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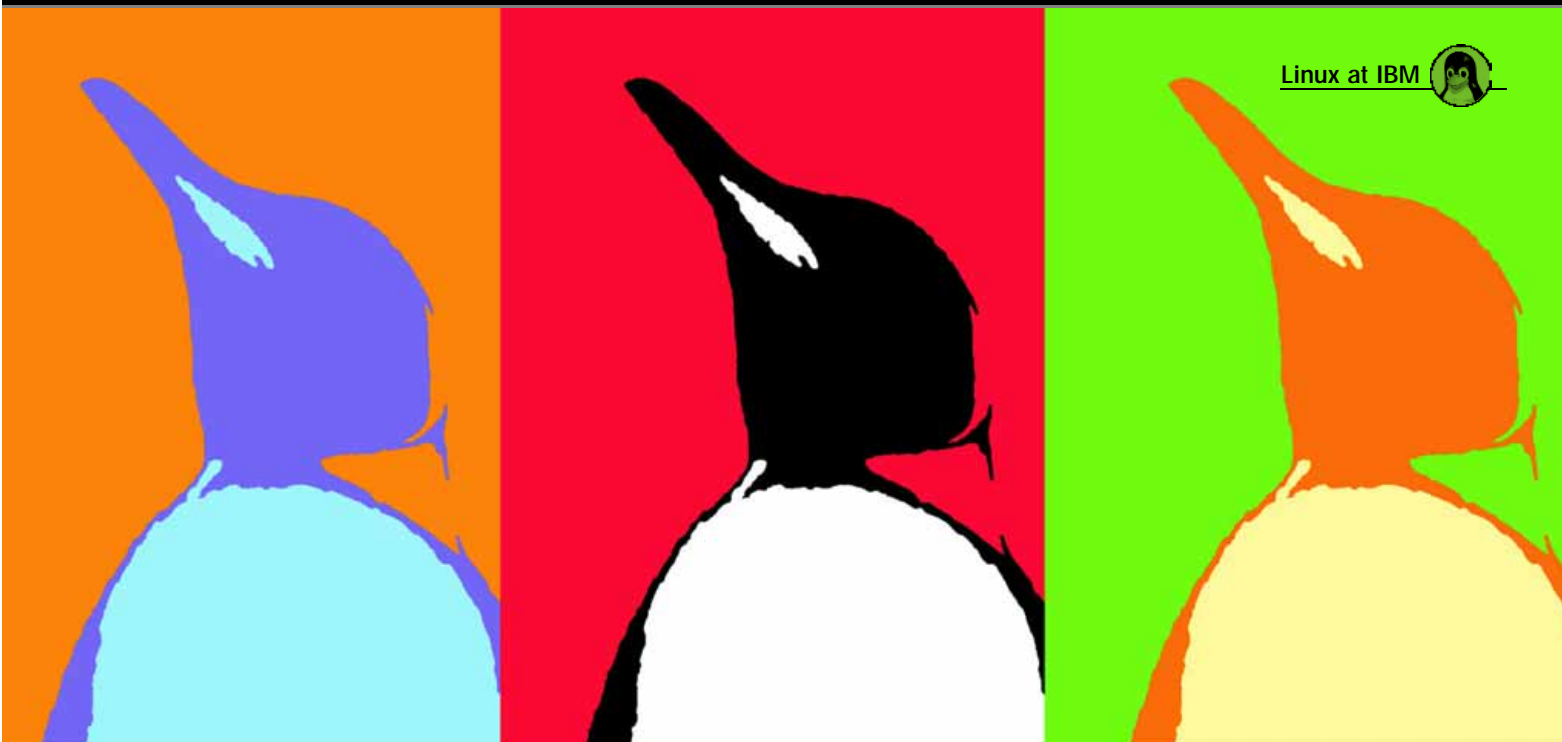
FEBRUARY 2004



# LINUX

Executive Report from IBM

Business and Linux in an On Demand World



Linux at IBM



# Linux on POWER

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# LINUX

Executive Report from IBM

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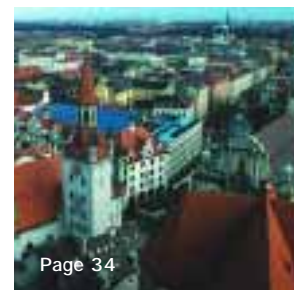
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# Linux: The Tip of the Iceberg

Welcome to the premiere edition of *Linux Executive Report* from IBM.

2003 was the year that Linux hit its stride, both inside IBM and in the marketplace. We see growing evidence that Linux is sweeping the market, much as we predicted it would three years ago when we came to our first LinuxWorld as one of the few commercial vendors to see its potential.

Now we are joined by all of you who share that vision.

In the three years since we first embraced Linux, we have signed the 100,000th developer to work with IBM to develop applications with our middleware. Red Hat v.3 is now supported across all of IBM's @server families. We also partner with Novell and SUSE LINUX, as well as Linux distributors in each geography. And we have signed agreements with a number of governments including those in the United Kingdom, Russia, China and Brazil, as governments around the world continue to accelerate their adoption of Linux.

The commercial sector has been swept along as well. A VARBusiness survey found that Linux is being used by roughly 20 percent of all corporations. In the embedded markets, Wind River Systems, who currently owns around 30 percent of the embedded software tools market, embraced Linux and joined both the Eclipse Consortium and the Open Source Development Labs. And Japanese cell phone service provider NTT DoCoMo urged its handset suppliers to build Linux-based cell phones to cut cost.

This is just the tip of the iceberg.

In this and future editions, we'll be giving industry analysts, our business partners and our customers a look at IBM's Linux plans and initiatives, our strategy, our new offerings and some Linux applications. We'll look at happenings in the industry. And we'll occasionally venture a look at what we think might lie ahead.

In this issue, we take a look at the POWER\* chip, and how Linux and POWER together provide unbeatable 64-bit performance at a remarkable price. Bill Zeitler, senior vice president and group executive for IBM Systems Group, tells us why customers have been adopting Linux so aggressively. Irving Wladawsky-Berger, IBM vice president of technology and strategy, talks about Linux and open standards. Walter Raizner, IBM country general manager for Germany, discusses the aggressive adoption of Linux by the German government. And Red Hat CEO Matthew Szulik discusses how Red Hat has extended its partnership with IBM, and shares his views on recent challenges to the GPL.

We also have a feature from Dee-Ann LeBlanc about the TOURCast application, hosted by Linux Virtual Services, which provides golf fans with PGA golf action and commentary online, in real-time—on demand. And we take a look at IBM BladeCenter\*, the remarkable speed at which BladeCenter and Linux have been selling into the market, and preview the new high-performance, low-cost JS20 POWER blade.

We hope this magazine will be an asset that will help connect you to the value of Linux, and to the world of open standards and on demand computing.

Jim Stallings  
General Manager, Linux  
IBM Corporation



# LINUX

Executive Report from IBM

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# Open for Business

IBM's Bill Zeitler explains  
the benefits of Linux open standards  
for businesses and governments

BY DAVID SCHOLES

*Linux has gained a strong foothold in corporations and in the government sector. To find out how the open source operating system is changing business and IT practices, IBM Technology Writer David Scholes sat down with IBM's Bill Zeitler, senior vice president and group executive, IBM Systems Group, for a one-on-one interview.*

**Q:** As CEOs look to IT more strategically, it's bound to change the relationship between IT and businesses. Is that happening? How has Linux contributed?

**A:** What we're seeing as a result of this move to open standards, Linux, Java\* and the like, is a shift in the relationship between business and technology. In the "old world" the ecosystems that arose were vendor-centric, built around core technologies and operating systems. These proprietary bonds created vertically integrated stacks built on Sun\* processors and Solaris, or Wintel platforms, for example. Businesses were forced to lock into an architecture, because breaking this proprietary bond was costly and disruptive. There was little flexibility for customers and business needs took a back seat to the latest "killer app."

The open movement changes all this. Now, we're seeing a very dramatic shift from an ecosystem where vendors called the shots, to a new ecosystem that's based on what businesses want to accomplish and what technology can do to reach those objectives.





No longer are companies locked into a particular architecture, program or vendor. The rise of standards is helping to fuel a new period of innovation.

**Q: As you work with customers, how do you see them using Linux? What degree of adoption do you see?**

**A:** We're seeing very strong adoption and that's validated by market research. IDC's most recent server track found that Linux server revenue and shipments both grew by about 50 percent year to year in the third quarter of 2003. That was the sixth consecutive quarter for growth and demonstrates the traction Linux has had in a variety of industries. In financial services, banks are using Linux to consolidate UNIX\* or Windows\* NT applications running on dozens of servers onto a single server. In life sciences, clients are clustering Linux servers to create supercomputers that deliver improved perfor-

the era of the open platform. This gives companies the ability to develop where it makes sense and deploy where they choose. Because of access to new applications, and because it can cost one-fifth as much to deploy, customers find Linux a compelling reason to go in a new direction. This substitution wasn't made possible by the hardware; it was unlocked by the open movement.

**Q: How has Linux changed the way governments operate?**

**A:** We've seen an incredible adoption of Linux by governments around the world. They realize that open standards can help make technology more accessible to their citizens and Linux's low price is attractive to all levels of government. Government agencies have discovered it's easier and cheaper to have clients get information or apply for permits and licenses on the Web. And, if you're running on the Web,



**“No longer are companies locked into a particular architecture, program or vendor. The rise of standards is helping to fuel a new period of innovation.”**

—Bill Zeitler, senior vice president and group executive, IBM Systems Group

mance at half the cost. Hollywood animators are running Linux on blades and workstations to create astounding visual effects on demand and under budget. Those are just a few examples. It's safe to say that Linux has had a profound impact on businesses in every industry.

I believe we've moved into a new phase of adoption. A couple of years ago, companies were running pilots to determine whether Linux was for real: whether it was secure, stable and could deliver the expected cost savings. In large part, those tests were successful, and today we're seeing companies putting Linux to work in their enterprise and looking for ways they can expand it into new areas. They also see Linux as a tool for integrating applications across departments or geographic boundaries so they can take advantage of economies of scale.

