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DXARTS-Apple XSAN Modular Server and Storage System Initiative

Proposal 2007-086-1

ID Permanent <http://techfee.washington.edu/proposals/view/2007-086-1/>

Link Department DXArts

Non- No restrictions

core First No

Access Application? Student No
Initiated?

Abstract

The DXARTS-Apple XSAN Modular Server and Storage System Initiative is a unique student centered request designed to substantially upgrade the overused and undersized DXARTS and CARTAH research project servers and storage systems. This initiative is a partnership formed between DXARTS, Apple and the College of Arts and Sciences. Apple and the College have committed \$34,000 worth of funding and discount's to make this initiative happen, thereby reflecting its high priority for them. The upgrade will expand and integrate our existing Apple XServe and RAID storage hardware into a modularly scalable system that provide students with a highly enriched, secure, and stable storage matrix for their data critical research projects. Our request simply seeks partnership with the STF to fund the modest remaining portion of the upgrade to the 14TB modular system.

Background

Created in 2001, The Center for Digital Arts and Experimental Media, DXARTS, is a revolutionary new model of creative practice, research, and discovery at the frontier of arts and sciences. Designed to support the emergence of a new generation of hybrid student researcher, DXARTS fosters the creative invention of new forms of digital and experimental arts by synthesizing expanded studio research with pioneering advances in digital computing, information technologies, science, and engineering. DXARTS offers both BFA and PhD degrees in digital and experimental arts, with concentrations ranging from digital cinema, computer animation, and sonic arts to robotics and mechatronics. The PhD program is the first of its kind in the world, and the undergraduate program pairs majors with doctoral students and faculty mentors to establish a close connection to the program, guiding them through the requirements for graduation, and promotes fully independent and original research.

Fifty percent of the enrollment in DXARTS courses are set aside for non-majors, serving more than 650 undergraduate and 100 graduate non-majors annually from diverse departments ranging from architecture and electrical engineering to philosophy. DXARTS provides the administrative home for CARTAH the Center for Advanced Research in the Arts and Humanities. CARTAH serves students, staff, and faculty of the University of Washington, providing advanced technical resources for independent research work in the arts and humanities. CARTAH is open to all students of the University of Washington. CARTAH is a staff assisted project-based research lab. Students bring research ideas that require equipment and expertise that is otherwise often only found on campus in restricted labs, if at all. CARTAH provides help and expertise in formulating and completing complex student based animation, video, audio, print publishing, and web based projects. Virtually all student proposals are accepted.

Benefits

For more than a decade DXARTS and CARTAH combined have provided access to phenomenal production tools, computing infrastructure and staff expertise for students engaged in

cutting edge technology research. As we have grown and exponentially increased our capabilities to serve students, we have witnessed a significant evolution in the complexity and scope of original research projects students are able to undertake and achieve. While this is precisely the outcome that is wanted from this kind of support, there has been a silent but parallel demand for greater access to secure, reliable and robust storage systems that will accommodate these complex student projects. Most students are initially attracted to the sophisticated production and computing tools we provide them, but they are becoming more and more vocal about their need for the high speed and high integrity data storage solutions that are required to accomplish their research projects.

DXARTS has generally met this increasing demand. However, we are beginning to recognize that with HD video production, stereo immersive computer animation, real-time audio wave-field synthesis, grid computing, etc. all coming online, there are some significant challenges to maintaining the server and storage quality without some major enhancement to our systems.

DXARTS is the administrative home to CARTAH. DXARTS provides the majority of the storage systems and servers for CARTAH's student projects. The scale of increased demand for active storage and server systems that support increasingly demanding student video, audio, animation, and team research projects are stretching our current 2TB system to the limit. A recent failure of a RAID hardware component used to store some active student projects provided us the real world catalyst to re-imagine student storage and server systems needs from the ground up. Working diligently with Apple Computer and the Dean's Office we have designed a new modular and highly scalable XSAN 14TB system that will massively increase space, allow unlimited expansion, provide rapid storage redistribution and allocation, decentralize our current single server operations, and provide best case failover options for hyper-critical student project data.

