Unidata Community Equipment Awards Cover Sheet

Project Title:

Upgrade the JSU Meteorology Computing Lab by installation of AWIPS II EDEX Server and CAVE Clients

Date: March 8, 2018
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Jackson State University
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Total requested fund for this proposal is: _____

[redacted]

Name of institution official: Dr. Joseph Whittaker
Title: Associate Provost
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[redacted]

Upgrade the JSU Meteorology Computing Lab by installation of AWIPS II EDEX Server and CAVE Clients

I. Project Summary

The Jackson State University Meteorology Program (JSUMP) serves numerous first-generation college students, particularly from African American students and other socio-economically disadvantaged groups. Currently, the program is comprised of three (3) full-time tenured faculty, one full-time teaching instructor and one part-time ajoint faculty. The program is focused on advanced atmospheric theories and applied coursework, where students are engaged in hands-on active learning through meteorological instruments, Unidata (e.g., IDV, GEMPAK, McIDAS) and other software (e.g., IDL, NCL, GIS), and fieldwork. Regarding the rapid and sustainable growth of the JSUMP, the objective of this proposal is to seek a support to expand Unidata visualization and advance data access to continue to provide innovative instruction and opportunities for under-represented students seeking careers in meteorology. This proposal requests funding to acquire hardwares for installing the next generation a Advanced Weather Interactive Processing System (AWIPS II) Environmental Data Exchange (EDEX) server with nine (9) Common AWIPS Visualization Environment (CAVE) clients in order to enhance the ability to project high definition graphics in a weather analysis and forecasting classroom settings in JSUMP. We also request fund to purchase a PC workstation to replace aging WRF model web server.

Additionally, we would also want to upgrade our projection system to accommodate high-resolution graphics created by Unidata products. Our current projector purchased in 2009 through other fund. It has very limited capability and low resolution. This projector system is composed of two projector lens directing two different screens in order to provide better viewing. During past two years, these projectors keep failing. A better resolution projector is needed so that it can better accommodate high-resolution graphics tools such that the instructor should be able to demonstrate the full power of AWIPS II. This will also benefit all classes that display Unidata products and/or numerical model outputs. It is anticipated that installing the AWIPS II EDEX server, CAVE clients, and a new projector system in our computer lab will enhance the learning environment for our undergraduate meteorological education.

II. Project Description

Jackson State University (JSU) has been an affiliate of UCAR since 1990. The JSUMP within the Department of Chemistry, Physics and Atmospheric Sciences offers the only B.S. degree of meteorology in the State of Mississippi, with a curriculum that meets guidelines established by the American Meteorological Society and federal government (GS-1340). The program is also unique within the Unidata community as the only B.S. meteorology program at a Historically Black University (since 1977) (Williams *et al.* 2007), and has a long record of working closely with the National Weather Service on operational weather research and training (Williams *et al.* 2006). The program is comprised of three full-time tenured faculty, one full-time teaching instructor and q part-time ajoint faculty. A significant fraction of our students intend to pursue post-graduate employment with the National Weather Service (NWS) or other private forecasting firms, with smaller percentages interested in broadcast meteorology, environmental science, or continuing their education with an advanced degree and becoming involved in research or academia. The program curriculum is focused on advanced atmospheric theories and applied coursework, where students are engaged in hands-on active learning through meteorological instruments, data analysis including Unidata (e.g., IDV, GEMPAK, McIDAS) visualization and other software (e.g., IDL, NCL, GIS), as well as necessary fieldwork. The main computational accessibility for meteorological students and faculty in JSUMP is located in Room 259 of the research wing of Just Science Hall building. This lab has served as a nexus for research and