**Q: How has Linux changed the way companies operate?**

**A:** It's absolutely clear that the developers and systems of this movement, like Linux, Apache, the protocols of the Internet and the Global Grid Forum, have achieved critical mass. The era of the proprietary platform is giving way to

there's an excellent chance that you're running Linux. Worldwide, more than 150 IBM government customers—including agencies in France, Spain, the United Kingdom, Australia, Mexico, the United States and Japan—have embraced Linux to save costs, consolidate workloads, increase efficiency and enact e-government transformation, and we believe this is just the beginning.

**Q: Does this mean companies and governments are making fundamental changes to their computing model, or is Linux used mainly to cut costs?**

**A:** The answer is both. Clients have been able to lower costs through consolidation. Nowhere is that more apparent than with the mainframe. We've worked with more than 600 clients worldwide to consolidate workloads from dozens of servers onto one mainframe running Linux in logical partitions. In fact, since we Linux-enabled our mainframes, Linux now accounts for about 20 percent of our capacity shipments. And we're seeing similar traction among iSeries\* operations, with more than 80 Linux solutions available from a variety of

independent software vendors (ISVs).

It's also clear that companies and governments are integrating their IT infrastructures around Linux and they're using Linux to provide universal access to applications no matter what server or architecture they run on. That's what we're doing inside IBM as well. We now have more than 3,500 servers inside IBM that are capable of running Linux. Mission-critical applications that run Linux include the IBM Web site, support of IBM's new \$2.5 billion 300mm chip manufacturing facility and applications supporting more than 300,000 IBM employees worldwide.

In addition, IBM hosts Web sites for many of its customers on Linux, including Wimbledon, the U.S. Open, the French Open and many other sporting events. There are now more than 50,000 Windows and Intel\* developers actively creating Linux-based applications that run on IBM software, includ-

2,000 developers register to build applications for Linux. The collaboration of the open community is generating new innovation and in the process generating new opportunities for customers.

It's clear to us that large-scale consolidations will continue. We also expect to see an expansion in blade servers as they replace racks of Intel-based servers to run front-end and Web applications. From IBM's perspective, we're offering more choices in deployment, by introducing IBM @server BladeCenter\* JS20 with 64-bit POWER\* PC blades—especially well suited for 64-bit high-performance computing environments. We'll likely see an expansion of Linux clusters for supercomputers. There were more Linux cluster systems (188) on the most recent TOP500 Supercomputer list than any other type of system, and there's every indication that the number will continue growing.



ing WebSphere\*, DB2\*, Lotus\* and Tivoli\*. These developers have created more than 6,500 Linux-based applications for IBM software alone, not to mention other software. Two-thirds of these new Linux-based applications are being created by corporate developers, signaling that more and more businesses are making the move to Linux. One-third is being created by ISVs.

**Q: What can we expect in the future? Continued growth? New applications? New markets? New products?**

**A:** Industry analysts are forecasting continued growth, with Linux server shipments expected to accelerate faster than any other operating system. Beyond that, we see our customers embracing Linux as never before because of the freedom it gives them to choose their architecture based on the needs of the application, rather than being tied to a single platform.

We expect this to continue. In November, IBM's Linux efforts reached a milestone as we registered the 100,000th developer working with IBM software to create Linux-based applications. In fact, every month, an average of

Linux is also an essential component to the flexibility that's being offered to clients. For businesses that don't want to own and operate parts of their IT infrastructure, Linux is helping to make available supercomputing on demand, in which businesses buy the processing power when they need it depending on their business model. For transaction processing, Linux Virtual Services is a similar concept that allows a company to tap into mainframe capabilities without having to buy the hardware.

There's no doubt in my mind that Linux and the open movement have had an enormous impact on our industry. I don't see any reason why this won't continue as business and governments around the world take advantage of innovative, cost-effective solutions built around this idea of standards, flexibility and customer choice.

*David Scholes is a technology writer who works in executive communications for IBM. He is a former award-winning broadcast journalist with 15 years of experience in television and radio. David lives in Dutchess County, N.Y., with his wife and two children.*



L i n u x o n  
POWER

Look out Batman and Robin—  
Here comes the dynamic duo of Linux  
and IBM's POWER chip

BY JIM UTSLER



# M

ore and more, companies are looking for less expensive, more easily managed, scalable and stable platforms for their IT strategies and infrastructures. They want a choice of vendors, they want to stamp out their security problems and they want to fuel innovation.

Hence the growing interest in Linux, the fastest growing operating system in the world, according to IDC. In 2002, Linux had 2.8 percent of the desktop space and 23.1 percent of the server market—and its market share continues to grow dramatically. “Companies are adopting Linux far faster than any other operating environment on the market,” says Brian Connors, IBM’s vice president, Worldwide Linux on POWER\*. “Linux is growing market share somewhere in the neighborhood of 30 percent annually.”

In recognition of customers' needs for a highly secure, low-cost and scalable IT platform from which they can spur innovation and growth, IBM has become a leading proponent of Linux. IBM has ported all of its middleware families to Linux and, working with some of the leading Linux distributors, has optimized Linux to run across all of its IBM @server families. Now, the 64-bit POWER chip is available on the BladeCenter\* JS20, which supports both SUSE LINUX and Turbolinux.

POWER chips have a presence in nearly every type of computing platform, from game machines to blade servers to supercomputers. "Our ultimate differentiator is competitive pricing married to the performance, reliability and the scalability of the POWER architecture," Connors says. "Now, with Linux on POWER, we have everything we need to match our customers' requirements."

### The Power of POWER

IBM's POWER chips have a long and venerable history, with development beginning in 1989 and the first commercial POWER-based system, the RS/6000\*, shipping in 1996. This history of development, improvement and deployment has continued since, with the POWER chip now being found in two of IBM's most popular servers, including the IBM @server pSeries and iSeries servers. "We've proven ourselves in both the 32-bit and 64-bit environments," says Connors. "And more and more customers are choosing POWER-based server technologies, like our @server pSeries, to run their mission-critical infrastructures."

This is hardly surprising, given POWER's robustness and backward-compatible computing environment. For example, POWER is well known for not only 64-bit compatibility, but also 32-bit compatibility. HP's Itanium 2, on the other hand, imposes restrictions on 32-bit computing. In fact, x86 code can only be run on Itanium 2 boxes running Windows\* Server 2003, Linux or HP-UX. The only other way to provide 32-bit compatibility for other Windows platforms is to run an included hardware emulator, which creates significant performance problems. In order to take full advantage of the Itanium 2's 64-bit processing while truly achieving high performance, 32-bit applications must be recompiled.

POWER is proving to be the microprocessor of choice for customers who need the highest levels of memory and performance in small devices and technologies. POWER licensees ranging from cash-register manufacturers to desktop computer developers, including, most notably, Apple (whose PCs run on POWER) use POWER. In fact, Apple, which uses the POWER 970 in its new line of G5 desktop computers, helped

Virginia Polytechnic Institute and State University (otherwise known as Virginia Tech) take the third spot on the latest list of the top 500 supercomputers in the world.

Consisting of 1,110 dual-processor G5s, with each processor running at 2 GHz and topping out at 10.28 teraflops per second, the Virginia Tech supercomputing cluster (which has been affectionately nicknamed Big Mac) was bested only by the Los Alamos National Laboratory in Los Alamos, N.M., and the Earth Simulator Center in Japan. The total hardware cost? Just more than \$5 million.

And then there's IBM's Blue Gene supercomputing project, which is based on IBM's microprocessor technologies. The microprocessor chip created for Blue Gene is providing IBM's researchers with a vision for next-generation POWER chip roadmaps. When fully completed, Blue Gene is expected to be four times faster than the Earth Simulator Center's supercomputer at a third of the cost. At the Supercomputing Conference in Austin, Texas, in November, IBM demonstrated 1/128th of the Blue Gene system, and it's already among the top 100 supercomputers in the world. Yet, unlike all other supercomputers, which are incredibly large, Blue Gene is small enough to slide under a desk. And it runs on Linux.

Of course, these are the more notable applications of POWER. But the technology also scales down, powering everything from PDAs to laptops to gaming devices, including those from Nintendo and Sony. It's clear that other, related companies have taken notice of POWER—and the POWER chip base is becoming pervasive. As Connors notes, "Versus HP's Itanium 2, which has shipped maybe 10,000 units, we're dealing in millions of units shipped, with applications ranging from game machines and embedded devices all the way up to supercomputers. We've more than proved the robustness of the POWER architecture."

At least one reason is its demonstrated savings in total cost of ownership, especially as it pertains to server consolidation. Both the IBM @server pSeries and iSeries servers allow users to run LPARs of not only the core operating systems (AIX\* and OS/400\*), but also instances of Linux. Customers using LPARs can effectively eliminate extraneous boxes running Linux and the administrative costs that go with them. Over five years, for example, pSeries customers can save, according to some estimates, 25 percent to 56 percent on hardware, software, maintenance, personnel and facilities costs when compared to competitive approaches by using LPAR.

"That's one of our three core plays when we're talking about Linux on POWER," says Connors. "First, we have Linux on the current @server, whether on a bare box or in a logical parti-

tion, driving consolidated workloads to Linux. Then we have scalability, both in terms of Linux and POWER, from embedded applications to supercomputers. And, third, we'll be introducing Linux-optimized, 64-bit POWER architectures at the price points of Intel's 32-bit architectures. That's the no-excuses robustness of POWER with the economics of Intel."

The JS20 BladeCenter, for example, with a starting price of \$2,699 per blade, is the lowest priced POWER-based server available on the market. Aimed at a wide range of customers, it takes advantage of POWER-based, 2-way symmetric multiprocessing and has a base memory of 512 MB. This announcement creates both a powerful and more economical solution for many customers considering consolidation, as Connors explains. "You can run an HS20 Intel-class Blade alongside a JS20 POWER-based Blade both running Linux or run the Intel Blade with Windows with a JS20 running AIX," he says. "So you can consolidate on a server consolidation plate inside this BladeCenter without having to change all of your operating environments. Then, over time, you can converge on a single operating environment to lower costs. In the best case scenario, this environment would be Linux."