The SAN model requires a master Metadata controller which controls the flow of data and directs attached servers, and a failover backup for the Metadata Controller which will automatically takeover for a failed master. As part of this proposal DXARTS will provide both these elements with existing server equipment. With this data allocation and distribution system, any added servers and/or RAID storage can be configured in a variety of ways in order to evenly or hierarchically distribute tasks and storage space for rapidly growing student project demand and scale.

The new Xserve in our design would become the server access head, running all our server tasks and distributing data to student client machines. Adding more servers is straightforward as we continue to expand our student research services. For example, it is very straightforward to connect a new server for running a distributive computing cluster for something such as a render farm or for real-time video processing, this is VERY important and necessary for new student research in these fields. The XSAN model provides access for up to 128 processors to calculate on one Storage pool or partition and data will not be bottlenecked by network constraints. The SAN also provides DXARTS the option for faster client operations by outfitting individual student client machines with fiber-channel cards and allowing them direct access to the RAID. This would need to be the case for any large data set operations where network bottlenecks would be an issue for data transfer, such as real-time video processing, or multiple person HD video editing.

RAID units can be added to current storage volumes or added as additional partitions in any number of configurations. This allows us much needed flexibility in the design of our physical backup design and RAID architecture in order to select the most secure and efficient option for each separate portion of our data hierarchy.

In summary, the XSAN option is ideal for supporting our growing student client systems. The modular design is necessary to meet growing student demands. It provides a flexible system that can evolve with the scale of their projects. It is unique in that each piece of hardware can be separately upgraded or reconfigured as needed. All of this can be done without implementing a complete reconfiguration each time. It reduces reliance on a increasingly centralized and finite storage system we currently have in operation. While storage and servers systems are not easily portrayed as glamorous, they are mission critical for student research in these fields. We have worked with Apple Computer and the Dean's office to effectively reduce the cost of the this upgrade by 2/3's of its retail price tag, while dramatically increasing the server and storage services students need.

Since their inception DXARTS and CARTAH have been providing some of the most advanced tools, technologies and assistance to all students at the University of Washington. With the modest funding of this proposal we will not only be able to continue this tradition, we will be able to offer wholly new resources which will open up completely new avenues of research, study, and artistic expression.

Student Access

This equipment will form the backbone of DXARTS and CARTAH information infrastructure. It will be used by all DXARTS students and CARTAH clients. Students are encouraged to use server and storage resources for individual academic and artistic work as well as class work. Many students have multi year large scale projects that are independent of or in parallel with class work.

CARTAH is a project based resource. Students from any department can submit a short structured research proposal. Virtually all proposals are accepted, with preference given to students in the arts and humanities. CARTAH is open weekdays from 8:30 to 4:30 and is available as a drop in lab during these hours.

DXARTS makes extensive use of electronic locks. All students taking classes beyond the entry level course have 24 hour access to our labs and studios. In addition students can access their data remotely from virtually anywhere.

Available Resources

This proposal represents a true partnership among the College of Arts and Sciences, the students of the University of Washington, Apple Computer, and DXARTS. Apple Computer

and the College of Arts and Sciences will both be providing \$17,000. In addition DXARTS will be providing the space, supporting equipment, networking, staffing, and operational costs. Equipment will initially be housed in our Raitt server facilities in room 106.

Installation Timeline

This equipment will be purchased as soon as funds become available.

Departmental Endorsement

This proposal is supported by Shawn Brixey, the Director of both DXARTS and CARTAH, and was produced in direct consultation with all the faculty and staff of these programs. This proposal also has the full support of Chuck Kenney, Apple Computer's UW representative and the College of Arts and Sciences.

Student Endorsement

The recent failure of one of our RAID's was a major impetus for this proposal. Students were particularly hard hit by this event. DXARTS students store months and sometimes years of their work on our systems. This event brought into stark focus the need for reliable and continuous access to this data for students. This proposal represents a remarkable opportunity to leverage funds from industry and the administration to create a reliable and secure information technology foundation for the students of DXARTS and for CARTAH clients.

