Unidata Community Equipment Awards Cover Sheet

Proposal Title: Installing LDM, RAMADDA, THREDDS, and IDV at TAMIU

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B. Project Summary

The Center of Earth and Environmental Studies (CEES) at Texas A&M International University (TAMIU) has a long history of conducting hydrometeorology research in the South Texas borderlands region. TAMIU is a Hispanic Serving Institution (HSI) and is the only comprehensive higher educational institute in a region that spans over 150 miles in all directions with a highly underserved population. There is as need to receive real-time meteorological data to support environmental monitoring throughout the region and this proposal is requesting resources that will allow CEES to install LDM, RAMADDA, THREDDS, and IDV at TAMIU. Unidata support can help CEES become an active conduit to support research activities where meteorological data streams can support the generation of actionable intelligence to potentially mitigate environmental problems. Specifically, real-time, watershed-scale modeling can elucidate potential water quality issues associated with extreme meteorological events. Therefore, the proposed project can serve as a model for how Unidata resources can be applied outside of the domain of atmospheric science.

C. Project Description

1. Overview of Hydrometeorological Activities at TAMIU

The Center of Earth and Environmental Studies (CEES) at Texas A&M International University (TAMIU) offers undergraduate coursework in Earth Science, Introductory Atmospheric Science, Geohydrology, and Geographic Information Systems (GIS) within the College of Arts and Sciences at TAMIU. In addition, CEES has a long history of developing undergraduate research in the field of hydrometeorology into papers that are presented at professional conferences such as regional and national Geological Society of America; national American Meteorological Society; and the NOAA sponsored Expanding Opportunities in Oceanic and Atmospheric Sciences: Inclusion, Innovation, and Investment conference. CEES has long standing connections with the Department of Atmospheric Science at Texas A&M University and the Texas Climate Studies Center dating back to 2001 and College Station faculty stand ready to help CEES with technical expertise in its quest to join the Unidata community.

2. Overview of proposed equipment

2.1 Description of equipment

The project will utilize a Dell PowerEdge R720 server with the following specifications:

PowerEdge R720
2 Intel Xeon, 2.56 GHz, GC processors
96GB RAM memory
2 1 TB SETA Hot-Plug Hard Drives
PERC H710 Integrated RAID Controller
RAID 1 for PERC H710 RAID Controller

A preliminary quote is attached but final amount may differ as specifications change depending on recommendations from technical support. As a freestanding center CEES has limited funds that can support modest additional equipment expenses if necessary.

This server will utilize a virtual machine running Linux and LDM software to obtain NEXRAD level IV data and surface observations from weather stations. The server will also run TDS and RAMADDA to host data obtained from LDM as well as derived datasets produced locally to run hydrological models. We will utilize our current infrastructure that includes 30TB of storage space to store all related datasets after processing. This proposed set up is not final and can be modified appropriately as recommended through consultation with professionals from Texas A&M College Station who has experience with the installation of LDM.

2.2 Responsiveness to proposal review criteria

(i) Intellectual or technical merit of the proposed work

Research on hydrological modeling in the South Texas region has focused on historical case studies based on inter-comparison of precipitation products and impact of extreme precipitation events on water quality. The next logical step is to extend this research into real-world applications that can only be supported with advanced informatics that Unidata technology affords.

(ii) Contributions to Unidata community capabilities

By developing a pathway to adapt Unidata resources such as LDM, RAMADDA, THREDDS, and IDV to support hydrologic and water quality research/applications. In addition, this project can provide data replication for hydrometeorological data that can be used by hydrologist and the broader water resource community.

(iii) Broadens the Unidata community scope and capabilities

The proposed project manifestly extends the application of Unidata resources outside of the core domain of atmospheric science.

(iv) Enhanced participation in the Internet Data Distribution (IDD)

By allowing TAMIU to take part in the IDD, we will become an active Unidata participant.

(v) Contributes to the advancement of technology

The approaches and tools (scripts and programs) developed in this project allowing for ingestion of real-time hydrometeorological data will be freely shared with the hydrologic research community.

(vi) Contribution to education

Participation in Unidata will expand the scope of our current educational activities, both in the classroom and with undergraduate research projects at TAMIU.

(vii) Contribution to research

The addition of the Unidata capabilities contributes to the research efforts of CEES at TAMIU in terms of developing a milieu where real-time hydrological modeling in the South Texas region can be supported.