### A Step Up

This philosophy of choice is, of course, a key notion behind the entire Linux on POWER effort. With increasing numbers of customers switching from whatever flavor of UNIX\* to Linux, as evidenced by the IDC Linux server numbers, IBM has decided to capture its share of the growing Linux-loving market—and the opportunity to do so has never been better. According to Connors, "We're seeing a phenomenon at the entry level, where Linux is gaining strength in the Intel world, including the xSeries\*, and taking away share from low-end entry Sun\* and HP business. We're trying to



"Our ultimate differentiator is competitive pricing married to performance, reliability and the scalability of the POWER architecture. Now, with Linux on POWER, we have everything we need to match our customers' requirements."

—Brian Connors, IBM's vice president,  
Worldwide Linux on POWER

aggressively address that market shift." To some degree, this is already being accomplished across the entire IBM @server line, including iSeries, pSeries, zSeries and the Intel-based xSeries servers—all of which are capable of running Linux.

Indeed, IBM's xSeries offering, although not based on the 64-bit POWER, is part of IBM's larger goal of providing choice. As customers—UNIX or otherwise—begin transitioning to Linux, they can find any number of offerings that support it. So, for example, if a Windows user wants to move to Linux but maintain a 32-bit environment, the user can do so using the Intel Xeon-based xSeries or

the AMD Opteron-based 32-bit/64-bit @server 325. Similarly, UNIX customers operating in a 64-bit environment can easily transition to the pSeries or iSeries servers, or the new BladeCenter JS20.

Linux on POWER clearly adds another choice for customers because it allows Linux users to take advantage of POWER's proven 64-bit architecture. This is one area where IBM has an advantage, with POWER's proven history of openness, pervasiveness and scalability. "When companies are transitioning from UNIX, many of them are looking at Linux as the most likely alternative," Connors remarks.

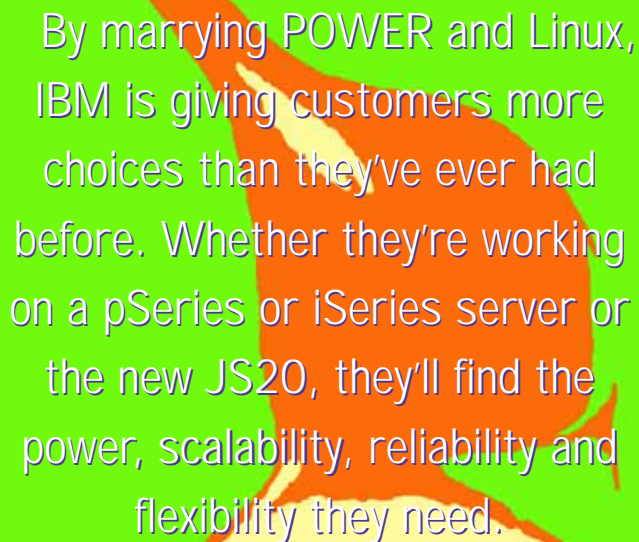
This point becomes particularly important when one considers that Linux continues to scale at voracious rates. It's becoming an enterprise-class operating system, assuming increasingly larger workloads, as evidenced by its presence on the zSeries, iSeries and high-end pSeries servers. "And not only is Linux growing," Connors adds, "but so is our POWER-based pSeries product line, which continues to ship in greater amounts quarter after quarter. This might sound self-serving, but it's actually not. We're putting a lot of effort into accelerating the robustness of Linux on POWER, not just for ourselves, but also for the larger open source ecosystem."

As proof of the power of Linux on POWER, IBM is focusing on the high-performance environment, such as seismic activity and life sciences. In fact, in addition to announcing the JS20, which will be available in the March time-frame, IBM also announced the @server BladeCenter for Bioinformatics, which has been positioned as an integrated solution for high-throughput environments involving research in life sciences. Already, popular sequence-analysis applications such as BLAST, FASTA and HMMER have been ported to and tested on this version of the IBM @server BladeCenter JS20.

Perhaps more interesting from a here-and-now perspective is the recent announcement that the Library of Congress, with the assistance of the University of Washington, Rutgers University and the Georgia Institute of Technology, has chosen to use four POWER-based pSeries servers running SUSE LINUX Enterprise Server to host its Moving Images Collection. The goal is to create a single reference directory and catalog of moving images, including film, video and archived television broadcast collected at a host of museums, broadcasting organizations and other relevant locations, that's accessible via an Internet database.

Partially funded by the National Science Foundation, the three universities will collaborate on the final solution, which will be the largest collection directory and union catalog of moving images in the world. The universities of Washington and Rutgers are responsible for designing and developing the image directory and the catalog databases of the digitally stored images. George Tech will be developing the interactive Web portal, which includes a search engine and display capabilities.

This collaborative group could have gone with Linux on Intel—or even a Windows-type solution—but it was convinced that Linux on POWER was the best way to go, citing



By marrying POWER and Linux, IBM is giving customers more choices than they've ever had before. Whether they're working on a pSeries or iSeries server or the new JS20, they'll find the power, scalability, reliability and flexibility they need.

its openness, availability, flexibility and scalability. As Jim DeRoest, assistant director of university computing services with the University of Washington, explains, "We've all had experience with POWER-based hardware since the first RS/6000, so we were very comfortable with that decision. And as far as Linux goes, it just seemed like a natural fit, allowing us to keep costs under control and leverage open source applications.

"In addition," he adds, "changing hardware and software configurations on Intel platforms is an issue with Linux distributions. With the pSeries and POWER technology, we know that the architecture

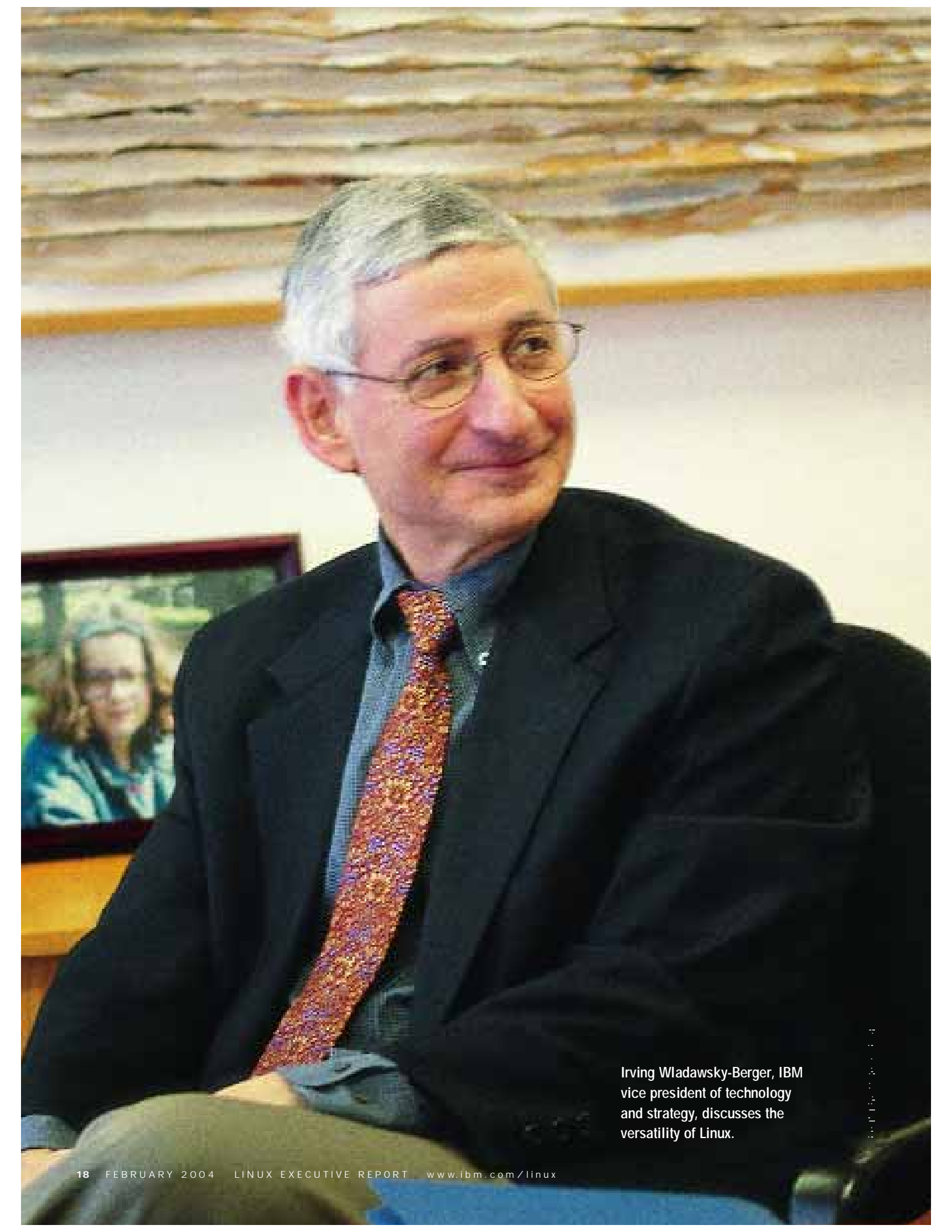
is going to remain largely the same from model to model. So if we buy a new machine in a year or two, the hardware configuration will remain the same and the Linux system we're using now will still work a year from now, without the need to add additional Linux drivers."

### Give Customers What They Want

By marrying POWER and Linux, IBM is giving customers more choices than they've ever had before. Whether they're working on a pSeries or iSeries server or the new JS20, they'll find the power, scalability, reliability and flexibility they need. As Connors succinctly explains, "We've taken a lot of our technologies and architectures down from the high end and midrange to our Intel-based xSeries. And we're doing the same for Linux on POWER, and that's where we'll ultimately drive differentiation. We'll be there at cost and then bring in the performance, reliability and the scalability of the POWER architecture and Linux."

Jim Utsler, *MSP TechMedia senior writer, has been covering the technology beat for nearly a decade. He can be reached at [jjutsler@provide.net](mailto:jjutsler@provide.net).*





Irving Wladawsky-Berger, IBM vice president of technology and strategy, discusses the versatility of Linux.

