Proposal for the 2014 Unidata Community Equipment Awards

AWIPS II Prototype Testing Equipment for a Standalone Experimental EDEX/LDM/CAVE System for Penn State and Unidata

Date:	14 March 2014
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Project Summary:

The National Weather Service (NWS) is replacing its aging Advanced Weather Interactive Processing System (AWIPS) I/ NAWIPS infrastructure with modern open source, standards-based software called AWIPS II. Penn State and other institutions are heavily dependent on the existing Unidata-supplied NAWIPS software for both their educational mission as well as research and outreach activities. At Penn State, the Department of Meteorology has an average enrollment of 250 undergraduate and 60 graduate students in diverse disciplines ranging from weather forecasting and broadcast meteorology, to weather risk management, environmental meteorology, and weather modeling. Each of these disciplines requires data integration, data analysis, and data visualization capabilities for understanding and utilizing these data to solve real-world problems. The modernized NWS AWIPS II data collection, analysis and display package will be one of these tools that each student and researcher should both understand and use. We intend to expose our students to these tools in our classroom instruction for various forecasting and analysis courses taught both at the undergraduate and graduate level.

Penn State currently participates with Unidata as an AWIPS II beta tester. Recycled workstation hardware (a Dell Optiplex 960, 3.16 GHz Core2 Duo, 8 GB RAM, 160 GB hard drive) is being used to test the basic installation and operation of a standalone Environmental Data Exchange (EDEX) / Local Data Manager (LDM) server and Common AWIPS Visualization Environment (CAVE) workstation. This prototype is clearly inadequate for significant testing in an operational environment. Funding of this project would allow us to purchase viable prototype test systems including a CAVE client that would be installed in our Weather Station classroom where students and faculty can become familiar with its capabilities and make suggestions for improvements, and a prototype EDEX back-end server to supply data to the CAVE client. A CAVE thin client would also be installed and tested using existing classroom hardware.

Penn State also operates and maintains an Internet Data Distribution (IDD) relay cluster serving 19 downstream institutions and acts as a top-level relay for CONDUIT data. Our relays were installed with 2011 Unidata Equipment Grant funds as three minimally configured servers each with 24 GB of memory and a single processor, but configured as six virtual servers of 12 GB each. This allows us to operate a six-server IDD cluster with 12 GB of memory per virtual server, but with a limited LDM queue size. With connections to the cluster and the volume of datasets (e.g. HRRR) continuing to increase, and in consideration of Penn State's participation in a new high-speed 10 GBit national data backbone (Research DMZ), we feel it is important

at this time to also upgrade our IDD cluster with additional memory. This memory upgrade also requires the installation of a second processor.

Penn State brings significant infrastructure resources and talent for the implementation of this proposal. Penn State is currently implementing a grant to upgrade its networking capabilities by adding a new 10 GBit data network, which will allow exploration of new avenues of high-speed data distribution. Penn State is a long-term Unidata participant and provider of IDD relay services, of Thematic Real-time Environmental Distributed Data Services (THREDDS) services, and of Repository for Archiving, Managing and Accessing Diverse Data (RAMADDA) services for the Unidata community. If granted, this proposal will significantly help Penn State to continue its commitment to the advancement and implementation of Unidata resources for the benefit of the Unidata community.

Project Description:

A prototype system for AWIPS II data ingest and visualization in an educational, research, and outreach environment will be deployed and evaluated. Operational problems and areas for improvement will be reported to Unidata. With the full IDD data stream exceeding 300 GB/day, processing any significant portion of the stream is particularly demanding on the EDEX/LDM server, which must parse, decode and file the data into the EDEX database system. This project will implement a Xeon E5-2630 server with 64 GB of memory and 8 TB of mirrored SAS storage to provide an initial starting point for a prototype system that will process a portion of the IDD data stream. The prototype CAVE client, in contrast, is more demanding in its graphical capabilities and this project will implement a Xeon workstation with a 1 GB NVidia graphics controller to provide an entry-level graphics capability for the prototype workstation.

Installation of a prototype AWIPS II platform will expose our students and faculty to the latest technology used by the NWS. This system will also provide access to advanced data sets and analysis and display capabilities. It will also further enrich our existing collaborative environment with the local NWS office, which involves a number of students interacting with the local NWS Science Operations Officer. The full CAVE client will be placed in the Penn State Weather Station classroom where it will be readily accessible to students and faculty during and outside of class. The CAVE thin client would also installed on existing classroom hardware and become

part of the classroom instruction. Users will be asked to provide comments on their user experience to identify problems and areas for improvement.

Part of the testing process for the prototype system will also include conversion of a subset of existing, locally created, NAWIPS GEMPAK scripts into the new environment. Penn State uses General Meteorology Package (GEMPAK) scripting extensively to generate products on its e-Wall, the electronic map wall (http://www.meteo.psu.edu/ewall), which is used extensively by Penn State students, faculty and staff as well as hundreds of external users. In order to discover problems and demonstrate conversion capabilities, a representative sample of scripts performing a variety of functions will be selected and converted to run in the new AWIPS II environment as a potential replacement for our real-time graphics generation.

