

# pervasive architecture

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# from the publisher

Welcome to the second issue of *Pervasive Architecture*, the quarterly publication that keeps you up to speed on HP's latest IT infrastructure technologies, services, partnerships and solutions.

This is our second issue, but in one important way it's also our first. It's the first issue to be published since the HP/Compaq merger. HP and Compaq bring together proud histories of industry-changing innovation.

Dive into this issue. We'll demonstrate the new HP's innovative spirit by focusing on the latest developments around the Intel® Itanium® 2 processor and HP's unique zx1 chipset.

See how you can unlock the power of Itanium 2-based systems from HP. Discover what the experts at the HP Intel solution center can do to make your organization's transition to 64-bit computing smooth and seamless.

Customers speak up: the U.S. Department of Energy's Pacific Northwest National Laboratory shares with you why they chose a mix of HP servers and workstations based on Itanium 2 processors and running Linux for their supercomputing

environment. In addition, leading analysts provide their perspective on the market uptake of the Itanium architecture.

TAL Digital, an HP partner, points out the performance virtues of the current rx4610 server in a digital content distribution solution that will change the entertainment industry. Finally, read up on how HP is using technology to revolutionize the charitable donation process for business.

Bottom line, the articles in this magazine will give you a clear insight on how the latest technical innovations and solutions from HP and its partners can play a key role in designing an IT infrastructure that exceeds your customers' expectations.

Your feedback on this issue of *Pervasive Architecture* will assist us in producing future magazines that meet your information needs. So please take a moment to e-mail our editor your feedback at [pa@okpmw.com](mailto:pa@okpmw.com).

We hope that you are as excited about the topics covered in this issue as we were in selecting them.

Marilyn Edling  
HP Americas, Business Critical Systems



Marilyn Edling,  
Publisher

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HP expects its innovative zx1 chipset will deliver at least a 20-30% performance increase for its Itanium® 2-based systems versus other vendors.

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Storage Area Networks (SANs) and Itanium®-based servers from HP are teaming to overhaul digital content distribution models. Experience how TAL Digital is turning science fiction into fact.

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A leading analyst predicts the Itanium processor family will become a major player if not the market leader in this space over the next five years.

# innovative zx1 chipset

## puts Itanium<sup>®</sup> 2 systems from HP on top

**P**icture this. It's near the end of the year and the new applications are running flawlessly. Careful planning and expert support services made sure the transition was smooth. Oracle 9i databases now run faster, and overall employee productivity has substantially improved. Technical staff running new modeling applications also get the answers they need in record times. That means products get to market ahead of the competition and corporate revenues increase. It took some gentle persuasion. But the leap to HP's workstations and servers based on the Intel<sup>®</sup> Itanium<sup>®</sup> 2 processor is starting to pay off. You wanted to start small. So the two and four way systems nicely fit the bill. Their blazing speed is slightly more than you expected. That's the added bonus. Enhancements such as a wider system bus, an on-chip level three cache, additional issue ports and more integer execution units certainly help push performance levels higher.

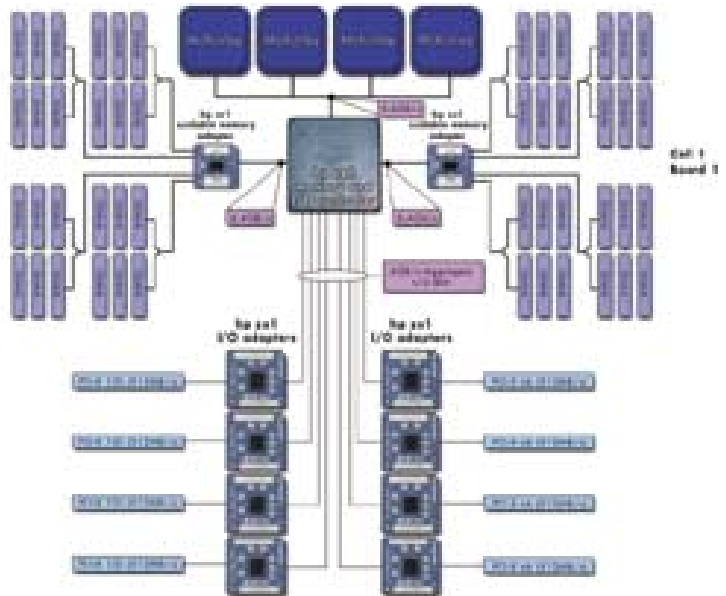
What really makes the new systems hum, however, is the visionary zx1 chipset from HP. Most rarely give the technology a second thought. You now know its impact. Optimized for low latency and high bandwidth in one, two and four-way systems, the zx1 is now helping you deliver an even clearer price/performance advantage over traditional servers and workstations. Some might consider you an early adopter of the HP systems. Take a look around in the coming few months, however, and chances are you'll find you're not alone.

"We think the sweet spot for the Itanium 2 processors is definitely going to be in the two and four way systems initially and so a design focus on scaling beyond those levels will likely not be as important as optimizing performance within that range," says Gordon Haff, an analyst with the New Hampshire-based consultancy, Illuminata Inc. "There will be larger deployments that need the kind of scalability of a Superdome going down the road but if you design a chipset focused on scaling then it won't be as cost effective or offer the higher levels of performance down in the smaller systems range."