PHOTO: JEFFREY M. HARRIS



# Linux

Helps Connect  
the World

IBM's Irving Wladawsky-Berger  
on the worldwide allure of Linux

BY RAYME JERNIGAN

IBM is known for predicting the next disruptive technology and putting it to work for customers—solving business problems and giving them the jump on their competitors. Part of IBM's success has been its ability to identify and back these key trends long before they enter the product phase.

For years, Irving Wladawsky-Berger, IBM vice president of technology and strategy, has been

instrumental in making these calls for IBM in areas like the Internet, Linux, grid computing, Web services and the importance of on demand business. We recently caught up with Dr. Wladawsky-Berger to get his views on why Linux has been so well received, on the tension between open standards and proprietary solutions and on where he thinks the next inflection points in information technology might be.

**Q: Last spring, Nicholas Carr famously stated in the Harvard Business Review that IT doesn't matter. What's your view?**

**A:** I believe that IT matters more than ever. The question really is, "Where does it matter?"

I think that if one tries to innovate by going over the same ground that's been worked on over and over for the last 10 or 20 years, it's fair to say that there may not be as much opportunity for innovation. For example, relational databases have been around for a long time. If the focus of the innovation effort is a better relational database, it may be tough to make a significant contribution.

But I think the real opportunity for innovation in IT—where the bulk of the innovation is happening—is in building all kinds of new applications in business, in science, in healthcare, in government and in education, all throughout the economy and society.

In business, especially, the need for innovation is rising because of all the fiscal, regulatory and competitive pressures that companies are under. IT is pretty much the only road open to those trying to satisfy that need. And, because of the tremendous advances in technology that we are continuing to see, business and other institutions will, I think, experience a growing wave of innovation focused on new, much more useful, efficient and faster applications.

**Q: Do you think that these advances in IT are driven by open standards?**

**A:** Absolutely! The most important lesson the Internet taught us is how much more useful and powerful information technologies are when they are all connected and working together. That's only possible when technologies are built to commonly accepted open standards.

As IT is infused deeper and deeper into business, into government and into every other institution, it has to work with everything. It has to work with older equipment, with new equipment—even with equipment that hasn't been invented yet. It has to work with capabilities from all vendors. The only way to achieve that kind of connectivity and integration is by embracing open standards across the board.

**Q: What role do you feel Linux plays in increasing connectivity between enterprises and research groups and other entities?**

**A:** Well, in the world of connectivity and integration, Linux is increasingly playing the role that, let's say, TCP/IP plays in networking. That is, Linux is the only operating environment that works across every single architecture, that works everywhere.

If a business wants to be sure that its applications are supported everywhere, all you need to do is make sure they run on Linux. That's your assurance that they can be ported to

every single platform, because Linux runs on every platform. So it has the incredibly important characteristic that TCP/IP, HTML, XML and other major Internet technologies have; it works everywhere and, therefore, facilitates connectivity and collaboration.

**Q: Governments often tend toward conservatism and aren't really exposed directly to market forces. For example, if the German government is more responsive to its citizens (its customers, so to speak) than the Canadian government is to its people, the Canadians don't all move to Germany. Yet governments around the world are leading Linux adoption in many areas, particularly on the desktop. Why do you think that is?**

**A:** Well, there are some very important reasons. I think governments realize that IT is becoming a critical infrastructure for research, education, healthcare, economic development, security and other major government responsibilities. It's becoming as critical an infrastructure as the highway system, the electricity grid, the telephone and public transportation.

When something becomes that vitally important to a nation and its citizens, governments really want it to be based on open standards so it's more easily articulated and more easily accessible to everybody in the country. And Linux certainly displays that characteristic. By building their critical IT infrastructures around Linux, governments are assured of a large, talented pool of skills because of the Open Source community around Linux. That gives them access to the best and brightest, not just in their country but around the world, to help support that critical infrastructure.

**Q: Platforms built on open standards interoperate with everything, including closed platforms. But closed architectures and platforms tend to keep to themselves. Wouldn't you think that means that in the end closed platforms win? That seems to be what happened on the desktop.**

**A:** In my experience when an open standard, an open capability, achieves widespread adoption, it will usually trump a proprietary technology. That happened with TCP/IP, for example. Initially it was used only in research applications, but it became better and better, eventually supplanting other, more mature networking capabilities like IBM's Systems Network Architecture. Of course, TCP/IP is now the standard.

I think we see a similar trajectory with Linux. As it becomes better and better, it's being embraced in more and more places at the expense of some proprietary technologies, and I would expect that to continue.

Now, that doesn't mean there will be no room for proprietary technologies. For a number of reasons, proprietary technologies will continue to be used. That's because, in some cases, customers already have substantial investments in

legacy systems. In other cases, Linux may not be ready to handle some workloads that proprietary technologies do—big SMP and mainframe-class applications, for example. But I'm very sure that Linux and other technologies based on open standards will continue to grow.

**Q: Let's talk about grid computing for a moment. One view of the end point of grid computing goes something like this: open standards, autonomic and on demand computing converge to make the Internet a global compute and storage resource, seamlessly accessible to end-users through Web services. And those end-users will get the service and the quality of service they need, on demand. Everything will just work. Do you share this very positive view? If so, why? If not, why?**

**A:** Let me give you a somewhat simpler view. The World Wide Web enabled us all to access content so we could share information over the Internet.

Grid computing allows all the multiplicity of systems out there to share resources, to access information and to access applications. That's why grid is becoming such a powerful force in the industry: It's taking the Internet to the next level, putting all—and I emphasize all—of that capability to work in increasingly shared, increasingly sophisticated applications.

Now, grid is doing very well, especially in the research community and disciplines like life sciences. Likewise, universities and governments are building more and more grids to share resources. But grid is also moving into the commercial world. In the commercial world, it is providing the common protocols that enable commercial middleware, like WebSphere\* and DB2\*, to make better use of shared distributed resources and collaborate with all other relevant software out there.

And in so doing, it's making businesses more efficient and faster. That's because, with grid, the infrastructure is increasingly optimized and applications are executed faster, saving money, saving time and increasing customer satisfaction.

**Q: You've established an enviable track record of predicting the big inflection points in information technology, and then helping IBM capture the opportunities those inflection points create. You were instrumental in mobilizing the company to adopt the Internet, for example, as well as Linux and grid**

**computing. Now you're involved in preparing businesses to compete in an on demand era. What else do you see on the horizon? What's the next big inflection point?**

**A:** Well, I see a number of important major capabilities coming on. For example, in on demand, a major objective is to allow business processes to be expressed in terms of modular business components that can then be brought together in very flexible, very dynamic ways to better support the business, to make it more productive and to accelerate innovation. That's a major, major capability that's coming.

We've seen huge advances in supercomputing. For example, at the most recent supercomputing show, we demonstrated the first stage of Blue Gene, which promises to take supercomputing to a whole new level and revolutionize disciplines like life sciences.

We see technologies being integrated into the very fabric of business in ways that could alter fundamental business relationships by creating "industry ecosystems" that make the best business processes available to large and small businesses alike. That integration could even influence the structure of the economy, creating "economies of expertise" that offer companies competitive differentiation based on unique expertise and efficiencies of scale.

We see the Internet becoming increasingly intelligent through access to growing volumes of information combined with the application of sophisticated search techniques and semantic analysis.


Finally, we see our interaction with all this information technology becoming much more human-friendly, so to speak, by being much more visual, much more based on sight and sound, which is how we humans like to deal with the environment.

I am convinced that a tremendous amount of innovation will be enabled by the advance of technology in the coming years.

*Rayme Jer nigan is a technology analyst living in the Research Triangle Park area of North Carolina. He was the founder and first elected president of the Triangle Java\* Users Group, and has published various articles, interviews and essays about Java and Linux-related technology. He is the managing editor of the IBM Corporate Linux Web site, Linux Line newsletter and IBM Linux Executive Report, from IBM.*

**"As (Linux) becomes better and better, it's being embraced in more and more places at the expense of some proprietary technologies, and I would expect that to continue."**

**—Irving Wladawsky-Berger,  
IBM vice president of  
technology and strategy**



# Moving FORWARD

Red Hat Enterprise  
Linux becomes a  
driving force in  
Open Source  
communities





BY RAYME JERNIGAN

Linux Executive  
Report, from  
Managing Edi

Jernigan recently caught up Szulik, CEO, Red Hat, to discuss his relationship with the Linux provider. In the following Q & A, Szulik discusses the evolution of Red Hat Enterprise Linux and the continued expansion of the North Carolina-based company, and its product line, into the global marketplace.

**Q: IBM recently expanded its already deep relationship with Red Hat to provide full support of Red Hat Enterprise Linux v.3, as well as packaging versions of your offerings on xSeries\* and BladeCenter\*. What does this deeper relationship mean for our customers?**

**A:** We're very pleased with the development of the Red Hat Enterprise Linux v.3 product line for both the commercial market and the federal marketplaces. The IBM team of engineers contributed significantly to the functionality that went into this product, and I'm sure that the engineers were representing the needs of IBM customers. This was an important development process that we went through together.

Secondly, Red Hat Enterprise Linux now runs on nine different computing architectures, so IBM customers now have a standard operating system platform to run the smallest of machines all the way up to the high-end zSeries\* server. This helps solve some of the growing issues that many enterprise customers are faced with around security, ease of management and, perhaps most critically, continuing to drive down the cost of maintenance as they build out globally distributed computing architectures.

**Q: Red Hat is successful in the market today, but how does Red Hat plan to scale its**



**business model to, say, \$200 million and beyond?**

**A:** The \$200 million is right in front of us. One of our goals is to become the defining technology company of the 21st century. We want to continue to really listen to the issues that customers have voiced to us as we try to move the industry forward to areas around open source and an Open Source Architecture. Red Hat will continue to develop software in tandem with the Open Source community around computing infrastructure—operating systems and middleware—which will be delivered as a service through our management technology called Red Hat Network. We are confident that this low-cost, high-value proposition to the customer will drive growth beyond \$200 million.

Our marketplace is nascent. We see the international expansion continuing to be a key growth driver for the company. Countries like China, India and Latin America are really green field opportunities for our company. As we look into the future for our business needs, we will continue to look to develop areas in the technology strata that are right for commoditization, where, in conjunction with an Open Source community, we can accelerate the time to market with affordable solutions.

