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EduConnection



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JOE'S NOTEBOOK

Changes for Education IT

Dear Friend,

The landscape is changing for education IT as institutions heighten their focus on energy efficiency, digital preservation and archiving, and secure client computing. [MORE »](#)



Joe Hartley, VP,
Global Government,
Education and
Healthcare
Sun Microsystems,
Inc.

RESOURCES

- » **Solaris ZFS Podcast**
Hear Sun's Bill Moore on how the Solaris 10 ZFS file system provides simple administration, transactional semantics, and data integrity
- » **Filthy Rich Clients Vodcast**
Find out what's new and cool for developing compelling desktop applications from Chet Haase, Sun client architect
- » **Identity Management Buzz**
Tune in to podcasts from the Sun identity management team about what's happening in the industry
- » **Free Executive Brief**
Learn how the Solaris 10 OS and CoolThreads technology can double your computing resources — using less space and energy than any other solution

INSIDE TECHNOLOGY

Consolidating the Datacenter

New multithreaded CoolThreads servers designed for virtualization

Academic institutions are struggling to build IT infrastructures to serve rapidly growing student populations and communities. New Sun SPARC Enterprise T5120 and T5220 servers and the Sun Blade T6320 server give you the flexibility and power of 64 virtual systems in a single server and can help you save up to \$1 million in energy costs.

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October 23, Seattle

» EDUCAUSE 2007

Visit Sun at booth #312 at the world's premier education IT conference.
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» Sun HPC Consortium

Join this forum for the Sun technical computing community. November 10-12, Reno, Nevada

» Sun Tech Days

Develop your skills as Sun's Worldwide Developer Conference stops in China, Japan, Germany, and the U.S.

EDU INSIGHT

'Immersive Education' Gives Academia New Frontiers for Virtual Learning

Open source projects offer universities new platforms for "immersive education," which enriches learning with interactive 3D graphics, game and simulation technology, virtual reality, voice, chat, Web cams, and rich digital media.

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Get Involved. If there are topics you'd like to see in future issues of *EduConnection* or you would like to submit an article, we want to hear from you. [Click here to e-mail us.](#)

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The Changing Education IT Landscape

When I joined Global Government, Education and Healthcare, I promised that I wouldn't assume I knew too much because I happened to have worked in Sun's Global Education and Research division for several years. As it turns out, I'm glad I made that promise. There are some significant changes in the technology market and what Sun has to offer education customers. These changes center around energy efficiency, preservation and archiving, secure client computing, and partners.

So what's changed?

Energy Efficiency

My biggest surprise is the concern about energy consumption and efficiency. Three years ago, we didn't talk about how the proliferation of technology caused power consumption to explode or how much it was going to cost to cool that technology. (Of course, you only need to have an Intel dual-core laptop on your lap to realize how hot those chips get!)

Now it's a huge concern for our customers that we're addressing with the [Sun Eco Innovation Initiative](#). We wrote about this initiative — and its relevance to education — in the [September issue of EduConnection](#).

Preservation and Archiving

Although initially presented in the context of a university library, there are very unique needs for the archiving and preservation of content that go well beyond what typically comes to mind when we think of data storage. There's also the whole digital conversion process that's under way through projects like the [Google Books Library Project](#), the [Open Content Alliance](#), Europe's [i2010 Digital Libraries Initiative](#), the [Stanford Digital Library Program](#), and the [California Digital Library](#).

There's also all the content that is not only "born digital," but published online. How will we record and preserve these items for the next 400 years? Anyone who tries to open a 10-year-old word processing document knows how challenging that process can be. But this challenge moves well beyond libraries — it includes medical imaging and the preservation of research data.

Since I last worked in this group, Sun has come out with some amazing products to address these challenges. I saw this first-hand in August at the three-day training events we held for our sales engineers. (I was actually a systems engineer when I started my career, so it was interesting to be back among these folks. They were patient with me). Several training sessions focused on storage. It was the first time I really understood how smart Sun's StorageTek acquisition was.