### Latency and high bandwidth real eye openers

At the heart of the zx1 is its I/O and memory controller. It interfaces to the Itanium 2 processor bus and provides a low-latency connection to DDR memory either directly or through memory expanders, and generates eight high-speed links that

connect to zx1 I/O adapter chips. These support PCI, PCI-X and AGP bus architectures. The simplest and lowest-cost configurations need only the zx1 memory and I/O controller connected to a single I/O adapter. At the other end of the spectrum, the memory and I/O controller can connect to 12 memory expanders for quadruple the base memory capacity at the same time that eight I/O adapters are handling 4 GB/second of I/O bandwidth. "Latency is the real eye opener in this architecture," Haff adds. "That, as well as the high bandwidth is going to be really important for any application that needs to move a lot of data in and out of the processor relatively quickly. Technical applications like weather forecasting and modeling that work against large data sets will definitely get better performance, as will a lot of the commercial applications like data warehousing and data analysis."



### HP systems outperform competitive systems

The zx1 delivers a total memory access latency of 112 nanoseconds from the time the processor requests data to the time that data obtained from memory is transferred to the requesting unit. This includes a total of 32 nanoseconds of latency within the Itanium 2 processor itself and 80 nanoseconds from the processor bus to memory and back. The latter figure compares to a latency of 108 nanoseconds for PA-RISC systems, a whopping latency of 157 to 197 nanoseconds in the IBM Summit chipset, and 300 nanoseconds in big iron

Unisys boxes. As well, the performance of the zx1 isn't dependent on applications being small enough to run resident in an L4 cache. The IBM Summit architecture is strongly tied to the L4 "hit rates" which can vary depending on the locality of the workload. This makes it very ineffective for technical applications. The IBM approach may help some commercial workload performance levels. But it doesn't approach the performance levels of lower latency systems like the HP zx1.

"We're expecting at least a twenty to thirty percent increase in performance for the HP Itanium 2-based systems over the other vendor offerings right out of the gate," notes Chuck Kaustch, senior technical consultant at HP. "Think of the Itanium 2 processor as the engine. You wouldn't put a Maserati engine in a Model-T Ford frame and expect it to perform in the same way. A poorly implemented, designed or tuned chipset will have the Itanium 2 processors sitting there starved for information. It won't be able to keep it fed and keep it fed fully and that's essentially what the zx1 chipset does."

#### **zx1 memory system design key to high application performance**

For demanding applications that don't fit within the processor cache, memory system design is a key component to performance. The zx1 memory bandwidth has been optimized with dual memory controllers to provide 12.8 GB/sec in a four-way system. At 48GB, this represents three times the memory capacity of other chipsets on the market. Memory bandwidth is essentially the rate at which data can be sent or received to or from main memory. It's especially important for high application performance. Some designers increase bandwidth by increasing the number of pipeline stages. This approach, however, generally causes an increase in latency. HP designed its zx1 chipset to balance high bandwidth with low latency, while also balancing costs and system design flexibility. The result is a chipset that provides customers with a cost-effective, high bandwidth and low latency solution for one to four CPU workstations and servers.

HP leveraged its technical relationship with Agilent Technologies to implement the physical design of the chipset. Agilent provided applications specific integrated circuit (ASIC) chips in a 0.18 um, low-voltage CMOS process that included custom AGP-4X, PCI-X and processor pads, as well as custom datapath logic. The three-chip solution consists of the HP zx1 memory on input/output controller, the HP zx1 adapter and an optional HP zx1 scalable memory expander. Servers and workstations that immediately benefit from the chipset include the HP zx6000 and zx2000 workstations and the rx2600 server line. These are ideal for small installations such as desk-side CAE, EDA or science and research systems. They also fit well into rack-mount clusters in small compute farms or can form the key component to clusters as large as super computers.



# **new HP workstations deliver superior price/performance over Sun systems**

**N**early twice the performance at half the cost. That's what HP is now delivering to workstation users. And many are going to feel like it's Christmas in July. The zx6000 and zx2000 whip both Sun and IBM systems in price as well as in SPEC2000 performance benchmarks (see related article on page 7).

The zx2000 also offers more expandability. It has both AGP and 5 PCI slots compared to the Sun Blade's 4 PCI slots. It can also run your choice of three operating systems and allow you to configure it as desk-side or rackable. Comparable Sun systems, in contrast, run only the Solaris OS and are not rackable. With Sun, you pay a premium for the 280R. The zx2000 also features a system bus bandwidth of 6.4 GB/sec, compared to 2.4GB/sec for the Blade 2000 products. Zx2000 workstations are priced at U.S. \$9,408, while the Sun Blade workstations sell for an astonishing U.S. \$14,995.

The zx6000 also delivers superior price/performance. It's almost U.S. \$4,000 less expensive than a fully loaded Sun Blade 2000 workstation, yet beats it by 512 points on the SPEC floating point performance scale - nearly 1.7 times faster. The zx6000 features total memory bandwidth of 8.5 GB/sec, compared to 4GB/sec, in comparable Sun Blade workstations. As well, the zx6000 offers a range of SCSI drives at different sizes and speeds. Just like the zx2000, the zx6000 can run your choice of three 64-bit operating systems and is both desk-side and rackable.