training activities for several years. It is the only facility available for meteorology students to work on computer programming and data analysis exercises for their courses. In this lab, there are two (2) Dell PowerEdge 840 Servers with quad core Intel Xeon 2.4GHz 1066 MHz and none (9) Dell OptiPlex 755 Mini-towers with Intel Core 2 Duo 2.66GHz 4M Cache. Many curricula utilize this lab during semesters including Computational Data Analysis and Visualization (MET270), General Meteorology (MET311), Weather Analysis/Forecast (MET299/399), Physical Meteorology (MET411), Synoptic Meteorology (MET421), Numerical Methods (MET431), and Intro to GIS/RS (SCI331). This lab is also utilized for various workshops during summer to train high/middle school science teachers within the state of Mississippi. However, computing infrastructure in this lab (some originally purchased under a 2008 Unidata Equipment Award) are nearing end of life and unable to keep up with current software demands. The JSUMP program is a participant member in the Unidata community and a user of Unidata programs and data (e.g., IDV, GEMPAK, McIDAS) in teaching, training and research. JSUMP would like to contribute more to UCAR community and Unidata activities (especially with the new radar coming online), which will require upgraded computing facilities to make the program more comparable to existing full member institutions. Students receive scientific computing experience utilizing Unidata programs and advanced scientific programming (Fortran and Python) throughout some courses in current curriculum, including Computational Data Analysis and Visualization and Intro to GIS/RS for meteorology majors. JSUMP once operated a LDM server (hardware originally purchased in 2008) to easily support Unidata program used in teaching and research (access to real-time data using the upstream LDM feed from the Southern Regional Climate Center at Louisiana State University). However, it experienced a hardware failure few years ago. We did not reinstall the system due to lack of funds. This impedes recent students from gaining full use of Unidata programs and data. Given the current situation, JSUMP does not have the ability to train students using the next-generation AWIPS-II, which results in a big problem since majority of our students will seek employment with the NWS. We estimate that more than half of hardware in our computer lab is near end of life and potential hardware failures would not be repaired given its age. On the other hand, ongoing budget issues in JSU have greatly limited significant funding opportunities for complete replacement of outdated or failed hardware. The equipment request herein denotes a evident upgrade and replacement of current infrastructure. It will allow the JSUMP program to continue and expand the use of the Unidata software suite in both teaching and research, as well as implementing AWIPS-II within the curriculum, especially for the classes of Weather Analysis/Forecast and Computational Data Analysis and Visualization.

In this proposal, JSUMP requests funding to purchase one high-end machine capable of being served as an EDEX server, and nine (9) high-end student workstation PCs running Linux compatible with UNIDATA software. The equipment we would acquire would modernize a significant portion of our computer laboratory and provide an EDEX server that would facilitate AWIPS-II access both on the JSU campus (through use of the 9 CAVE clients computers) and to the larger UNIDATA community, thus contributing to UNIDATA community capabilities and broadening community scope. We envision a significant impact of the proposed hardware/software in our teaching. We will open an account for each of our major students on the new computers. Over the course of the academic year, students will have ample time to use the workstations in an unstructured environment in order to explore the particulars of AWIPS II. JSUMP also hired a part-time joint faculty from local national Weather Forecasting Office (WFO) to teach MET299/MET399 (Weather Analysis and Forecasting lab), where she frequently utilizes many NWS ralevant softwares including AWIPS-II, GR2 Analysis, and WES9.7. We expect thar the installation of AWIPS II will provide JSUMP students the opportunity to integrate lecture material with actual data and modeled output in order to help them visualize atmospheric processes. It is critical that students learn how to use these tools and software in meteorology, which may be used in many aspects in their future professions. This is where the requested EDEX server becomes especially valuable, as students will finally gain substantive access to AWIPS-II.