Combine our StorageTek products with some amazing technology like SAM-QFS, the [Sun StorageTek 5800 System \(Honeycomb\)](#), and the [Sun Fire X4500 Storage Server](#), and we've got a solutions portfolio that nobody else has. This portfolio gives our customers the ability to store the right type of data on the right type of media at the right time. And more importantly, we give customers the ability to retrieve that data whenever they want.

Some of our competitors believe that everything needs to be stored on spinning disk — mostly because these companies don't offer tape solutions. But tape is not only more economical than disk — it's more energy efficient as well. (Check out [Nigel Dessau's blog](#) for a perspective on the "green" aspects of Sun's storage solution). Needless to say, I'm bullish on our storage lineup.

Secure Client Computing

There's not a university, government agency, or enterprise out there that isn't concerned about the CNN moment of having a laptop with confidential data stolen out of someone's car and then dealing with the aftermath of that

theft. Then there's the complexity of managing all these desktops and the energy they consume. All of these concerns have escalated during the past three years.

Like storage, [Sun Ray thin clients](#) have important ecological, economic, and security benefits for our customers. When I last worked in Sun Global Education and Research, we were trying to get universities to use Sun Rays in dorm rooms and labs. We may have been ahead of ourselves. Over the last three years, we've made significant strides in desktop virtualization, while at the same time, people have become increasingly disenchanted with the cost and complexity of managing desktop PCs. (Oh, and did I mention how hot they get? Once again, we come back to energy and cooling costs.) Then, as I mentioned, there are the well-publicized security problems universities have when laptops — and the confidential information on them — get stolen.

Educational institutions are starting to understand the value of thin clients. By installing Sun Rays, [Valparaiso University](#) reduced its IT administration time — from eight hours a week to one hour a month — in critical lab environments. It also reduced the risk of loss by theft or system failure. In Holland, we sold 10,000 Sun Rays to help doctors better run their offices so they can focus on healthcare delivery instead of desktop maintenance.

Sun's New Partners

Our partners have changed over the last three years in ways that very few people could have foreseen. We know that you want to work with vendors who innovate, and who partner well (who "play well with others," in other words). Well, I can't think of a better example of our ability to partner than [our recent announcement that we're expanding our strategic alliance with Microsoft](#). As you've probably read, Sun signed on as a Windows Server OEM, and Sun and Microsoft will collaborate to further enable the deployment of Windows Server on Sun x64 systems.

Sun CEO and President Jonathan Schwartz talks about this new development quite eloquently in his September 16 blog posting, "[Are You Serious? \(Sun Partnering with Microsoft\)](#)." If you have any questions about what this means for our education customers (quite simply: more value, choice and innovation), please feel free to email me at Joe.Hartley@sun.com.

In other competitor-turned-partner news, IBM [recently joined the OpenOffice.org community](#). IBM will help Sun (the project's creator and primary sponsor) and other stakeholders further develop OpenOffice.org and the Open Document Format (ODF), the ISO-standard for office documents used natively by OpenOffice.org and other applications. In August, IBM also [expanded its support](#) for Solaris on x86-based systems.

The bottom line: It's an exciting time to be at Sun. I'm thrilled to be back in sales and back in the public sector marketplace.

Best regards,

Joe Hartley
VP, Global Government, Education and Healthcare

Questions or comments? Please email education_news@sun.com



Consolidating the Datacenter

New CoolThreads servers deliver the power of 64 systems — in a single system



Academic institutions around the world are struggling to build IT infrastructures to serve rapidly growing student populations and communities. Worldwide enrollment in higher education is growing between 10 and 15 percent per year ¹; some universities now have enrollments in the hundreds of thousands.

At the same time, more academic and administrative systems are going online and pressuring the IT infrastructure to be always on, 24x7. Yet IT administrators are also under pressure to meet tight budgets, even as costs for IT services increase.

