Proposal for the 2018 Unidata Community Equipment Awards

Upgrading the Penn State IDD Relay for the Next Generation

Date:	**1 March 2018**
Principal Investigator:	**Dr. George Young**
Title:	**Professor**
Co Investigator(s):	**Mr. Arthur Person, Assistant Research Professor**
Institution:	**The Pennsylvania State University** **Department of Meteorology and Atmospheric Science**
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[redacted]

Institution Official:	**Dr. John W. Hanold**
Title:	**Director, Office of Sponsored Programs**
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Upgrading the Penn State IDD Relay for the Next Generation

Project Summary:

Weather information is the lifeblood of any organization making forecasts or analyzing weather threats, and as technology advances, so does the quantity of weather information. This requires upgrades in hardware to handle additional data loads, additional users, and to maintain system reliability. Penn State is currently at this stage in the life cycle of its IDD data collection and dissemination equipment. Our cluster of three servers that handle the Penn State IDD feed are now over six years old, and during those six years data volumes have risen dramatically while downstream sites have grown from 12 to 23 unique sites using 120 connections. On an average day, the cluster, in aggregate, will ingest approximately 3.5 TB of data (340 Mbps) and transmit approximately 10 TB of data (970 Mbps). With this increase in data volume, memory and queue capacity are approaching their operational limits, and the aging hardware is beginning to become unreliable. To address these issues, we propose replacing the existing servers with fresh hardware that is more capable, upgradable and ready to handle the increasing data volumes of the future.

Project Description:

The current Penn State IDD cluster, purchased in 2011 with Unidata funds, consists of three systems, each having dual Xeon E5606 (4-core) 2.13 ghz processors with dual gigabit Ethernet ports and 72 GB of memory in each system. These systems are configured in an LVS cluster with all nodes acting as "real servers" and two of these same nodes acting as "directors" as well. The current operational LDM queue size is 60 GB and allows for a minimum data residence time of 40-45 minutes. This falls short of the recommended 60 minutes. Although these systems could be expanded to a maximum capacity of 96 GB, this would not be cost effective due to the age of the systems and would only marginally increase the data residency time beyond 60 minutes, allowing no room for growth. Thus, these systems have effectively reached their end of life.

This project proposes to replace these aging systems with three new systems each consisting of a Xeon 4110 (8-core) 2.1 ghz processor with dual 10 Gbit Ethernet and 128 GB of memory. These systems can be easily expanded to 256 GB by simply adding memory, and can be expanded to a maximum of 1 TB of memory with the addition of a second processor. In addition, the 10 Gbit network interface provides ample room to add many new data feeds without concern for saturating the network interface. This equipment will help fulfill the overall plan of the Penn State Department of Meteorology and Atmospheric Science to provide reliable

real-time weather information to the students, faculty and staff of the department, and also benefits the entire Unidata community by offering relay services to downstream sites as part of the Unidata IDD network.

Allowing for additional bandwidth is important in our "Big Data" era. Already this year, an additional 6 GB/hour of GOES-16 rebroadcast data has been added to the IDD, increasing demands on data queues and network bandwidth for relays such as the Penn State IDD cluster. Yet these data are of critical importance for instructors, researchers and operational users to better understand and forecast the weather, underlining the importance of data distribution channels such as Unidata's IDD. The data demands will further increase in the coming year as GOES-17 becomes operational, adding another chunk of data to the IDD bandwidth requirements. Soon after this, NCEP's FV3-based model output will begin to flow providing new opportunities for regional model nests and expanded medium-range and seasonal ensemble products. These too will be important to get into the hands of end users, but will also require additional data handling and network capacity.

Penn State is well-suited to handle these demanding network needs and is a leader in setting the strategic direction for research networking in the era of "Big Data." Locally, Penn State is a member of the Pennsylvania Research and Education Network (PennREN/KINBER), and nationally, is a member of Internet2 (I2) and the Big Ten Academic Alliance (BTAA). Currently, Penn State maintains two connections to Internet 2, a 100 Gbit path and a 10 Gbit path, with a third 100 Gbit path to Ashburn, VA planned in the next several months. Within the department, 10 Gbit fiber is available to traverse the campus. The department employs full-time computer administrators running dozens of servers in support of continuous operations and problem solving with backing from a university-wide network of experts in all areas of computer technology. Finally, the Penn State Department of Meteorology and Atmospheric Science is composed of over 320 faculty, staff and students including 185 undergraduate and 65 graduate students focusing on diverse subjects ranging from weather forecasting and broadcast meteorology, to weather risk management, environmental meteorology and weather modeling, and is an active consumer of IDD data. As such, the department is always alert to issues regarding data quality and transmission.

Unidata's IDD is a key channel for universities and other end users to receive large volumes of real-time weather information for research, instructional and operational use. New and exciting data like GOES-16 and the coming FV3-based models continue to come online. If funded, this project will allow Penn State to

continue serving the Unidata community with all types of real-time weather information according to individual user needs.

