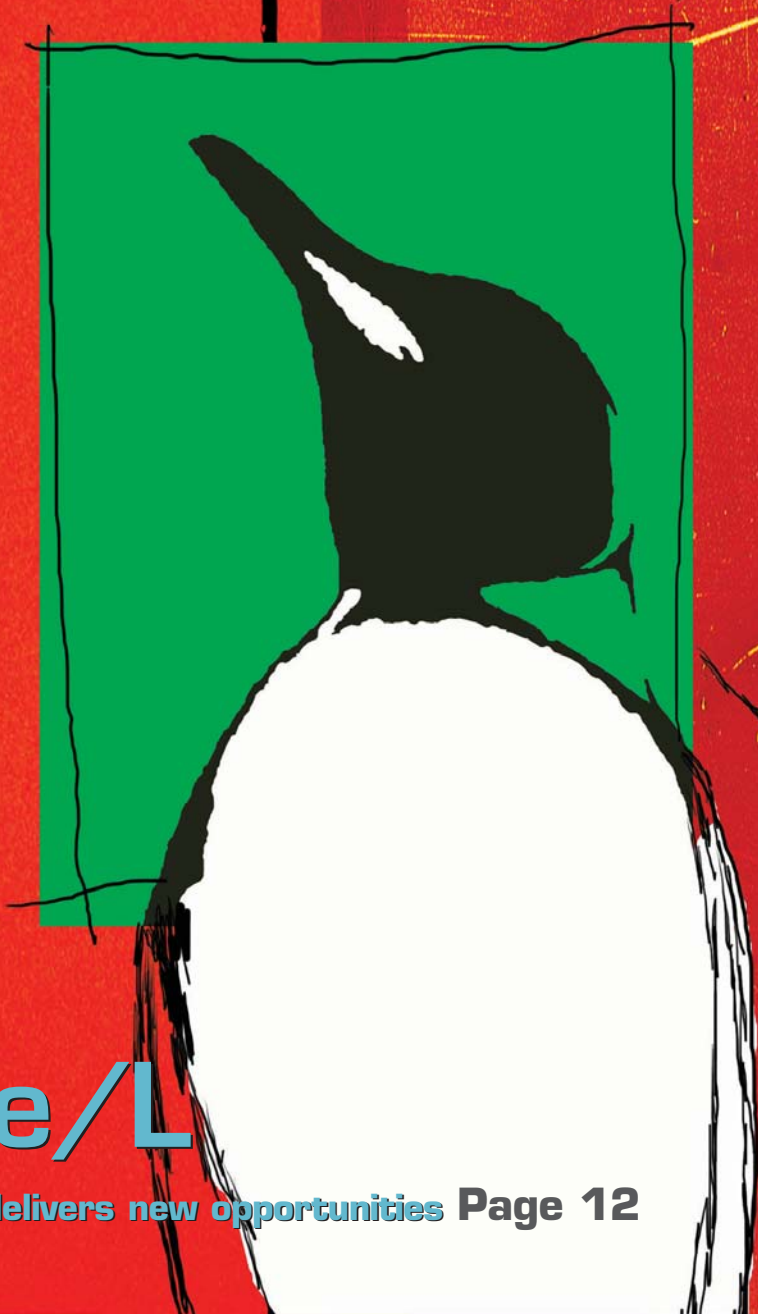FEBRUARY 2005

IBM

LINUX

Executive Report from IBM

Business and Industry in an On Demand World

Linux at IBM

Blue Gene/L

Innovative IBM technology delivers new opportunities **Page 12**

LINUX

Executive Report from IBM

Page 12

LINUX

E x e c u t i v e   R e p o r t   *from IBM*

Page 22

Page 32

Page 19

IBM
A USER PUBLICATION

Page 38

Page 42

Page 46

Page 50

Solving Business Challenges with Linux

MORE THAN EVER BEFORE, organizations are challenging their IT departments to develop technology solutions that solve today's business challenges. And with a global economy—an increasingly mobile workforce and a customer base often short on loyalty but long on expectations—the challenges facing today's organizations have never been greater.

The move to open-standards technologies, like Linux*, supports a shift in the relationship between business and technology. In the "old world," IT ecosystems were vendor-centric, built around core technologies and operating systems (OSs). Businesses were forced to lock into an IT architecture since breaking this proprietary bond was costly and disruptive. Flexibility suffered and business requirements took a back seat to the latest killer app.

The open movement changed the paradigm of the IT infrastructure, and the relationship between technology and business issues. Today, we're seeing a dramatic shift from an ecosystem where vendors called the shots, to a new ecosystem based on what businesses want to accomplish and how technology can help organizations reach those objectives.

No longer are companies locked into a particular architecture, program or vendor. The rise of open standards is helping fuel a new period of innovation 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 performance at half the cost. State and local governments, both in the United States and abroad, are running Linux on blades and workstations to cut costs and improve functionality. Those are just a few examples. It's safe to say that Linux has had a profound impact on businesses in every industry.

But don't just take my word for it, in this issue of the *Linux Executive Report*, discover how organizations in several industries have adopted and are succeeding with a Linux-driven solution. From governments to retail, an increasing number of organizations and businesses are reaping substantive benefits from the flexibility provided by a technological environment based on open standards.

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 businesses and governments around the world take advantage of innovative, cost-effective solutions built around this idea of standards, flexibility and customer choice.

Scott Handy
Vice President, Linux, Worldwide Business Lead,
Strategic Growth Initiatives

Linux Adoption
in the Enterprise

Framingham, Mass.-based IT research firm IDC recently released some encouraging findings about the prevalence of Linux* in the enterprise. The firm's findings include:

THE PERCEIVED COST ADVANTAGES of Linux—both initial price and ongoing costs—are the key drivers of Linux adoption, along with application reliability and availability. Linux wins on economics. Conversely, skills, lack of applications, staff costs and added IT-management complexity remain the biggest hurdles to Linux adoption.

LINUX IS EXPECTED TO MOVE from a niche player to a mainstream operating system worldwide between 2003 and 2008.

THE LINUX MARKETPLACE, including servers, PCs and packaged software, will rise by a compound annual growth rate (CAGR) of 26 percent between 2003 and 2008. By 2008, revenues from the Linux market are expected to reach $35.7 billion.

THE DESKTOP/PC MARKET, consisting of new shipments and redeployments of existing systems, is expected to grow by a CAGR of 30 percent over the five-year time frame, generating $10 billion in revenues and totaling 17 million units shipped and/or redeployed by 2008. Linux PC shipments will be stronger in the Asia-Pacific region and the Europe, Middle East and Africa (EMEA) region than in the Americas.

LOOKING AT THE THIRD SEGMENT of the Linux market, servers, Linux will claim 28 percent of worldwide server shipments and redeployments by 2008, growing annually over the five-year period by 24 percent.

Source: IDC, Worldwide Linux 2004-2008 Forecast: Moving from Niche to Mainstream, IDC #32424, December 2004.

DRIVING FORCES FOR LINUX DEPLOYMENT

Source: IDC Linux Marketplace Multi-client Study, 2004

LINUX USAGE BY COUNTRY

Source: IDC Linux Marketplace Multi-client Study, 2004

ACCOUNT PENETRATION OF LINUX
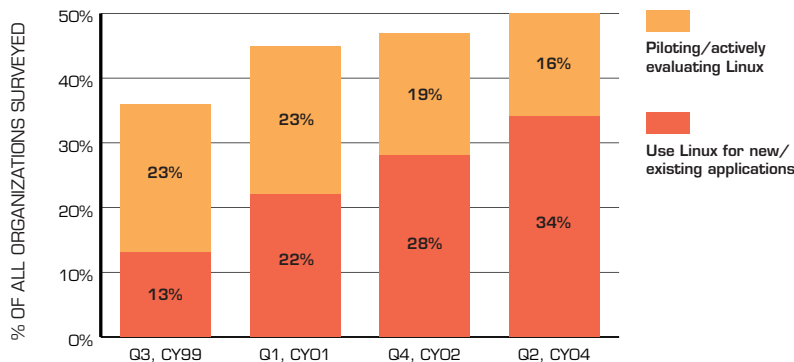
Source: IDC Linux Marketplace Multi-client Study, 2004

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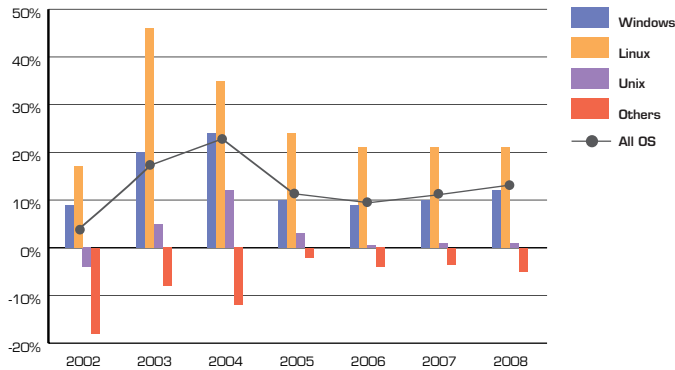
Source: IDC's Quarterly Server Forecast (Q204, September 9, 2004)

SERVER SHARE BY OS SHIPMENTS
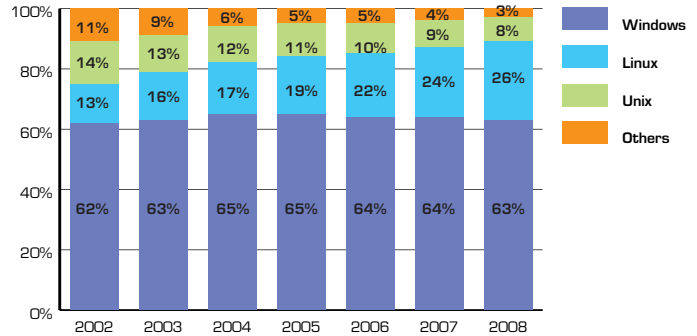
Source: IDC's Quarterly Server Forecast (Q204, September 9, 2004)

Middleware Industry Solutions for Linux

IBM* middleware industry solutions for banking, government and retail are now available for enterprises using the Linux* platform.

Current business drivers such as choice, security, reliability and cost continue to be compelling reasons for customers to use Linux. In the banking, government and retail industries, companies are faced with more industry-specific challenges, including multichannel interaction with customers and an increased demand for industry collaboration. IBM's middleware industry solutions can help customers reduce their total cost of IT ownership by addressing all of these issues.

IBM's middleware solutions for various industries include technology from its five software brands (WebSphere*, DB2*, Tivoli*, Lotus* and Rational*), industry-specific middleware, industry-specific services expertise from IBM and others, and industry-specific application software from IBM's network of ISV partners. At its core, each solution provides the middleware needed in an operating environment that can be flexibly tailored to help customers transform their businesses into an on demand enterprise.

IBM Middleware Solutions for Government

IBM is leveraging its broad software capabilities and thought leadership to help governments reduce costs, increase efficiencies, balance conflicting demands for safety and privacy, and empower workforces to deliver higher value and increased productivity. Middleware Industry Solutions for Government now available on Linux are: IBM Middleware Solution for Government Access; IBM Middleware Solution for Government On Demand Workplace; IBM Middleware Solution for Government Collaboration; IBM Middleware Solution for Government Public Safety.

IBM Middleware Solutions for Retail

IBM's retail solutions address business challenges in the retail industry and enable retailers to better integrate with trading partners, better manage store inventory and performance, track shipments, support multiple sales and fulfillment channels and streamline store operations procedures. Middleware Industry Solutions for Retail now available on Linux are: IBM Middleware Solution for Retail Store Operations; IBM Middleware Solution for Retail Advertising, Marketing & Promotions; IBM Middleware Solution for Retail Merchandising; IBM Middleware Solution for Retail Inventory Management.

IBM Middleware Solutions for Banking

In addition to enhancing access to information and increasing productivity, banks need to introduce new products in response to market needs and enhance customer service. They also need to present a set of consistent functions and services to customers and execute effective, value-based marketing campaigns across all channels. Middleware Industry Solutions for Banking now available on Linux are: IBM Middleware Solution for Banking Branch Transformation; IBM Middleware Solution for Banking Core Systems Transformation.

IBM WebSphere Business Integration Server's newest version, 4.3, is available now on the Linux platform. Customers across multiple industries can use WebSphere Business Integration Server to implement scaleable business processes requiring process automation, workforce management and enterprise application connectivity. IBM WebSphere Business Integration Server v4.3 offers Red Hat Enterprise Linux 3.0 and Novell SUSE LINUX Enterprise Server 8.1 support.

IBM middleware on Linux provides a reliable, scalable and cost-effective software platform for developing, deploying and managing business and industry applications. On the Linux platform, IBM software offers a full range of middleware from databases and Java* 2 Platform, Enterprise Edition (J2EE) application servers to systems management and application-development tools, across Intel*, POWER* and IBM @server zSeries* hardware platforms.

Analyst numbers confirm that Linux plans are translating into real-world deployments

Linux BY THE NUMBERS

BY JOE MCKENDRICK

Talk to technology executives across the industry, and it seems that Linux* has captured just about everybody's imagination. But just how pervasive is Linux in the enterprise? Is it replacing other operating systems (OSs), or serving as a platform for entirely new application deployments? Are IT executives still "kicking the tires," or is Linux in production, supporting mission-critical applications?

Hard Numbers

Analyst firms have been talking to CIOs and IT managers from across the industry and are drawing up hard numbers that provide a glimpse to the progression of Linux into the enterprise. The numbers confirm what everyone has been suspecting: Not only is Linux here to stay, but it's also taking on the heavy lifting of enterprise IT. This is evident with server- and client-side implementations. While analysts' numbers offer different takes on the nature and scope of Linux deployments, they agree that most enterprises already have the open-source OS running somewhere within their organizations. In many cases now, Linux has moved beyond the pilot stage where a developer runs a copy on a server in some corner of the IT department. Now, instances of Linux are running mission-critical applications, such as e-mail servers, e-commerce sites, and even parts of enterprise-resource planning (ERP) and customer-relationship management (CRM) systems.

Data on Linux software and hardware shipments show it as one of two growth platforms in the industry. Framingham, Mass.-based research firm IDC, which continually tracks Linux and other product shipments, finds Linux's share of server OS shipments is now second only to Microsoft* and is expected to grow at a healthy clip through 2008. IDC's research finds that one out of five server OS licenses purchased today worldwide is for Linux software. By 2008, IDC predicts that number will be closing in on 28 percent. Al Gillen, research director at IDC, says that when the non-paid Linux licenses are considered, the percentage will be higher. However, not every Linux license goes into a new hardware shipment. ("Worldwide Client and Server Operating Environments 2004-2008 Forecast: Microsoft Consolidates Its Grip," by Al Gillen and Dan Kusnetzky, Dec. 2004)

Other survey data confirms that Linux is making inroads into enterprises as well. Santa Cruz, Calif.-based Evans Data Corp., which regularly tracks enterprise sites with more than 1,000 employees, finds that Linux deployments are becoming more than commonplace. In its fall 2004 survey of 400 enterprises, the research firm found that 71 percent of enterprises were running Linux on at least some of their servers. This is up from the previous year's 67 percent, and 60 percent in 2002. Linux will be even more pervasive across the enterprise in 2005 when 77 percent of the enterprise IT managers surveyed expect to be running Linux somewhere within their organizations.

While there's much industry debate over the total cost of Linux versus that of Windows*, Linux clearly offers a major cost

TRENDS
Industry signals to keep
you in the know

savings over its more expensive distant cousin, UNIX*. In fact, when Evans Data asked enterprise IT managers this question, 63 percent say they did realize some kind of savings as a result of deploying Linux. Two out of five estimate that the savings was greater than 10 percent. ("Fall 2004 Enterprise Development Management Issues Report," by Joe McKendrick, Dec. 2004)

Evans Data even puts an approximate date on the point when Linux crossed the chasm from early adoption technology to the environment of choice for a majority of enterprises. In the first half of 2002, Linux server usage crossed the 50-percent threshold. That follows the period of time when IBM began to offer integrated Linux solutions across the breadth of its product line, and was making the first series of

say that it's now capable of delivering much of the same performance and functionality as competing enterprise-class OSs. In terms of functionality and scalability, enterprise Linux could now be comparable to commercial UNIX (IBM* AIX*, Sun* Solaris, or HP-UX) and high-level Windows. The latest Linux kernel, version 2.6, includes support for 64-bit processors, more disk storage, and larger system memory and improved multithreading for running multiple tasks. IBM has also worked with its distribution partners—Novell, SUSE LINUX and Red Hat—to help Linux achieve a new level of security certification.