# solutions center assists in migration to Itanium® processor

**P**lants dot the foyer. Sunlight streams in through the spacious front lobby. Workers take care of the day's first tasks. At first blush, The Intel HP solutions center in Chantilly, Virginia looks and feels just like most work environments on any busy day. It's not. The building actually houses a showcase for some of the most innovative computer solutions on the market today. This week is a little busier than most. That's because preparations are underway for the arrival of staff from the Defense Department. Work will soon begin on helping them migrate legacy applications to the Intel® Itanium® processor family platform. Some of the code has already been written. Now they need to make sure it runs according to expectations. Loads need to be tested. Systems can be fine-tuned. Welcome to the industry's first center of excellence dedicated to helping federal government clients migrate to the future of high-performance computing.

"Its output is essentially recommendations, bill of materials and answers on how to tweak and tune things so that an agency feels confident that everything has been thought about as opposed to them just hiring some gear on contract and then have their own staff try to figure out how to properly implement everything," notes Dan Beres, a center manager at Intel. "Between the two companies we're offering the resources and expertise in Chantilly to really help customers stay ahead of the curve by getting it right the first time." The new center of excellence is one of four labs in the facility, which is owned and operated by Intel. HP and Intel jointly provide sales, marketing and engineering services targeted to government clients, as well as system integrators and commercial enterprises in the area. The primary goal is to offer a hands-on proof of concept center for the Itanium processor family platform and HP's Always On Internet Infrastructure (AOII). Located on the outskirts of Washington D.C., the lab will provide customers with the

flexibility to contract all the engineering work to HP and Intel staff, provide some of their own manpower to work alongside HP and Intel staff within the lab, or rent the highly secure lab and perform all the work alone. "A demo dog and pony installation is one thing but this is a facility that you can rent out for weekly engagements," Beres adds.

"There are conference rooms in each section, demonstrations of high-speed Internet access and workbenches to physically tear machines apart. At the end of the day everyone knows that what will come out is something like a guideline paper on how, for example, to implement an Oracle solution on HP servers based on the Itanium processor."

The center currently has three rx4610 servers as well as

two HP NetServers and a range of PC clients. The company has been showcasing this base configuration to channel partners and system integrators for several months, and plans to continue adding more equipment, such as several i2000 servers, and to upgrade the systems to the new HP servers and workstations based on Itanium 2 in the near future. Also planned for installation are several IA32-based LPR 1000 and 2000 systems, as well as HP va7400 storage arrays. The environment will offer a complete AOII center managed by HP, with access to HP and Intel engineering resources and experts in Itanium processor migration. Although the center is already open for business, the official launch is set for July. "There are a lot of Federal agencies currently testing the Itanium processor and we see them making use of the facility for things like load balancing, testing, capacity planning, migration and porting," says Timothy Simon, a marketing specialist at HP. "It's a stable and fixed environment where customers can cycle through and run any kind of system on any configuration and equipment they need us to set up. It's essentially scalable up and down to meet whatever the customer requirements are."



**Timothy Simon**  
HP



Unmatched performance at a price that meets business demands: that's been the elusive goal of almost every IT manager for several years. Are we any closer to Nirvana?

# HP's line-up of powerful servers and workstations

The answer may be both yes and no. Most industry analysts agree that traditional architectures lack the price-performance metrics many companies need today. But newer approaches to building workstations and servers from vendors such as HP and Intel are definitely a step in the right direction.

Itanium®-based workstations and servers from HP are built around the powerful HP zx1 chipset. That means applications running on these systems get higher bandwidth and lower latency over commodity chipsets.

The zx1 chipset offers 8.5GB/second of memory bandwidth; 78 nanoseconds open page memory latency; and AGP graphics support. It enables the performance benefits of the Itanium® 2 processor, ensuring more data gets processed in less time and also offers industry-standard graphics functionality for visualization. So what does that really mean for your business? Simply stated: get more work done in less time at a lower cost, which translates to a faster time to market for your products.

HP's zx6000 workstation represents the pinnacle of workstation performance. It's the industry's first 64-bit platform at an awesome price. SPEC2000<sup>1</sup> benchmarks rate zx6000 systems running 1GHz Itanium 2 processors as having 20 percent better integer performance and 70 percent better floating point performance than a Sun Blade 2000 1GHz box. In a 1GB entry-level graphics configuration, the zx6000 is also less than half the price of a similar Sun Blade 2000 system. In a 2GB extreme graphics configuration, the Sun Blade 2000 system is 100 percent more expensive than a similarly configured HP zx6000. The zx6000 1GHz systems also beat the IBM RS/6000 44P-270 systems with a 450 MHz processor by 218 percent for integer performance and 120 percent for floating point performance.


The zx6000 is ideal for CAE, scientific research, life sciences, digital content creation, rendering, and software development for SMP capable code. All zx6000 systems come equipped with up to two 1GHz Itanium 2 processors

loaded with 3MB of on-chip level three cache and 12GB of RAM. This can increase to 24GB when 2GB DIMMs become available. This configuration is ideal for customers who need racked graphics workstations. If graphics aren't required, the HP rx2600 server is the same small powerful package and ideal for cluster nodes. Both the zx6000 and rx2600 deliver extraordinary compute density, with up to 40 CPU's in a single 2M rack. Their power potential is an impressive 160 GFLOPS per rack.