In addition, JSUMP has an operational WRF model running for few years. The real-time model forecasts have been accessed from website (http://twister.jsums.edu/JSU_WRF). The model products have been used for the purposes of teaching, training and research (Fig. 1). However, the computer serving as a web server for WRF model forecast failed few weeks ago. This is a significant problem for our program. We need funds to purchase a new computer to replace failure one in order to resume website. Therefore, we request fund in this proposal to purchase one (1) workstation PC as web server

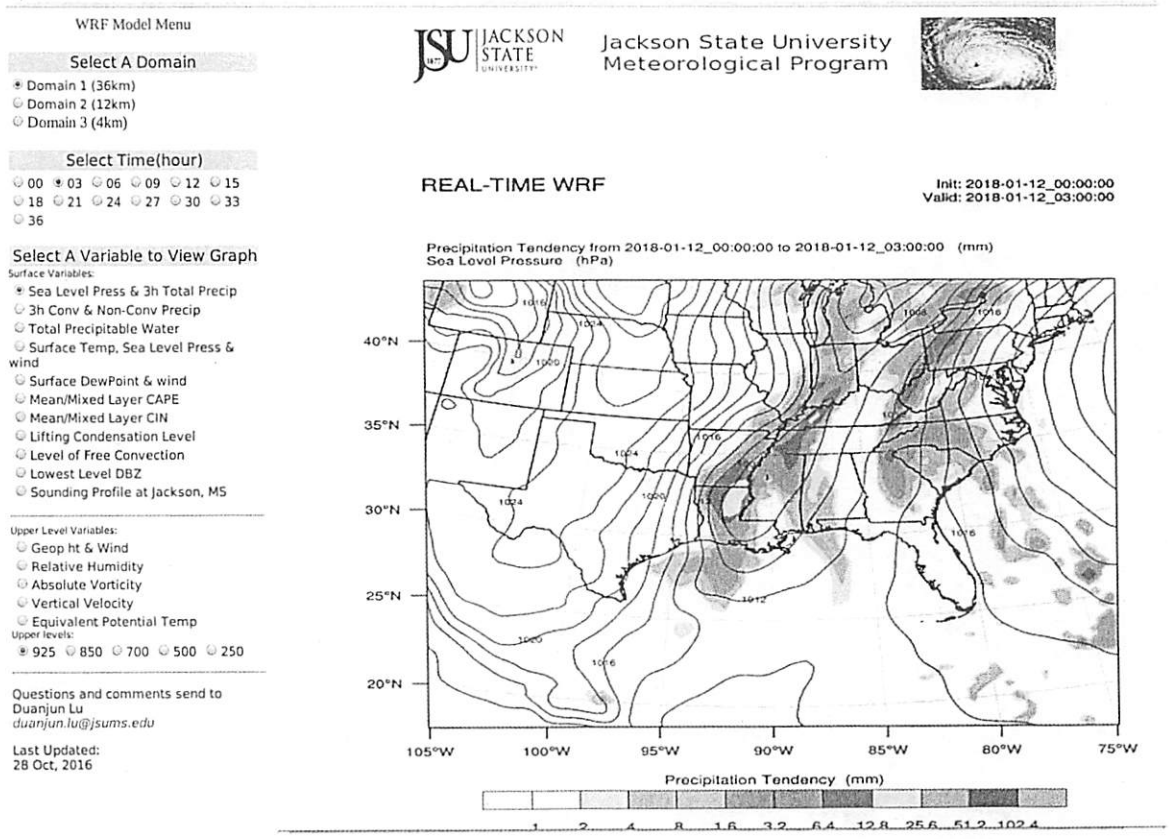


Fig. 1. JSU WRF model real-time forecast web page (web server stop functionning on 1/12/2018)

The projector system in our computer lab provided two screen displays by two projectors (Fig.2). One of projection failed last year. The left one keeps making a noise while displaying. This situation has posed a significant instructional problem for our faculty. The current projector system features a very limited capacity and low resolution, which impedes the use of high resolution image view. We plan to upgrade this projection system to accommodate high-resolution graphics created by Unidata products. A better resolution projector is needed so that it can better accommodate high-resolution graphics tools such that the instructor should be able to demonstrate the full power of AWIPS II. This will also benefit all classes that display Unidata products and/or numerical model outputs. New projector system will replace an aging one which is used for class lectures, student presentations, daily weather briefings, workshops, and seminars. Ensuring the continued capability for such presentations is important for instructional development, improvement of student presentation skills, and smooth interaction with visiting researchers.