Virtualization has emerged as a compelling technology for campus IT managers tasked with consolidating datacenter environments and reducing costs. Virtualization allows you to consolidate multiple environments onto a much lower number of physical servers, which translates into greater manageability, better use of resources, and tremendous savings — often millions of dollars per year.

New Sun SPARC Enterprise [T5120](#) and [T5220](#) servers and the [Sun Blade T6320](#) server give you the flexibility and power of 64 virtual systems in a single server — that's up to 2500 systems in a rack — and can help you save up to \$1 million in energy costs.

Based on Sun's new multithreaded [UltraSPARC T2 processor](#), these [CoolThreads servers](#) are designed to meet the top needs of campus CIOs — to conserve funds, scale services to students and related communities, and run more cost-efficient datacenters.

Designed for Virtualization

Today's campus CIOs need to consolidate underutilized, sprawling server infrastructures with an open, no-cost virtualization solution that enhances business agility, improves disaster recovery, and reduces operating costs. They also need to reduce datacenter complexity by deploying fewer, standard platforms. Improving the uptime and reliability of both the datacenter and its servers is also paramount.

Sun's next generation CoolThreads servers and blades are designed for virtualization, and deliver the flexibility and power of 64 individual systems on a single server or blade. By using the 64-thread UltraSPARC T2 processor, these systems can meet the steepest peaks in demand.

For example, one Sun SPARC Enterprise T5120 or T5220 server or Sun Blade T6320 server delivers the performance and compute capacity of eight IBM x346 servers. The Sun SPARC Enterprise T5120/T5220 server delivers same performance as an IBM p6 570 [at half the price and one-fourth the space](#).

Virtualization capabilities built into Sun SPARC Enterprise T5120 and T5220 servers and the Sun Blade T6320 server — and the [Solaris 10 Operating System](#) — make these the most flexible, cost-effective servers for maximizing system utilization, with utilization levels as high as 85 percent. These capabilities include:

RELATED RESOURCES

- » [Sun SPARC Enterprise T5120 Server](#)
- » [Sun SPARC Enterprise T5220 Server](#)
- » [Sun Blade T6320 Server](#)
- » [UltraSPARC T2 Processor](#)
- » [UltraSPARC T2 Virtual Tour](#)
- » [Virtualization Learning Center](#)

Sun's next generation CoolThreads servers and blades are designed for virtualization, and deliver the flexibility and power of 64 individual systems on a single server or blade.

- **Logical Domains (LDDoms)** is new hardware-enabled server virtualization and partitioning technology from Sun that integrates multithreading capability of the UltraSPARC T1 and UltraSPARC T2 processors and the Solaris 10 OS, letting you run multiple operating systems simultaneously while maintaining isolation and security between each. LDDoms is available at no extra charge and can save you up to \$9,000 per system compared to proprietary alternatives.
- **Solaris Containers**, included in the Solaris 10 OS at no additional cost, can virtualize and consolidate hundreds of applications on a single system, delivering savings in energy and space and a huge reduction of complexity.
- The Solaris 10 OS is the industry's first and most secure OS for virtualization across the enterprise.

Energy-Efficient Features

Energy costs are consuming a larger portion of the campus IT budget. Campus IT managers are striving to reduce energy costs and meet social responsibility goals by improving performance for each watt of power the datacenter consumes.

New Sun SPARC Enterprise T5120 and T5220 servers and the Sun Blade T6320 server reduce demand for datacenter real estate by creating highly dense compute infrastructure and avoiding "hot spots" common with blade solutions. As a result, they deliver unmatched energy efficiency compared with competitive systems, including:

- Eight times the Web-scale performance of [competitive systems](#)
- Over two times the performance per watt of a [dual-processor IBM POWER6 server](#) in one-fourth the space, delivering nine times higher data center efficiency
- Extreme reliability through an integrated and simplified design that has resulted in these systems having the fewest parts of any system in their class

For example, by using a Sun SPARC Enterprise T5220 server, you can consolidate eight 2-year-old IBM x346 servers, each configured with dual 3.8GHz Xeon processors, and achieve an eight-fold savings in space and power. [Consolidating 160 x346 servers to 20 Sun SPARC Enterprise T5220 systems](#) can save you \$3.7 million in power and over 920 tons of CO2 emissions over three years.