The HP zx2000 workstation is your chance to ride the accelerated performance curve with what may be the most flexible workstation ever created. It's U.S. \$5,500 cheaper than Sun Blade systems, and more than 20 percent more powerful in SPEC floating point benchmarks. The zx2000 also features nearly three-times the system bus bandwidth of Sun boxes, can be racked or used as desk-side systems, and allows you to run your choice of three 64-bit operating systems. It's a terrific solution for CAE, life sciences visualization, scientific and research nodes, software development, digital content creation, and MCAD.

Need more CPU power? The HP server rx5670 scales to 4 CPUs and empowers technical computing users to process more transactions, do more in-depth analysis, run complex models faster and render high quality images with optimized performance. But its use is not limited to technical computing. Commercial computing users will run their applications with superior performance, decreased costs and reduced complexity, using all familiar management, availability and security tools running HP-UX, Windows or Linux.

What's more, customers who have invested in the PA-RISC based L3000 and rx5400 series systems can now take advantage of the zx1 chipset. "The rx5670 server is HP's first proof point in delivering on our commitment to investment protection," says Manuel Martull, HP's product line section manager for Unix servers in North America. "HP offers in-box upgrades from the rx5400 series platform to the rx5670 – a benefit not offered by anyone else in the industry." Combine that benefit with binary and data compatibility offered with HP-UX 11i Version 1.6, and you can deploy the rx5670 seamlessly into your environment.

"With many of our current PA-RISC based servers, customers are already buying into the future and flexibility of the Itanium architecture," says Adrian den Hartog, HP's Itanium marketing manager in North America. "Current plans are also to offer future Itanium processors as in-box upgrades to our latest mid-range and high end PA-RISC based servers." 

1. Estimated performance based on initial benchmarks. Spec.org is expected to publish SPEC performance figures in the August 2002 timeframe.

# Itanium<sup>®</sup>-based systems from HP enable TAL Digital to turn sci-fi into fact

They make it all look so easy. Push a button. Jump to light speed. Leave the competition in some galaxy far, far away. Most of the characters in George Lucas' *Star Wars* adventures, of course, need those capabilities just to survive. Whether fleeing from the clutches of the evil empire or getting to the next planet on time, speed and agility are essential. Back in the early days of episode four, however, few would ever have thought of applying those same characteristics to the task of actually getting the story into thousands of theatres around the world. Film distribution, after all, needed tapes. It needed lots of slow and expensive manual labor. And most of all it relied on traditional ways of moving information from one point to the next. Movies had to be shot, edited and copied at one location. Then they could be physically carried to each individual theatre.

distribution models more efficient, pervasive and cost effective. Novel approaches to getting digital entertainment or almost any kind of information into the hands of end users are quickly becoming mainstream. "Right now there are only four theatres in the San Francisco area where you can see the new digital *Star Wars* and that's because the distribution model still isn't where it should be," says Steve Trubow, director of technology for TAL Digital Inc. "What we'll be able to do with the Itanium<sup>®</sup> 2 processors is push uncompressed High-Definition video signals out from storage area networks to hundreds of end points over private Internet Protocol (IP) connections with the speed and cost effectiveness that the industry needs. It's going to transform digital cinema delivery mechanisms from just vaporware into a solid reality."



## HP rx4610 servers delivered the memory, bandwidth and throughput

The TAL Digital architecture, called Junction Enabling Technology (JET), is currently based on HP's VA 7400 storage array equipment as well as several four and two CPU HP rx4610 servers running a combination of Linux and Windows. The company uses management software from Tivoli to keep track of the files in each storage

The same systems applied to any kind of news or entertainment distribution. Images could be moved around with satellites. But costs were high. Schedules were rigid. That meant you normally got what everyone else was sent.

Now fast forward to today. Digital technology is quickly revolutionizing film production. *Star Wars* can be shot using bits and bytes. Networking is commonplace. Digital projectors are also gradually coming on line. All this allows some audiences to see *Attack of the Clones* digitally at a handful of locations. Yet the best is still to come. Innovative HP systems based on Intel<sup>®</sup> Itanium<sup>®</sup> processors and high-speed storage area networks (SANs) are promising to completely overhaul the way most people view and access digital information or video entertainment by making the new

storage area network, as well as best of breed Fiber Channel and IP switches from vendors such as Foundry Networks and Brocade Communications Systems Inc. JET relies on the powerful Itanium processors in the rx4610 server to push and pull files from one SAN to the next by translating 2-Gbps Fiber Channel signals into IP streams at data rate speeds. Each rx4610 essentially acts as a "pump" between high-speed SAN storage and almost any size private IP network. "That's simply not possible without these processors," adds Trubow. "We've tried doing this with every 32-bit server we could get our hands on as well as some of the other 64-bit systems but they just don't work. You need the memory capabilities, bandwidth and overall throughput to really pull this off."

The company currently has two rx4610 servers, based on the first generation Itanium processor, running 64-bit Windows set up in its lab in San Francisco as well as another running RedHat 7.2 Linux. Operating system flexibility is critical to TAL, since the servers are also currently being asked to read and write video images to disk as part of trials underway with Sony Corporation. TAL uses Linux for its networking and sharing attributes. Windows is used as the operating system for the rx4610 video "ingestion" servers. Problems with Linux's system caching and raw I/O file system prevent it from performing this job well. "We've got two 500 Gigabyte SANS set up and we're moving video files back and forth from Fiber to Ethernet and back again at wire-line speeds flawlessly," Trubow adds. "We could scale up and fill the biggest pipe there is to something approaching OC-192 or 10Gbps Ethernet without any problems. The HP servers we have are absolutely in a class all by themselves."