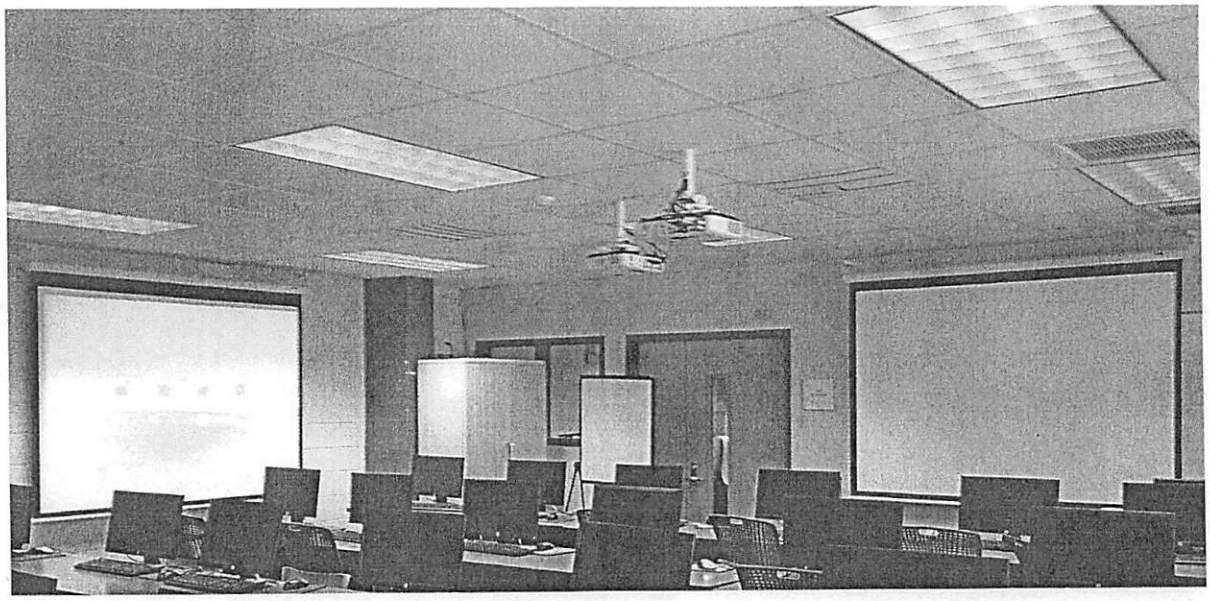


Fig. 2. Projector system in JSUMP computer lab

It is anticipated that installing the AWIPS II EDEX server, CAVE clients, local WRF model real-time forecasting website and a new projector system in our computer lab will enhance the learning environment for our undergrad meteorological education. Given award of this proposal, we expect to

- facilitate student training and development with AWIPS-II;
- integrate Unidata infrastructure into our meteorology curricula;
- provide for a unique real-time operational testbed for the AWIPS-II software and for the student-led development of training materials intending to share with the community.
- integrate our program further with the Unidata community and expand the community reach of next-generation Unidata offerings.
- showcase our meteorological students with local WRF numerical simulation.
- provide students with resource-intensive data visualization in classroom and research activities.

III Details of Equipment Request

In order to achieve the goals outlined above and to remain a vibrant contributor to the Unidata community, we propose to upgrade our existing facilities with the following hardware purchase.