**Q:** You mentioned the Open Source Architecture—I believe you recently announced a statement of direction detailing where you're going with that. Could you review your reasons for laying this out, and update us on your progress?

**A:** Sure. We felt it was critical, as Red Hat moved into the enterprise computing marketplace, to be able to offer customers a statement of direction that went beyond the development of an operating system. It's clear that, as customers are now migrating from legacy environments and client/server architectures, they're looking to build a computing architecture based on neutral, vendor-independent standards. Customers want to have access to source code and want to be able to accelerate the development of functionality while not being tied to the traditional vendor product development schedules.

When talking with customers about some of their challenges in making this migration, they continue to tell us that they're in favor of the transparency and the benefit of customer choice that this transparency delivers.

**Q:** When all is said and done, how does your plan to develop an open source stack help customers solve business problems? Will IBM have a role to play in all this?

**A:** Absolutely. IBM was an original investor in Red Hat and clearly has a significant role in our global business. What you're seeing is that as customers now are recognizing the benefit of an open source stack on a commoditized hardware platform, they're able to achieve unprecedented levels of cost

savings, but important performance improvements. Improvements in the reduction of costs associated with the maintenance of these systems.

**Q:** Grid computing is an important part of IBM's on demand strategy. What role will grid computing play in your Open Source Architecture plan, and what are your thoughts in general about grid computing?

**A:** Well, we're hearing quite a bit of it, starting in the scientific arenas, starting into the compute-intensive environments, like oil and gas. We expect that to move into the broader markets over the next 12 to 18 months. We clearly see grid, which has had a strong footprint in open source with the Globus Project, to continue to be important as a part of our Open Source Architecture story. Significant work around SMP scaling, which Red Hat and IBM collaborated on, is moving us closer to the vision of on demand computing.

**Q:** The Fedora Project is generating a lot of buzz in the industry. Could you tell us about the project and its purpose?

**A:** I'm glad you asked that question. The Fedora Project is Red Hat's opportunity to accelerate the development of new functionality in conjunction with the Open Source community. The community likes to develop often and release often, in short development and rapid release cycles. The Red Hat Enterprise release has a longer release cycle and delivers a certified and more tested release while optimizing the applications like DB2\* and WebSphere\* on the Red Hat Enterprise Linux platform.

Red Hat is committing substantial development resources and development effort to make sure that Fedora becomes a valued, free offering for open source contributors.

**Q:** Several new players have announced plans to deploy Linux on the desktop. What are your near-term plans for the desktop and what are your longer-term plans?

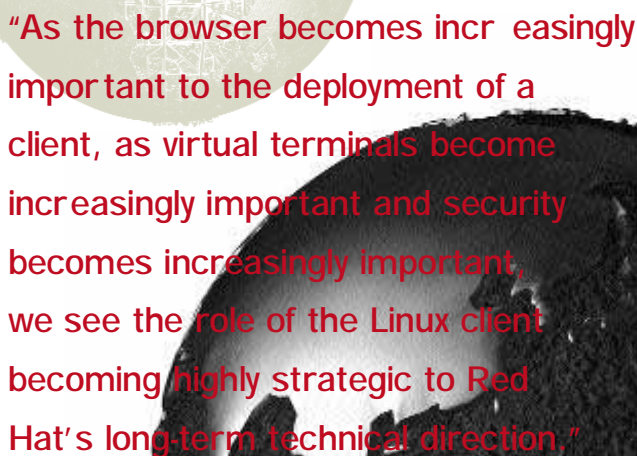
**A:** The desktop means many things to many people. Internally, we focus on both the Linux client and the back-end infrastructure in support of the client. I think what cus-





tomers have been telling us is that as they've evaluated the increasing cost of servicing the current Intel\* client marketplace, there's either too much functionality or too little use of this function, while the management of this environment is expensive and difficult. Security for the client is an example of such a problem.

So we've been listening and developing alternatives. As the browser becomes increasingly important to the deployment of a client, as virtual terminals become increasingly important and security becomes increasingly important, we see the role of the Linux client becoming highly strategic to Red Hat's long-term technical direction.



**"As the browser becomes increasingly important to the deployment of a client, as virtual terminals become increasingly important and security becomes increasingly important, we see the role of the Linux client becoming highly strategic to Red Hat's long-term technical direction."**

*—Matthew Szulck, CEO, Red Hat*

The issue is not function today. The issue is really finding the value equation for the customer that helps them to move out of the lock-in that they've experienced in such areas as mail servers, messaging servers and content servers, and creating function that's available to make sure that there's synergy between the client, the back-end processing and the back-end service environments, while delivering value that's worth their investment in a completely vendor-neutral environment.

**Q: Red Hat Enterprise Linux v.3 was announced in the third quarter of last year. Has this release met your expectations, from a quality and acceptance standpoint?**

**A:** I think you're asking the wrong guy because, as people would tell you at Red Hat, I'm never satisfied. I think that we have to look at this on a regional basis. I think that you've certainly seen very strong uptake and improving cooperation

between the North American channels of distribution. I think we're starting to see very good progress being made across the EMEA marketplace. I expect to see that ramp-up occur within the Asia Pacific and the Indian marketplace in the current first and second quarter of calendar 2004.

We've been very pleased with the growing support that Red Hat is receiving, both technically and from a service and marketing and distribution relationship with IBM, and I expect that will only continue as we get into more global markets together.

**Q: What's your response to people who have questioned validity of the GPL and raised concerns about intellectual property issues surrounding Linux?**

**A:** Well, Red Hat has been in business developing software under a GPL license for over 10 years now, so when I look back at our experiences, we have continued to live with this question mark and thrived by continuing to develop technology that we believe is more improved, more reliable and more secure in collaboration with the global Open Source community of developers.

The irony is that as the community of developers continues to expand, the technology becomes more robust. But I believe most importantly, from a customer's perspective, the testing and inspection that Red Hat does during product certification is part of our unique value-add. It ensures that the technology that we put into a customer's environment is respectful of intellectual property rights, copyrights and trademarks, et cetera.

I don't personally believe that the genie will ever get put back in the bottle. I believe that this movement is no longer a product movement; it's an opportunity for governments to be able to improve the technical proficiency of their economies to create jobs.

Countries that missed the technology boom of the last 50 years see the low cost of commoditized hardware and Linux as a way to elevate standards of living by giving their people low-cost computing platforms to access the Internet and create sources of commerce. I believe that the role of open source, and certainly companies like Red Hat and IBM, will continue to play a very large role in moving the technology paradigm forward and not looking retrospectively to a model that really did not deliver sustained value to customers.

*Rayme Jer nigan is a technology analyst living in the Research Triangle Park area of North Carolina. He was the founder and first elected president of the Triangle Java\* Users Group, and has published various articles, interviews and essays about Java and Linux-related technology. He is the managing editor of the IBM Corporate Linux Web site, Linux Line newsletter and Linux Executive Report, from IBM.*

# TOURCast

A Real-Time Golf Coverage Application on Linux

ShotLink and TOURCast connect spectators to the PGA TOUR tournament

BY DEE-ANN LEBLANC

Many Internet-connected golf enthusiasts are keenly aware of TOURCast, the PGA TOUR's real-time window into every happening on the course. Any system administrator who thinks about what must be involved in developing and hosting such a tool begins to quickly appreciate its complexity. Here's an application that can be idle one day and accessed by tens of thousands the next.

Traditionally, the only solution to such a task is to build a collection of servers that you hope can handle the maximum predicted traffic, and then a bit more. Most of the time, that

system would be idle—a massive waste of money in reserved bandwidth and hardware. This is on top of the trouble of keeping users up to date with the very latest information about what's happening on the course.

There's a saying in fiction that the writer must keep asking how things could become worse for our heroes. How about having only a limited time with which to implement a cost- and resource-effective, friendly-to-use, comprehensive and stable solution to the problem of offering tracking, analysis and commentary for an entire golf tournament online—in real time?





PGA TOUR fans and the media can get real-time progress information and statistics on tournament participants through PGA TOUR's TOURCast, without having to walk 30 acres.



This accomplishment is, in fact, no fiction, although it had a solid base to build on rather than having to start from scratch. Visit the TOURCast site to see the results for yourself ([www.ibm.com/linux/pgatourcast.html](http://www.ibm.com/linux/pgatourcast.html)).

## In the Beginning

Until 1983, PGA TOUR golf tournaments were tracked manually. The first scoring technology was introduced that year by the TOUR, bringing 13 electronic scoreboards onto the course. These new scoreboards were a big hit with the fans, offering up-to-date scoring and other significant information. As is the case today, golf fans had to decide whether to wait at one of the 18 holes, follow one of the more than 150 golfers for 30 acres or more—allowing television and radio sports announcers to select who to cover at each particular moment—or hang out by one of the scoreboards to try to follow everything. Even with this new technology, the scores were still captured manually.

This system allowed information to move far faster than the old way of doing things, but there was room for improvement. The electronic scoring process was streamlined and extended through the rest of the 1980s, but by the early 1990s the PGA TOUR realized that to really capture the best benefits technology could bring them, they needed a technology partner. Their decision? Call in IBM.

These days, mentioning an information-sharing application that needs to offer access to as many people as possible almost immediately brings up the Internet. Although such a network existed in the early 1990s, it was still primarily the domain of researchers, students and other early adopters. The focus at that time was on local networks, so the initial IBM solution involved bringing 100 computers onto the course and networking them. For the first time, the TOUR was able to offer their broadcast partners an automated feed of information for the telecast. Outside of the broadcast compound, these computers allowed fan and media access to the latest scores and statistics. But while 100 access points are better than 13, some golf courses are 30 acres or more. This solution served only a limited number of people. Worse, the computers had to be packed up and moved for each tournament, increasing the risks inherent in moving that much hardware around.

This base fulfilled PGA TOUR's needs through 1996, growing and expanding as needed, but the solution became more and more dated. Meanwhile, technological advances promised the ability to bring more data faster to television, radio and print commentators. The burgeoning Internet offered a chance to build services for those brave enough to venture its choppy waters.

