Within nearly five years of AWIPS II experience already, CIMSS hopes to contribute to the development knowledgebase and become a leader in AWIPS II support as the broader Unidata community begins to embrace AWIPS II for use at the many member institutions.

This proposal requests funds for a central processing server to which to run the Environmental Data Exchange (EDEX) component of the AWIPS II software and a workstation capable of running a visualization client, the Common AWIPS Visualization Environment (CAVE). It is envisioned that the EDEX will support remote connections and serve thin clients. The thin client capability will support CIMSS employees with telework agreements who conduct training and cannot use the full visualization client remotely. The equipment will also support development of the AWIPS II software to improve satellite imagery and product visualization among other envisioned capabilities.

Project Description

In order to support the next-generation Geostationary Operational Environmental Satellite R-Series (GOES-R) and Joint Polar Satellite System (JPSS), CIMSS is participating in a proving ground activity with other similar institutions across the country as well as the NWS (herein referred to as the GOES-R Proving Ground). This is helping to further CIMSS' existing research to operations interactions and increase the benefactors of new and upcoming satellite imagery and products. The Unidata Local Data Manager (LDM) is used to deliver the satellite imagery and products from CIMSS to its partner NWS offices.

Details of Equipment

In the research setting, it is infeasible to run a redundant set of four servers similar to how the AWIPS II software will be deployed across multiple servers at a single NWS office. Furthermore, a critically high level of uptime is not necessarily as paramount in a non-operational environment. However, the research setting requires more computing power and disk space because the number of experimental data sets can be substantial in such a setting. Thus, the proposed equipment must be high performance, in excess of NWS hardware standards, and need not consist of multiple units.

To fulfill that objective, the request is for a Dell PowerEdge R820 Rack Server and Dell Precision T7600 Workstation at a combined cost of $19,600.

The server is expected to run the AWIPS data exchange and serve data to thin clients and clients within CIMSS. Both pieces of hardware will run RedHat Enterprise Linux (RHEL) version 5, which is required to run AWIPS II at the current time. The workstation will be one of the clients within CIMSS that can also run the AWIPS II Development Environment (ADE), which contains the entire code base to make changes to the software and deploy plug-ins.

In addition, the workstation will be localized to a NWS office outside of the continental United States. In AWIPS, the localization process configures the maps and some of the data sets. This will allow CIMSS to focus on improving the AWIPS II user experience for large and/or unique satellite data sets covering the polar regions or Pacific Ocean, for example. It is anticipated that AWIPS II may have difficulty with some high-resolution, vast-coverage data sets which require a large amount of memory in the Java heap space to ingest. This is an issue which will be of interest to many in the Unidata community.

How Equipment will meet Goals

The proposed equipment will help CIMSS share satellite imagery and products with NWS offices using AWIPS II, and support the installation and use of new imagery and products at those offices, a critical function of the GOES-R Proving Ground. It will also facilitate growth in understanding of the underpinnings of AWIPS II among CIMSS staffers and allow for new satellite data to be shared across the Unidata community with partners using AWIPS II.

Contribution to Unidata Community Capabilities

The acquisition of additional computing hardware at CIMSS will allow for an increase in AWIPS II development activities and for CIMSS staff to further familiarize themselves with the AWIPS II environment. This will assist CIMSS in building the necessary background knowledge to aid others in the Unidata community with AWIPS II installation and development issues – and to assure that unique CIMSS data is AWIPS II compliant.

Broadens the Unidata Community Scope and Capabilities

The proposed server will support remote connections and serve AWIPS data to a thin client. This will not only provide scientists and students an ability to access real-time weather data remotely; it will also demonstrate a potential proof of concept for how users can interact over a consistent platform and unique data sets can be shared in real-time.

Enhanced participation in the Internet Data Distribution (IDD)

The AWIPS II software uses the Unidata LDM to receive data. CIMSS also sends new and experimental satellite imagery and products via the LDM to NWS forecast offices, as do the other GOES-R Proving Ground partners. These could also be made available to other non-NWS AWIPS II sites within the Unidata community.