Items

Below are the items making up the current proposal. The asterisk (*) beside items signify that they were approved by the committee. This however was not implemented correctly for our database before 2005, so earlier years may not show this.

Click an item's title to view details on that item, or [show all item details](#).

| Title | Type | Price | Qty | Subtotal |
|---|-------------------|-------------|-----|-------------|
| Apple Xserve | server | | | |
| Location: Raitt Hall - 106 | | | | |
| Description: Xserve 2x3.0Ghz Dual Core Xeon with 4GB Ram, 2 80GB sATA drives, Dual Channel Fiber Card and Backup Power Supply. | | | | |
| Justification: This will be the server head in our XSAN setup that actually serves the data to client machines. | | | | |
| Apple 7TB XRAID | server | \$13,071.23 | 2 | \$26,142.46 |
| Location: Raitt Hall - 106 | | | | |
| Description: 7 terabyte XRAID, with battery backup and fiber channel card | | | | |
| Justification: This will provide the storage pool for hosting our data. | | | | |
| Qlogic SANbox Fibre Channel Switch | network-equipment | \$7,833.55 | 1 | \$7,833.55 |

Location: Raitt Hall - 106

Description: Qlogic SANbox Fibre Channel Switch

Justification: This provides the fast connections between various servers, the metadata controller and the data itself and affords us the ability to architect and expand our setup in a modular fashion without losing said speed.

| | | | | |
|---------------------|-------------------|---------|---|----------|
| Fibre Channel Cable | network-equipment | \$67.46 | 8 | \$539.68 |
|---------------------|-------------------|---------|---|----------|

Location: Raitt Hall - 106

Description: Fibre Channel Cable

Justification: Necessary in order to connect server and data components together.

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|-----------------------------|-------------------|------------|---|------------|
| Netgear 24x2 Gigabit Switch | network-equipment | \$1,359.95 | 2 | \$2,719.90 |
|-----------------------------|-------------------|------------|---|------------|

Location: Raitt Hall - 106

Description: Netgear 24x2 Gigabit Ethernet Switch

Justification: One will provide an access point between servers and the campus network. The other will provide the internal communication between servers and metadata controller, necessary for the XSAN.

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|---------------------|------------------|------------|---|------------|
| Integration Service | maintenance-cost | \$5,400.00 | 1 | \$5,400.00 |
|---------------------|------------------|------------|---|------------|

Location: Raitt Hall - 106

Description: Installation service by Apple Professionals. Includes onsite training for proper operation of the XSAN.

Justification: Necessary in order to insure proper initial setup and administration for the XSAN.

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|-----------------|-------------------|----------|---|----------|
| Ethernet Cables | network-equipment | \$108.80 | 1 | \$108.80 |
|-----------------|-------------------|----------|---|----------|

Location: Raitt Hall - 129

Description: 1000 feet of Cat5 Cabling plus caps

Justification: Used for connecting clients to the campus network. Also used to replace damaged cabling.

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|--------------------------------------|--|------------|---|------------|
| UPS 2200 VAC Battery Backup Hardware | | \$1,088.00 | 1 | \$1,088.00 |
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Location: Raitt Hall - 106

Description: UPS 2200 VAC Smart Battery Backup System

Justification: Provides battery backup and graceful shutdown options for our server components in case of brownout.