## A New Solution for a Modern Tour

In 1999, PGA TOUR's data collection entered what is even now an ultramodern phase. The first stage (and the method by which data still is collated on the course) is handled by an application called ShotLink—another project coordinated with IBM—that took two years to develop and implement. This application depends heavily on the volunteer organizations that run each tournament.

The days are gone of offering only the scores and perhaps a brief description of the shots. With ShotLink, 250 volunteers are split primarily into two groups: walkers and laser operators. The walkers are in charge of recording each shot as it happens, using a Palm device with a data radio to send the information back to the ShotLink truck for real-time processing. Each walker carries a voice radio and

headset in case he or she needs to talk with the ShotLink producer in the truck or the producers need to contact the walker for more information about a shot.

Data noted by the walkers include where the shot was hit from, the player's stance, the lie of the ball (good or bad), the golfer's stroke (how many shots it took the golfer to reach this position on this hole), and other attributes like penalties and drops. As soon as the club hits the ball, the walker presses a button on the Palm and the exact shot time is recorded. If the volunteer isn't sure how to record the starting point for the next shot, he or she radios the producers in the truck for further instructions.

After the ball is hit, the laser operators come into the picture. Two laser operators using survey-grade laser equipment are assigned to each hole on the course. One laser operator is positioned along the fairway; the other is stationed on a platform beside the green, providing a good vantage point for all shots on or around the green. A laser operator's job is to identify the ball belonging to each player, and then "shoot" the



ball with the laser to get its x and y coordinates on the course. This information is transmitted to the computers in the ShotLink truck. As the data from the walkers and the laser operators feed in, the computers, which already have the x and y coordinates for every tee (the starting point for each hole), calculate the real-time position of each ball and match this data with the other transmitted information on the player, lie and more. If a volunteer forgets to record an important piece of data, the ShotLink software alerts the producers in the truck, who then radio the particular volunteer and ask for the missing information.

Once recorded, the data is immediately available to the 100 IBM ThinkPads placed in the hospitality tents, media center and broadcast compound. The broadcaster's area also includes leader boards, bottom-of-the-screen statistics, player ranks for the entire tour and more.

For those not on site, the data is transmitted to PGA TOUR headquarters. From there, it's used to publish automated scoreboards and leader boards to PGATOUR.com—but that's not all. This data is then translated into a very efficient form of XML and pushed out to the IBM on demand center and the TOURCast application.

TOURCast is where things really get interesting.

### Real-Time Data for the Subscribing Masses

The TOURCast application's data framework and architecture was designed by IBM's people who had been working on the ShotLink project, providing rapid and seamless integration between the two programs. This solution was constructed in a rapid timeframe:

1. Development began in August 2002 and was completed in January 2003.
2. IBM wasn't able to test the application until December.
3. The beta version was tried in January in a tournament scenario.
4. TOURCast went live in February at the Nissan Open for public use.

TOURCast's front end is a Flash application, which can be run by anyone with an Internet connection, Web browser and Flash support. It's designed to provide the best, most immersive experience possible in golf, offering the ability to:

- \* Select a group of players to follow at any given moment

- \* Watch a particular hole
- \* Request data on a player's performance in previous tournaments as well as the current one
- \* Read information about a hole (typically written by a local golf pro)
- \* Select two players for a head-to-head comparison of their performance
- \* Receive alerts for significant things happening on other parts of the course

This program might sound bandwidth-intensive for the individual user, but TOURCast is designed to require only a small bandwidth footprint, using an average of 5 Kilobits per second.

To help build drama, a commentary feature shares statistics as players get themselves into particular situations. "If they hit a ball into the left fairway bunker," explains Steve Evans, the PGA TOUR's Vice President of Information Systems, "[TOURCast] will tell you that player's proficiency of making par out of that position, or where [the player is] ranked on the tour [for that particular problem]." It was this type of feature that proved the most complex to implement. People judge in the blink of an eye whether it's more relevant to look at the particular player's statistics in a situation or the whole field's handling of that particular location. Teaching a computer to do this looks simple, but is actually a difficult process. This is one of the features of which Evans is most proud.

Difficult lessons are typically learned on such time-compressed projects, but Evans says that three things made the implementation of TOURCast smooth and mostly uneventful:

- \* Because the IBM team had spent two years working on ShotLink and thoroughly understood the complexities of its data, PGA TOUR asked them to architect the data feed for TOURCast. There was no need to start from scratch learning about data formats and the range of information available through ShotLink.
- \* PGA TOUR already had a successful relationship with IBM; thus, they trusted that IBM would provide an economical hosting solution that worked. Starting an operation like this is typically difficult to accomplish. Given that the nature of tournament golf produces natural peaks and valleys in demand, a scalable solution was very important to the TOUR.
- \* PGA TOUR was confident that IBM was ready to take on this challenge from the moment they signed the contract and

TOURCast's back end is a variable set of Linux servers run from IBM's on demand hosting center on IBM zSeries machines

have it ready for the upcoming season. The fact that IBM met PGA TOUR's expectations only reinforced the strong relationship between these two organizations.

Despite these benefits, there were lessons to be learned. For one thing, PGA TOUR discovered that the key to rapid rollout for an application such as TOURCast is quick and thorough layout of specifications for the solution, with no deviation allowed. Anytime they wanted to change the requirements, they had to consider how much this alteration would push back the timeline.

Another lesson learned was the importance of actively listening to potential customers. Even before starting to develop TOURCast, PGA TOUR ran focus groups that tested storyboards of how the resulting tool might look and work. After development began, pieces of the application were tested with more focus groups and then the entire TOURCast program was tested for feedback. Strongly tying the end-user feedback and usability issues into the development cycle sped up the overall process and, as a side effect, prevented a lot of time and money from being wasted.

Perhaps the most important lesson learned was that developers must really listen to and think about feedback instead of blindly reacting to it. When the entire application was in place, the focus groups complained that the TOURCast program was slow. While the first impulse was to completely redesign the front end, the team took the time to look deeper into the problem. They discovered that the TOURCast scrollbar navigation was slowing everything down with heavy use of CPU time. Instead of rewriting the entire program—which would have cost significant time and money—the developers replaced the scrollbars with Back and Next buttons. Like magic, the complaints about performance disappeared.

### **TOURCast Behind the Scenes**

TOURCast's back end is a variable set of Linux servers run from IBM's on demand hosting center on IBM zSeries\* machines. The choice of Linux was actually a simple one for PGA TOUR, because PGATOUR.com had been running on Linux servers since 2000 at IBM's recommendation.

PGATOUR.com had proved incredibly solid with excellent uptime, so the group saw no reason to move away from their choice of server operating system.

IBM's on demand hosting was also an easy sell, as this is entirely a Linux-based service and provides the flexibility needed by an application with fluctuating CPU and bandwidth needs. This service consists of a collection of firewalls, switches, load balancers and zSeries machines. zSeries boxes are 64-bit servers with one to four CPUs on board. Where mainstream PC multi-CPU machines are not fully utilized

unless an application is specifically written to take advantage of multiple processors, a zSeries machine separates the work among its processors in the hardware layer, meaning that any program can take advantage of the multi-processing capabilities (the application must be written for a 64-bit rather than a 32-bit architecture).

TOURCast is stored as a server image in the on demand control center, with all its data on shared storage servers. It has its own custom security boundaries, and PGA TOUR initially designated what it thought would be the CPU and network load required. For the first three months of service, IBM tracked all aspects of bandwidth usage, CPU usage and more, working with PGA TOUR to design the most appropriate service package for their needs, much like a cell phone carrier might. Monitoring continues; if usage for the CPUs in the TOURCast server starts to climb, a new CPU can be added, or the TOURCast image can be pushed out to a new zSeries server at a moment's notice, and another one to four CPUs can be engaged.

With bandwidth, it's simpler. Just as PGA TOUR can contract for half of a CPU or more per month, they also contract for a specified average bandwidth per month. When TOURCast needs more "zoom" than contracted, that amount comes automatically, at a premium charge for the additional time, storage space or bandwidth usage.

And the usage does spike. Typically, the hardest hits come when play doesn't end on Sunday night, but is held over until Monday. By this point, most people are back at work and don't have television or radio access. Instead, subscribers rely on TOURCast for all of their golf news. (On a standard hosting setup, this situation would either slow the existing servers, or

**PGA TOUR's  
continued Linux  
successes have led  
to even more  
server migration  
to Linux.  
Originally, only  
their Web services  
ran on Linux  
boxes; now the  
PGA TOUR mail  
servers are also  
based on Linux**



require new servers to be brought in at the last minute.)

For Evans, this scalable solution will doubtless add years to his life that would have otherwise been lost due to stress. "On Sunday night at 6:00," he points out, "there's not much planning you can do for the next day. You can't just roll a pile of servers in for Monday morning." With on demand, bandwidth and CPU are already there, waiting for the challenge.

## Into the Future

PGA TOUR's continued Linux successes have led to even more server migration to Linux. Originally, only their Web services ran on Linux boxes; now the PGA TOUR mail servers are also based on Linux. The IT staff is being trained for Red Hat's certification exams, with the objective of achieving one Red Hat Certified Engineer (RHCE) and two Red Hat Certified Technicians (RHCTs).

Along with these changes, constant innovation is required to keep up with the times. MobileLink, the ShotLink data-feed program, also has the ability to send out user-specified data by SMS and WAP technologies to cell phones and PDAs. No doubt feeds will be added for new mobile technologies as that industry continues to mature.

When asked whether PGA TOUR plans to market its infra-

structure technology to other sports leagues and organizations, Evans points out one lesson learned during ShotLink's development: "[While there are] a lot of similarities in scoring from one sport to another, there's a lot of uniqueness in golf." After all, in how many sports must you try to follow so many different people over such a large area, with all of them doing different things at the same time?