What environments will Linux replace as it moves into the enterprise-server stack? Since Linux is closely related to UNIX, and can be leveraged through the same skill sets, analyst firms say Linux is taking its biggest bites out of the UNIX-server market. However, Linux also runs on the same commodity (Intel* or AMD-microprocessor based)

Not only is Linux here to stay, but it's also taking on the heavy lifting of enterprise IT.

significant investments in developing and promoting the open-source OS. IBM first announced in 2001 that it would invest $1 billion in Linux, including the deployment of Linux to all of its server lines, as well as making Linux versions of its applications available.

Linux hasn't only become operational within a majority of enterprises; the corporate development community is also targeting it. According to the Evans Data survey, Linux application development has increased significantly and closely paralleled rollouts of the OS to servers. In the most recent survey, 56 percent of IT development managers expect to be building Linux applications over the coming year, a number that has risen steadily since the survey was first conducted in 2000. At that time, 24 percent of development managers were considering building or integrating applications to run on Linux.

From the Edge to the Core

Linux isn't just being deployed on the peripheries of enterprises, either. Peerstone Research, for example, released numbers that show growing Linux adoption for the largest ERP installations—the very core of the enterprise. ("Linux and ERP: A White Paper by Peerstone Research," by Jeff Gould, Nov. 2004)

Peerstone estimates that the number of ERP installations running on Linux will increase eight-fold over the next two to three years, from about 1,000 today to 8,000 by the end of 2007. "We expect to see several thousand big-three customers per year converting to Linux over the next few years," said Jeff Gould, CEO and director of research for Peerstone.

To date, many companies have been deploying Linux for workloads associated with "edge-of-the-datacenter" functions (e.g., e-mail, security and Web serving). However, Linux may have reached a turning point, and many Linux proponents

hardware as Windows, and it could more effectively take on many Windows workloads as well.

Peerstone estimates that about 65 percent of enterprises currently run ERP on UNIX. Another 28 percent run their ERP systems on Windows and 2 percent run on Linux. The UNIX share of the ERP space will decrease to 50 percent, while Windows will remain at 28 percent. Linux will cut deeply into the UNIX space, and also take away potential growth from Windows. Peerstone also finds that fewer than 20 percent of ERP customers that will be migrating off UNIX will move to Windows, while 70 percent say they will move to Linux.

Evans Data says that more of its enterprise-survey respondents plan to replace Windows with Linux, not UNIX. Almost half of the IT managers surveyed say Linux is likely to replace many Windows installations. By contrast, 37 percent predict that Linux will replace UNIX systems.

The Client Side

Industry data has shown that Linux's growth as a client OS has taken a more uncertain path. IDC's data finds continuing growth in Linux shipments on the desktop or client side, and projects that all client-side sales of Linux will grow at a healthy 2003-2008 compounded annual growth rate of 28 percent. However, in relation to Windows, Linux will continue to occupy a smaller percent of total client-side deployments, growing from 3 percent of paid-license shipments today, to about 6 percent by 2008.

Evans Data, however, finds that many enterprises are interested in pursuing the possibility of deploying Linux as a client-side OS. More than a third of respondents to the analyst firm's recent enterprise survey say they either "absolutely" or "probably" plan to deploy Linux on workstations, a 52-percent increase over the previous year's survey.

While there has been uncertainty in the market about whether to deploy Linux on client machines, many solutions and tools have been emerging on the market that ease this process. IBM's Workplace* technology, for example, provides a service layer that enables enterprises to seamlessly link Linux, Windows and other clients to back-end server systems. This removes one of the final barriers to more wide-spread Linux desktop deployments, which is the reason why many application-server architectures are tethered to specific client types.

Some full-function Linux desktop solutions are now on the market, including SUSE LINUX Desktop, Red Hat Enterprise Linux WS (Workstation), Xandros Desktop OS Business Edition, and Sun Microsystems Java* Desktop System (JDS).

Challenges

Evans Data has been tracking "comfort" levels with Linux since mid-1999. Discomfort levels with Linux (those either saying they would "probably not" or "absolutely not" feel comfortable using Linux for mission-critical applications) have declined dramatically during this time. In the summer of 1999, when few mainstream vendors openly supported Linux, a majority of enterprise developers—58 percent—said they were uncomfortable with the open-source OS, versus the 30 percent that were comfortable.

It should be noted that one out of four respondents still holds out as being uncomfortable with using Linux. While this is still a far cry from the earlier days of enterprise Linux, when more than half of enterprise developers wouldn't touch it, this shows that there's still a substantial segment of IT executives that aren't ready to "bet the business" on Linux.

While Linux deployments are wide spread across the enterprise, they aren't running deep. Peerstone Research points out that there's increased interest in running large ERP applications on Linux, but about 70 percent of its sample still has no plans to use Linux in the future. In addition, nearly one out of three respondents says they will probably never use Linux to run their mission-critical applications, a number not too far from the 25 percent expressing reservations about Linux in the Evans Data survey. Evans Data also finds that while the number of companies running Linux on their servers has grown into a larger majority, the OS is only deployed, at most, on about one out of 10 server boxes.

Peerstone's survey respondents also cite the difficulty of transferring IT staff skills, which are heavily invested in the commercial UNIX flavors, to Linux. Both Evans Data and Peerstone find that there are still lingering doubts about the level of support available for Linux-based applications.

Linux Solution

For proponents of Linux in the enterprise, there's still plenty of work to be done in terms of educating and selling Linux as a solution. But Linux has come a long way since the beginning of the decade, when a forward-thinking handful of IT executives began to work with the OS. Today, Linux is an OS standard for most organizations.

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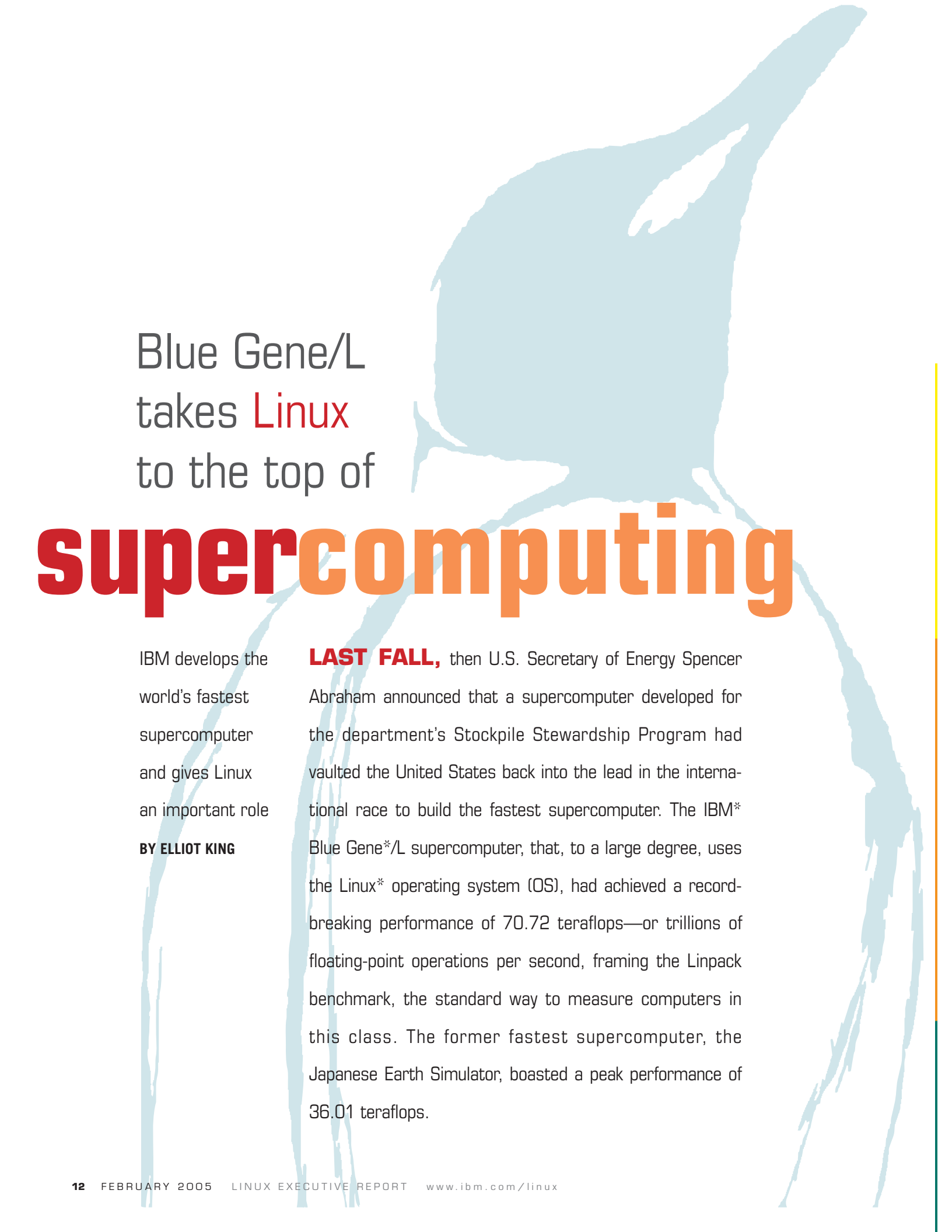
ACROSS INDUSTRY GROUPS, Linux* is most pervasive in the high-tech sector (computers, electronics, and software), Evans Data finds. 92 percent of high-tech organizations run Linux on their servers, and 14 percent report that Linux now supports a majority of their systems. A year from now, 22 percent of high-tech executives expect to rely mostly on Linux.

Approximately 87 percent of educational institutions run Linux, along with 81 percent of telecommunications companies. The retail sector, which already has a strong stake in Linux, is fast becoming a leading deployer. By next year at this time, all retail organizations surveyed by Evans expect to be running Linux somewhere in their enterprises.

LINUX BY INDUSTRY

	THIS YEAR	NEXT YEAR
High tech	92%	92%
Education	87%	95%
Telecom	81%	81%
Retail	78%	100%
Government	69%	85%
Manufacturing	53%	69%
Healthcare	52%	62%
Transportation/utilities	43%	43%

Source: Evans Data Corp.

Blue Gene/L takes Linux to the top of
supercomputing

IBM develops the world's fastest supercomputer and gives Linux an important role

BY ELLIOT KING

LAST FALL, then U.S. Secretary of Energy Spencer Abraham announced that a supercomputer developed for the department's Stockpile Stewardship Program had vaulted the United States back into the lead in the international race to build the fastest supercomputer. The IBM* Blue Gene*/L supercomputer, that, to a large degree, uses the Linux* operating system (OS), had achieved a record-breaking performance of 70.72 teraflops—or trillions of floating-point operations per second, framing the Linpack benchmark, the standard way to measure computers in this class. The former fastest supercomputer, the Japanese Earth Simulator, boasted a peak performance of 36.01 teraflops.

The performance breakthrough represented by Blue Gene/L is even more dramatic than dry statistical comparisons indicate. Two earlier Blue Gene/L prototypes had already cracked the Top 10 list, and when Abraham made the announcement, he noted that a computation that would take the number three supercomputer on 2003's Top 500 list 30 days to complete could be completed on the current iteration of Blue Gene/L, which is one quarter of the final size, in three days. The final Blue Gene/L system scheduled for delivery to Lawrence Livermore National Laboratory will exceed the performance of the Japanese Earth simulator by a factor of seven. The goal of the project, says David Turek, vice president, Deep Computing at IBM, wasn't to simply make an incremental step in the marketplace, but to make a major step forward. And it has.

Making a Supercomputer

Interestingly, according to Turek, the Blue Gene project was launched with just a tad of deception. In 1999, IBM announced its plans to create a machine to tackle what was then described as one of the grand challenges of science—an effort to simulate protein folding. Grand challenges in science had been the organizing theme for much of supercomputings development through the 1990s. The idea behind the grand challenges was to

marry breakthroughs in high-performance computing (HPC) with specific applications in the life sciences, geophysics and other compute-intensive applications

While sequencing the human genome has received the lion's share of publicity concerning the application of HPC and biology, protein folding is a more complex problem. Simply put, genes express themselves through proteins and protein folding controls the body's physical processes. Abnormal protein folding causes diseases. By simulating protein folding, Blue Gene would be able to help determine the cause of diseases. It could also be used to assist in the development of new drugs and other means to cure disease.

Nevertheless, IBM never really intended for Blue Gene to only be a "protein-folding machine," says Turek. "That was the target because we needed an application that everybody could understand and interest in the life sciences was extraordinarily high." And, it was an application that would stretch the architectural design of supercomputing.

The first criterion for the new machine was speed. "We wanted an application that genuinely needed a petaflop of computing," Turek says. IBM also wanted to create a reliable system that didn't regularly fail. And, it wanted to build something that would have a more general use.

In fact, says Turek, "For the past two-and-a-half to three years, we've been looking at the applicability of a wide-ranging

technology come from the academic-and government-scientific research community. "We're interested in Blue Gene/L for two reasons," says Steve Louis, assistant department head for Integrated Computing and Communications at the Lawrence Livermore National Laboratory, which is one of IBM's key partners in the Blue Gene development effort. "First, its design is well-matched to some of our most important applications and second, it addresses critical issues on the path to petaflop computing." Those issues are, he says: power, floor space, cost, single-processor performance and network scalability.

Each is significant in its own right and Blue Gene/L has made strides in each area. Ironically, it's accomplished these goals in an unorthodox manner. The hype surrounding most new high-performance computers usually focuses on higher performance CPUs, advanced interconnects and more memory. Blue Gene used slower CPUs and less memory per node to go with its innovative interconnect technology.

Scalability is perhaps the most important aspect of the Blue Gene/L project. In many ways, Blue Gene represents what can be understood as the return of the concept of massively parallel computing. When the complete machine is delivered this year, it will be able to scale to 65,536 (64K) processing nodes with two CPU cones per node.

The idea of massively parallel computing isn't new. In the

"**F**or the past two-and-a-half to three years, we've been looking at the applicability of a wide-ranging set of applications for the platform." —David Turek, vice president, IBM Deep Computing

set of applications for the platform. We've used the insights garnered from those investigations to shape the design of the systems since then." Last summer, the Blue Gene effort at IBM made the transition from research and development to product-development status.

The Many Uses of Blue Gene

IBM anticipates that supercomputers based on Blue Gene technology ultimately will be used in commercial applications. After all, notes Turek, past generations of HPC technologies have been implemented by financial-services companies for risk-management applications. Product design, oil exploration and logistics can also require massive amounts of compute power.

As expected, however, the initial users of the Blue Gene

1980s, innovative companies such as Thinking Machines built early generations of the technology. At that time, however, the technology didn't live up to its promise. "For awhile in the mid-1990s, massively parallel dropped from 64,000 (nodes) to 64," observes Richard Loft, formerly an engineer at Thinking Machines and now the associate director of the Scientific Computing division at the National Center for Atmospheric Research (NCAR), where he's also in charge of the computational science section. The scientific computing division has traditionally been responsible for all of the supercomputer assets that NCAR employs for simulating the world's climate and meteorological applications, as well as space, weather and oceanographic applications. "In people's thinking, the focus shifted from large parallel computers in processor count to smaller computers," Loft says.

Spreading the Word

With Blue Gene, the thinking has shifted back to larger scales. For example, Louis says the laboratory wants to focus on the physics and materials part of the Advanced Simulation and Computing (ASC) program operated by the National Nuclear Security Administration of the U.S. Department of Energy. "There is a major program element in Advanced Simulation and Computing that focuses on physics and materials science," said Louis. "That's one of the focuses we wanted to have for this machine."

The applications initially targeted included compute-intensive problems in classical and first-principles quantum molecular dynamics, as well as dislocation dynamics for material strength, research hydro dynamics, instability and turbulence. Those applications were selected because they were important to ASC and they had enthusiastic support among the scientists at the laboratory, according to Louis. He adds, "They had very good potential for code scaling. Blue Gene/L has a particular kind of architecture and we tried hard to target the kinds of codes that we thought would be able to best take advantage of the way this machine was designed."