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|--|--------------------------|----------|---|------------|
| Battery Backup Replacement Batteries | Hardware | \$120.77 | 3 | \$362.31 |
| Location: Raitt Hall - 106 | | | | |
| Description: Replacement batteries for our current UPS battery backups. 2 for the UPS smart 1000, and 1 for the UPS smart 700XL. | | | | |
| Justification: This will eliminate the need to buy completely new battery backup hardware for the new server. In supplement to the requested battery backup our current battery backups will provide the rest of the required power backup for the server components in case of brownout. | | | | |
| Ethernet Patch Bay | network-equipment | \$221.07 | 1 | \$221.07 |
| Location: Raitt Hall - 106 | | | | |
| Description: 24 Point RS-422 Patch Bay | | | | |
| Justification: Will provide ethernet access points from the server components in order to increase ease of maintenance and installation as well as to prevent possible server interruption due to physical interaction with the direct on-board components. | | | | |
| KVM Switch | Hardware | \$652.75 | 1 | \$652.75 |
| Location: Raitt Hall - 106 | | | | |
| Description: Belkin OmniView Enterprise 8 Port KVM Switch | | | | |
| Justification: Provides access via a single keyboard, video and mouse (KVM) for multiple server components. Increases ease of maintenance and eliminates the need for multiple monitors and keyboards for up to 8 server heads or metadata controllers. | | | | |
| XSAN software | software-operatingsystem | \$542.91 | 3 | \$1,628.73 |
| Location: Raitt Hall - 106 | | | | |
| Description: XSAN software | | | | |
| Justification: Licenses necessary for server, metadata controller and backup metadata controller. Runs the software engine that implements the XSAN. | | | | |
| Rack Mount Kit | Hardware | \$217.55 | 1 | \$217.55 |
| Location: Raitt Hall - 106 | | | | |
| Description: Qlogic Rack Mount Kit for SANbox switch | | | | |
| Justification: Necessary in order to mount the SANbox switch in the server rack. | | | | |
| XSAN AppleCare | insurance | \$695.23 | 3 | \$2,085.69 |

Location: Raitt Hall - 106

Description: XSAN AppleCare Support and service

Justification: Provides continued support and repair services for the XSAN software, guaranteeing the continuous proper functioning of the software.

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|------------------|-----------|----------|---|----------|
| Xserve AppleCare | insurance | \$826.88 | 1 | \$826.88 |
|------------------|-----------|----------|---|----------|

Location: Raitt Hall - 106

Description: Xserve AppleCare support and service

Justification: Provides continued support and repair services for the Xserve hardware, guaranteeing the continuous proper functioning of the hardware.

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|-----------------|-----------|----------|---|------------|
| XRAID AppleCare | insurance | \$869.31 | 2 | \$1,738.62 |
|-----------------|-----------|----------|---|------------|

Location: Raitt Hall - 106

Description: XRAID AppleCare support and service

Justification: Provides continued support and repair services for the XRAID hardware, guaranteeing the continuous proper functioning of the hardware.

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|--------------------|------------------|----------|---|----------|
| Server Maintenance | maintenance-cost | \$542.12 | 1 | \$542.12 |
|--------------------|------------------|----------|---|----------|

Location: Raitt Hall - 106

Description: 36 Months of Server Maintenance from Apple Service Specialists

Justification: Will provide continued maintenance options for server components.

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|--------------------|-------|--------------|---|--------------|
| Apple Contribution | other | \$-17,000.00 | 1 | \$-17,000.00 |
|--------------------|-------|--------------|---|--------------|

Location: Raitt Hall - 106

Description: Apple will be providing a \$17,000 discount below the usual academic discount.

Justification: Thanks to the work of Chuck Kenney, Apple Computer will be offering us a significant discount on the equipment and installation of this equipment.

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|----------------------------|-------|--------------|---|--------------|
| Dean's Office Contribution | other | \$-17,000.00 | 1 | \$-17,000.00 |
|----------------------------|-------|--------------|---|--------------|

Location: Raitt Hall - 106

Description: The School of Arts and Sciences will be providing \$17,000 towards this proposal.

Justification: The School of Arts and Sciences will be bearing a significant portion of the cost for this proposal.

| | |
|-------------------------|-------------|
| Requested Total: | \$24,760.14 |
| Approved Total: | \$0.00 |
| Funding Status: | Rejected |

Comments

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I use the computing resources at DXARTS/CARTAH on a daily basis, and being able to have a sophisticated back-up system and substantial storage space for this data is essential. Please support this proposal! Thank you.