Benefits

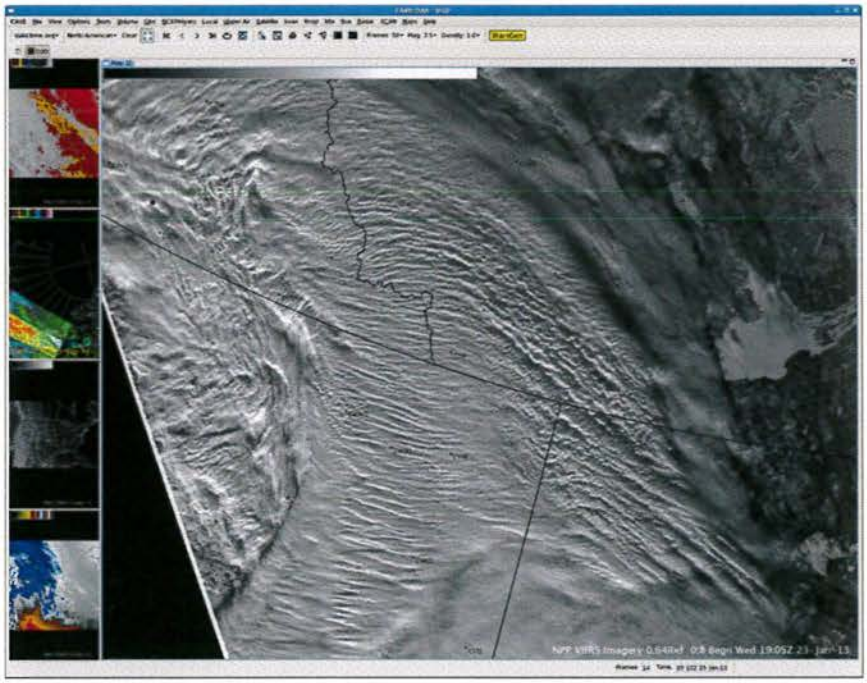
Contribution to advancement of technology

AWIPS II is a next-generation visualization tool for real-time weather information. AWIPS II also provides the first time that operational meteorologists in the NWS and throughout the Unidata community will be able to use the same software platform. As such, contributions from CIMSS, the NWS, and the rest of the Unidata community will further increase the capabilities of the software as AWIPS II serves as a catalyst for growth of the weather information and visualization community.

For example, CIMSS has already worked with Raytheon and the NWS to envision a true-color imagery widget that will soon be available in the software. CIMSS has also developed a plug-in to ingest a new source of lightning data, and is currently working on additional display configurability. These capabilities will be available to the Unidata community.

Contribution to education

Beyond students and scientists enrolled in or affiliated with the University of Wisconsin's Department of Atmospheric and Oceanic Sciences who would benefit from a thin client, CIMSS also runs a popular satellite blog which explains interesting weather phenomena as found in satellite imagery and products. The satellite blog is a great education tool for general public, weather enthusiasts, students, and meteorologists alike. AWIPS is one of the primary tools for creating images used on the blog, which can be found online at *http://cimss.ssec.wisc.edu/goes/blog/*.



Above: An example of an AWIPS II screen capture from the CIMSS Satellite Blog. The full post can be found at *http://cimss.ssec.wisc.edu/goes/blog/archives/12199*. Credit: Scott Bachmeier, CIMSS

Contribution to research

The National Oceanic and Atmospheric Administration (NOAA) requires that many new research products have a path to operations, which requires testing and evaluation in an operational environment. In many cases, this requires such testing to occur in the NWS. However, this often necessitates that the research product be available in a format that can be ingested and displayed using AWIPS, and in the future, AWIPS II. Since CIMSS is a NOAA Cooperative Institute, sufficient computing resources for AWIPS II allow CIMSS to articulate a pathway to operations, involving a direct interaction with NWS forecasters, in research proposals.