TAL first demonstrated its JET architecture at the National Association of Broadcasters (NAB) convention early last year. The company has since been conducting trials with several news organizations and broadcasters using the first generation Itanium processor to handle MPEG files or broadcast and video on demand. The first commercial installation is expected to be operational by early fall. One system will allow a national broadcasting company to more cost-effectively distribute programs to affiliates across the U.S., by storing them at a central "library site" for transmission during off-peak satellite times. Others may allow cable operators to offer video on demand service more cost effectively, or allow news organizations to centralize editing resources while providing simultaneous and real-time access to video story clips to every employee around the world. The company expects to soon begin work on HP systems with Itanium 2 processors and then begin aggressively pursuing cinema distribution opportunities based on the system's ability to quickly process massive uncompressed High-Definition video signals at data rate speeds of 160-Mbps per stream.

#### Corporate applications abound

JET, however, is much more than simply a way to send and store large video files from one location to the next. Companies can also leverage the power of the architecture to conduct live video conferencing or, for example, digitally archive thousands of periodicals and index them accord-

ing to date, subject or title. Corporate announcements can be sent to thousands of printers or emails at the touch of a button. Or live news can be broadcast as it happens from a camera to digitally networked projectors. "It's essentially a SAN enabler that delivers on the technology's earlier promises of seamless and ubiquitous access to any information from any corporate location," says Paul Shapiro, vice president of sales and business development at TAL. "A lot of companies have steered clear of SANs because of



their geographical limitations or the costs of connecting those huge data silos across a wide area network. We're expanding the selling points of any SAN from one location where everyone has to be hooked up with U.S. \$3,000 Fiber Channel cards to a system where any employee in the world attached to the company's private IP network benefits and multiple SANs in different regions can be managed from one location as a single global SAN."

The JET architecture, Shapiro adds, provides an ideal way for processing multiple smaller file requests in instances where the number of employees may be large or the number of end users potentially huge. TAL, for example, has recently begun work with an Internet music company to process tens of thousands of simultaneous MP-3 requests. "One of the really nice things about basing this solution on a completely open architecture is that we can scale up and down from the core right out to the edge of the network," Shapiro notes. "We've been working with some companies where the end connection is DSL or in some cases even 56K." JET comes with all the flexibility to allow each customer to determine the solution that best fits their needs. Connections can range from leased lines or fiber, dedicated T1s or T3s and satellite links. "It's not just the size of the files per se but also the bandwidth of the total number of requests," Shapiro adds. "When we start talking about a system that will be heavily used and heavily accessed then the Itanium processors become really critical in order to deal with that aggregate bandwidth demand."

"the HP servers we have are  
**absolutely in a class**  
all by themselves"

# Analysts offer the low down on the uptake for Itanium® 2-based systems

What is so rare as a day in Spring? Last year the answer may well have been Intel® Itanium®-based systems running large commercial applications. Some businesses took the plunge. Many just kicked the tires. All that's about to change, as independent software vendors such as Oracle and Microsoft come on board. It's also shifting thanks to general market awareness, and the ongoing price/performance enhancements witnessed in Itanium 2 processors. Going through the early adopter stage this year might mean a large percentage of sales remain concentrated in the scientific and research markets. But some analysts are predicting quick market growth over the next three years.

"A three year development ramp is not out of the ordinary and its probably more accelerated than some other environments like RISC that have come on stream over time," says Steve Josselyn, Research Director for Global Enterprise Server Solutions at International Data Corp. (IDC) in Framingham, Mass. "It will ramp up and steal market share from both the IA-32 and RISC worlds. We think running database applications will likely be the first commercial style deployments but as time goes on




**Steve Josselyn**  
IDC

and the applications are developed across the board then we will start to see the Itanium 2-based systems compete against IA-32 for file and print type applications as well." He adds that sales of Itanium-based servers will reach U.S. \$2.4 billion by the end of 2004 and over U.S. \$9 billion in 2006. "One of the gating factors right out of the chute has been the lack of a native 64-bit Windows operating system and that's not expected until later this year," Josselyn notes. "Based on that we still see this as something of a development year, with people trying to integrate the 64-bit platform into their environments. Application developers have been moving to Itanium-based systems but it always takes longer for a platform to mature than anyone expects when it's initially introduced."

According to Sarang Ghatpande, a research analyst at D.H. Brown, the "sweet spot" for Itanium 2-based systems

over the coming year will be in the technical computing market, with high-performance computing and strong floating point performance. "We'll definitely start to see more commercial applications such as a wider mix of large databases, Enterprise Resource Planning and business intelligence systems come on line over the medium term but there's always a ramp up time for that," Ghatpande notes. "The Itanium 2-based systems are going to get a lot of attention because of the boost in performance. I think there will be some aggressive deployments later this year."

What kind of needs will Itanium 2-based systems address in the commercial space? The challenge many businesses face today is one of information overload. Most need to cope with a flood of data from an ever-expanding range of systems. More sales data, competitive information, market projections and inventory information place severe strains on the storage capabilities of even the largest databases. They also test the performance limits of the most powerful workstations and servers.