Item	Quantity
EDEX Server Configuration (Dell PowerEdge T630) Xeon E5-2640V4, 2.4 GHz, 16 GB, 1 TB	1
CAVE Client (Dell PowerEdge T330) Xeon E3-1240V5, 3.5 GHz, 8 GB, 1 TB	9
WRF model web server (Dell PowerEdge T630) Xeon E3-1240V5, 3.5 GHz, 8 GB, 1 TB	1
Projector system (Epson PowerLite) 2155W, 3LCD projector, 802.11n wireless / LA	2
Graphic Cards configuration (Nvidia) NVIDIA Quadro K620 Graphics Card, 2 GB RAM	2
Monitors (for both Server and Client) ViewSonic VA2055SM, 20" LED-backlit LCD, Black	10

IV. Benefits to Research, Education, and Unidata Community

The JSUMP has a strong collaborative research relationship with with NOAA (e.g., EPP) and provides a growing resource of observed and model datasets for use by researchers, educators, and the public. Especially, underrepresented minorities (mainly African American) and stakeholders in the local region depend heavily on the capabilities of the JSUMP for research, training, and outreach (Shoemake *et al.* 2007; Williams *et al.* 2007). We provide students with an in-depth knowledge of the atmosphere sciences and prepare them for careers in the meteorology relevant.

The support from the Unidata Equipment Grant will make it possible to purchase new PC Linux machines as described above for one (1) EDEX server, nine (9) CAVE clients, one WRF model real-time web server as well as a high definition projector for instructional purpose. We expect that many education and professional benefits will be gained by upgrading our computing infrastructure including expanding use of Unidata products, and implementing AWIPS-II into the curriculum that provides opportunities for the students to experience meaningful software used on a daily basis at NWS Weather Forecast Offices. Fully functional use of the new computer infrastructure in our lab will benefit several undergraduate and graduate classes, in particular several courses with enhanced laboratory components in the current curriculum, which will enable JSUMP further to enhance education/research environment, as well as community participation.

V. Budget

The budget request covers equipment only, per Unidata guidelines. The total requested fund for this proposal is $18,457. Total **Indirect Costs**: $0

Item	Quantity	Unit cost	Total cost ($)
Dell PowerEdge T630, Xeon E5-2640V4 2.4 GHz - 16 GB - 1 TB	1	$2,789.19	$2,789.19
Dell PowerEdge T330 , Xeon E3-1240V5 3.5 GHz - 8 GB - 1 TB	10	$1,161.09	$11,610.90
Epson PowerLite 2155W – 3LCD projector - 802.11n wireless / LA	2	$1,416.88	$2,833.76
NVIDIA Quadro K620 Graphics Card - 2 GB RAM	2	$170.99	$341.98
ViewSonic VA2055SM 20" LED-backlit LCD - Black	10	$88.12	$881.20
Total			18457.03

JSU will cover excessive costs of the requested from Unidata if needed. Although there is no formal matching (not required), JSU provides in-kind contributions including JSU support for a dedicated Staff/Faculty assistant responsible for software development and server administration, existing support for on-call systems support from the JSU Information Technology Division (Appendux I) as well as PI time. Technical oversight for the proposed project will be provided by the PI, supported by on-call support system from the JSU Information Technology Division staff.

VI. Project Milestones

A quote for all components we proposed has already been obtained from CDW site (Appendix II). It is anticipated that, if funding is provided, the proposed equipment will be purchased and initially installed during the summer of 2018. It is expected to complete the installation/configuration of equipment and software from Unidata and other vendors in Fall 2018. In Spring 2019, data will be available both on and off campus to individuals using packages like the Unidata IDV or McIDAS software.

VII. References

Shoemake, J. L., M. Benjamin, S. Dixon, K. Hair, M. Jones, and Q. Jones, 2007: Professional development for undergraduate minority meteorology students through the NOAA Educational Partnership with Minority Serving Institutions. *16th AMS Sympos. on Education*, San Antonio, TX.

Williams, Q., R.S. Reddy, L. White, H.P. Liu, M.M. Watts, and J.L. Shoemake, 2006: The Jackson State University Meteorology Program's role in undergraduate atmospheric science training and research. 15th AMS Sympos. on Education, Atlanta.