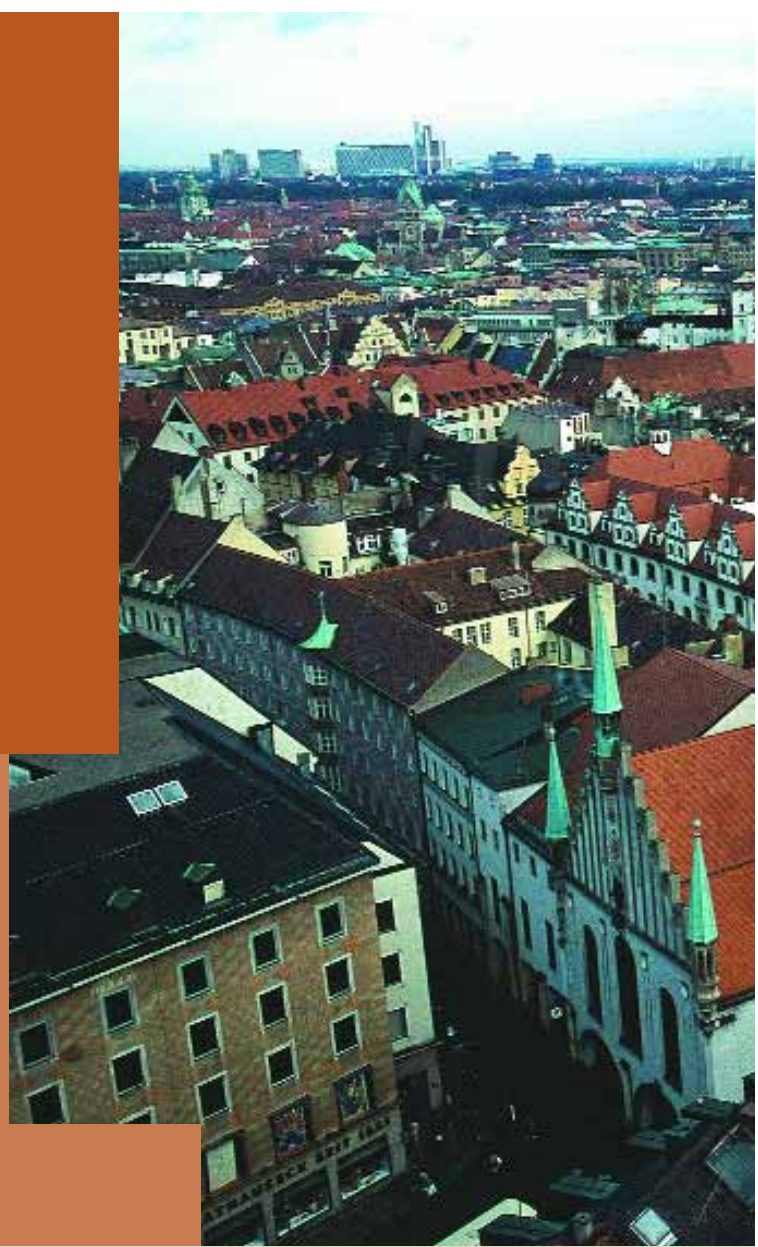
Finally, Evans says that perhaps the best feedback has actually come from golfers' friends and families who can now follow every shot. Tracking every move in real time means that not only can a player's key shot for a tournament win be viewed, but the bad shots are also viewable—and open to feedback.

Many people once believed that Internet technology would bring us closer together. Although the Internet actually seems to be making people less likely to gather in person, applications like TOURCast show that the Internet won't necessarily drive us all into hermitage.

*Dee-Ann LeBlanc, RHCE, is a best-selling author, editor and trainer specializing in Linux. She is also the Gaming Industry Editor for LinuxWorld Magazine and a member of the AnswerSquad. Article provided courtesy of InformIT.com.*

# German Government Accelerates its LINUX Adoption

IBM's German GM discusses the importance of open source software



BY SABINA STEIN

In July 2002, the IBM Linux Line newsletter spoke with Erwin Staudt, former IBM Country General Manager for Germany, about the progress of Linux adoption there. Since that time, much has changed. The Munich city government has decided to replace more than 14,000 Windows\* desktops with Linux, for example, and other cities have moved to adopt Linux as well. For an update on German Linux adoption and their motivations for moving to Linux, we talked to Staudt's successor, Walter Raizner. Here's what he had to say.

**Q:** As you probably know, an English-speaking author has redefined the word “defenestration” to describe the process of Microsoft\* Windows replacement. Over the last year or so, we’ve been seeing what appears to be an effort in the German public sector to “defenestrate” their infrastructure. What is

**the German government up to? Why are they doing this?**

**A:** You may be aware that the German Ministry of the Interior (called BMI) and IBM, as well as SUSE LINUX, have signed a contract in 2002 to facilitate the use of Linux and other open source software in the public sector. Part of the contract was the opening of an e-Government Center in Berlin. In this center, IBM and Business Partners, as well as independent software vendors, are showing IT-solutions designed for the public sector. The focus is on cost-saving solutions that reduce complex administration processes. e-Government is developing so rapidly because the public sector has realized that it has to keep pace with the modern and fast lifestyle of its citizens. Of course, all e-government solutions should be able to communicate with each other. Open source software endows authorities with a backbone that ensures compatibility. There are a lot of reasons for the interest in the public sector for





Munich, Germany, where the city government's switch from Windows to Linux and open source software offers more system independence, security and flexibility.

using open source software—most of them have to do with the search for independence, better security, more flexibility and, only in the context of other reasons, lower cost. At the moment, you can find many projects going on both on country, regional and local levels. Most prominent at the moment are the examples of the German Parliament and the cities of Schwabisch Hall and Munich with their move to Linux, but there are many others around.

**Q:** The U.S. Nuclear Regulatory Commission has reported that two important systems at the Davis-Besse nuclear power plant in Ohio were knocked offline when the utility had failed to install a patch from Microsoft and the slammer worm got inside their infrastructure. The government of Taiwan claims that their National Police Administration, the Ministry of National Defense, the Central Election

**Commission and the Central Bank of China are all under attack by a foreign power, and they specify Windows as the vulnerability. I could cite more incidents like this without much difficulty. Have you been hearing anything from the German government about security during this latest spate of Windows security incidents? Have they caused similar problems in Germany?**

**A:** As mentioned, security is one of the key driving factors for the use of Linux and open source software in Germany in the public sector. Clearly, security problems have also been seen in Germany as issues that need to be solved. The recent worm attacks in August have also caused many companies and institutions in Germany to closely review their existing IT infrastructure. Open source software offers a lot of advantages in regard to security. The most important feature is the transparency of the code. A huge community of programmers



## Expenses by the public sector need to be justified and future-oriented.

Walter Raizner, country general manager for Germany

around the world is united because they have one thing in common: to improve Linux. Should a bug occur, it will be identified almost immediately and, even more importantly, it can be fixed in almost no time. Moreover, Linux took over the very strict regulation of access rights for all resources from UNIX\*, and developers and administrators can choose from a variety of free and commercial tools to secure Linux and detect intrusion.

**Q: Do you see the German government moving toward a total Windows replacement?**

**A:** For the moment we don't see a total replacement—there are clearly a number of initiatives for Linux on the desktop, but the focus in most projects is the use of Linux on servers. We'll see where we get from there. The contract with the German Ministry of the Interior is a good start, however, and has obviously been a signal: One of Germany's largest cities, Munich, has decided to deploy open source software.

**Q: What government Linux and open source projects are currently underway in Germany to help agencies evaluate, procure and deploy Linux in the German government infrastructure?**

**A:** In the context of the contract between the German Ministry of Interior and IBM, there are initiatives both on a country and regional, as well as on a local, level. Important steps were a) to facilitate the purchase process for open source software projects, and b) Linux user training. Linux has already been adopted in many public institutions' worldwide capital investment, and they made their nine-month deadline.

**Q: SUSE LINUX is an excellent Linux distro, and they are also based in Germany. What role is SUSE LINUX playing in the German government's efforts?**

**A:** SUSE LINUX is contractor in our contract with the German Ministry of Interior and a very valued partner in many Linux projects in the public sector.

**Q: Are the German government's Linux efforts ahead of the marketplace? Or do they reflect a more general trend in German business and industry?**

**A:** In this case, we can clearly say that the public sector is playing a leading role in the market. They are paving the way for many other IT decisions in the private sector. In this regard, total cost of ownership is a key word in the public sector. The economy slowly recovers and citizens are very interested in the way the government spends their taxes. Expenses by the public sector need to be justified and future-oriented. Open source software can offer this value because of its independence and flexibility, and is therefore seen as a good alternative to software monocultures for both the public and the private sectors.

**Q: When you look ahead at the next couple of years, what changes do you think all this will have on the German government's way of doing business, and the German infrastructure as a whole?**

**A:** I think the IT infrastructure in the public sector will be very secure, modern and flexible. It will pave the way to what we call D21 (Germany being an innovator in the 21st century). The public sector will be in a position where they're not depending on one single vendor. This resembles the industry view on maintaining a healthy competition and sound economic conditions for smaller software companies.

**Q: Is there anything else you'd like to add?**

**A:** Yes, I would like to remind you that Linux initiatives are also very vivid and active in emerging countries like China or Eastern Europe—enabling those countries to use modern software at an affordable price. Linux and open source play an important role as facilitators for developing countries supplying their citizens with modern IT tools.

*Sabina Stein is a communications specialist with more than four years of experience at IBM. Sabina lives with her husband in Stuttgart, Germany.*





# The BUZZ About Blades

With a new blade server running Linux, less is really more

BY ALICIA BARTZ

Linux is well known for the value it provides—and its openness, flexibility and ease of integration with other products have accelerated its acceptance and adoption. Those same characteristics are pushing the remarkable growth of IBM BladeCenter\*, making Linux and BladeCenter a natural match.

## Blade Basics

A blade server is basically an entire server that fits on a single card, or blade, and contains the CPU, memory and networking components necessary to run applications. While many blade servers are offered by various vendors, the IBM BladeCenter offers the densest solution in the industry. The IBM blade is plugged into a single chassis that can accommodate up to 14 blades in 7U of rack space. This is twice the density of existing rack-optimized solutions. The result is a more cost-effective, high-density, high-performance architecture that's been capturing much attention recently.

"The idea is analogous to books on a shelf," explains IBM's Jeff Benck, vice president IBM @server BladeCenter. "The servers come on cards that are mounted vertically in a chassis or enclosure, in the same manner that books might slide onto a shelf. The chassis provides power, cooling, networking and storage, and it provides functionality to the blades."