Scientists at Lawrence Livermore have also spread the word about Blue Gene/L's capabilities. For example, they encouraged a team of scientists at the University of Chicago's

"We're interested in Blue Gene/L for two reasons. First, its design is well-matched to some of our most important applications and second, it addresses critical issues on the path to petaflop computing."

—Steve Louis, assistant department head, Integrated Computing and Communications, Lawrence Livermore National Laboratory

Flash Center to think about ways to use the Blue Gene/L prototype and urged the scientists at Chicago to explore the opportunity. The Flash Center is an ASC Academic Strategic Alliances Program (ASAP) center and the Flash code project was launched by the Department of Energy to study thermonuclear flashes on the surfaces of supernovas. "We're trying to figure out how stars explode; how they go supernova," says Katherine Riley, a senior applications engineer at Argonne National Laboratory, who has worked on the Flash project for the past seven years.

The scientists associated with the Flash project study what are known as Type 1A stars, which are very dense and steal mass from neighboring stars, which are generally younger and larger. As the star steals mass, it builds up material on its surface, which results in nuclear explosions on the star. "There are really large nuclear explosions similar to the mechanisms of nuclear weapons," Riley says.

While these phenomena have been observed, the processes that lead to the giant explosions that light up the night sky are still unknown. The Flash project scientists run simulations to try to determine the mechanism. "We've come up with some new and promising results," says Riley.

In past simulations, the scientists would let the star burn for a period of time. Then they would manually program an explosion to see the results. "What Flash has been able to do is form first principles to have a star explode on its own," she says. "It's a very cool result and this is what Flash was designed to do, study stars and make them explode."

Over the past several years, the Flash team has had access to the largest supercomputing systems in the world. "Flash is an interesting problem because of the problem size," Riley notes. "The amount of data is so large that you need to make sure your code can deal with all of it."

To run the star simulation, the computing must occur on a very fine grid, which changes while the simulation is underway. The greater the resolution for problems like this, the more interesting the physics taking place. Indeed, in physics there's a well-known scale that ranges from kilometers to the nuclear. To deal with problems that must be resolved across such a wide range requires the cutting edge of computing power.

"With such a large number of nodes that can scale and an interconnect that allows you to use all of the nodes effectively, Blue Gene will be able to do simulations with a resolution and study physics; that hasn't been able to be done before—period," Riley says.

Simulations will be conducted along a much broader range of physical scales. In the past, Riley says, the machines have simply not been able to manage the problem. But with 64,000 processors, or even 16,000 processors, "we're going to be able to attack these problems and bring them to finer detail than we've ever been able to before," she says.

The IBM Blue Gene/L supercomputer has achieved record-breaking performance.
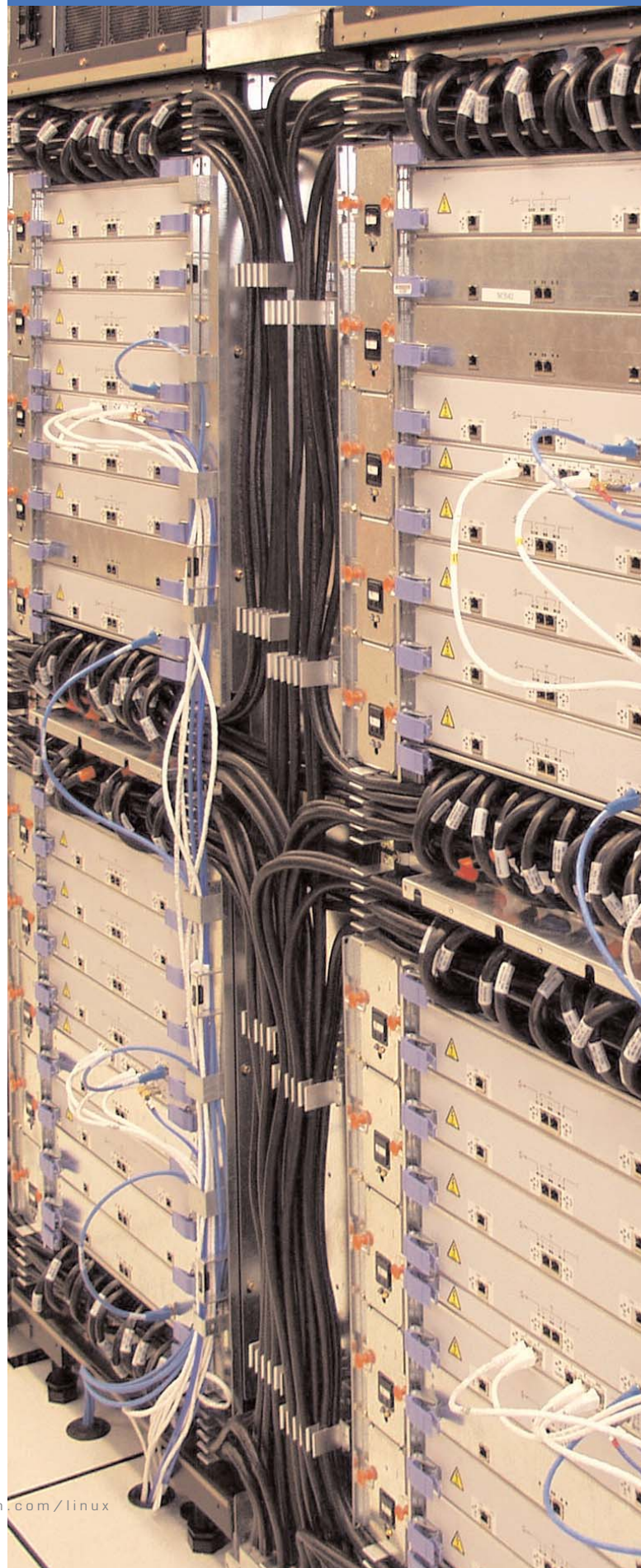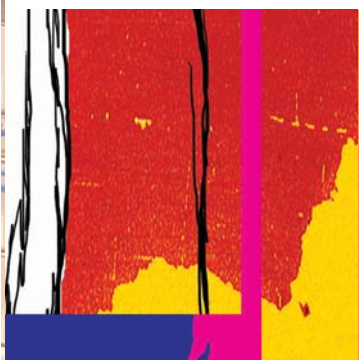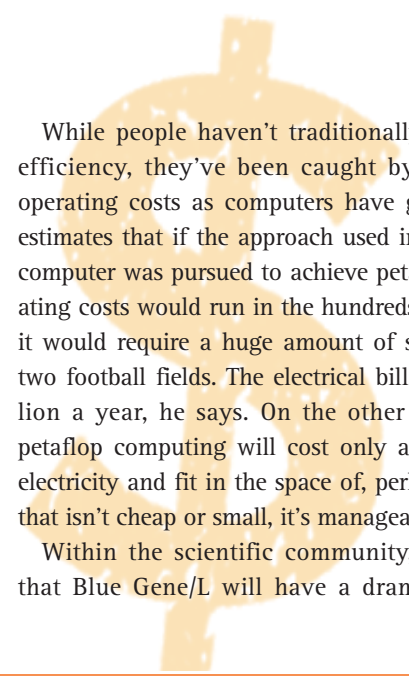
The Linux Factor

Blue Gene/L is much more than just a large Linux cluster. Two of the primary challenges that Blue Gene/L had to overcome to achieve its degree of scalability are power management and size. "The problem with large super computer systems is that they consume a lot of power and space. And they are relatively expensive," says NCAR's Loft. "The facility's costs have become obvious to us as a hidden cost, sitting on top of cost of the rest of the system."

Blue Gene/L has solved many of those problems. It's a low-power technology that delivers a lot of "fuel efficiency," Loft says. "We measure fuel efficiency in terms of sustained flops-per-watt. That's how you efficiently turn electrical energy into computations." By that metric, Blue Gene/L is 10 times more efficient than a common Linux cluster.

While people haven't traditionally tracked computing fuel efficiency, they've been caught by surprise by the leap in operating costs as computers have gotten larger. IBM's Turek estimates that if the approach used in the NEC Earth Simulator computer was pursued to achieve petaflop computing, the operating costs would run in the hundreds of millions of dollars and it would require a huge amount of space, perhaps as much as two football fields. The electrical bill alone could be $150 million a year, he says. On the other hand, with Blue Gene/L, petaflop computing will cost only about $2 million a year in electricity and fit in the space of, perhaps, a tennis court. While that isn't cheap or small, it's manageable.

Within the scientific community, many observers believe that Blue Gene/L will have a dramatic impact. "People are

> "**B**lue Gene will be able to do simulations with a resolution and study physics; that hasn't been able to be done before—period."
>
> —Katherine Riley, senior applications engineer, Argonne National Laboratory

rethinking their codes," says Claudio Rebbi, professor of physics and director for the Center for Computational Science at Boston University. Running on Linux, Turek notes, should facilitate the porting of codes.

The Next Steps

Of course, IBM has grand ambitions for a technology that started its life being promoted for use with a single application. The next steps in the product roadmap call for IBM to deliver a machine that can achieve 360 teraflops/second to Lawrence Livermore National Laboratory within the next several months. It also plans to deliver a developer edition to aid scientists who wish to develop code for the machine.

And, over time, IBM officials believe that Blue Gene/L will win market acceptance as a commercial product. In the spring of 2004, for example, the Dutch astronomy group Astron announced a joint project with IBM that will harness the 34-teraflop supercomputing capability of IBM's Blue Gene/L to peer back billions of years, deep into the history and even the birth of the universe. Argonne National Laboratory is also reportedly considering the purchase of a smaller version of Blue Gene/L.

In any case, with Blue Gene/L, IBM has clearly achieved at least three major goals. It's on the road to petaflop computing. It's demonstrated its commitment to this initiative. "In 1999, we committed $100 million to this and we delivered," says Turek. And, it's given Linux an essential role in the most advanced HPC platform in the world.

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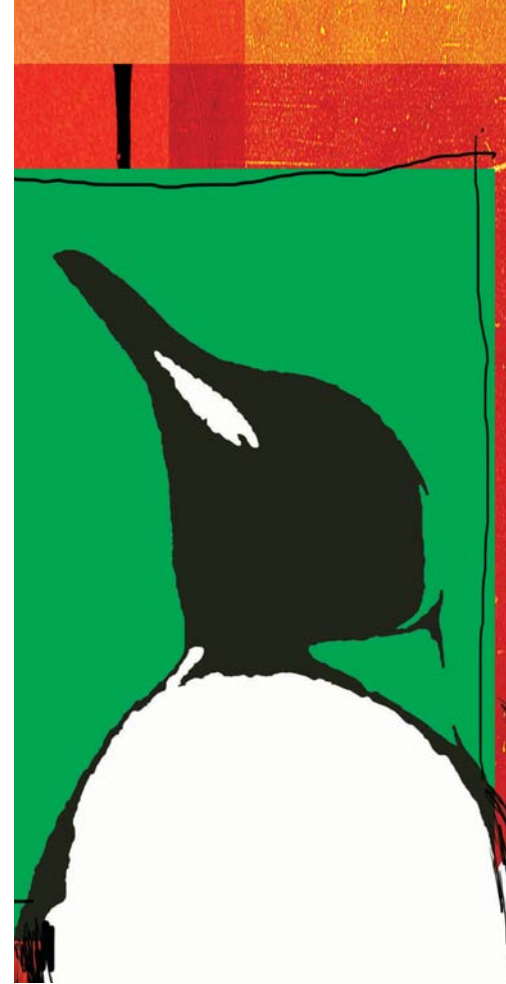
BANKING ON LINUX

A large Italian bank consolidates using zSeries and Linux

If

BY RYAN RHODES

If you were to mention OS/2* today, most people probably wouldn't know what you were talking about—even though many of them rely on OS/2 whenever they visit their bank branch or use an ATM. If they're familiar with the history of computing, they might flash a nostalgic grin for the legacy operating system (OS), which many recognized as technically superior, but was largely squashed by the emergence of Windows* in the 1990s.

For many branches constituting the worldwide banking sector, OS/2 continues to enjoy popular use, both as the software engine that powers many of today's ATMs, and as an OS that could scale from desktops to servers and has a reputation for high up-time and stability.

Whatever the OS, financial institutions are re-evaluating their branch technology investments since many legacy OSs are reaching end-of-life, phasing out support and institutions are realizing the need for a more flexible IT infrastructure to support the transition to on demand business.

Stacked atop OS concerns is the reality that the financial industry worldwide is in a state of rapid evolution, due in large part to deregulation and consolidation, which—combined with leaps in technology—continually spurs competition between banks. This competition requires those institutions to balance the need to control costs while simultaneously pushing to provide higher levels of customer service and satisfaction.

Making Change

For Milan, Italy-based Banca Popolare di Milano (BPM), one of the largest banking organizations in the country, with 600 branches and 6,300 employees worldwide, the inevitability of migrating forward from OS/2, coupled with the need to remain technologically competitive, prompted them to initiate an entire IT upgrade starting in December of 2002.

BPM is no stranger to the realities of consolidation. As a group comprising such financial institutions as Meda SIM Bipemme, Ges.Fi.Mi, Bipiemme Gestioni SIM, Bipiemme

Vita, Banca 2000 S.p.A and First Skelling Inter Finance Co. Ltd., BPM needed to ensure continuity within these disparate entities while providing the flexibility for further acquisitions down the road.

It was a two-year upgrade process that replaced OS/2 with a mixed environment that leverages z/VM* and Linux* and consolidated multiple distributed servers onto two new IBM* mainframes.

Linux continues to emerge as a viable alternative for institutions—both financial and otherwise—that are looking to upgrade their IT resources. Linux is well suited for organizations looking for a solid return on investment (ROI), overall leveragability of existing and new resources and the ability to support service-oriented architectures. Linux also delivers the same legendary reliability and security that banks have depended on with OS/2.

As with most banks, BPM is driven to provide its customers with the technological conveniences, such as Web-based and telephone banking, which helps ensure their continued loyalty. Although such delivery channels have become commonplace, updating the IT infrastructure to accommodate the technologies can be a daunting proposition, particularly—as was the case with BPM—when the delivery channels had been

deployed, one on top of the other, haphazardly and with little or no integration with the bank's branch operations.

The end result for BPM, not surprisingly, was a tangled system of transaction-processing offerings, making it extremely difficult for the bank to provide its customers with a hassle-free and seamless banking experience across its many channels. Customers conducting Web-based transactions would have to wait for their transactions to be reflected in the bank's branch and telephone channels,

BPM teamed up with IBM Global Services to improve the overall customer experience.

ultimately leading to frustration for the customer as well as requiring additional IT and personnel processes to sort out the confusion, driving up overall costs.

"Our main goal was to integrate all of our channels so we could have a single view of our customers," says Clive Whincup, CIO of Banca Popolare di Milano. "Channel integration could help give us a competitive advantage because we can be more reactive to business demands and cut the cost of implementing and maintaining the system."

Thrown into the mix was an IT infrastructure largely dependent on distributed OS/2-based servers operating everything from credit evaluation to customer relationship management (CRM) applications. The entire system demanded a more streamlined IT environment to better serve the bank's customers as well as boost overall system security and availability.

BPM coordinated with IBM Global Services—Business Consulting Services to achieve its goals for a new IT infrastructure to help improve the overall customer experience by implementing a consolidated, integrated and multi-channel banking solution that could accommodate Web-based, phone-based and ATM-based transactions while also providing the potential for future growth and innovations.

"We saw IBM as the only global partner that had the depth of skills and expertise—in both processes and technologies—that we needed for such an intensive effort," says Whincup. "IBM's strong support for open technologies like Linux was also key."

They also recognized the need to streamline their system to ferret out the redundant processes that had emerged as a result of their distributed server environments and conflicting applications.