Proposed Budget:

We propose using Unidata Community Equipment Award funds to purchase the following hardware to replace the existing Penn State IDD cluster:

3 each IDD Relay Server:

> Silicon Mechanics iPC-12-304-EN: Intel Xeon 4110 (8-core), 128 GB DDR4 memory, dual port 10 Gbit Ethernet, 240GB DC S4600 SSD, 2 TB Exos 7E8 hard drive Cost: $3970 each

Total Cost: $11,910

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.

Project Milestones:

By end of June 2018 - Award in-house and ready for implementation.

By end of September 2018 - Acquire hardware, configure with operating system and cluster software.

By end of December 2018 – Testing and implementation is completed.

Fwd: Review of Unidata Equipment Proposal

From : KRISTIN MARIE COX <kmd112@psu.edu> Tue, Mar 06, 2018 04:17 PM
Subject : Fwd: Review of Unidata Equipment Proposal
To : KRISTIN MARIE COX <kmd112@psu.edu>

From: "ARTHUR AUGUST PERSON" <aap1@psu.edu>
To: "KRISTIN MARIE COX" <kmd112@psu.edu>
Cc: "Jennifer Renoe" <jlg28@ucs.psu.edu>, "Jennifer Renoe" <jlg28@psu.edu>, "GEORGE SPENCER YOUNG" <g3y@psu.edu>, "TAMARA B FETTEROLF" <tbb2@psu.edu>
Sent: Tuesday, March 6, 2018 4:04:14 PM
Subject: Re: Review of Unidata Equipment Proposal

Kristin,

The Penn State Department of Meteorology and Atmospheric Science currently runs and maintains an IDD relay as part of the Unidata IDD network. We have the expertise in-house to obtain the necessary hardware and to install, manage and maintain the operation of IDD relay systems, including both hardware and Unidata supported tools. We are committed to using our expertise and skills to bring up these new systems in like fashion if this award is granted.

Thank, Art--

Arthur A. Person
Assistant Research Professor, System Administrator
Penn State Department of Meteorology and Atmospheric Science
email: aap1@psu.edu, phone: 814-863-1563

Meteorology (Earth & Mineral Sciences) / The Pennsylvania State University
Upgrading the Penn State IDD Relay for the Next Generation
Unidata Program Center
Project Dates: 07/01/2018 - 06/30/2019

	07/01/2018 - 06/30/2019	Total
Direct Costs		
Salaries (Category I)		
Young, George Spencer (Principal Investigator)	0	0
No salary being requested from sponsor. Penn State to cost share 1% effort over 12 months (0.09 acad and 0.03 summer months).		
Person, Arthur August (Co-Investigator)	0	0
No salary being requested from sponsor. Penn State to cost share 3% effort over 12 months (0.36 calendar months)		
Total Salaries	0	0
Total Salaries and Wages	0	0
Fringe		
Category I @ 41.60%	0	0
Total Fringe	0	0
Total Salaries, Wages and Fringe	0	0
Other Direct Costs		
IDD Relay Servers (3)	11,910	11,910
Total Other Direct Costs	11,910	11,910
Total Direct Costs	11,910	11,910
F&A Costs (MTDC basis)		
F&A Rate: 58.30%	0	0
Total Requested From Sponsor	11,910	11,910
University Participation		
Young, George Spencer (Principal Investigator)	1,920	1,920
Person, Arthur August (Co-Investigator)	2,254	2,254
Fringe		
Category I @ 41.60%	1,738	1,738
University Participation F&A		
F&A Rate: 58.30%	3,446	3,446
Total University Participation	9,358	9,358
Total Project Costs	21,268	21,268

THE PENNSYLVANIA STATE UNIVERSITY
BUDGET JUSTIFICATION

Unidata Community Equipment Award (Requested):

Equipment – (3) each IDD Relay Servers: Silicon Mechanics iPC-12-304-EN: Intel Xeon 4110 (8-core), 128 GB DDR4 memory, dual port 10 Gbit Ethernet, 240GB DC S4600 SSD, 2 TB Exos 7E8 hard drive. Equipment quote follows.

The Pennsylvania State University Support (Approved):

Personnel - The principal investigator is budgeted at the percentage of time shown using his/her actual salary in the calculation. The principal investigator's time includes both technical and project management functions. Any other individuals/positions shown are technical staff with the percentage of time shown and actual salaries used. For project time occurring after July 1 of any given year, the salaries have been adjusted at the University approved rate of 2.5%.

Principal Investigator – Dr. George Young, 1% effort / 12 months (0.09 academic and 0.03 summer months)

Co-Principal Investigator – Mr. Arthur Person, 3% effort / 12 months (0.36 calendar

Recovery of Fringe Benefits - Fringe benefits are computed using the fixed rates of 41.60% applicable to Category I Salaries, 15.40% applicable to Category II Graduate Assistants, 7.90% applicable to Category III Salaries and Wages, 0.10% applicable to Category IV Student Wages, and 26.30% for Category V, Postdoctoral Scholars and Fellows, for fiscal year 2018 (July 1, 2017, through June 30, 2018). If this proposal is funded, the rates quoted above shall, at the time of funding, be subject to adjustment for any period subsequent to June 30, 2018, if superseding Government approved rates have been established. Fringe benefit rates are negotiated and approved by the Office of Naval Research, Penn State's cognizant federal agency.