Williams, Q. L., V. Morris, and T. Furman, 2007: A real-world plan to increase diversity in the geosciences. *Physics Today*, November.

Appendix I

JSU 1877 | JACKSON STATE UNIVERSITY*

Department of Information Technology ~ P.O. Box 17750 ~ Jackson, MS 39217 ~ Ph: 601-979-4299 ~ Fax: 601-979-8071

March 7, 2018

LETTER OF SUPPORT

To whom it may concern

I am pleased to offer my full support for the proposal entitled "Upgrade the JSU Meteorology Computing Lab by installation of AWIPS II EDEX Server and CAVE Clients". On behalf of the Department of Information Technology at Jackson State University we strongly support and endorse computer infrastructure development that enhances research and educational activities within JSU. The Department will designate needed resources (i.e., personnel) and support the activities of Dr. Duanjun Lu, associate professor of meteorology and a dedicated faculty member. We are committed to help Dr. Lu to setup and establish AWIPS II EDEX Server and CAVE Clients in Meteorology Program. We will fully support this effort as they are directly aligned with our mission. The proposed project will indeed be a benefit to our commitment of educating the scientists and engineers of tomorrow. Jackson State University is a Historically Black Carnegie Doctoral/Research Intensive public institution of higher learning, with a majority of our students from the STEM disciplines.

Sincerely,

Dr. Michael Robinson
Deputy CIO/CTO
Information Technology
Jackson State University

Appendix II

QUOTE CONFIRMATION

PEOPLE WHO GET IT

DEAR DUANJUN LU,

Thank you for considering CDW•G for your computing needs. The details of your quote are below. Click here to convert your quote to an order.

QUOTE #	QUOTE DATE	QUOTE REFERENCE	CUSTOMER #	GRAND TOTAL
JQFQ728	3/6/2018	POWEREDGE	166718	$18,457.03

QUOTE DETAILS

ITEM	QTY	CDW#	UNIT PRICE	EXT. PRICE
Dell PowerEdge T330 - tower - Xeon E3-1240V5 3.5 GHz - 8 GB - 1 TB Mfg. Part#: 9VDTW UNSPSC: 43211501 Contract: MARKET	10	4769536	$1,161.09	$11,610.90
Dell PowerEdge T630 - tower - Xeon E5-2640V4 2.4 GHz - 16 GB - 1 TB Mfg. Part#: V0X37 UNSPSC: 43211501 Contract: MARKET	1	4758467	$2,789.19	$2,789.19
Epson PowerLite 2155W - 3LCD projector - 802.11n wireless / LAN Mfg. Part#: V11H818020 UNSPSC: 45111614 Contract: MARKET	2	4425355	$1,416.88	$2,833.76
NVIDIA Quadro K620 Graphics Card - 2 GB RAM Mfg. Part#: VCQK620-PB UNSPSC: 43201401 Contract: MARKET	2	3449431	$170.99	$341.98
ViewSonic VA2055SM 20" LED-backlit LCD - Black Mfg. Part#: VA2055SM UNSPSC: 43211902 Contract: MARKET	10	3668405	$88.12	$881.20

PURCHASER BILLING INFO		
Billing Address: JACKSON STATE UNIVERSITY ACCOUNTS PAYABLE P.O BOX 17159 ***** MUST SHIP COMPLETE ***** JACKSON, MS 39217-0001 **Phone:** (800) 848-6817 **Payment Terms:** NET 30 Days-Govt/Ed	**SUBTOTAL**	$18,457.03
	SHIPPING	$0.00
	GRAND TOTAL	**$18,457.03**
DELIVER TO	**Please remit payments to:**	
Shipping Address: JACKSON STATE UNIVERSITY Constance Martin 1325 HATTIESBURG ST CENTRAL RECEIVING WAREHOUSE JACKSON, MS 39204 **Shipping Method:** UPS Ground	CDW Government 75 Remittance Drive Suite 1515 Chicago, IL 60675-1515	