The infrastructure upgrade was no small feat, requiring the installation of two zSeries* 990 servers running z/VM as well as Novell SUSE LINUX v.8 partitions. Through z/VM, the bank is able to dynamically shift central processing units (CPUs) and memory to the necessary workloads as well as provide the capability to create virtual server partitions to accommodate
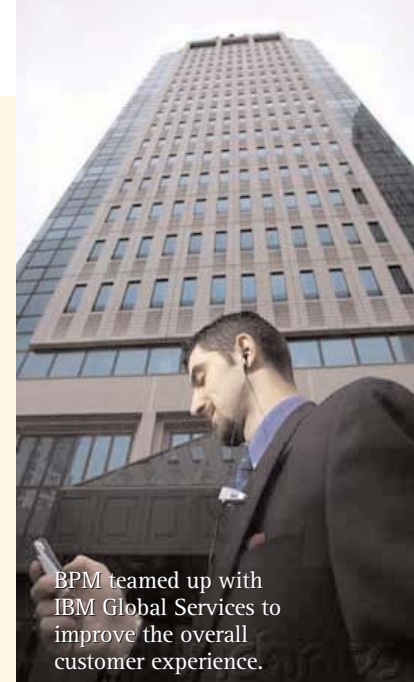
> "We saw IBM as the only global partner that had the depth of skills and expertise — in both processes and technologies — that we needed for such an intensive effort."
>
> —Clive Whincup, CIO,
> Banca Popolare di Milano

new applications in the future. Via Linux, BPM can host a variety of other business-critical applications while realizing a reduced total cost of ownership (TCO) through savings on software licensing and support.

Loaded on z/VM and Linux is a smorgasbord of application suites, including WebSphere* Application Server–Enterprise, IBM Rational development tools, Lotus* Domino*, Lotus Notes* and a wide array of Tivoli* offerings.

BPM was able to leverage Linux in a variety of ways. The bank was able to dispose of most of its previous client applications by hosting Lotus Notes and Domino 6.5.1 on Linux, where branch users can now access the company mail server through Lotus Domino Web Access 6.5 clients. Standardizing its branch clients on Linux this way allowed the company to end the need to distribute software and dispose of the costs associated with their previous client maintenance support. Additionally, thanks to Linux, the bank was also able to reuse some of its existing hardware. With the savings realized on reduced software and licensing, BPM was also able to update its line of desktop systems within its branch offices.

Cashing In

Today the bank now enjoys a single, multi-channel, fully integrated banking solution that's unified on a system anchored by Linux, z/VM, Java* 2 Platform, Enterprise Edition (J2EE) and WebSphere, on two zSeries 990 mainframes serving Linux-based clients across its entire 600-branch network. The system provides universal access across its branches and across its multiple transaction channels to the same singular view of the core customer data, all via a Web browser.

As a result of its standardization, integration and IT innovations, the bank is realizing an improvement in its cross-selling and up-selling capabilities, which is helping to optimize its revenue potential while improving its all-important customer loyalty. Additionally, BPM is experiencing a reduction is its TCO and, thanks to reusable hardware components, it's able to quicken the deployment of new services and look ahead to adding more functionality.

"We look forward to building on our platform by adding Web Services, which will give us the means to expand our revenue opportunities through service partnerships–without having to build them ourselves," says Whincup. "This is the essence of on demand business, and it wouldn't be possible for us without IBM's vision and guidance."

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Linux: Well Done,
Flexibility on the Side

How Linux is helping Logan's Roadhouse transform the restaurant industry

BY GARY J. EVANS

Implementing Linux* solutions in a restaurant environment isn't as obvious a pairing as, say, combining provolone with French onion soup— at least not yet. But the truth is, the value that Linux provides for companies of all types— banks, software firms, manufacturers—applies as much to the food and hospitality sector as anywhere else, even if it's only now beginning to be realized.

Apprehension about new technology isn't exactly new to this space, I should know, I worked at a restaurant a little over a decade ago. I remember how my manager reacted when they brought in the first computer terminal (not cutting edge even by early '90s standards), which replaced the pen/paper ticketing system we'd used up until then to communicate orders with the cooks.

"Gary, my boy," he said. "Mark my words. This isn't going to fly. Computers in restaurants just aren't necessary."

Now fast forward to the comfy interior of a modern restaurant. The place is Logan's Roadhouse, a chain of more than 100 stores servicing 18 states, primarily in the South and Southeast. Headquartered in Nashville, Tenn., Logan's Roadhouse is a wholly owned subsidiary of the publicly held CBRL Group, Inc. Though the restaurant theme is modeled after 1930s and 1940s roadhouses, the business needs of Logan's Roadhouse are very much like those of any post-millennial corporation.

This is a restaurant that long ago realized the value that technology brings to a restaurant environment. And Scott Dever, vice president of Information Systems at Logan's Roadhouse, continually looks for ways to increase that value. "When we began considering Linux, we wanted to get out of the closed, proprietary systems we'd been using, particularly in regard to our point of sale (POS) terminals, and we wanted to keep our costs as low as possible," Dever says. "We also put a premium on flexibility, stability and security."

I'll Have the Penguin, Please

"There were several things we needed to accomplish," explains Dever. "Outside of basic POS setup, we had no flexibility with our existing systems. And while our terminals were touch screen, they were non-graphical, and

Scott Dever, vice president of Information Systems at Logan's Roadhouse, discusses the value that Linux brings to the table.

not as easy to use as we wanted. We needed something new."

The flexibility of Linux held obvious appeal. "The shift away from proprietary systems has already paid us some nice dividends," says Dever. "We've added tweaks to our software, which have added a lot of value to the system overall."

For starters, Logan's Roadhouse was able to create an ID-checking program to help ensure those ordering alcoholic drinks were at least 21 years old, and more was to come.

"Another issue that we deal with a lot is beverage orders, including non-alcoholic orders," Dever says. "Servers are responsible for efficiently and accurately managing complex beverage service. The majority of drinks served are non-alcoholic, and in the process of getting the alcoholic beverages made, these other beverages are an easy thing to forget to ring up. We've developed an application that prompts the server for the number of active seats at a given table, and then makes sure a corresponding number of drink orders have been placed, even if just for water. This is a great example of the flexibility we were looking for: We were able to identify a source of revenue loss, and we were able to tap into the open architecture of our software to create custom applications to deal with it."

What's more, Logan's was able to create these applications with internal staff. As Dever explains, "We can build the things we want ourselves—it's just Java*."

Value Menu

Dever also points out the cost savings involved in the move. "There's certainly a lower cost of ownership to implement a solution in Linux, as opposed to proprietary operating systems (OSs)," he says. "In a given restaurant, we average about eight POS terminals. Currently, we have 180 of our new terminals in place, and by the end of this fiscal year [July 2005], we'll have about 425 in use. We figure we're saving $1,600 to $2,000 per store right there, just in OS licenses."

> ## "The overall combination of the IBM hardware and the Linux OS has added a new level of stability. I think the OS could be the most stable part of our system."
>
> —Scott Dever, IT vice president, Logan's Roadhouse

And it doesn't stop there. Dever comments on the savings received through an IBM* "self maintainer" program, which allowed the company to extend the warranty of its IBM @server xSeries* servers and other hardware by taking its support system in-house.

"Our technicians took a test and became certified to work on the IBM POS terminals," says Dever. "All we need to do is maintain a small inventory of parts, and if something goes wrong, we have what we need on hand to fix it. Because the system is component based, we don't have to have an extensive knowledge of the inner workings of the IBM terminals."

Open 24 Hours a Day

Like most businesses, restaurants are acutely aware of the revenue that's lost when systems go down; reliability is a huge issue.

"I've got to tell you," says Dever.

"Availability simply hasn't been an issue. The overall combination of the IBM hardware and the Linux OS has added a new level of stability. And I think the OS could be the most stable part of our system."

And support hasn't been a problem, on the occasions it's been necessary. As Dever explains, "Logan's is moving to in-house support as we continue to roll-out the new system. All we've needed is a Java developer for custom apps, and a basic knowledge of Linux and how to set up network protocols and IP addresses. Easy stuff. And we don't have to update Linux nearly as often as other operating systems," says Dever.

Dever also points out the value that Squirrel, the software that runs on the POS terminals, brings to the table. "The fact is," he says, "that Squirrel is what enables us to enjoy the benefits of a Linux environment. They make a Windows* version of their software, but they are one of the few who make a

Linux version as well. We've been using their software for a long time, and we're very happy with it."

All Part of the Team

To Mike Todd, vice president of Sales, Retail Solutions, Keylink Systems Group, Agilysys, (an IBM business partner instrumental in helping Logan's shift towards Linux), utilizing Linux in the restaurant industry just makes sense. "It's not a revolutionary idea. People have been talking on and on about how a Linux-based system fits this space. But not many have implemented yet," he says.

As he goes on to explain, "Restaurants have a lot in common with other businesses, and that's why they can take advantage of Linux solutions just like other companies do. In essence, they have to be able to turn over customers, keep their inventory balanced, and make sure they're managing their labor and associated cost."

He continues, "The operating environment with Linux provided Logan's with a very simple solution that was easy to manage, easy to upgrade, low in cost and very efficient in terms of speed. This is exactly what Logan's was looking for. Beyond this, of course, the advantages of the low licensing cost, not to mention the flexibility of using an open system, are also huge benefits."

Agilysys, one of three distributors in North America for IBM stores and part of the Business Partner Value Network for Linux, has a lot of experience in this space. Says Todd, "We worked very closely with IBM, and also with a Nashville company called Cash Register Systems—or CRS, as they're more commonly called—to craft a custom solution for Logan's. As part of this Value Network, we were able to work with best-of-breed partners—including the company that Logan's has a longstanding, comfortable relationship with, CRS—and provide a solution that works on every level."

The concept of the Value Network (or simply "ValueNet") is important. It allows IBM and its business partners to work together on behalf of a customer. As Rich Farber, IBM business partner for Linux systems, was quoted as saying in a recent *Linux Executive Report* article, "A value network is a multi-partner solution provided to an end customer" ("Partners in Linux: IBM Business Partner Value Networks for Linux delivers near turn-key business solutions," Aug. 8, 2004).

In other words, ValueNet can be thought of as a team of business partners working together, playing off of each other's strengths. If one business partner doesn't have the ability to handle all of a customer's business needs, they can tap the network for another partner to provide whatever element is missing without losing a step.

In the case of Logan's Roadhouse, this becomes significant. Jim Culp, CEO of CRS relates, "We've had a relationship with Logan's for a long time. We know and trust each other, and CRS has developed an intimate knowledge of the needs at Logan's."

For a variety of reasons, it made sense for Logan's to move to open hardware, in this case IBM SurePOS 500 POS terminals on the front end, and xSeries servers in the back. But they're still using Squirrel software, which can run on Windows or Linux. "Between us, we were able to handle creating and implementing the systems that Logan's Roadhouse is using today," Culp says.

Coming Right Up

Logan's Roadhouse, Inc. is currently in the middle of the rollout process. On top of the POS terminals, each site requires an IBM ThinkCentre* workstation and also an IBM xSeries 235 server for redundancy and expansion purposes. These machines, with mainframe-inspired technologies, smart-management tools and unparalleled reliability in an Intel* platform, are helping to lower costs while increasing speed. Additionally, to better facilitate asset management, Logan's utilizes IBM Director—software that operates over the company wide area network (WAN)—to manage the hardware installed at each site.

"Right now we have 22 restaurants running these systems," says Dever. "By July we'll have about 55 restaurants up and running, out of about 122. That equals about 425 machines just in terms of POS terminals. We began this process last August, so we're making excellent time."

Of course, there was some trepidation before the rollout, but fears have proven to be unfounded. "All I can say is that I'm really very happy with how things have worked out," notes Dever. "On every level, this has been a success. Our only real fear going in was from a support angle, and as I've mentioned, this has been no issue at all."

Linux may be new to the restaurant and hospitality space. But the value it's providing in this sector is becoming apparent quickly. My old manager Chuck wasn't ready for the future with the sleek (for the time) machines that were only the start of the computer revolution in restaurants.

The new generation of owners and managers is quick to see the benefit, take the leap, and reap the rewards. As Dever concludes, "Moving toward the Linux solution, not to mention partnering with IBM and the other business partners, has been a good move. It was the right decision."

Gary J. Evans *has been chronicling technology's impact on business and the world for several years. Gary can be reached at gevans@gobeyond.com.*

THE ONLY WAY TO GO

Family Dollar finds success with the combination of Linux and IBM @server xSeries servers

BY JIM UTSLER

There's something to be said for all of those non-big box retail outlets out there. For example, you don't need to spend hours wandering the aisles looking for a screwdriver, park half-a-mile away or camp out in a 20-customer check-out lane waiting for everyone in front of you to finish writing out their checks.

Today's retail businesses are facing new and daunting challenges, especially as the competition in this business sector continues to heat up. It's no longer enough to have low prices and good service, but they also need ways to react quickly to changing dynamics, dealing with vendors and complicated supply-chain matters, not to mention internal day-to-day operations such as inventory, accounts receivable and payable, and human resources.

Fortunately, they don't have to invest a great amount of dollars in their IT environments. They can often get by on less-costly, but no less robust alternatives, including Linux* and physical servers such as the IBM* @server xSeries* server, as is the case with the Matthews, N.C.-based Family Dollar. Rather than using overpowered UNIX* and big mainframe boxes, which can be too costly to both purchase and maintain, the company relies on xSeries boxes and a small mainframe—both running Linux. This has allowed the company to run a lean and flexible computing envrionment that meets the deamnds of today's competitve retail market.

mainframe, which was replaced by a newer IBM mainframe around two years ago. Needing to run a key UNIX financial application, however, it began moving toward UNIX-capable HP boxes, including some HP 9000s. Even though the company began to rely on these UNIX servers, it also began investigating Linux for internal purposes, "we began running it on some desktops. And then, as we were looking at putting additional applications on the HP-UX boxes, we thought, well, why don't we look at Linux running on IBM hardware."

Based on this early Linux experience, the company began introducing Linux applications to its IT environment as they became available and a proper fit was found. "We started looking at alternatives to the HP server to perhaps run our sales audit application," explains Poff. "So we picked up an x345, loaded Linux and put the sales audit application on it. When we compared that to a similar configuration on HP-UX, we found they were pretty comparable in terms of performance. That opened a lot of eyes around here, and we started taking a closer look at what we could do with Linux on the xSeries [servers]."

> " **W**e've been very happy with our choice of the IBM hardware; it's been very good for us. And now, it's our preferred choice."
>
> —John Poff, senior systems engineer, Family Dollar

Investigating Linux

Despite its name, Family Dollar isn't a dollar store in the purest sense of the term. In fact, according to John Poff, senior systems engineer with Family Dollar, "We have items that run up to $15 or $20, although those are probably our most expensive items." Thanks in large part to its low prices (not to mention its customer-centric retail philosophy), the company continues to grow. As of late 2004, it had more than 5,500 stores in 44 states, from Arizona to Maine.

As one might expect, the company needs a rock-solid and easily adjustable IT environment to support this large and expanding presence. To that end, it has a host of xSeries boxes, an IBM mainframe and other systems in place. The xSeries servers consist of an x445, an x360 and 19 x345s, most of which are running Red Hat Linux Advanced Server version 2.1. (The others are running Advanced Server 3.0.) The mainframe, which the company is slowly phasing out, runs a variety of legacy applications as well as several parti-tioned instances of Linux. It also has, in addition to some Windows* technology-based servers (many of which are also running on xSeries servers).

Prior to 1998, Family Dollar had relied heavily on an IBM

Because the company already had an HP-UX box in place, it didn't immediately dismiss other HP platforms as viable alternatives on which to run Linux. As it conducted further tests, however, it became clear that the xSeries servers had the advantage when it came to price/performance measurements. This became especially evident when the company was considering a Linux-based transportation-management system to help it more easily administer shipments coming from its vendors, through its carriers and to its distribution centers. The application provides a Web site that its carriers can log onto to update information and perform other tasks. "We decided to run the application, which saves our carriers a lot of money, on Linux, and we wound up going with the x345s, which we rolled out and put into production about a year ago," Poff recalls.

This decision to run the transportation-management application, as well as others, on the xSeries servers was based on performance and cost. According to Poff, this Linux on xSeries solution came in less expensively than a similar solution on an HP platform. Other issues also related to ease of use and man-ageability, with—in an unlikely scenario—Family Dollar's Windows administrators encouraging the use of Linux on the xSeries servers. In fact, the company's first xSeries servers

were introduced into its IT environment to runWindows.

As Poff remembers, "The Windows team came to us, saying, 'These are really nice, powerful boxes; you should consider running Linux on them as well.' That, in addition to our earlier experimentation with Linux, kind of helped get the ball rolling, and that's when we started evaluating them."

When asked about the rather odd notion of Windows administrators suggesting that the company should also deploy Linux, Poff laughs, saying, "We all get along pretty well unlike other places. In fact, I read about a place where, when the Linux and Windows teams had meetings together, they would have to have an HR representative with them because of a previous fist fight. Here at Family Dollar, we know we're all on the same team with the same goals, which are the betterment of the company."