The Sun Blade T6320 server delivers additional power and cooling efficiency in large configurations. Thanks to centralized power and cooling, blade servers can reduce energy usage by up to 15 percent. For example, a Sun Blade T6320 server could replace a 3-year-old HP rp4440 4RU server in one-fourth the space with one-third the power consumption.

UltraSPARC T2 Microprocessor at the Heart of Sun's New Servers

Sun SPARC Enterprise T5120 and T5220 servers and the Sun Blade T6320 server are based on the new [UltraSPARC T2 processor](#), the fastest, most energy-efficient microprocessor on the market. With eight cores and 64 threads, the UltraSPARC T2 processor (also known as Niagara 2) delivers more throughput, performance, and functionality per watt than any chip in its class.

"We're at a historic point in computing, moving away from sequential processing to multicore designs," said Professor Dave Patterson, Pardee Chair of Computer Science for the University of California at Berkeley. "Hence, we need to invent new ways to evaluate these new parallel systems. Our initial experiments suggest that Niagara 2 has the highest performance, is the most power efficient, and is the most 'software friendly' of the processors we've tested."

Like its predecessor, the UltraSPARC T1 processor in T1000 and T2000 CoolThreads servers, UltraSPARC T2 extends Sun's lead in eco performance and "green computing" by consuming fewer than 2 watts per thread — in other words, one-tenth to one-thirtieth the power consumption of competitive offerings.

A "System on a Chip," Ideal for Virtualization

The UltraSPARC T2 processor is called a "system on a chip" because it combines essential functions on a single piece of silicon, including multithreaded 10 GbE networking, security, and I/O. Importantly for campus IT administrators, the processor is engineered for consolidation and virtualization, with support for up to 64 domains on a single chip and the Containers and LDDoms virtualization technology included in the Solaris 10 OS.

UltraSPARC T2 also excels at such diverse workloads and applications as enterprise-grade Java technology, database and mail servers, ERP and HPC applications, networking, and storage. Bottom line: Sun's multithreaded processing technology has the potential to save campus IT millions of dollars in skyrocketing power, cooling, and space expenses.

Take a Look Inside UltraSPARC T2 Technology

Having surpassed 6000 downloads of OpenSPARC T1 source code, Sun is working to release source code for the UltraSPARC T2 processor to the OpenSPARC community at www.opensparc.net. Sun is giving developers a first look at the inner workings of the processor by releasing the OpenSPARC T2 Technology Programmer Reference Manual and the OpenSPARC T2 Technology Microarchitecture Specification through the GPL, and launching an NDA Developer Beta program. Developers will find all of these at www.opensparc.net.

In support of this effort, several leading U.S. universities have opened [OpenSPARC Centers of Excellence \(COEs\)](#) to establish collaborative relationships between Sun and faculty within the OpenSPARC community. These COEs include the [University of California at Santa Cruz \(UCSC\)](#), the University of Texas at Austin, the [University of Illinois at Urbana-Champaign](#), and the University of Michigan.

Questions or comments? Please email education_news@sun.com

Bottom line:
Sun's multithreaded processing technology has the potential to save campus IT millions of dollars in skyrocketing power, cooling, and space expenses.

¹. Heyneman, Stephen P, "Global Issues in Higher Education," eJournal USA, U.S. Department of State International Information Programs, February 2006.