3. Overall Project Goals

There is a need to receive real-time meteorological data to support environmental monitoring throughout the region and this proposal is requesting resources that will allow CEES to install LDM, RAMADDA, THREDDS, and IDV at TAMIU. Currently, we have obtained hydrometeorological data through either direct contact with National Weather Service (NWS) River Forecast offices or over the web through the NWS National Climate Data Center (NCDC) web portal. This method is sufficient to support legacy environmental modeling of historical time series but is insufficient to support simulations based on the ingestion of real-time data, which includes surface meteorological observations and level 3 and 4 NEXRAD precipitation data.

Unidata support can help CEES become an active conduit to support research activities where meteorological data streams can support the generation of actionable intelligence to potentially mitigate environmental problems. Specifically, real-time, watershed-scale modeling can elucidate potential water quality issues associated with extreme meteorological events. Therefore, the proposed project can serve as a model for how Unidata resources can be applied outside of the domain of atmospheric science.

4. Benefits of proposed equipment acquisition and implementation

4.1 Contributions to research and educational programs at TAMIU

Professor Tobin has hydrological simulations, based on the GSSHA and SWAT models, established for several South Texas watersheds, which can be ran forward in quasi-real-time based on hydrometerological data ingested through the IDD. Model output includes streamflow and numerous water quality parameters that include nutrient, bacterial, pesticide, and petrochemical loading. With the recent boom in petroleum exploration and production in rural areas of South Texas local water quality issues are likely to become more acute. Specifically, extreme meteorological events such as a tropical cyclone that makes landfall in South Texas can generate excessive loadings within the region's watersheds. Consequently, the modeling environment developed as a result of Unidata funding has the potential inform real-world decisions that can really make an impact on the lives of people in the underserved South Texas region. Critical to the success of the modeling platform to be developed is dissemination of data across diverse stakeholders. This is where the data sharing and visualization capabilities of RAMADDA, THREDDS, and IDV can be harassed.

The proposed research capabilities described below has a strong synergy with educational activities at TAMIU. A major component of my teaching philosophy emphasizes the development of regionalized curriculum materials that resonate with my students, creating an informed awareness of environmental issues of relevance to the local community. IDD through the Unidata program serves as a strong pathway for obtaining regional data

supporting the development of customized curriculum in my Earth Science, Atmospheric Science, and Geohydrology courses. Pedagogical research has shown that regionalization of curricula is especially important to Hispanic students' participation and performance in science courses. Such curricula best establishes the connection in the student's mind that the geosciences are important and significant to their lives.

4.2 Contributions to Outreach

Not only would the proposed equipment enable us to establish an LDM/IDD feed to support research and educational activities at TAMIU but it would allow us to develop a model for how Unidata applications can be applied beyond the core atmospheric science discipline for which these resources where originally designed. We are committed to adapting RAMADDA to facilitate data sharing from the proposed project to the community at-large, which is important to funding agencies such as the National Science Foundation. Additionally, as a HSI there are numerous STEM educational programs funded at TAMIU and the PI (Tobin) would strategically develop linkages with some of these programs to showcase the funded project as an example of how advanced computational resources can facilitate meaningful data sharing across STEM fields. Finally, the PI is on the board of directors for the local planetarium/visualization facility at TAMIU and can use IDV to produce compelling visualizations of hydrometeorological phenomena that can be potentially observed by thousands of individuals; mostly K-12 students.

4.3 Contributions to Unidata Community

The data obtained from the LDM feeds would be an input to scripts customized to format data into the required configuration for hydrologic models. These customized files can be made available using THREDDS, RAMADDA, and as a GIS web application to the Unidata and broader hydrologic communities. The automatic retrieval of required data using LDM would increase the efficiency of our current operations as a research center. In addition, being part of the Unidata community would provide us with access to data sources that would otherwise be unknown to us. The combination of our current GIS infrastructure and the access to data available in the Unidata community would undoubtedly provide greater access to research opportunities and the ability to interact with geosciences professionals both within and outside of Unidata across the county.

5. Relationship Between Proposed System and Existing Facilities

5.1 Overview of Existing Computational Facilities

Computational resources within CEES include an environmental modeling and GIS laboratory that can support scientific analysis and visualization. The CEES computational facility supports instruction as well as student and faculty research. CEES is currently furnished with Dell Windows-based and PowerPC Macintosh computers, which support Windows in a virtual environment with GIS software (ArcGIS, Geostatistical Analyst, Spatial Analyst). Environmental modeling software includes the Soil and Water Assessment Tool (SWAT) and Gridded Surface and Subsurface Hydrologic Analysis (GSSHA) with supporting software such as Mathematica, Adobe Suite, 3ds Max (3D Animation software), MS Office, web browsers, etc. Printers (including an Hewlitt Packard 36-inch color plotter),

scanners, a video projector, monitors, and other peripherals facilitate the coursework and research conducted by students and faculty associated with CEES. Finally, CEES operates a Campbell Scientific MET station on the TAMIU campus.