I have been using the DXARTS/CARTAH server for two years and have noticed an unacceptable decline in performance. The downloads and uploads have progressively gotten more sluggish, sometimes folders would take minutes just to open and show the files inside. There are computers in the lab that never really seem to work. I complained to the staff, but it later became clear that they did not have the resources to fix the problems within the system. Not only is the lab understaffed, but they do not have the necessary upgrades in technology to handle the demand of a growing department. Further, when the server crashed I lost some ideation proposals that were very valuable to me, along with an assignment I had been working on for a couple weeks. The class websites were wiped out as well, which caused further complications. A fully functioning server is necessary to any organization, especially one that relies on the use of the digital domain as an everyday practice.

Gary Pennock, Senior, DXARTS

As a DxArts major I use the servers for a large number of things both DxArts and Cartah related. Hosting my own personal digital portfolio, storage media so that it may be more accessible to me for particular applications, and having the ability to work from an account in raitt hall where I can work with my peers to better accomplish school related tasks. I fully support this. Thanks.

I fully support this proposal not only because digital-art works requires a lot of space, but also because the number of students that uses the DXARTS's infrastructure has grown in the last years. Having a safety, and trusty server is essential. A month ago there was a failure in one of the servers and some students lost key information. All my artistic production is digital, I cannot imaging losing years of work and research. Hugo Solis, PhD student at DXARTS.

This upgrade is a must. I lost many hours of work on the last hardware failure. I use the DXARTS servers on a daily basis for storage and projects for many of my classes. Having reliable backed up data access is something that any research level institution should not be without. I can attest to this by comparison to the Computer Science department here at UW who have an entire support team dedicated to computer access. Surely a Digital Arts major, with our reliance on technology as a means of expression must impose the same rigor in managing this technology in an efficient, and beneficial manner. I fully support this proposal and hope it gets funding.

Amir Stone
DXARTS & CS undergrad

The computer upgrade is essential to cut down the rendering substantially for video editing, 3d animation, and common music. In return the students will have more time to spend on the creative side of their projects. I have taken the video and 3d sequences, and I am taking the computer music class. Based on my experience when it comes to processing intensive application like Maya, CM, or Final Cut Pro the dual G5 we have in the labs seems too slow to do the job. In order to conduct more experiments on our projects it is essential for us to have access to the latest hardwares and softwares.

As a student who regularly uses the server at DXARTS/CARTAH I offer my full support to this proposal. This much needed upgrade to the current system will enable students such as myself to maintain research more effectively. DXARTS is a department that caters to the needs of students from all disciplines, and as such, a method for storing and distributing work

is vital to the students that actively participate in research related to the program. Timothy Friend - Undergraduate Student

This would be just wonderful! The server in use now is way overtaxed and has become a bit unreliable for me. I often experience dropped transfers of large files. This is very inconvenient for me as the server is a nexus point in a major group project I am involved in. A new server would benefit many students by providing better connection with their peers and a good way to document their work.

I also am a heavy user of the DXARTS/CARTAH server, and can attest to the fact that it is due for a hardware upgrade. The fact that Apple is willing to invest directly in upgrading this system is remarkable, and shows that even organizations outside of the UW community recognize the value that DXARTS and CARTAH bring to the university. This equipment will be put to immediate and constant use by many users.

I support this proposal. These fundings are much needed to the academic community such as DXARTS and CARTAH to research, reapproach and renew studies using updated technology. This will help many scholars and students to achieve their goals. Thank you.

Again this program is asking for funding for equipment that has never been intended for anyone's use except dXarts students, it is amazing how much money they have garnered over the past few years. How about making them fully disclose who uses the equipment and where they are from on campus. CARTAH was a good idea, dXarts is a waste of student monies!! From a UW community member who wishes to stay unknown for fear of retaliation by dXarts faculty.

As Technical Director of the Dance Program, I fully support this proposal. This upgrade of data storage capacity will greatly facilitate student use of the High Definition cameras requested and funded in other proposals. Sincerely, Michael Wellborn

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