Just a Bit More

Since adopting Linux on the xSeries servers, the company has added additional applications. For example, one instance supports an FTP server that allows its vendors to upload and download files. It also has a database running on Linux and is piloting a portal that's partially hosted on Linux. This portal, which is part of the company's larger "Store of the Future project," now allows a limited number of beta-store sites to access key operational data. This will help the individual stores, which are all corporately owned, better serve their customers.

Notably, Family Dollar is also running a Linux instance on its mainframe. It's used for a number of purposes, including as a file server for its warehouse conveyor system and a print server for the mainframe. As Poff explains about the latter, "We have some big dot-matrix printers on the network, both in the warehouse and in our building here, and we use a Linux partition as a print server so the mainframe can access them. This was just a matter of deciding that since the mainframe was available and capable of running Linux, as well as our legacy apps, we might as well get some additional use out of it."

This multiplatform approach to its IT environment has allowed Family Dollar to create the flexible computing backbone needed to remain competitive in the retail market. Linux, it has discovered, is a less expensive, better performing and more easily managed alternative to other proprietary operating systems (OSs), especially when it runs on the xSeries server. As Poff points out, the HP systems might be more powerful, but they also cost much more than the xSeries boxes. That's why the company is relying more heavily on the xSeries servers to run everyday Linux-based applications instead of putting them on the more expensive servers.

Despite minor performance differences, Poff indicates that the company will continue introducing Linux-based applications on the xSeries servers as needed, seeing no need to revert to other systems, unless heavier—and often significantly more expensive—iron is required. "We've been very happy with our choice of the IBM hardware; it's been very good for us. And now, it's our preferred choice. If we're going to get some additional boxes, that's our default, being a known quantity."

The company is also exploring ways to cluster its xSeries environment, seeing this as a way to introduce new applications into its xSeries technology-based Linux environment. Although still in the planning stages, Poff says this will benefit the company greatly, giving it another way to exploit not only Linux, but also the affordable power of the xSeries platform.

The Business Mindset

Because the retail industry has become increasingly competitive over the past several years, organizations such as Family Dollar need ways to respond quickly to changing market pressures, ways to "react fast," as Poff puts it. "If you have an issue in the retail business," he continues, "you're probably losing money. You have to move now and solve the problem. You have to find the best solution with the best fit that's also economical. It's that type of business mindset that drives what we do in IT at Family Dollar."

Thankfully, combinations such as Linux on the xSeries server allow for this type of problem solving—at a reasonable cost. As Poff explains, "When new applications come out, we know we have solid platform for it, both on the operating-system and hardware fronts. And instead of going through a six-month implementation process, which other industries have the luxury of enduring, we can now get it up and running very quickly. Coming from a cost/performance perspective, it's really the way for us to go."

Jim Utsler, *MSP TechMedia senior writer, has been covering the technology beat for several years. Jim can be reached at jutsler@msptechmedia.com.*

Versatility Defined

How three institutions leverage Linux to host images, manage critical applications and serve e-mail

BY RYAN RHODES

My cable remote control is an intimidating little device. There are a lot of buttons and, quite frankly, I'm not sure what roughly 60 percent of them do. I'll accidentally push one and a strange, foreign-looking screen will pop up on my television, and I'll have no idea how to get rid of it. I'll sometimes have to resort to unplugging my cable box, which may seem like a primitive approach to problem solving, but it seems to work.

Sometimes, however, I'll discover something about my cable remote that is truly useful, and often time-saving. I found out recently, for example, how to program in my favorite stations, so I can warp to them immediately. Yes, it makes me more of a couch potato, but it sure is convenient.

Similarly, ever since IBM* iSeries* servers have been rolling out with the ability to house Linux* partitions, some iSeries loyalists have been cautious about leveraging the new technology. They know they have the Linux functionality at their disposal and they've been assured that it's a useful and convenient technology. Still, it's tough for some companies to garner the courage to push that strange little Linux button to actually see what it can do.

That's not the case with everyone, of course. A lot of times, it comes down to how familiar IT floor personnel are with a given technology, such as Linux or logical partitioning (LPAR). For companies well-versed in Linux, there's more willingness to tinker with a Linux partition. For others, a little education and training may be in order before they jump into a Linux partition on their iSeries servers.

Whatever the case, more and more companies are experimenting with iSeries Linux partitions, and *Linux Executive Report* explored how three such institutions have successfully utilized Linux in their iSeries environments. From acting as a repository for Asian art images, to hosting some of a company's business-critical applications, to modest e-mail serving, Linux on iSeries servers has proven useful in a variety of ways.

A Museum Dons The Tux

THE SAN FRANCISCO-BASED Asian Art Museum features nearly 15,000 pieces of art created by cultures throughout Asia, with some specimens dating as far back as 6,000 years.

Following the 2003 relocation from its former Golden Gate Park location to its new digs in a renovated city library, the museum is now home to such modern IT hardware as an iSeries Model 820, a Model 270, eight integrated xSeries* servers (IXSs) and five external xSeries servers—although, chances are good you probably won't see all of that technology on display.

Prior to the move, renovation and IT upgrade, the museum operated largely on Dell equipment running variations of the Windows* operating system (OS). The extensive upgrade to the integrated and consolidated IBM solution had to ensure that the museum's critical applications were secured while also offering the opportunity for further growth.

The new IBM hardware does, indeed, accommodate the museum's online ticketing system, its membership package, accounting application, gift shop point-of-sale (POS) system, building maintenance program and an inventory application. Thrown into the mix is the museum's voice over IP (VoIP) system, Web-filtering tool and fax applications.

Early this year, the museum also went live with a Linux on iSeries partition on their Model 820 that acts as a searchable online database of more than 2,500 images (and growing) of selected museum art pieces.

"What happened was, we recognized the need to display our art electronically," says Jim Horio, the museum's director of IT. "As part of our ongoing public outreach initiative, we wanted to put on our Web site images of the 2,500 pieces of art we have on display. Since we had just gone live with a fairly expensive IT overhaul, we didn't have the funding to host such a Web site on a separate piece of hardware. Instead, it made a lot of sense, because we had an iSeries [server], to host the images on a Linux partition. So, we just

"It was mostly a matter of learning the new lingo and acronyms. If you're familiar with operating systems and devices, chances are good that you'll pick it up easily."

—Jim Horio, director of IT, Asian Art Museum

bought a couple more gigs of memory and a couple more gigs of DASD (direct access storage device). We talked to our sales group out here on the West Coast, and they actually paid to get the Rochester, Minn.-custom development team to develop our Web page for us."

With the decision to opt for a Linux partition, Horio (who has iSeries experience going back to the System/32) took a Linux class at the IBM Rochester, Minn., location in September 2004.

The system was developed using Tomcat and Java* and it was designed to extract data from the museum's inventory system, which was previously PC-based. According to Horio, he extracted the inventory system and now has it residing on a native iSeries DB2* database. The database houses detailed descriptions of the art pieces, and it works by pointing back to the Linux partition where the actual JPEG images reside. The Linux partition also houses small HTML files that act as labels describing the artist, what the art is, a short description and other details. Additionally, there's a function that allows people to search on areas such as the country in which the art originated, the artist and the title.

The museum also makes use of another Linux partition utilizing an additional 200 GBs of DASD that acts as a Samba server. Because the museum does most of its image creation and editing on a Macintosh, and because those images weren't previously backed up to another system, other departments throughout the museum couldn't access and view those images. Horio worked to copy all of those images to the Linux/Samba partition, so the images can be accessed by users both in the museum's Windows and Apple environments. They opted for a separate Linux partition to keep the public Internet partition and the internal-use partition separated.

Having gotten his feet wet with Linux on the iSeries server, Horio says the experience of learning Linux and implementing it on an iSeries server was a lot easier than he thought it would be.

"Probably the most difficult thing was learning the new definitions and terminology used by Linux," says Horio. "It was mostly a matter of learning the new lingo and acronymns. If you're familiar with operating systems and devices (DOS), chances are good that you'll pick it up easily. If you're coming from a Windows GUI (graphical user interface) environment, unless you're working with some of the newer Linux releases that are more GUI-based, you'll likely have a harder time picking it up."

You can visit the Asian Art Museum online at www.asianart.org

Shifting Gears

SOME COMPANIES just appreciate having the option of tinkering with Linux on the iSeries platform, so much so that it's enough of a reason to carve off a partition just to see what they can do with it.

For Chicago-based Tripp-Lite, Linux on the iSeries server presented an opportunity to further leverage Linux in their IT environment. The company, which manufactures uninterruptible power supplies (UPSs), as well as providing power protection and connectivity solutions, makes extensive use of Linux.

"I love making use of Linux here, because I think Linux represents competition in the marketplace," says Mike Pavlak, Tripp-Lite director of information services. "Competition is a healthy thing, and I like to do our part to promote that health. We host Linux on our xSeries machines, as well as other network-attached storage (NAS) devices. We're always on the lookout for new ways to leverage Linux."

Linux on the iSeries platform represented another opportunity to further the company's Linux reach, and they started experimenting with a Linux on iSeries partition around May 2004.

To better understand Linux on the iSeries platform, Tripp-Lite sent their network engineer, Don Weisman, to the same Linux training class attended by Horio, and the company was able to obtain the necessary skills to shake out some of the bugs they encountered while getting their iSeries Model 810 up and running with a Linux partition.

According to Weisman, creating the Linux partition was fairly straightforward, with only minor stumbling blocks along the way. He says that somebody who's proficient in
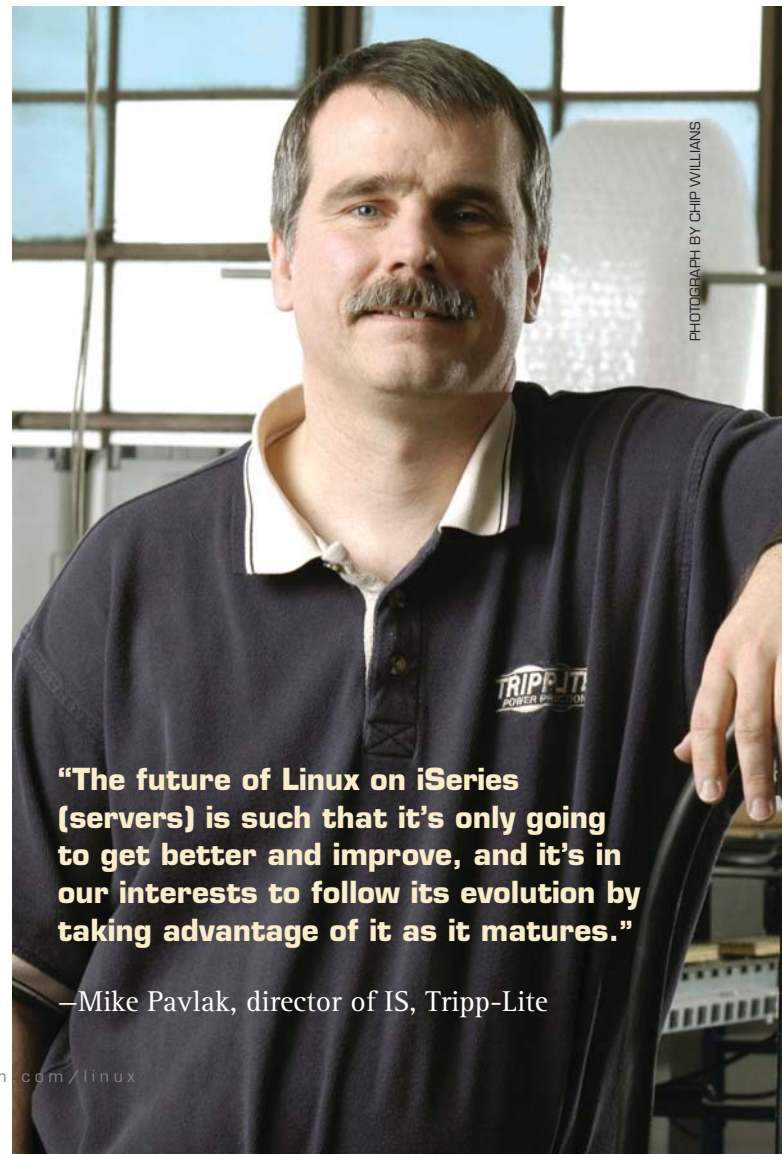
"The future of Linux on iSeries (servers) is such that it's only going to get better and improve, and it's in our interests to follow its evolution by taking advantage of it as it matures."

–Mike Pavlak, director of IS, Tripp-Lite

Linux and is familiar with the iSeries server would probably be able to set up a Linux partition with relative ease.

"It's a little more involved and complicated than setting up Linux on a home PC, of course, and you have to know a little bit about networking, understand virtual devices and be able to look at the iSeries hardware with some proficiency," says Weisman. "We encountered some errors as we worked, but they were mostly minor irritations–a CRC check problem in the IP stack–rather than major problems."

With the Linux on iSeries partition created and ready for use, only one question remained: what to do with it.

"We looked at our existing IT implementations," says Pavlak. "What we were doing, in many cases, was buying an Intel* server, loading Linux on it, and loading each one with its own business application. What wound up happening was we ended up with more and more of what we were trying to fight, which was silos of applications and silos of information. What we saw with Linux running on the iSeries [server] was an opportunity to rein in some of that server sprawl. It was mostly a matter of deciding which servers to try consolidating."

Working with an iSeries Model 810, which the company acquired in November 2003, Tripp-Lite initially experimented with consolidating six Novell file and print-sharing servers onto their Linux partition. Although the testing results were in line with what IBM projected the company should expect,

the performance fell short of its goals.

"At that point in the development of the technology, it just wasn't up to where we wanted it to be for the particular tasks we wanted it to run," says Pavlak. "This version of Linux, on this model iSeries [server]–with a single processor and the current switches and configurations we have in house–was just not providing the results we'd like to see. Will it be an ideal option in the future? Probably, and we'll keep an eye on it, because I'd still love to consolidate, but the timing just wasn't right for that particular aspect of our business."

Shifting gears, Tripp-Lite started looking toward alternative uses for its Linux on iSeries partition. Considering that the company leverages Linux so heavily in their IT environment, it didn't take them long to find other applications with which to experiment.

Three open-source production applications running on separate Linux-based servers came to mind as candidates for migration and consolidation on the iSeries Linux partition: a content-filtering and management solution, a project-management solution, and the company's internal employee intranet, all of which have been brought on board the Model 810.

For their Web proxy and content-filtering solution, the company opted for an open-source solution that allowed it to circumvent traditional costs, which can often price out anywhere between $7 and $25 per user.

> **"We couldn't ask for anything better. There was very little learning involved as far as managing and administering the software."**
>
> —Philip Gordillo, IS manager,
> Pacific Steel Casting Company

"We were able to basically download mySQL, download an open-source content-filtering solution called XOOPS, and we were able to run a full-blown solution for all the users for the cost of downloading and compiling," says Pavlak.

The project-management solution is called dotProject, which is an open-source initiative written in PHP and is designed to provide independent consultants with a method for managing their clients' activities and workloads. The company tweaked the solution to serve as an internal application that runs the IS department projects for the user community. According to Pavlak, the solution also includes a ticket system and is built on common frameworks that allow plug-ins like the help desk.

Finally, the Tripp-Lite internal employee intranet operates as a combination of several content-management systems, with the site driving all internal employee communication. Additionally, the company is looking for ways to further utilize its Linux on iSeries partition.

"Our strategic plan going forward is to continue migrating certain Linux technology-based and other open-source applications to our Linux partition," says Pavlak. "It's obvious that IBM's committed to Linux on the iSeries [platform], and they're committed to making it as functional and attractive as anything in the IT market today. We're confident that we can make an investment in this space now secure in the knowledge that it's only going to get better. Our experience has been mixed,

but it will not deter us from utilizing the technology. The future of Linux on iSeries [servers] is such that it's only going to get better and improve, and it's in our interests to follow its evolution by taking advantage of it as it matures."

Testing Linux's Metal

iSERIES LINUX PARTITIONS don't necessarily have to be called upon to run only larger business tasks. Indeed, a partition can be created to serve some smaller purposes, such as e-mail serving, which was the case for Berkeley, Calif.-based Pacific Steel Casting Company.