Existing CEES servers include a general purpose Macintosh server to support the centers website and a high performance computational resources to support the dissemination and storage of large datasets. At the core of our computational facility is our server (Dell - 4 U Server Chassis, Four Quad Processors), which has 3 Extra RAID Hard Drive with a total of 30 TB of available storage. Additionally, a dedicated router and three equipment switches (3560G) exists to support high performance data collection and dissemination. Currently, these computational resources support a geospatial server with dedicated map applications; however, within installation of a newer version of ArcGIS Server (10.x) some of the existing computational resources can be repurposed to support Unidata activities.

5.2 Relationship Between Existing and Proposed Facilities

The existing CEES servers are located in the central computer operations room on the TAMIU campus. This room houses the main university servers and has full climate control and back-up redundant power. Additionally, the PI (Tobin) reports to the Graduate Dean (Dr. Jeff Brown) in his capacity as center director who has a good working relationship with the university's CIO.

6. Context and Support for Proposed Computational Resources

6.1 Overview of Proposed Computational Resources in Comparison with Existing Resources
We currently have 2 servers with limited storage capability (#1 67.6 GB; #2 135GB) with 12 GB of RAM each and processors of 2.93GHz. The proposed server will have much greater storage capacity (2 TB) that will allow us to create virtual machines to install the proposed software. The proposal will effectively increase the number of CEES servers by 50%. We have a PowerVault Storage Array with 30TB of memory with 19 TB, 63% of existing storage, which can be potentially dedicated for the proposed project at no cost to Unidata. The requested 2 TB of internal storage in the proposed server constitutes 6% of the total storage available to CEES. Finally, we have available space in our server rack to house additional servers.

6.2 Management and maintenance/University commitment

The PI (Ken Tobin) is the director of the Center of Earth and Environmental Studies (CEES) and will provide the administrative support needed to overcome internal obstacles to becoming a functioning Unidata node. CEES has a long history of working with the TAMIU Office of Information Technology to develop high performance computational resources. Within CEES Arturo Diaz (Programmer I) is experienced with complex server system configurations. Mr. Diaz will assist in the installation and maintenance of the computers obtained through this grant. Additionally, Neal Smith (Texas A&M University, College Station) is an expert on LDM software and has agreed to consult during the installation process. Finally, CEES is committed to ensuring that the benefits of the proposed project are maintained long after the end of the performance period of the project.

D. Project Budget

1. Budget Justification

The proposed equipment will fulfill the requirements needed by CEES at TAMIU to become an active participant in Unidata data-sharing initiatives. The costs below are for hardware only; all of the system maintenance will be provided by the PI (Tobin) and IT support specialist (Diaz). Additionally, CEES has limited funds that can be used to support some travel to Unidata workshops and user group meetings in Boulder.

Without the requested funding, given the fiscal pressure that exists in the state of Texas, it will be difficult for TAMIU to participate as an IDD within the Unidata system.

2. Line Item Budget

Installing LDM, RAMADDA, THREDDS, and IDV at TAMIU	YEAR 1 9/1/2013-8/31/2014	TOTAL
EQUIPMENT		
Dell PowerEdge R720 with 2 Intel Xeon Processors	$10,579	$10,579
Total Direct Costs	$10,579	$10,579
Indirect Costs (39% of MTDC)	$0	$0
TOTAL PROJECT COST	$10,579	$10,579

E. Project Milestones

There are no significant perceived obstacles to the successful execution of the proposed project within the one-year performance period. If award notice is received by the end of the summer of 2013 then purchase of equipment can commence in September 2013 during the university's bi-annual computer refresh period. If the award notice is delayed acquisition of proposal equipment will be delayed to early spring of 2014. We have sufficient space within our existing server rack to accommodate the proposed equipment. We anticipate that the proposed equipment will be configured and deployed within several months of acquisition, which will be at the latest early summer of 2014.