The blade server technology creates an infrastructure that allows companies to deploy multiple servers using shared resources. "This allows you to get a better feature set in a smaller amount of space," says Rob Sauerwalt, senior product manager of blade architectures at IBM. "The most comparable independent discrete or rack-optimized server class would be

a 1U type server. Still, the blade server offers twice the density of our thinnest rack-optimized server, plus better performance, better scalability and better availability features. It's a real 'more for less' architecture."

The move from horizontally-stacked rack-optimized servers to vertically-lined blade servers offers some compelling business benefits. According to Sauerwalt, it takes only 30 seconds to install a blade, compared to an hour to install a 1U server. This gives companies additional flexibility in deploying servers as demand requires. Also, a blade system requires 83 percent less cabling than a rack-optimized server, and it consumes less power and generates less heat. The shared chassis also offers space savings and improved integration.

Along with the improved physical integration with this technology, blades put the networking, storage and servers inside a single chassis, as opposed to other servers in which these components are external and must be wired together. This allows for integration at the management layer, decreasing the complexity of systems and networking management. In some cases, blade server technology allows companies to integrate their support structure, allowing one technician to have access to storage and servers, which helps maximize resource productivity and minimize IT administration costs, according to Sauerwalt.

The list of advantages doesn't stop there. "By integrating the servers, storage and networking, it's possible to deliver new capabilities that aren't available in a pizza-box style rack-optimized server," Benck says. "Setup and deployment is much quicker because you don't have to install cables, rails and all of the peripherals. It's very user-friendly. You can set up and deploy hundreds or thousands of blades in a short

period. Since you're sharing power and cooling, there's also higher availability and higher reliability."

### IBM's Offering

IBM's @server BladeCenter began shipping at the end of 2002. This product is a 7U rack-optimized chassis with up to 14 blade-server bays, featuring a high-availability midplane for maximum uptime and redundant hot-swap cooling and power to help ensure there's no single point of failure. The BladeCenter also provides high-speed Gigabit Ethernet switch connections between each blade server and the outside network environment. IBM offers its own modular blade servers optimized for the @server BladeCenter enclosure.

"The first blade servers in the industry featured lower power and lower performance, but hyper density," Benck says. "Companies were cramming as many servers as possible into a chassis, so you could store a lot of servers in the design, but the servers weren't very powerful.

"We decided to deviate from these early entrants because our customers told us they didn't want to compromise performance when they moved to blades; they just wanted to consolidate servers. We realized you could be too dense, so we decided to compromise a little density to offer the highest performance density. Our design uses the latest Intel\* and POWER\* processors, and allows our customers to continue doing the work they do today with fewer servers."

The BladeCenter design allows the company to target core business applications, not niche markets, on its platform. BladeCenter works with two-processor type systems and handles enterprise-class applications that require performance availability. These include Microsoft\* Exchange, Lotus\* Notes\*/Domino\*, Citrix and WebSphere\*. Benck says a natural synergy exists between blade servers and Linux clusters. In fact, he says about 50 percent of shipments have been for Linux applications. BladeCenter HS20 Xeon blades currently support Windows\* 2000 and above, as well as Red Hat and SUSE LINUX. The JS20 POWER blade running Linux ships in March, and IBM plans to support AIX\* in the third quarter of 2004. Other OSs may be added in the future.

### Real-Life Use

Already, blade servers are popular among ISPs and ASPs, and for applications such as e-mail, Web hosting and domain-

name serving. Those in the financial and life science industries have also expressed interest in blades.

The Genome Sequencing Center at Washington University Medical School in St. Louis is one such example. Researchers at the center have been involved in the Human Genome Project since its inception. They're also working to analyze DNA sequences in other organisms, including chimpanzees, fish, plants and disease-causing bacteria. All of the center's research is entered in the public GenBank database, which is available to genetic researchers worldwide. The center has purchased BladeCenter and begun testing.

Genome Center Senior Technical Manager Kelly Carpenter is banking on BladeCenter to provide more power, greater compute density and higher availability to cope with the center's ever-increasing workload. He believes pairing blades with Linux will help accelerate the center's genomic data acquisition and analysis.

"Basically, we're trying to get the highest compute power density per area of server rack volume," Carpenter explains. "We used to have a series of 1U computers with two—and in some cases four—Pentium 3s on them. Now, we have 28 Pentium 4 CPUs. We have a rack with 75 blades running 150 processors. We can stick more computers and faster computers in the same amount of rack space with blades. That will give us more computing horsepower, so we can handle our existing jobs faster and add new loads. For us, the move to

BladeCenter was a no-brainer."

While blades have been criticized for cooling problems, Carpenter says he has had no problem with overheating. Benck wouldn't be surprised. He insists that heating and cooling aren't problems for BladeCenter. In fact, he says IBM has leveraged its power and packing know-how to overcome this challenge.

### Not for Everyone

Still, blade servers aren't the right solution for every enterprise. If you're not filling half the chassis—using at least eight or nine servers—then a rack-optimized server is the better option. If you have high I/O demands or require a PCI adapter or option card for an application, the blade platform may also be the wrong answer because no traditional PCI slots exist in the blade platform.

"I believe we'll get to a point where blades will be ubiquitous from a technology standpoint. They will just be a better way to do things. You've got to love the ability to do more with less."

—Jeff Benck, vice president  
IBM @server BladeCenter



"If you have legacy I/O applications like old PCI cards, then certainly rack-optimized or discrete servers are a better alternative," Sauerwalt admits. "Some of the functions that people use with PCI cards like Ethernet are available in blades. But, in general, you're not going to find the much older legacy or niche-type applications in the blade platform yet because blade architecture is new. The industry is going to have to catch up with the technology."

### The Next Big Thing

The blade server market is growing quickly and shows no signs of slowing. The Server Blade Trade Association was formed in the fall of 2002, and industry researchers at IDC in Framingham, Mass., estimate that the market will grow to \$3.9 billion by 2006.

Demand is driving hardware and software vendors to deliver new products and upgrades. IBM is no exception. The company recently rolled out a line of blade servers based on its POWER processor.

"In November 2003, we introduced @server BladeCenter JS20, the industry's first blade server based on 64-bit POWER architecture," Benck says. "It's a significant technology leap. The JS20 supports both SUSE LINUX and Turbolinux and uti-

lizes the POWERPC 970 processor. JS20 support for the AIX platform will follow shortly. We'll also grow beyond the current application set into the back-end of the enterprise, so you'll see things like Oracle, PeopleSoft and CRM- and CRP-type applications. Also, we'll continue to enhance not just the server, but the networking and storage.

"I believe we'll get to a point where blades will be ubiquitous from a technology standpoint," he says. "They will just be a better way to do things. You've got to love the ability to do more with less."

Sauerwalt agrees. In the end, he says, blades aren't so much about servers as about infrastructure. "When customers are considering moving to blades, they shouldn't just think about servers," he says. "They should think about networking, storage and management. Blades are really just a solution platform that customers can use to build a very dynamic, on demand business solution. That's the most important point."

*Alicia Bartz is a Rochester, Minn.-based freelance writer. She has covered technology topics for Minnesota Technology Magazine, Twin Cities Business Monthly and other publications.*



# Linux Line

@server customers discuss the benefits of open source

## BBDO INTERACTIVE

"IBM has been working with Linux for a long time and is committed to the platform. We are certain this proven combination of Linux and IBM xSeries\* will meet our customers' high availability expectations.

"IBM DB2\* for Linux offers the scalable, Web-ready database we need to deliver top-level performance and availability at a total cost of ownership we believe to be at least 75 percent lower than that of any comparable solution." —**Andreas Walter, IT Manager, BBDO INTERACTIVE**

## GHY International

"I have enjoyed the many opportunities you have given me to share the decision that GHY International has chosen to go with our IBM server consolidation and Linux on iSeries\*.

"I am delighted to report that besides talking about what we are planning to do, I can now speak to what we are doing. With over 73 percent of the consolidation complete into our two new iSeries machines, I have been impressed beyond belief and I can now testify that server consolidation and Linux on iSeries are more than good ideas; they work for GHY International.

"What I am most impressed with to-date is the caliber of individuals that IBM devoted to this project, and the depth of knowledge and skills they brought to this project. Erwin Earley and Fant Steele are two of the best of IBM that we have had the privilege to work with. What has taken GHY International over three years to build as an extensive Linux environment, Erwin and Fant carried us through an intensive conversion process in just under five days. Erwin and Fant were rock solid through the entire project, and Erwin was especially helpful in leading the conversion process and keeping everyone focused. Without the abilities of Fant when it came to networking and using Virtual IP, and his ability to keep humor in the

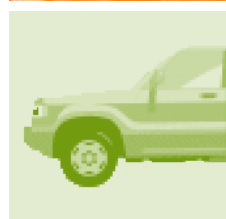
process, the long days would have been even longer.

"We continue to migrate the remaining pieces that are left with the help of IBM and various business partners, but the end result is the same: It works for GHY. Thank you again for this amazing opportunity."

—**Sincerely, (A very happy customer) Nigel Fortlage, Vice President Information Technology**

## Kyoto Sangyo University

"IBM has provided a highly flexible, intelligent and manageable solution that's ideal for an education environment." —**Nobuo Tsubouchi, Head of Operations, Kyoto Sangyo University Computer Center**



## Thrifty Car Rental

"IBM for me is three magic letters that make problems like ours go away. And Linux is the perfect match on the operating system side for the reliability and stability of the IBM servers." —**Newman Emanouel, CFO, Thrifty Car Rental, Australia**

## Wisconsin Physicians Service Insurance Corporation (WPS)

"The IBM @server and Linux will help Wisconsin Physicians Service Insurance Corporation (WPS) to consolidate more than two dozen Intel\*-based servers onto a single mainframe.

"The introduction of Linux Virtual Services from IBM takes this capability to the next level, offering the flexibility to add computing capacity as business needs dictate. It's a significant breakthrough for customers running Linux applications who want to turn up the power at a moment's notice." —**Jim Hwang, Director, Enterprise Network Systems, WPS**



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