New Frontiers in Virtual Learning

Open Source Projects Create Platform for “Immersive Education”



Check out a demo for MPK20, Sun’s virtual workplace

What’s on the horizon for innovative new learning environments? One exciting new concept is “immersive education,” a learning platform that combines interactive 3D graphics, game and simulation technology, virtual reality, voice, chat, Web cams, and rich digital media with online course environments and classrooms.

Immersive Education: Rich, Collaborative Environment for Learning

Unlike traditional online courses, which involve the delivery of simple Web pages or streaming video, immersive education combines interactive virtual reality and sophisticated digital media with collaborative online course environments and classrooms. It’s designed to immerse and engage students in the same way that today’s best video games grab and keep players’ attention.

Immersive education supports self-directed learning as well as collaborative group-based learning environments that can be delivered over the Internet or using fixed-media such as CD-ROM and DVD. Shorter mini-games and interactive lessons can be injected into larger bodies of course material to further heighten and enrich the immersive education experience.

Imagine, for example, a history class that lets students explore the halls of the Forbidden City of Beijing from home or a lecture on nanotechnology that includes a lab session for participants to examine and manipulate molecular structures entirely online. These types of activities would be too costly and impractical to undertake in the physical world, but thanks to advanced 3D simulation technology and resources like the [Media Grid](#), the public utility for digital media, they can be created and distributed to students over the Internet.

Immersive education gives participants a sense of “being there” even when attending a class or training session in person isn’t possible, practical, or desirable. It provides educators and students with the ability to connect and communicate in a way that greatly enhances the learning experience, giving remote learners a sense of community.

New Platforms Offer Alternatives to Second Life

So what are the technologies that will enable immersive education? One option is [Second Life](#), which holds great promise for education. In fact, more than 150 colleges around the world have a presence in Second Life’s 3D online world (as does [Sun](#)), where they do everything from holding distance-education classes to planning and building the ideal college campus. Particularly for distance education, virtual worlds create new possibilities for communication, sharing, and community-building.

Second Life, however, is not right for every educational institution. Some educators worry about inappropriate content. For others, creating a virtual presence requires time and resources they don’t have. But for designers seeking alternatives, generations of incompatible technology — in the form of multiple proprietary APIs, data models and messaging systems — have created a landscape of complexity.

To give education customers more choices, Sun Microsystems and other organizations have created [Darkstar](#)

RELATED RESOURCES

- » [Darkstar University Special Interest Group](#)
- » [Immersive Education Initiative](#)
- » [Media Grid](#)
- » [Project Darkstar](#)
- » [Project Wonderland](#)

University, a community of academic systems users, designers, and students working to create open source 3D learning environments for immersive education. The idea is to help educational institutions build their own virtual environments using open source technologies — and allow those environments to connect to a university's existing academic and administrative computing systems.

The Darkstar University platform for designing virtual environments includes:

- **Code:** [NetBeans IDE](#), [JavaFX](#), and [Java Studio Creator IDE](#)
- **Content:** [OpenOffice](#), [Pachyderm](#), [MediaWiki](#), and [Roller](#)
- **Client Software:** [Project Wonderland](#) client-side 3D environment and SDKs. Project Wonderland is a 3D scene manager for creating collaborative virtual worlds. Within those worlds, users can communicate with high-fidelity, immersive audio and can share live applications such as Web browsers, OpenOffice documents, and games. Project Wonderland has already been termed “impressive” by [reviewers](#), who say that it “could well be the major game changer.”
- **Game Server Software:** [Project Darkstar](#) server-side game server. Project Darkstar is the game industry's first open source, enterprise-grade, highly scalable, online game server. Project Darkstar source code is now available for download and free use under the GPLv2 license.
- **Workstations:** [Sun Ultra 20 M2](#) workstation and [Ultra 40 M2](#) workstation; [Sun Ray thin client](#) for writing and debugging server-side code
- **Servers:** [Sun Fire X2200 M2](#) server and the [Sun Fire X4200](#) server
- **Hosted Grid:** [Sun Grid Compute Utility](#) at [Network.com](#)

Five universities have signed on to collaborate on development, systems development and deployment, open curriculum and pedagogy, and standards development: [Saint Paul College](#), Minnesota; [University of Essex](#), United Kingdom; [Shanghai Jiao Tong University](#), China; [Great Northern Way Campus](#), Canada; and the [University of Sydney](#) in Australia.