APPROVED
By pablo at 3:28 pm, Mar 07, 2013

Pablo Reyes

Digitally signed by Pablo Reyes
DN: cn=Pablo Reyes, ou=IS, o=Texas A&M International University, ou=OIT, email=pablo@tamiu.edu
Reason: review specs
Location: TAMIU - OIT
Date: 2013.03.07 15:31:39 -06'00'

QUOTATION

Quote #:	**646821735**
Customer #:	**003108784**
Contract #:	**42AFU**
CustomerAgreement #:	**DIR SDD-1951**
Quote Date:	**03/06/2013**
Customer Name:	**TEXAS A&M INTL UNIV LAREDO**

Quote for Arturo Diaz / Center for Earth and Environmental Studies use only. Prepared by Kourosh.

These computing equipment specifications do not explicitly or implicitly grant the receiver rights to purchase.

Only budget unit heads can authorize any such purchase.

Date: 3/6/2013

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Sales Professional Information

SALES REP:	TASHA MYERS	**PHONE:**	1888 - 9773355
Email Address:	tasha_myers@dell.com	**Phone Ext:**	5139362

GROUP: 1 QUANTITY: 1 SYSTEM PRICE: $10,578.98 GROUP TOTAL: $10,578.98

Description	Quantity
PowerEdge R720 (225-2133)	1
ProSupport for your Enterprise: 7x24 HW / SW Tech Support and Assistance, 5 Year (935-2314)	1
Mission Critical Package: 8-Hour 7X24 On-Site Service with Emergency Dispatch, 4 Year Extended (935-2324)	1
Dell Hardware Limited Warranty Plus On Site Service Extended Year (939-2678)	1
Dell Hardware Limited Warranty Plus On Site Service Initial Year (939-2768)	1
Dell ProSupport. For tech support, visit http://support.dell.com/ProSupport or call 1-800-945-3355 (989-3439)	1
Mission Critical Package: 8-Hour 7X24 On-Site Service with Emergency Dispatch, Initial Year (991-5711)	1
MISSION CRITICAL PACKAGE: Enhanced Services, 5 Year (995-4858)	1
On-Site Installation Declined (900-9997)	1
Proactive Maintenance Service, PE, 1 Event per yr, 1yr (988-7407)	1
1 Yr 1 Case Remote Advisory Service (996-3179)	1
PowerEdge R720 Shipping (331-4437)	1
Risers with up to 6, x8 PCIe Slots + 1, x16 PCIe Slot (331-4440)	1
VFlash, 8GB SD Card for iDRAC Enterprise (342-1413)	1
iDRAC7 Enterprise (421-5339)	1
Broadcom 5720 QP 1Gb Network Daughter Card (430-4418)	1
2.5" Chassis with up to 8 Hard Drives (317-8472)	1
Bezel (318-1375)	1
Power Saving Dell Active Power Controller (330-5116)	1
RAID 1 for H710P/H710/H310 (2 HDDs) (331-4381)	1
PERC H710P Integrated RAID Controller, 1GB NV Cache (342-3531)	1
Intel Xeon E5-2640 2.50GHz, 15M Cache, 7.2GT/s QPI, Turbo, 6C, 95W, Max Mem 1333MHz (317-9595)	1
Heat Sink for PowerEdge R720 and R720xd (331-4508)	1

DIMM Blanks for Systems with 2 Processors (317-8688)	1
Intel Xeon E5-2640 2.50GHz, 15M Cache, 7.2GT/s QPI, Turbo, 6C, 95W (317-9609)	1
Heat Sink for PowerEdge R720 and R720xd (331-4508)	1
16GB RDIMM, 1333 MT/s, Low Volt, Dual Rank, x4 Data Width (317-9639)	6
1333 MHz RDIMMs (331-4422)	1
Performance Optimized (331-4428)	1
1TB 7.2K RPM SATA 3Gbps 2.5in Hot-plug Hard Drive (342-1998)	2
No System Documentation, No OpenManage DVD Kit (310-5171)	1
DVD+/-RW, SATA, INTERNAL (313-9090)	1
ReadyRails Sliding Rails With Cable Management Arm (331-4433)	1
Dual, Hot-plug, Redundant Power Supply (1+1), 750W (331-4605)	1
Power Cord, NEMA 5-15P to C13, 15 amp, wall plug, 10 feet / 3 meter (310-8509)	2
No Operating System (420-6320)	1
No Media Required (421-5736)	1

***Total Purchase Price:**	**$10,578.98**
Product Subtotal:	$10,578.98
Tax:	$0.00
Shipping & Handling:	$0.00
State Environmental Fee:	$0.00
Shipping Method:	LTL 5 DAY OR LESS
	(Amount denoted in $)*

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