"We're seeing huge growth rates in the amount of data that's being generated and stored and subsequently needs to be analyzed," says Mike Graf, product line manager for the Itanium processor at Santa-Clara-based Intel Corporation. "The average corporation has maybe 300 terabytes of capacity today and we see that rising to 1,000 terabytes by 2003. All that data has to be analyzed in order to be meaningful and so that's one area where the Itanium processor will really excel." Graf adds that Itanium 2-based systems will deliver substantially higher levels of performance than the first version of the chip through an integrated level-three cache, a wider bus, more issue ports and integer execution units, and faster clock speeds. "We're anticipating Itanium® 2 systems will deliver fifty percent higher transaction performance than Sun at lower costs," Graf adds. That level of performance, for example, may well facilitate the emergence of innovative solutions capable of spanning data repositories across the world using query-processing techniques to generate data intelligence from large numbers of events and transactions. The Itanium-based servers within this architecture would provide fast and flexible analytical data handling across multiple systems. Their role will also be to provide businesses with the ability to quickly consolidate and integrate massive amounts of data from multiple sources – giving key decision makers a single view of vital business information. 

# SupplyLink program revolutionizes charitable donation process for businesses

Online transactions today are all the rage. Goods are bought and sold with the click of a mouse. Products can be moved around the globe at lightening speeds. The benefits of e-business have made sophisticated security engines, databases and inventory management programs a necessity across most industry segments. Survival increasingly depends on the ability to talk to suppliers electronically rather than through paper-based systems. Trouble is, most of the new business models have yet to make an impact on how charitable organizations interact with potential donors. Many are simply frozen out of potentially beneficial relationships. Overly complex record keeping and costly manual processes mean that businesses still dispose of surplus goods or end of lifecycle products in landfill sites. All that's about to change thanks to an innovative program from HP that allows any business to quickly and easily donate any surplus materials or goods to a nationally registered charitable organization over the Internet for free.

The idea behind HP SupplyLink first began to surface in the late 1990s with the arrival at HP of employees closely connected with the food industry. The first version got a facelift earlier this year and was officially launched under its new name in February. "We think this is something close to a gift from God," notes Dave Miesse, a member of the board of directors of the Ohio Association of Second Harvest Food Banks. "HP really studied all the old processes and made an effort to understand what everyone's needs were so that they could put a system in place that works. It functions according to standard business practices and replaces some very antiquated paper-based systems we used before where no one really understood what was going on and how they could get involved." The idea behind the new program is deceptively simple. It essentially creates a central repository, or "virtual online warehouse," to collect donation information and communicate that information to the appropriate charity. Businesses first register and tie the appropriate databases of goods into the system. They can log on and identify the goods they wish to make available through a series of number codes. In many cases they can automatically have the goods picked up through a seamless interface to truck-

ing industry dispatch and trucking systems such as that operated by C.H. Robinson.

At the heart of the new system is a three-tiered server architecture running Apache Web server software, Oracle databases and the HP SupplyLink program. Three HP rx4610 dual Intel® Itanium® processor family-based servers currently deliver access to the system for developers, testers, and quality control staff from all over the country. They also provide a solid foundation for stress testing the current PA-RISC based environment at five to ten times the current loads. "We're likely going to need that kind of throughput to handle some of the volumes we're looking at over a two year window," notes Wil Snyder, manager of HP SupplyLink in Ontario, California. "One of the new relationships we're looking at right now is with the U.S.



Department of Agriculture because they would dearly love to find a way to move millions of pounds of cheese and butter out onto the market without having it negatively impact market prices. Right now most of that just gets stored in warehouses if they can't move it to places that really need it. We had to get the system built on this more stable, larger platform that we have with the Itanium-based servers to be able to handle those kinds of volumes."

According to Miesse, food manufacturers disposed of 93 million pounds of usable products into landfill sites in the year 2000. Most of the goods may have been mislabeled, slightly damaged or approaching the end of a shelf life. Yet no mechanisms existed to quickly and efficiently deal with the end of lifecycle challenges. With HP SupplyLink, he explains, businesses now have a way to better manage the end of product lifecycle phase. They also have the option of dealing with nationally registered charitable partners such as America's Second Harvest who maintain the integrity of the system by ensuring that goods do not re-surface for sale, issue tax receipts, and help ensure goods are delivered to their intended destination. HP SupplyLink conducts most of its present business with food manufacturers. Plans are also in the works, however, to link up with additional organizations such as Habitat For Humanity, electronics suppliers, and many other industries in a host of market sectors looking for a way to help.



For more information on how you or your business can get involved with this non-profit program, visit: [www.hpsupplylink.org](http://www.hpsupplylink.org)