Mixed-Reality Lecture Room Links China, US and UK

One example of an early Darkstar University project is the Mixed-Reality Lecture Room, a joint project between Sun, the University of Essex, and Shanghai Jiao Tong University. Its goal is to provide an open source mixed-reality environment in a traditional instructive higher education setting. Another goal is to enhance existing teaching practices by fostering a sense of community among remote students and between remote and co-located locations.

The Mixed-Reality Lecture Room builds on several Sun technologies, including Project Darkstar, Project Wonderland, and [Sun SPOT \(Sun Small Programmable Object Technology\)](#). In the Mixed Reality Lecture Room, Sun SPOTs will be used for physiological sensors that give real-time feedback to instructors on students' interest level as well as to increase accessibility for physically disabled students.

Researchers hope to have a prototype up and running by October 2008 and to demonstrate it at the [Shanghai World Expo](#) in 2010.

Sun's MPK20 Demonstrates Value of Virtual Environments

Virtual environments aren't hypothetical. Sun, for example, is using its own virtual world to enable collaboration among employees scattered all over the globe. In fact, on any given day, over 50 percent of Sun's workforce works remotely. [MPK20](#) is a virtual 3D environment in which employees can accomplish their real work, share documents, and meet with colleagues using natural voice communication.

Just like on Sun's physical Menlo Park campus, known as “MPK,” inhabitants of the virtual MPK20 office building can work together in planned meetings, or can talk informally in unplanned encounters. Unlike the physical campus, however, the MPK20 community can be built and maintained without the constraints of physical location.

“We're frequently asked why we use 3D for a collaboration environment,” says Nicole Yankelovich, Sun Labs principal investigator. “While it might be possible to build a 2D tool with functionality similar to MPK20, the spatial layout of the 3D world coupled with the immersive audio provides strong cognitive cues that enhance collaboration. For example, the juxtaposition of avatars in the world coupled with the volume and location of the voices allows people to intuit who they can talk to at any given time.”

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The MPK20 software is built on top of the [Project Darkstar](#) server infrastructure. Darkstar, a platform designed for massively multi-player games, provides MPK20 with a scalable and secure multi-user infrastructure well suited for enterprise-grade applications.

For the client, the MPK20 prototype uses the [Project Wonderland](#) 3D engine for creating the world as well as the avatars and animations within with world. As you explore MPK20, you hear people, music, or videos in much the same way as you would walking around the physical world. The initial prototype supports the sharing of Java technology and X applications, but the vision is to eventually be able to use, edit, and share all desktop applications within the virtual world.

Media Grid Launches Immersive Education Initiative

One of the characteristics of the immersive education movement is its openness and focus on collaboration. In June, open standards organization MediaGrid.org launched the [Immersive Education Initiative](#), an international collaboration of universities, colleges, research institutes, consortia and companies that are working together to define and develop open standards, best practices, platforms, and communities of support for virtual reality and game-based learning and training systems. Sun is on the board of the initiative.

At its launch, the initiative issued an open call to educators, students and professionals who have experience using virtual learning environments or video game technologies. Individuals and organizations can visit [ImmersiveEducation.org](#) to select the next-generation immersive education platform, contribute to best practices, and establish standards for virtual learning environments and game-based learning platforms.

Projects like these dovetail with Sun's philosophy of sharing innovation and building communities. Virtual worlds like this one are the next evolution of Sun's long-held vision: 'The Network Is The Computer.' The online virtual world offers unlimited potential for collaboration on everything from education and social issues to Java technology development. Dive in!

Questions or comments? Please email education_news@sun.com