Recovery of F&A - F&A rates are negotiated and approved by the Office of Naval Research, Penn State's cognizant federal agency. Penn State's current provisional on-campus rate for research is 58.3% of MTDC from July 1, 2017, through June 30, 2018. New awards and new competitive segments with an effective date of July 1, 2018, or later shall be subject to adjustment when superseding Government approved rates are established. Per 2 CFR 200 (Appendix III, Section C.7), the actual F&A rates used will be fixed at the time of the initial award for the duration of the competitive segment.

Export Control – The Pennsylvania State University employs individuals and accepts students and graduate research students from a multitude of national backgrounds. As an entity, the University is subject to, and works diligently to obey, federal regulations regarding the export of controlled technologies and data. Sponsor, as an independent entity, is individually responsible for ascertaining its compliance with federal export laws and procedures. If Sponsor anticipates disclosure or provision of controlled technology or data to University as part of the proposed sponsored project, Sponsor should inform University, in writing, of the existence of, and information concerning the scope and extent of, such anticipated disclosures or provisions.

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

Quote

Date	Quote #	Confirmation #
02 / 22 / 2018	344939	1110339695

Please note that due to unusually high volatility in memory and storage component prices in recent months, Silicon Mechanics quotes are now valid for 30 calendar days from date of issue.

Bill To:	Ship To:
psuinvoices@psu.edu or invoices@arl.psu.edu for Applied Research Lab orders	Arthur aap1@psu.edu

Description	IDD upgrade
Notes	

Quantity	Description	Price Each	Amount
1	**iPC-12-304-EN (R308) "IDD upgrade"** CPU: 1 x Intel Xeon Silver 4110, 2.1GHz (8-Core, HT, 2400 MT/s, 85W) 14nm RAM: No Item Selected NIC: Dual Marvell 88E1512 PHY Gigabit Ethernet Controller via Intel C621 Chipset Management: Integrated IPMI 2.0 & KVM over LAN Controller: 10 Ports 6Gb/s SATA (Intel C621 Chipset) NOTE: CacheVault Module can be mounted in HS Drive Bay 4 PCIe 3.0 x8: Intel X710-DA2 Ethernet Network Adapter, Dual-Port 10GbE SFP+, PCIe 3.0 x8 NOTE: Hot-swap and fixed drives will be connected to SATA3 controller (C612) unless otherwise specified NOTE: SED and 4Kn Drives may have an extended lead time. To order, please contact our sales department. Hot-Swap Drive - 1: Intel 240GB DC S4600 Series 3D TLC (6Gb/s, 3 DWPD) 2.5" SATA SSD Hot-Swap Drive - 2: Seagate 2TB Exos 7E8 HDD (6 Gb/s, 7.2K RPM, 128MB Cache, 512e) 3.5-in SATA Hot-Swap Drive - 4: No Item Selected Optical Drive: Blanking Panel - No Optical Drive Front Input: Blanking Panel - No Front Inputs Power Cables: IEC60320 C13 to C14 Power Cable, 16AWG, 240V/15A, Black - 6' Power Supply: 500W Power Supply with PMBus 1.2, I2C, and PFC - 80 PLUS Platinum Certified Rail Kit: Quick-Release Rail Kit for Square Holes, Outer Slide Extendable Length 25.6 - 33.05 Inches OS: No Item Selected Management SW: Supermicro Update Manager (SUM) Out-of-Band Management Software Standard Warranty: 3 Year Silicon Mechanics Standard Warranty NOTE: Advanced Parts Replacement service covers the cross shipping of replacement parts. Advanced Parts Replacement: Declined Advanced Parts Replacement NOTE: For onsite service, international coverage, or additional options please contact our Sales department. Notes:	3970.00	3970.00

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Bill To:	Ship To:
psuinvoices@psu.edu or invoices@arl.psu.edu for Applied Research Lab orders	Arthur aap1@psu.edu

Quantity	Description	Price Each	Amount
	*** Production - include second heat sink even though currently populated with a single CPU *** **** Additional Components **** RAM: 2 x 64GB DDR4-2666 Reg ECC 4R 1.2V LRDIMM Rx: Intel 10GbE SFP+ SR Fiber Optic Transceiver (LC), Short Range (up to 300m over MMF) - For X520/X710 Network Adapters **Total rackmount units:** 1U x 1 = 1U		

Total Rackmount Units

1 x iPC-12-304-EN (R308) "IDD upgrade":
Sub-total Rackmount Units: 1U

Total Rackmount Units: 1U

Subtotal	3,970.00
Sales Tax (0%)	0.00
Total	USD 3,970.00

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

Subject to Silicon Mechanics' Warranty Terms and Conditions - https://www.siliconmechanics.com/terms-and-conditions.php