Existing Computing Resources and Future Plans

Recently, CIMSS has invested in a Lustre cluster file system as a way of keep a multi-week repository of all data ingested into AWIPS II from the Satellite Broadcast Network (SBN), as well as the CIMSS-produced data. This will allow CIMSS to easily prepare case studies from recent weather events and provide "just-in-time" training.

The requested equipment represents a very small fraction of the entire computing resources at the Space Science and Engineering Center (less than 1%), the parent organization for CIMSS. This does not mean the requested equipment is of small importance to this particular project. It also does not mean that existing equipment within SSEC can be repurposed to fill the role of that requested. This equipment award is seeking to replace old hardware that is out of warranty (beyond five years from date of purchase) or increase capabilities with new hardware.

Budget

This proposal requests support for one server and one workstation to run AWIPS II. The collective cost of the request is $19,600. There are no other expenditures other than the capital equipment. Personnel support for hardware installation and maintenance at CIMSS will come from existing projects that benefit from the new systems.

The requested server is a Dell PowerEdge R820 Rack Server with the following approximate specification, at a projected cost of $13,200. The actual purchase and hardware specification will vary slightly based on product offerings at the time of purchase.

Processor	2x Intel® Xeon® E5-4640 2.40GHz, 20M Cache, 8.0GT/s QPI, Turbo, 8 Core, 95W, Max Mem 1600MHz
Hard Drives	3x 200GB Solid State Drive SATA Value MLC 3Gbps 2.5in Hot-plug Drive-Limited Warranty
Memory Configuration Type	Performance Optimized
Memory DIMM Type and Speed	1333 MHz UDIMMs
Memory Capacity	4GB UDIMM, 1333 MT/s, Low Volt, Dual Rank, x8 Data Width

The requested workstation is a Dell Precision T7600 Workstation with the following approximate specification, at a projected cost of $6,400. The actual purchase and hardware specification will vary slightly based on product offerings at the time of purchase.

Processor	Dual Six Core XEON E5-2630 (2.3GHz, 15M, 7.2 GT/s,Turbo)
Hard Drives	3x 256GB, 2.5" SATA 6Gb/s Solid State Drive
Monitor	Dell UltraSharp™ U2410 24in HAS Wide Monitor, VGA/ DVI/ DP/ HDMI
Memory	8GB, DDR3 RDIMM Memory, 1333MHz, ECC (4 x 2GB DIMMs)
Graphics	Nvidia Quadro K5000, 4GB, 2 DP + DVIi +DVId

While there is no cost sharing or matching, the University has already procured some components of the AWIPS II system at CIMSS, including a server, two workstations, and three portable workstations, all of which are now approximately two or more years old. Some workstations were purchased more than five years ago and are beginning to fail.

There is no institutional overhead for individual equipment expenditures over $5,000.

Here is the summary of the proposed budget:

Server (Dell PowerEdge R820 or similar)	$13200
Workstation (Dell Precision T7600 or similar)	$6400
Overhead and other costs	$0
Installation, maintenance, and support	$0
Total	**$19600**

Project Milestones

There are not any projected hurdles or conditions which would preclude the installation of the proposed hardware within three months from receipt of the requested funds. Procurement would occur shortly after funds are received in May 2013.

Here is the summary of the project milestones:

Notification	May 2013
Receipt of funds	June 2013
Procurement	July 2013
Installation	August 2013
Article summarizing use of allocated funds	Early 2014

Project Expertise

Jordan Gerth is a PhD student in atmospheric and oceanic sciences at the University of Wisconsin. He has worked at CIMSS as a student assistant since 2005, most recently under the GOES-R Proving Ground project. He has engaged in development activities for the AWIPS II software since 2008, and AWIPS since 2003. He has committed code to the AWIPS II software and has participated in the design review process for AWIPS II enhancements. He also participates in the bi-weekly developers' forum with the NWS and Raytheon, and has given several talks on AWIPS II and satellite imagery visualization at annual meetings of the American Meteorological Society and National Weather Association.

Lee Cronce and Kaba Bah at CIMSS will provide additional support for this procurement. They have been active in the GOES-R Proving Ground, and recently in AWIPS II development activities.