The upgrade of the Penn State IDD cluster system is straightforward. A second processor and 48 GB of memory for each of our three existing servers will be purchased and installed. This will allow the operation of six virtual servers each configured with 36 GB of memory allowing a much larger LDM queue and stepped-up processing capability. The upgrade will provide improved resources to support an expanding user base and an increased dataset volume on existing and soon-to-come high-speed data networks enabling us to maintain a growing data stream to the Unidata community.

Throughout this project, active, close cooperation with Unidata will be present to provide guidance on installation and operational issues as well as feedback for improvement of the final AWIPS II package.

Proposed Budget:

We propose using Unidata Community Equipment Award funds to purchase prototype EDEX/LDM/CAVE hardware to develop the above-specified AWIPS 2 environment. In addition, processors and memory to upgrade our IDD cluster servers would be purchased. The following hardware would be purchased:

EDEX/LDM Server:	1 Xeon E5-2630 (6-core)
	64 GB RAM
	4 each 7.2K rpm 4 TB SAS hard drives
	1 each 100 GB SSD OS disk

	1 each 250 GB LDM Queue disk
	Cost: $5,224
CAVE Client:	Dell Precision Workstation
	Xeon E3-1220v3 (4-cores)
	16 GB RAM
	Nvidia Quadro K600 with 1 GB video RAM
	27" monitor
	Cost: $1,329 + $250 monitor
IDD Relay Upgrade:	3 each Xeon E5606 (4-cores each)
	3 each 48 GB memory
	Cost: $2,385
CAVE Thin Client:	Provided by Penn State at no cost

Total Direct Cost:	$9,188
Total Cost with F&A:	$11,150

Matching support from Penn State will be provided in terms of funding appropriate personnel salary time and any unanticipated hardware needs in support of this project. Salary support in the amount of $7,020 will be provided by Penn State (including fringe and F&A costs). In addition, Penn State will provide existing hardware for the installation and testing of the CAVE thin client.

Project Milestones:

By end of June 2014 - Award in-house and ready for implementation

By end of August 2014 - Acquire hardware, configure with operating systems and Unidata AWIPS II beta software, and deploy CAVE client in the classroom. The CAVE thin client will be installed on existing hardware. Installation of memory and processors to upgrade the IDD cluster will be completed.

By end of December 2014 - Prototype testing of GEMPAK script conversions to the AWIPS II environment will be completed. Feedback from students and faculty for experiences with the CAVE client and thin client will be summarized.

Silicon Mechanics
22029 23rd Dr SE
Bothell, WA 98021-4410
(425) 424-0000

Quote

Date	Quote #	Confirmation #
03 / 04 / 2014	264971	202172607

Bill To:	Ship To:
psuinvoices@psu.edu	Arthur aap1@psu.edu

Description	EDEX 2014
Notes	

Quantity	Description	Price Each	Amount
1	**Storform iServ R513.v4** CPU: 1 x Intel Xeon E5-2630v2, 2.6 GHz (6-Core, HT, 15MB Cache, 80W) 22nm RAM: 64GB (4 x 16GB DDR3L-1600 ECC Registered 2R 1.35V DIMMs) Operating at 1333 MT/s Max Management: IPMI 2.0 & KVM with Dedicated LAN - Integrated Controller: X540 Dual-Port 10GbE, 2 Ports 6Gb/s SATA, and 8 Ports 3Gb/s SATA SAS 2.0 Expander: Expander provides connectivity to all drives and expansion port (SAS Controller Required) Expansion Port: External SAS 2.0 Connector (SFF-8088) for JBOD Expansion NOTE: RAID controllers with CacheVault included will consume 2nd PCI slot LP PCIe 3.0 x16: LSI 9240-4i (4-Port Int, PCIe 2.0) 6Gb/s SAS/SATA - no BBU LP PCIe 3.0 x8 - 1: No Item Selected Drive Set: 4 x 4TB Seagate Constellation ES.3 (6Gb/s, 7.2K RPM, 128MB Cache) 3.5-inch SATA RAID Configuration: RAID 10: Mirroring & Striping System Volume: No Item Selected NOTE: Rear Drives are connected to onboard SATA controller unless otherwise specified Rear HS Drive - 1: 100GB Intel DC S3700 Series HET-MLC (6Gb/s) 2.5" SATA SSD Rear HS Drive - 2: 250GB Western Digital VelociRaptor (6Gb/s, 10K RPM, 64MB Cache) 2.5" SATA RAID Configuration: No Item Selected Power Supply: Redundant 920W Power Supply with PMBus - 80 PLUS Platinum Certified Rail Kit: Quick-Release Rail Kit for Square Holes, 26.5 - 36.4 inches OS: No Item Selected Warranty: Standard 3-Year Warranty Notes: OS: no OS RAID: 4 x 4TB HW RAID10 off LSi 9240-4i PSU will install OS onto Intel S3700 250GB 10k drive will be used as real time data queue	5224.00	5224.00

Subtotal	5224.00
Sales Tax (0%)	0.00
Total	USD 5,224.00

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Orders shipped to WA and TX are subject to the appropriate tax rate. The quoted tax amount is subject to change.