With 400 employees on site, Pacific Steel operates as a steel foundry that manufactures casted steel parts, with about 40 percent of its business generated through contracts with PACCAR, Inc., which is best known as a manufacturer of heavy-duty Class 8 trucks.

Pacific Steel has been an iSeries shop for the past seven years, starting with an AS/400* Model 500, which was required to run its selected enterprise resource planning (ERP) solution. In the years following, the company moved up to an iSeries Model 820 and in early 2004 it upgraded to a Model 810, a move that offered new innovations, not the least of which was the capability to create Linux partitions.

"The new iSeries server certainly brought a lot more functionality to the table," says Philip Gordillo, IS manager for Pacific Steel. "I was aware that we could run Linux partitions, but I

wasn't immediately sure how we'd use it, or even if we would."

As an IS manager who's more familiar with Microsoft* and who wasn't natively trained on the iSeries server, Gordillo admits that he's constantly on a learning curve when it comes to new iSeries and Linux innovations.

"I learned about the iSeries [server] on the job," says Gordillo. "And I'm still learning it on the job. Overall, I think it's a great machine that's very stable, and there's no downtime to speak of. Still, I sometimes have to have new things pointed out or suggested to me. I knew, however, that our e-mail solution was Linux-based, and I thought our new iSeries [server] was an ideal platform to consolidate that aspect of our IT environment."

Going way back in time, the Pacific Steel e-mail server was once run on an older IBM product called a Whistle InterJet hub, which Gordillo says was "a little toaster-sized box that just wasn't working for us any longer; we needed a new e-mail server."

Gordillo approached the company's IBM business partner contact, Steve Giondomenica of Cotati, Calif.-based Chouinard & Myhre, Inc., who the company worked with previously when it acquired its Model 820. Gordillo inquired whether his company should opt for Domino*, Lotus*, or Microsoft Exchange, or some other option. Giondomenica suggested using Linux and an e-mail server solution called Bynari Insight Server.

"Based on their suggestion, we went with Bynari, initially, on an Intel xSeries Model 225 box," says Gordillo. "We wanted to put it on the iSeries [server], but at the time we were running the Model 820, which didn't support Linux partitions."

With the new Model 810, Gordillo had Chouinard & Myhre create a Linux partition and loaded it with the e-mail server. The result, according to Gordillo, has been great overall performance.

"We've had no problems with the software, and we've had no problems with the hardware," says Gordillo. "We couldn't ask for anything better. There was very little learning involved as far as managing and administering the software. It's been working wonderfully ever since it was installed."

Going forward, Gordillo says he imagines leveraging Linux even more in the IT environment. Whether that will include more iSeries Linux partitions, he's not sure, but he says he's becoming more of a Linux fan every day.

"My background is Microsoft, but I'm leaning more and more towards Linux," he says. "In fact, I'm hoping to migrate our network over from Windows. My immediate plans are to migrate our network domain onto our xSeries [server] running Linux. I have no such immediate plans for the iSeries [server], but there's a lot of potential with that machine, so who knows."

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Linux guru John Patrick talks about innovation and Linux

John Patrick, president of Attitude LLC, isn't afraid to see what's around the curve.

It's about freedom

BY ELLIOT KING

JOHN PATRICK has been described in the media as one of the most important and intriguing individuals in information technology (IT); a person who sparks innovation and growth. Patrick authored the 2001 book, "Net Attitude," and is president of the consulting firm, Attitude LLC. When he served as vice president for Internet Technology at IBM, he led the company's initial forays into the Net. The *Linux Executive Report* (LER) talked to him recently about innovation, hot new technologies that could impact the IT world, and, of course, Linux*.

LER: Over the past decade, you've been at the forefront of some of the most important IT developments.

Patrick: Innovation is so important in our lives, so it's important to think about it and talk about it. I have no crystal ball, but I have been fortunate to see and participate in what was just around the corner—not 20 years from now or 10 years from now or even five years from now. Some of the most important things going on right now nobody talked about five years ago. Some of the most important things are right under our noses or already here, but their significance is not always appreciated.

LER: How do you determine if something will have an impact and isn't just the flavor of the day in the hype cycle?

Patrick: Not by studying it, talking to pundits or venture capitalists investing in it, or talking to the CEO of a start-up betting his future on it, but by using it, by living it and using it yourself. That's how you can determine what it's all about.

LER: So have you applied that approach to Linux?

Patrick: A lot of people have opinions about Linux. But the best way to form an opinion about Linux is by using it.

LER: So are you using Linux?

Patrick: I have a number of Linux computers in my home that are actually controlling my home. When you use it, you know it is real.

LER: Are there other tests?

Patrick: Talk to students. I used to say that if you had any doubts about Java*, go to your favorite university and talk to computer-science students. Ask them if they have heard of Java, and they'll say that of course they've heard of Java and in fact they are using it. That's true about Linux as well.

LER: How should the implementation of innovation within a company work?

Patrick: There are two things at work. One is the more generic point about business cases. How do you justify something new? Frequently, the question should be reversed. How can we justify not adopting a new technology? When it comes to trying new things and incorporating new ideas, the way to deal with that is through a skunk-works approach. I urge every corporation to have a skunk-works. If you're a small company, it may be a part-time person. If you're a big company, it may be a group of a dozen people. It's a little group of people that you don't over manage.

LER: And what do they do?

Patrick: They have their fingers in everything that's new and are using it. When there's something that's compelling, you adopt it. Do you need a business case to have telephones or a fax machine? You may have a business case to pick this telephone system or that one, but you don't need a business case to say if you need any telephones.

LER: Should that approach be applied to Linux?

Patrick: I think Linux is a bit different, although I do believe that all companies should be at least experimenting and prototyping with Linux. There's the financial side of it that needs to be dealt with the same as every other financial consideration. But the bigger issue with Linux is the freedom that it provides. It's not about free; it's about freedom.

LER: What do you mean by that?

Patrick: I don't think anybody I know in business or otherwise, downloads a free copy of Linux. People buy Red Hat or Novell's SUSE LINUX or Mandrake so they have a distribution that they know is reliable and some level of documentation and perhaps support. Linux is about the open-source model.

LER: In your view, what's important about the open-source model?

Patrick: The way it works is put into the open for everybody to see. There's no mystery. You know how it works. If you don't like the way it works—you find something that's broken or you think should work differently—you can change it. You can do that because it's open source. The way in which it works is in the public view.

LER: Linux is still pretty technical. What impact does that have on its adoption?

Patrick: Linux covers a wide spectrum of opportunities. The acceptance of Linux and its penetration across that spectrum of opportunities are different.

LER: How so?

Patrick: In the server world, in financial-services companies and large manufacturing companies, they see the benefits and are adopting it. Linux is gaining because it's reliable and it's reliable because it's open source.

LER: And in the other areas of opportunity?

Patrick: We are beginning to see Linux adopted in the mobile and handheld devices space by companies that make cell phones. The motivation there is that companies have the flexibility to mold the software platform to their phone, as opposed to molding their phone to somebody else's platform.

A third category would be supercomputing. In supercomputing, you want to pull together clusters of multiple computers and have them act as a single computer. That's grid computing. Linux is very adaptable to that. IBM has contributed to the Linux community to help Linux to become a major platform in the world of supercomputing.

LER: How about Linux on the desktop?

Patrick: It's more complicated and more controversial. People who are hobbyists and like total control of their environment love Linux. People who don't want to know much about how the software works—all they want to do is a couple of applications—they don't really care. Companies such as IBM have a client approach to Linux, with the desktop representing one of those clients.

LER: You use a Linux desktop. What's been your experience?

Patrick: It's a liberating feeling. You can sense the entrepreneurial spirit that went into developing it. But if it doesn't have something that you need and you need to add a device driver or emulate an application or make some modification, you have to know more than some people want to know. And that's the inhibitor. One theory I do believe is that if the Linux desktop gains significant market share, it will be because of governments.

LER: Why?

Patrick: Take Brazil. There are 200 million people and only 10 million have computers. When you look at that from the top, down, there are only so many dollars to go around. If they're going to subsidize it through the school system, how much should they spend on Microsoft* Office functionality given the limited resources?

LER: What are the obstacles confronting the adoption of Linux?

Patrick: The application development companies have to make the leap. They have to make their applications available on Linux. They may not do that. There are a handful of applications that people use. There's no Quicken for Linux; there's no TurboTax for Linux. Dreamweaver is not available for Linux. For me, personally, not having them is a real inhibitor.

LER: What's the role that major technology companies, such as IBM, play in promoting Linux?

Patrick: They play an important role. They contribute technology to the open-source community. Secondly, they provide support alternatives to the customers. The skill base is lower. Many companies say they're convinced of the benefits but their staff isn't trained. It's important that vendors provide consulting and support services. Vendors also have a role in highlighting the benefits of Linux. IBM was a lone voice five years ago.

"We are beginning to see Linux **adopted in the mobile and handheld devices** space by companies that make cell phones."

—John Patrick, president, Attitude LLC.

LER: Why are vendors playing such a large role?

Patrick: They see it as a business opportunity and they see that if they can level the playing field as far as the operating system goes, they can compete on a higher level. They can compete on the total solution, including the support, services, applications and middleware they can build on top of Linux.

LER: In addition to government, are there other key vertical markets for Linux?

Patrick: All of the embedded markets where Linux is behind the scenes are a very important segment. A lot of the consumer electronics devices on the market are a Linux computer under the covers.

LER: Of all the innovation taking place, what are you most excited about now?

Patrick: Voice over IP is still underestimated. Over the next couple of years, people will realize that voice over IP isn't about the price; it's about the integration of voice as another kind of data.

LER: Anything else?

Patrick: I think blogging is still underestimated. It's the tip of the iceberg of the semantic Web. It's a dramatic change in the way information is created, published and shared. It will completely change the way we find information. Web pages are documents without context. With blogging, when you write something, there's a date, there's an author, a category, a title and the content. Those five simple tags give the document somebody wrote a context. It can be found. It can be related to other things by the author or that category.

And Wi-Fi (wireless fidelity) is at the very beginning, too. It's not about coffee shops and hotel lobbies. It's about Wi-Fi being in handheld devices. Mobile will change dramatically through the incorporation of real browsers.

LER: Don't you think some of these are being over-hyped?

Patrick: I think that with many of the new technologies that we have seen over the past dozen years, the reality has been much bigger than the hype.

Elliot King *is an associate professor at Loyola College in Maryland where he specializes in new communication technology. Dr. King has written five books and several hudred articles about the emergence and use of new computing and communication technology.*

Value

Government departments save money, improve data access with Linux

STATEMENT

BY EVELYN HOOVER

OPEN. Scalable. Flexible. Inexpensive. All of these words have been used to describe the advantages that Linux* delivers to customers, from businesses to governments. And in no one sector are these words more important than the public sector, government in particular. Governments, like all organizations, are being forced to do more with their often shrinking budgets, increasing the importance of the Linux value proposition.

Many government agencies are embracing Linux for mission-critical applications, while others are starting with a more cautious approach, using the open-source operating system (OS) for file and print serving before migrating it to even bigger applications. Two divisions of two state governments have made great strides with their Linux adoption—the Oklahoma Department of Human Services and the Idaho State Controller's Office.

"Idaho and Oklahoma are two good examples of state governments that have used Linux for infrastructure optimization, allowing them to become more cost efficient and responsive. Internal processes are simplified, taking legacy computer applications and 'paper applications' and consolidating them on an open, less-expensive-to-maintain system running Linux," says IBM's Amy David, vice president, sales, public sector west.

Idaho's Story

The datacenter staff at the Idaho Controller's Office began exploring Linux more than three years ago. At that time, they were thinking of running UNIX* systems services on z/OS*. "We were toying with the idea of running a Web server," explains Systems Programmer Matt Lashley. "Looking at running Web services on a traditional mainframe got us running Linux."

Unfortunately, none of the office's IT staff had Linux experience. So they enlisted the help of Mainline Information Systems, a Premier Business Partner with knowledge of not only Linux, but also Linux on IBM* zSeries* servers.

With Mainline's help, the office set up the VM mainframe OS, which ran on a separate logical partition (LPAR). Mainline also helped implement the Integrated Facility for Linux (IFL). In addition, the state upgraded to a zSeries Model 800.

Once the infrastructure was in place, the applications-development group quickly identified a project to run in the new environment. "Our customers had wanted us to publish reports on the Internet," says Marla Marchant, the applications bureau development chief. "So we started to look at the cost of supporting traditional print services."

Those costs, however, proved too high—5 cents per printed page. "And legacy applications produced boxes and boxes of paper," she adds. In the end, the team estimated the cost of printing services for the legacy applications to be $300,000. Moving the application to the Web would eliminate those costs and allow the state to replace expensive, high-end printers with less-expensive commodity printers, saving the state an additional $40,000 a year on hardware and maintenance costs, according to Marchant.

To that end, the team decided to develop a utility-reporting program to deliver reports via the Web, reducing printing and distribution costs. Initially the project was rolled out to the Division of Statewide Accounting and the Statewide Payroll and Human Resources division.

Marketing, it seems, was a bit of a challenge, but it was a challenge that Marchant and her team overcame. "Our application owners are used to owning every project that touches their systems. Marketing an enterprise-level reporting utility took some time," she says.

After six months, Marchant had the buy-in she needed and a budget to develop the project. The report application runs on an open-source Apache Web server and uses an open-source MySQL database for document storage. The results of the nine-month-long project, from a user perspective, are impressive. Currently, the system has about 800 named users and that figure is expected to climb. One of the initial application owners now distributes virtually all reports via the Web and the other is moving in that direction. Additional Linux on zSeries applications are also in development.

IT results are equally impressive with the system meeting performance, manageability and disaster-recovery expectations. "Running the legacy applications and the Linux servers on the same hardware speeds the upload process into the database," explains Lashley. "Moreover, since the Linux servers are running under VM one administrator can manage all four Linux servers."

With this project succeeding, the team has turned its attention to its next Linux on zSeries project—porting Lotus* Domino*/Notes* to its applications.

"Idaho and Oklahoma are two good examples of state goverments that have used Linux for infrastructure optimization."

—Amy David, IBM, vice president, sales, public sector west

Oklahoma's Story

With a large database used by more than 1,400 people, the Oklahoma Department of Human Services stores crucial data dealing primarily with child-welfare case management, including child-abuse cases and other high-impact situations. Consequently, the database has to be reliable and available 24-7 with users needing immediate access to its reports.

But the application, which was running on a Hewlett-Packard UNIX platform wasn't meeting the department's needs. Despite the costs involved, the department decided to upgrade its IBM mainframe and migrate existing applications to the new platform. This would allow the agency to improve its ability to respond in real time, without adding staff. The mainframe's resilient infrastructure would also increase availability, reduce costs and enhance responsiveness.

The department decided to consolidate two mainframes into one on a z900 running Linux. "Choosing the zSeries [server] was a matter of economics," says Marq Youngblood, CIO. "When we made the decision to upgrade the mainframe, we were doing so during an economically challenging time. To make this financially feasible for us, we did something really aggressive: we moved 25 third-party software packages to IBM within this timeframe, in effect taking the foundation out from under our software applications."

The mainframe's reliability was the key to this decision. Running Linux was a matter of economics. "Linux was a more cost-effective solution, both in the immediate and long term," explains Youngblood. "We had a good solution, but what we were looking for was the best solution."

"All we had to validate was whether or not our system would operate properly under Linux and whether Linux would be as reliable on the IBM platform as some of our other software was on the IBM platform. Compatibility with

Oracle (which was running the child-welfare database) was another concern."

Beginning in the summer of 2002, the department adopted a phased approach, helping make the transition transparent to users. The agency first moved a help-desk solution, which supported the child-welfare database, to Linux in production. The migration process was completed in April 2004.

"Testing took several months," notes Debbie Smith, the department's CTO. "We had to increase the confidence levels of our own staff, which had grown used to the existing platform. We worked with IBM up front on training and every day it was up and problem-free, confidence built."

The Oklahoma Department of Human Services has obtained impressive cost savings, reduced the risks of unplanned downtime, increased the infrastructure's reliability, improved services by providing more timely responses to its citizens, simplified its IT infrastructure management and enhanced performance by 20 percent.

Linux and IBM

IBM's David adds that Idaho and Oklahoma, from a technological perspective, are on the leading wave of local governments adopting Linux for mission-critical applications. In fact, to spur the continuing use of Linux for higher-end applications, IBM has sponsored several pilot projects for government agencies. Many more are starting to consider Linux for more robust, production application use similar to Idaho and Oklahoma.