# science, engineering communities warming to new Intel® Itanium®-based systems

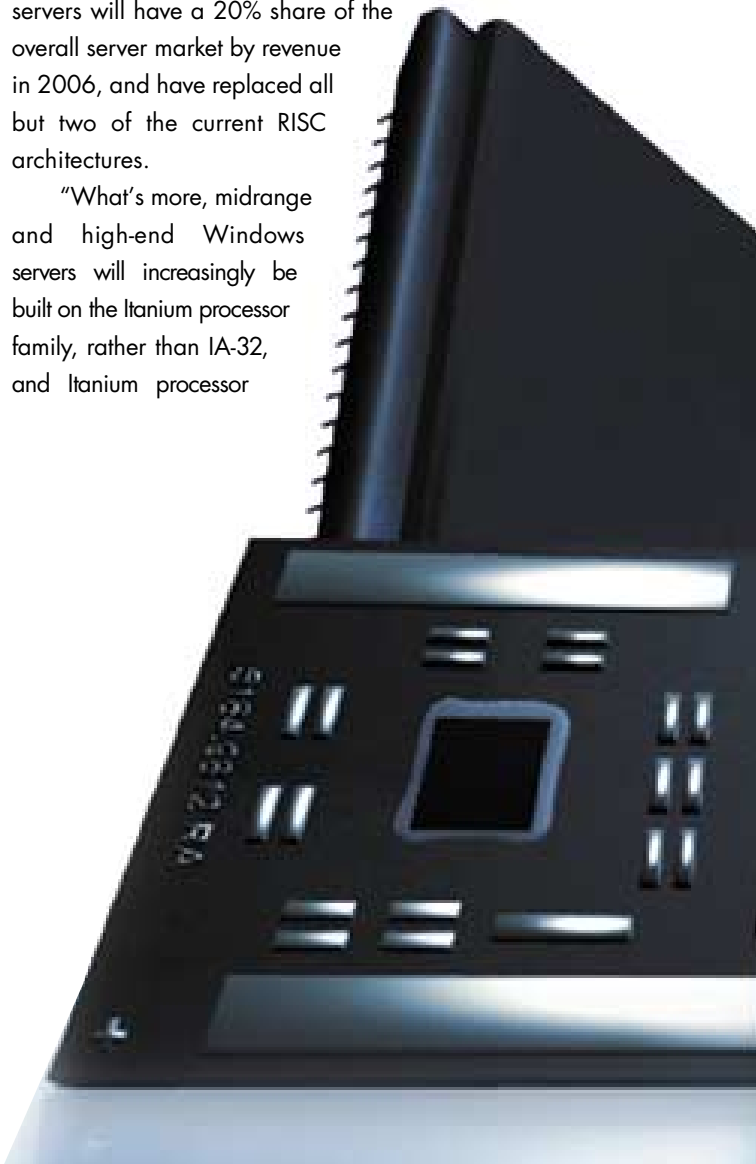
**T**hink about science and engineering today and one need immediately springs to mind: raw speed. Breakthrough medical research needs it. So do new car designs. Engineers engaged in complicated modeling, 3D designs and simulations can't do without it. Nor can scientists exploring the deepest mysteries of the environment. Truth is that speed impacts nearly every aspect of today's fiercely competitive science and engineering market – with success normally going to those able to come up with the right design or answer first. In the time-to-market rat race there's little room for error and almost no tolerance for system failures. Workstations and servers need to flawlessly move massive amounts of data in and out of memory. They also have to come with the ability to address more than a paltry two to four gigabytes of it. They need the appropriate instruction ordering techniques in order to maximize parallelism. Floating point performance is often critical. Sophisticated applications often need to run continuously for weeks at a time on one single problem. And, of course, everything needs to come together in record times.

Can present computer systems keep pace? The answer is both yes and no. Traditional workstation and server architectures provide adequate performance for some types of mechanical design or animation work. Other researchers have more exacting CPU requirements. Their applications are both compute and memory bandwidth intensive. Data sets can grow to 20 gigabytes of memory space. The ability to perform multiple calculations in parallel is a must. The need to support more and more complex programs also places serious strains on already overburdened computer centers to deliver more computing power. New approaches are therefore increasingly needed to achieve or maintain a leading competitive advantage.

"We believe the Intel® Itanium® processor family will become a major player if not the market leader in this space over the next five years," notes Christopher Willard, research vice president of workstations and high performance systems at the Framingham, Mass.-based research

firm International Data Corporation (IDC). "We're seeing some large Itanium clusters out there already. That's definitely a trend that will continue with the Itanium® 2 processor and almost certainly accelerate as the ecosystem gets built up around the processor itself." IDC places the technical server and systems market at U.S. \$5 billion in 2001, growing to U.S. \$8.4 billion in 2006, with the bulk of sales going to Itanium-based systems. As well, Gartner Group predicts that Itanium processor-based servers will have a 20% share of the overall server market by revenue in 2006, and have replaced all but two of the current RISC architectures.

"What's more, midrange and high-end Windows servers will increasingly be built on the Itanium processor family, rather than IA-32, and Itanium processor



technology will cascade into more 'commoditized' markets as prices reduce," a Gartner Group research note adds. "Itanium's initial impact will be in the high-end and midrange server space. In the low-end landscape the architecture will fit in right where Sparc and Power are today: technical and financial workstations, and rack-dense servers for telcos and Internet service providers. In these non-commodity segments, there are enough independent software vendors porting to Itanium to really make it a success."

So, where does the Itanium processor family stand today? In many respects the chip's market uptake is on track to nicely mirror Geoffrey Moore's widely accepted technology lifecycle adoption model. In his classic work on the industry, called *Crossing the Chasm*, Moore noted new technologies need to pass through several phases of customer adoption before gaining wide-spread market acceptance. The first involves acceptance by an "innovator" group. The second is uptake by "early adopters," and the third phase involves widespread purchase by an "early majority." The initial early adopters of Itanium processor-based systems, of course, include organizations such as the Pacific Northwest National Laboratory (See related story on page 14). This organization is counting on HP's Itanium-based systems to deliver superior performance at price points approaching those of the Intel® Pentium® 4. "They're people who find it easy to imagine, understand and appreciate the benefits of a new technology, and to relate these benefits to their other concerns," Moore points out. "Whenever they find a strong match, early adopters are willing to base their buying decisions upon it."