"Often times, it's an issue of 'do they have the existing staff with Linux skills?' They've got to run their businesses 24-7 and it's hard. Everyone is challenged, particularly in the IT space of government where the growing retirement-eligible workforce is putting pressure on maintaining skilled IT professionals," she says. "The reluctance, I think, is the fear of the migration. The fact that Linux is open and available from

many sources cheaply and the fact that support skills are available from IBM to help with migration can offset the fear of a new platform. I think as we see more and more governments come on board to use Linux, like Idaho and Oklahoma, more governments will adopt Linux. They just need to see other people using it and realizing demonstrable savings."

Several factors contribute to the attractiveness of Linux for government, with increased security being one of them, as well as reduced cost realized by the flexibility and choice Linux offers. "Governments have to run competitive procurements. I know that many organizations, when they're faced with having to go to their next Windows* migration, consider the costs. At that point, I think more of them are thinking this is the time we ought to be looking at Linux," David adds.

From a strategy perspective, IBM is targeting three areas in the public sector with Linux—infrastructure optimization, public safety and security, and social services. David expects the social-service applications will prove a solid play for Linux. "All of these governments are trying to streamline their many silo'd social-service applications—they have to be federally compliant—and Linux is a potential way to help them with consolidating the many workloads that they have in this area and putting the workloads on a less-expensive platform."

That's the approach the Oklahoma Department of Health Services took, consolidating on Linux on zSeries servers. "This was a logical approach for them. They used an existing zSeries asset already proven superior for scalability and security features. They also had skilled IT professionals comfortable with the zSeries platform," she explains.

David is quick to point out that the mainframe isn't the only platform that can run Linux. All of IBM's platforms, including the xSeries*, iSeries* and pSeries* servers are also popular Linux servers. High Performance Computing is yet another place where Linux is popular in government. "Whatever platform you're comfortable with, we've got Linux options to help meet your organization's challenges," she concludes.

Evelyn Hoover *is MSP TechMedia's senior editor. Evelyn can be reached at ehoover@msptechmedia.com.*

Linux Accounts for Savings
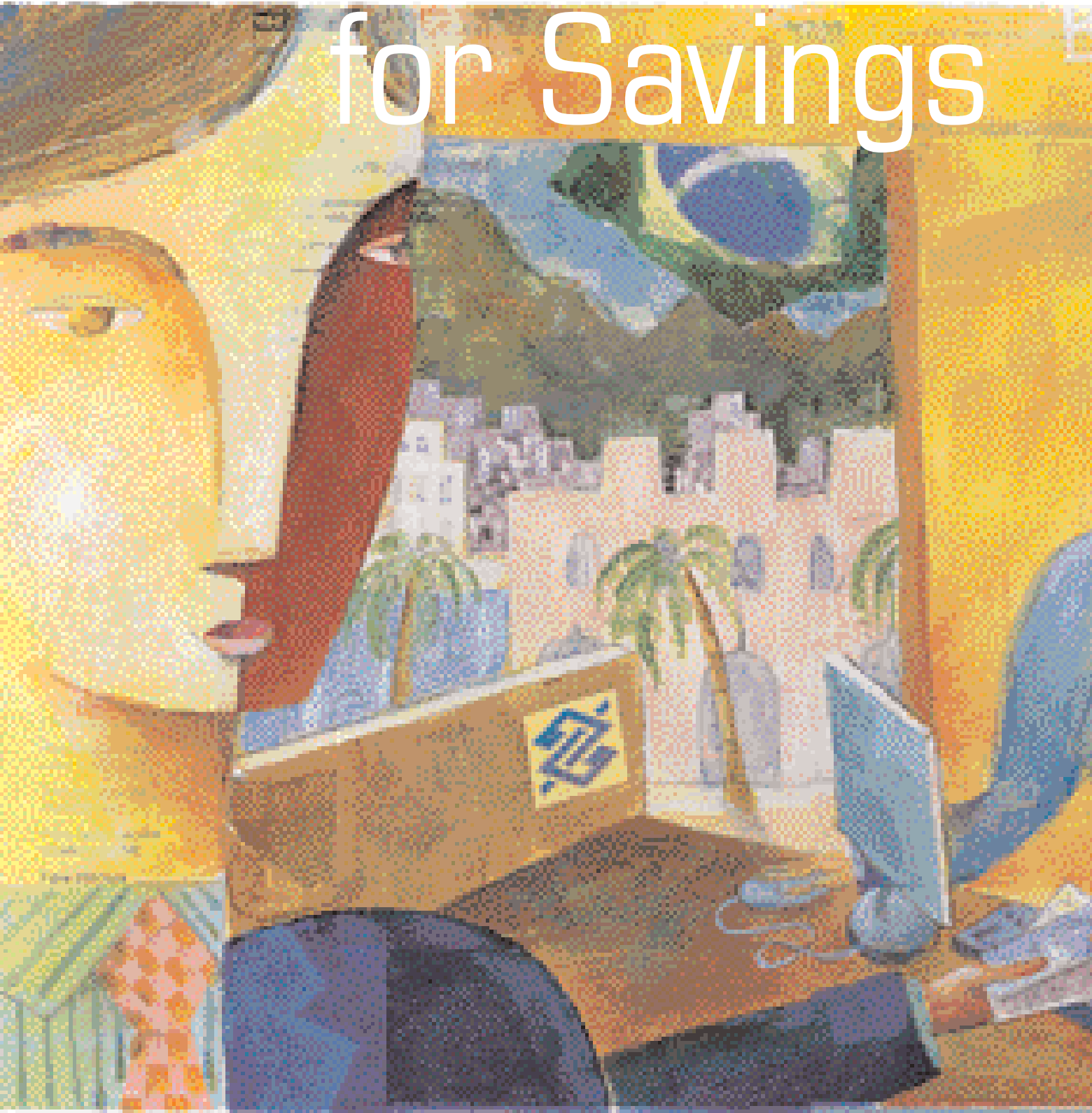
Through the mainframe's virtualization capabilities, Banco do Brasil no longer makes deposits at the server farm **BY NEIL TARDY**
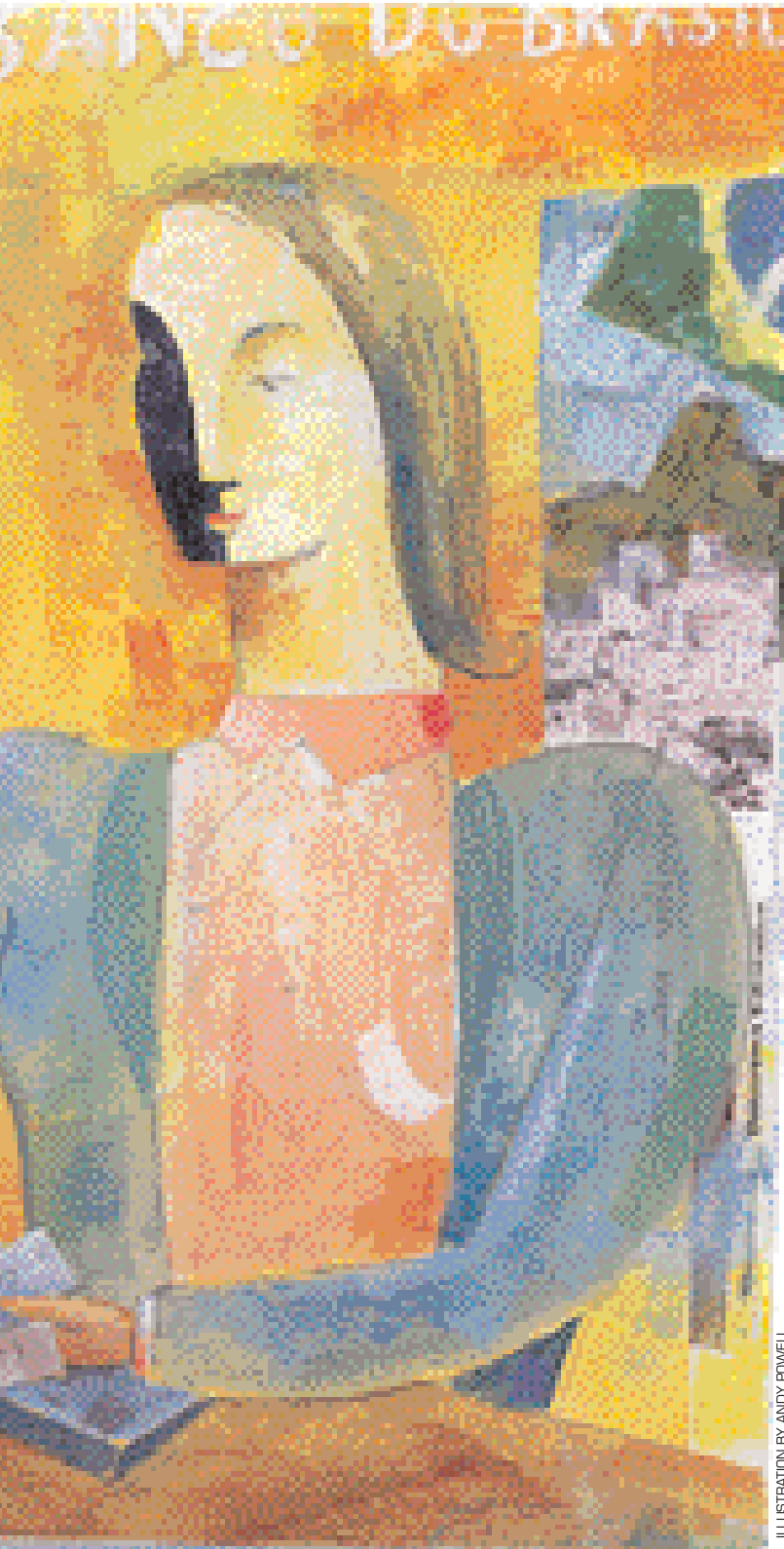
It was the one type of deposit that wasn't welcomed at Banco do Brasil.

The bank, which has branch offices throughout Brazil and around the world, had been addressing its soaring growth by regularly depositing new servers into its datacenter. But rather than continuing to expand a massive server farm consisting of hundreds of Intel* and UNIX* boxes, Banco do Brasil turned to Linux* and the IBM* mainframe. Now with three IBM @server* zSeries* servers doing the work in conjunction with many Intel and UNIX boxes, Banco do Brasil relies on the mainframe's unparalleled virtualization technologies to simplify its development process, reduce administrative and licensing costs and shorten deployment time.

'Hungry' Servers

The history of Banco do Brasil goes back nearly 200 years and its inception predates even Brazil's independence. According to the bank's Web site (www.bb.com.br), Prince Dom João created Banco do Brasil shortly after his arrival in Rio de Janeiro from Portugal in 1808. When it began its activities on Dec. 11, 1809, Banco do Brasil was just the fourth issuing bank in existence.

Today, the bank offers an array of services ranging from retail banking to private savings to insurance and investments. Based in Brasilia, Brazil's capitol, it's present in about 3,000 cities worldwide. While most of its 3,241 branch offices are located throughout the South American nation, Banco do Brasil also reaches international locales like New York City, Miami, London and Tokyo.

In 2003, Banco do Brasil reported that 8.3 million clients received their income at the bank. That figure represented an increase of 16.2 percent compared to 2002.

To the world, Banco do Brasil was a thriving entity. But the accelerated growth rate posed daunting challenges to a 2,000-person IT department charged with serving a user base of about 70,000 employees.

Generally, the response was to add additional servers

to interact with the bank's legacy applications held on its zSeries 900 mainframes running z/OS*. The PC servers brought in spanned a range of providers—including IBM, Microsoft*, Dell and Sun* Microsystems—and operating systems (OSs)—including AIX*, Windows*, Solaris and Linux.

"Banco do Brasil was always hungry for new server boxes," says Ulisses de Sousa Penna, analyst/consultant, Banco do Brasil, who estimates that the datacenter houses 500 to 600 servers. "Every day, it seemed, we needed to deploy a new server for a new service," Penna says.

Server-a-Day No More

While the bank was reliant on its sprawling set of disparate servers, it realized that it didn't want its IT environment to get any larger. So last year, in an effort to escape the server-a-day approach, it investigated, negotiated and eventually chose to bring in three zSeries 800 mainframes running Linux and z/VM*.

Like Banco do Brasil's existing UNIX and Intel boxes, the "zLinux" mainframes communicate with legacy banking applications held on the zSeries 900 servers. But the difference is the new zSeries 800 servers do the job more efficiently, allowing the bank to bring its IT environment under control while continuing to support its constantly growing user and customer bases.

Now, rather than accumulate additional physical servers, Banco do Brasil carves out server power when needed through virtualization. According to IBM, the three zSeries 800 models allow the bank to create as many as 10,000 virtual servers that can serve as many as 100,000 clients.

"The attractiveness of the zSeries servers running Linux is the virtualization capabilities," says Penna. "We can create virtual servers very quickly. We just copy a few files and modify them, and we have a new 'machine'."

The zSeries 800s also allow the bank to incorporate WebSphere* Application Server (WAS) as well as Apache, rather than purchase additional Web servers based on Microsoft IIS or other technologies. WebSphere provides a more stable platform for interacting with call-center applications, while its support of Java* 2 Platform, Enterprise

Edition (J2EE) and Web services standards paves the way for the creation of new banking applications that support Java and Eclipse.

In addition, Banco do Brasil utilizes various other IBM technologies: MQSeries* helps enable connectivity between the new and existing mainframes; IBM DB2* Connect Enterprise Edition V8.1 and IBM Content Manager OnDemand V8.2 serve as the basis for a system that's designed to improve customer service through the Internet, branch locations and ATMs by providing customer financial information through multiple channels for multiple user groups; DB2 Universal Database* (UDB) Enterprise Server Edition V8.1 is used with the bank's stock exchange system; DB2 Content Manager Server V8.2 helps make check images available to both customer and client representatives via the Internet and Banco do Brasil's intranet; and Tivoli* Storage Manager V5.1.5 manages security and disaster prevention and recovery for the new mainframe systems.
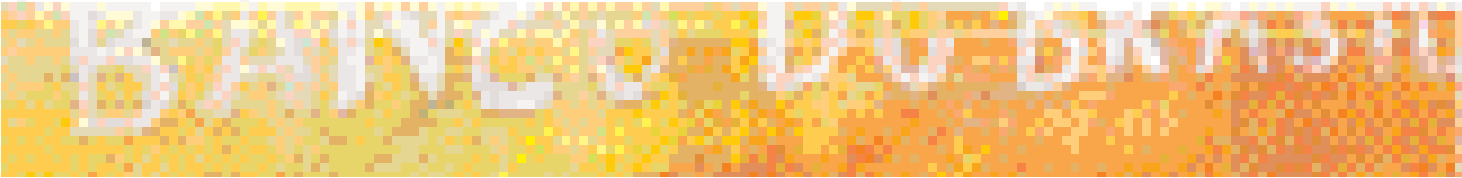
Supporting Argument

Penna adds that the acquisition and implementation of the zSeries 800 servers took about a year, as Banco

"The attractiveness of the zSeries servers running Linux is the virtualization capabilities."

—Ulisses de Sousa Penna, analyst/consultant, Banco do Brasil

do Brasil introduced the servers as development boxes before gradually bringing them to production.

Nonetheless, the biggest obstacle encountered during the process, he says, wasn't a technological transition, it was the need to sell management on Linux. While Linux was already present in Banco do Brasil's environment (it ran many of the bank's Web servers), management had to be convinced that the open-source OS could be supported on a larger scale. While it could be plainly noted that implementing Linux saved the bank money on OS licensing fees, IBM support personnel also stepped in to help make the case by walking the bank's IT administrators through the process of creating virtual servers and providing performance and storage analysis.

"Our managers weren't confident about Linux," says Penna. "But with the support we got from IBM, they could see how easy it was to create the image and how much disk space could be saved."

Saving Money and Time

By implementing Linux and the zSeries server, Banco do Brasil is no longer making frequent deposits to its IT server farm. But, like its customers, the bank is saving—saving money and saving time.

"That's the great benefit of the zSeries and Linux combination—the time-to-market is reduced compared to other architectures," says Penna. "We can develop faster, and we can deploy faster."