What Itanium-based systems bring to many early adopters in science and engineering, as well as to other market segments, is

unmatched memory bandwidth, increased parallelism, enhanced floating point performance and better overall price/performance results. Fields such as mechanical computer-aided design (MCAD) can take advantage of Itanium systems' floating-point performance to benefit from large zoom resolutions and the ability to work with large models and sets. Digital Content Creation (DCC) shops also benefit from higher degrees of parallelism throughout their post-production, compositing and rendering functions. While Electronic Design Automation (EDA) can take advantage of massive memory addressing to get the job done faster and more efficiently.

Where Itanium-based systems perhaps initially shine brightest is within the Computer Aided Engineering (CAE) and life sciences market segments. Physical modeling, realistic physics and accurate object interactions are some of the most compute-intensive tasks today. Computational chemistry applications, sequence alignment algorithms and other computationally demanding challenges can similarly benefit from large memory addressability and better floating point performance. Problems are solved faster, simulations take less time, and database searches execute faster.

"The CAE and life-sciences markets have some interesting things in common to the extent that both have applications that are very technical and large in terms of massive data sets, and both use complex algorithms or



**Christopher Willard**  
IDC

**"we believe the Intel Itanium processor family will become a major player if not the market leader in this space"**



mathematical modeling concepts for breaking things down and understanding them," says Jim Skog, marketing manager for HP's Technical Computing group. "One of the considerations that sets life sciences apart is their risk aversion to some types of new technology, and their need for very stable production environments. There has to be a very clear benefit behind what they buy and it can't just be a five percent improvement."

Initial benchmark results suggest that Intel® Itanium® 2 processor-based systems will deliver 50 percent better performance than Sun Ultra Sparc III systems at half the price. HP systems equipped with Itanium 2 processors are also more than just 64-bit systems. Workstations such as the HP

zx6000 and servers such as the HP rx2600 come with HP's innovative zx1 chipset, a DDR/RAM-based chipset with lots of bandwidth and low latency to ensure the processor always has the data it needs. The server version of the HP zx1 chipset offers an astounding 12.8GB/sec of memory bandwidth. Two-way workstation and server chipset solutions offer an equally astonishing 8.6GB/sec bandwidth. Wide memory bandwidth, low latencies, plenty of physical memory and powerful parallelized architectures coupled with leadership price/performance makes these systems ideally suited to meet the demanding requirements of science and engineering markets both now and in the future.

For details on the zx1 chipset, refer to page 4.



# HP reaches the very highest echelon of supercomputing power

**N**umerous companies have saved money and increased efficiency by deploying moderate-scale HP Linux solutions. Now, Linux is enabling the construction of true supercomputers at more reasonable costs than traditional platforms, and HP is leading the charge. HP and the U.S. Department of Energy's Pacific Northwest National Laboratory (PNNL) recently announced that PNNL had ordered a U.S. \$24.5 million HP supercomputer that will allow researchers to address major scientific challenges using computational science. PNNL is one of the world's premier molecular and life sciences labs.

The supercomputer will be installed in the Molecular Sciences Computing Facility (MSCF), which is part of the William R. Wiley Environmental Molecular Sciences Laboratory (EMSL) at PNNL, located in Richland, Washington. The facility is available to the scientific community at large and serves over 275 users from universities, national laboratories, and industry. Employing approximately 1,400 Itanium® 2-based processors, the PNNL supercomputer is expected to reach performance levels exceeding 8.3 teraflops, or 8.3 trillion floating-point operations per second. Complex calculations that currently take a month to complete will

now be finished in a single day. "This system will allow our users to solve ever more complex problems with higher reliability and accuracy," says Scott Sudham, technical group leader of computer operations for the MSCF. "We're excited by the opportunity to provide more than 30 times the performance of what we currently have to our user base."

HP and Linux are no strangers to supercomputers. In fact, HP systems made up almost a third of the 500 most powerful supercomputers in the world when the latest biannual Top 500 Supercomputer Sites list ([www.top500.org](http://www.top500.org)) was released in November 2001. HP Superdome systems accounted for more than a quarter of the Top 500, and HP was the only vendor to place more



systems on the list than it had on the previous list. The PNNL supercomputer, however, represents HP's breakthrough into the very highest echelon of supercomputing power. When completed, it's expected to be the world's fastest Linux-based computer and to rank among the five most powerful supercomputers on the planet.



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HP and Intel are expanding the scope of the HP Intel Solution Centers in Cupertino, California and Grenoble, France to include the Intel® Itanium™ architecture. These centers provide customers with a place to test Itanium™-based solutions in a dedicated environment with a broad range of hardware and extensive technical, consulting, and application migration support. HP and Intel are collaborating with leading Independent Software Vendors and Systems Integrators to make Itanium™ - based applications a reality now.

## HP Intel Solution Centers expanding to include Intel® Itanium 2™ architecture

Customers looking for “proof of concept” engagements to explore the advantages of Intel® Itanium™ architecture as well as the added value of HP’s deep solutions expertise can realize immediate benefits such as increased price/performance, scalability, and multi-OS flexibility. If you would like more information on how the HP Intel Solution Centers can help your business, please visit our website at <http://hpintelco.net> or email us at [itanium\\_center@hp.com](mailto:itanium_center@hp.com).





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