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FLEXIBILITY
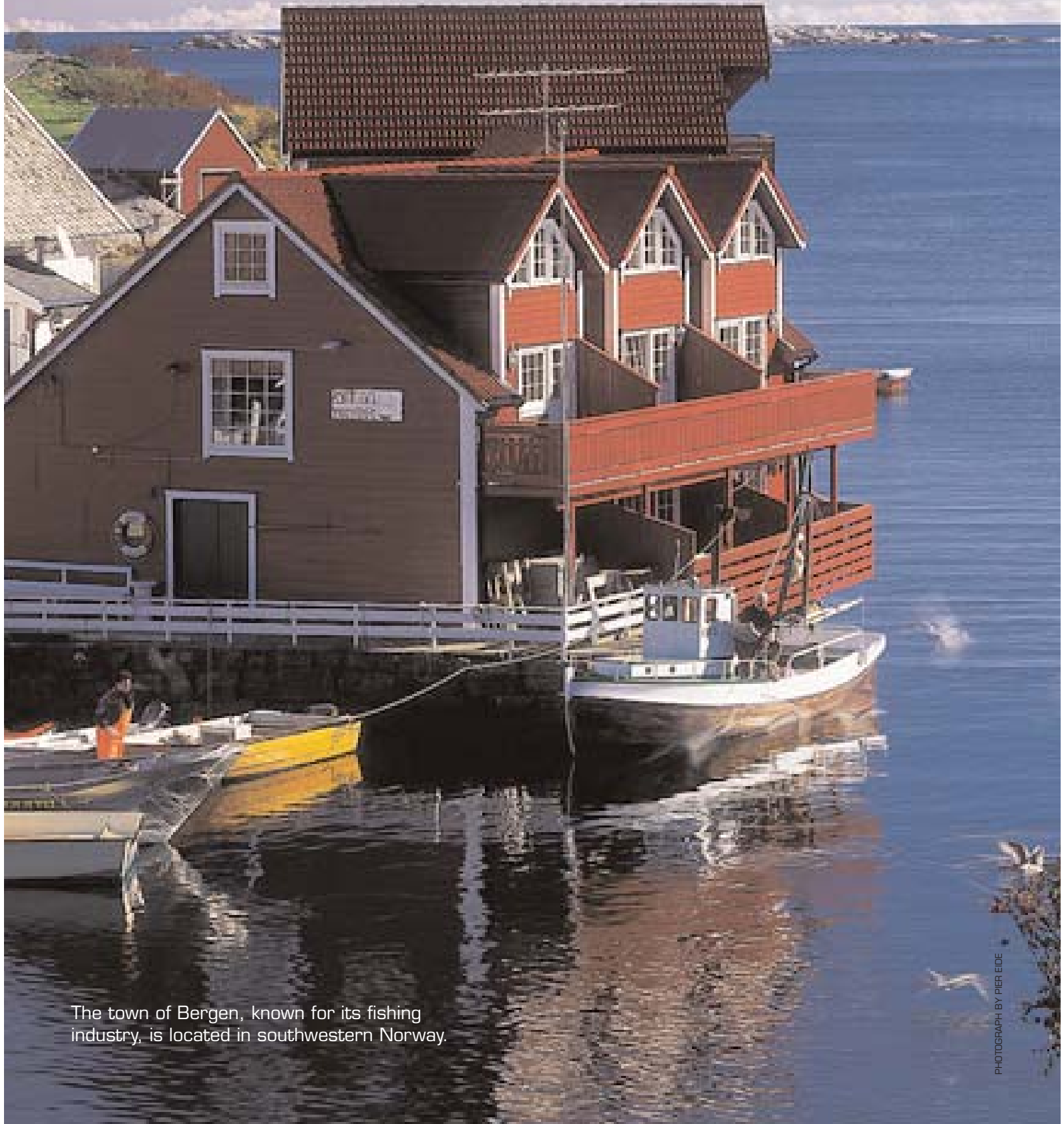
The town of Bergen, known for its fishing industry, is located in southwestern Norway.

& THE CITY

The city of **Bergen, Norway,** consolidates with Linux

BY CAROLINE JOYCE

It could be said that choosing an operating system (OS) is like searching for a new car. You want your new wheels to be dependable, safe and secure, economical and easy to drive. Buying a car–if you do the proper amount of research and number crunching–isn't something you'll end up doing on a regular basis. Nor is searching for the right OS for your IT environment, which is why the IT department for Bergen, Norway's second largest city, hit the books in early 2003 to find the right solution for its consolidation needs.

Tightening the Purse Strings

Bergen, located in southwestern Norway, is home to roughly 240,000 people. Once the capital of Norway, the city is almost 1,000 years old and is struggling to keep up with today's technology and the budget constraints many city governments face. So, when the challenge of consolidating the city's education network–consisting of 100 Microsoft* Windows NT* servers–surfaced, the city needed an affordable solution. According to Ole-Bjørn Tuftedal, the city's chief technology officer, "It was beginning to be a nightmare to administer all of those decentralized servers."

Keeping the city's tight budget in mind, the IT department looked into a few alternatives before deciding on Linux*. One alternative was basing the education network on Windows* servers. But, says Tuftedal, they found Windows would be "more expensive, both because of higher licensing costs and partly because Linux scaled better than Windows. It's been scaled to serve 6,000 concurrent users. We could implement the server solution with less hardware than had we done it with Microsoft Windows, so that's why we decided on Linux." Because of the difference in licensing and support costs alone, the city of Bergen expected to save 50 percent on the servers.

When it came down to it, Bergen's IT department compared the UNIX*/Linux team with Microsoft and found that the former was more stable and secure than Windows.

These penguins live at the Bergen Aquarium in Bergen, Norway.

Also, the single-desktop origins of Windows complicated enterprise management; there were problems with scaling, complexity and multi-user environments. In addition, Windows came with increased labor costs and frequent upgrades and patching.

The city of Bergen has 100 schools, each having its own server prior to consolidation. Altogether, there are 32,000 students and 4,000 teachers using the network with an average of 20-30 computers in every school. After some test phases, the school began implementing the transition to Linux in the fall of 2004, migrating one school every day to the new servers. "The transition so far has been very smooth and successful and even better than we had hoped when we started," says Tuftedal.

The affordability of Linux hasn't lost its appeal on the rest of Norway. Geir Lislerud, territory manager for Public Sector in Norway, says an increasing number of schools in Norway are adopting Linux because of the cost, security and system availability.

Bergen is one of many cities facing tight budgets. According to Tuftedal, "In Europe it's a trend that the public economy is becoming tighter; you have less money and at the same time you have an increasing number of tasks and responsibilities. [Cities] have to take a serious look at what types of spending they do."

Lislerud tells the same story, saying the number one issue governments face is cost. "Cost is definitely number one in the government sector in Norway because they have a very tight budget; this is true in other countries as well," he says.

Bergen also deployed Linux on the city's database servers. About 30 servers run all of the city's important critical databases, such as health care and social services, with 20 of them running the HP-UX version of UNIX and 10 of them running Microsoft Windows, according to Tuftedal. Consolidation was necessary because "many of the servers are getting old and as a result, support costs are rising," he adds.

"A couple of years ago, we had 75 database instances on seven different versions of Oracle; eight different versions of OSs and several hardware architecture versions," says Tuftedal. "So, in a situation with high licensing and support costs, we saw that we could get better prices and better performance by upgrading the hardware to an industry-standard hardware. And so that we no longer had just one vendor for the servers, we chose 64-bit titanium-based servers running SUSE LINUX."

There are at least 16,000 employee-users of the city's systems on 300 servers, all of which are running Windows. The IT organization's staff of 80 must keep a watchful eye on the 10,500 PCs in 450 city locations. But, according to Lislerud, that doesn't seem to be a problem.

"The IT department in Bergen is staffed with extremely well-educated people," says Lislerud. "They're very well-trained. They're doing extremely well."

Cents and Flexibility

Besides security and cost, flexibility is another aspect of Linux that appealed to Bergen's IT department. Tuftedal has worked with IT personnel in other European cities and says the open-source software allows the "public sector to collaborate, to learn from each other's experiences, to join together and create solutions."

Lislerud also says that flexibility is a key, "I think the flexibility for running on Linux is great with open standards ... it's good to have more than one opportunity when you want to run software."

The IT department in Bergen considers the open standards and open-source aspects of Linux as the way of the future. With the open standard comes the freedom of choice and an "open, democratic business model." The result, says Tuftedal, is "faster development and more innovation, leading to independence from vendors and greater competition, which results in lower prices and better service.

"I think the whole open-development model is also seen to be positive because when the source is open and known then anyone can learn how it works and can contribute by building on and modifying." "Therefore, from a city point of view, this is a stimulus for having new local enterprise that in the future can develop software."

With the trend to adopt Linux snowballing through Europe, Tuftedal says he's been traveling frequently.

"We've been in contact with several cities, both in Norway and in other European countries," says Tuftedal. "I've traveled to several cities and met people, corresponded with them and so on; we have built a network of contact in several countries. That's been useful too; to get more information about local experiences and to have shared our solutions and our experiences with others."

What helps this collaboration is the fact that the cities aren't competing against each other to get ahead; rather, they're aiming toward the same goal and can help one another.

Testing, Testing

To get a feel for how the students would adapt to Linux on the desktop, Tuftedal says the IT department set up tests in several schools. "We have done tests looking at Linux desktop and in particular the pupils like it. We were using SUSE LINUX Professional 8.2 with the KDE desktop and the Open Office software, which was popular; they found it easy to use," explains Tuftedal.

Not even the language barrier seemed to discourage the students using Linux on the desktop during the test phase. Tuftedal says the IT department was a bit behind schedule, so the students had to use the English version of Open Office. Even though students were tested on the Norwegian version of Windows and the English version of Open Office, Linux still came out on top.

Bergen's IT department also included a challenge to the students in the testing: they wanted them to try and crash the

Bergen is just one of many European cities willing to share IT resources and information in order to keep its budgets down and increase productivity.

system. Tuftedal took into consideration all of the vandalism that might occur in a school and said the students were given the challenge of creating chaos for both the Windows and Linux setups. A consulting firm came in to "harden" the Windows setup, and had planned on "hardening" the Linux setup as well, but ran out of time.

"They tested the hardened Windows setup versus the standard Linux setup. Still, [the students] managed to do a lot of things they shouldn't have been able to do with the Windows setup, but they were not able to—in any way—crash or change the Linux setup," says Tuftedal. "From a stability and security point of view, the results from Linux were positive."

Bergen's IT department took into consideration the fact that the teachers are city employees, which means they still have to use the Windows desktop. However, if and when the time comes for teachers to move to Linux on the desktop, it appears they'll be ready. They too were given the opportunity to test Linux on the desktop.

"The teachers saw that they could build on everything they've learned from using Windows software, so it wasn't a large transition," says Tuftedal. "We thought the quick implementation would create too many small problems for the teachers. For example, the keyboard shortcuts may be

different in MS Word than in the writer application of the Open Office.

"What we decided to do is implement the Microsoft desktop for the pupils this year and then we'd start the second project in the first part of next year to look more thoroughly at how we can implement the Linux-based desktop for the pupils and still have a way of making the teachers' everyday life not as complicated."

Not only did the teachers find their adjustment to Linux seamless, the students were able to do their normal, everyday tasks without missing a beat.

"All the typical applications they would use during the day, such as Web browsing, writing and the typical office software that was connected with the desktop itself, all the things integrated in the KDE desktop, they found easy and intuitive," says Tuftedal. "Without getting any form of instructions on what would be different using Linux, they just logged on and started using it. They could find their way around and do their own stuff."

The Future Looks Bright

The goal is to have all of the city's schools migrated over to Linux by early 2005. Most of the schools were migrated by the end of December 2004, but since a few schools are in remote locations, the migration process took longer in some cases.

"We have a small number of the schools that are so remotely located that we presently don't have a high bandwidth fibre-network connection, instead they use an ADSL (phone line) connection," says Tuftedal. "These schools with a lower-bandwidth connection will be migrated in January."

Also with the new year comes the possibility of the startup and design of a Linux-based desktop for the students and employees. Currently, the PCs are still running Windows, while the servers are running Linux.

"This is because the school teachers have to use the standard employee desktop, as well as the student desktop. To avoid confusion and small everyday complications for the teachers, we decided to make the student desktop the same as the employee desktop in the first phase," says Tuftedal.

"We have some legacy application systems that are either integrated with Internet Explorer, Microsoft Office or Microsoft Windows. Therefore, it's a longer process to change the desktop of the employees, but in 2006 we'll start the project to look at the next generation of the employee desktop. In the meantime, we're optimistic about creating a Linux desktop for the students that can be smoothly integrated with the teachers' desktop needs."

Caroline Joyce *is a managing editor at MSP TechMedia. Caroline can be reached at cjoyce@msptechmedia.com.*

LINUX LINE
IBM customers discuss
the benefits of open source

Quotable Quotes

Customers explain the business benefits of deploying Linux

Statistics Austria

"**We wanted to run Stellent** alongside our business-critical applications on zSeries* [servers]. With zSeries and Stellent on Linux*, we can get information to the Web in a very efficient manner. As a statistics organization, we rely on the processing power of the mainframe, and having Stellent on the same platform has enabled us to take advantage of existing skills. Statistics Austria is taking advantage of the performance, reliability and stability of Linux on zSeries [servers] to help cut total costs of ownership and at the same time produce innovative services."

Wolfgang Schenk, Master of Science and Stellent Project Leader, Austria

Norwegian Meteorological Institute

"**@server and Linux* are delivering** direct cost savings to the Institute through faster system performance and lower cost of ownership, and enabling more accurate forecasts. Because all the components of the IBM* Linux cluster are standard, we can create a high-performance computing center at low cost, using our existing Linux skills. We believe it will be easy to expand the cluster, so this Linux solution may even become our main computing platform for the future. Weather forecasting and climate models our researchers have created today will also run on tomorrow's Linux cluster, reducing our costs and eliminating the need to port code from one vendor's operating system to another."

Dr. Roar Skålin, director of Information Technology, Norway

Princeton University

"**I work with another team** in the Department of molecular biology that uses an IBM* pSeries* server-based Beowulf Linux* cluster, and the service and support from IBM for that solution has been first rate. Software support and support for hardware problems is transparent. I call for help one day, and a technician has the issue fixed the next day."

Douglas Welsh, senior professional technical staff, Princeton, N.J.

Ogilvy & Mather Worldwide

"**Linux* provides** the essential benefits of return on investment, robustness, scalability, security and stability. Ultimately, that will allow us to build value for our stakeholders."

Atefeh Riazi, senior partner and CIO, New York

RheinLand Versicherung Insurance Company

"**With Linux* on zSeries*** [servers], we have been able to keep our operational IT costs among the lowest in our industry. We estimate the market average for IT costs to represent 3.1 percent of income from premiums; we have achieved a figure of just 1.9 percent through server consolidation and the move to Linux. That ultimately equates to enhanced profitability and better value for our customers.

"The z990 will enable us to standardize on a single, highly scalable platform for the future. Ultimately, we plan to move all of our business-critical systems to Linux on the z990, to take advantage of the stability and reliability for which the mainframe is famous, and the low cost of ownership offered by Linux."

Erich Pfeifer, IT leader, Germany

Emuge-Franken

"We are confident that Linux* on [the] iSeries* [platform] was the best solution for our needs, offering excellent reliability and scalability, with low long-term cost of ownership.

"We needed a scalable, stable and reliable solution that was easy to manage, and we felt that the Power Architecture* on [the] iSeries* [platform] would offer better performance than the Intel*-based option. Cost was not such an important factor because we also felt that the long-term cost of running the new solution on iSeries [servers] would be lower.

"Running Linux in an LPAR on [the] iSeries [platform] has proved more than capable of meeting our needs."

**Gerd Urbach, computer center manager
and assistant IT manager, Germany**

LeapFrog Enterprises, Inc.

"We decided we needed a high-performance computing cluster on Linux* and the Intel* platform with the fastest speed and form factors that would easily scale. But we didn't want someone to come in and cobble a solution together with different vendors responsible for different aspects of the project.

"The IBM* Linux cluster investment paid for itself in six months because it does not require the ongoing capital investments required to meet our performance requirements."

**John Casella, CIO,
Emeryville, Calif.**

Levanta, Inc.

"IBM's commitment to producing high-quality hardware platforms with excellent price/performance ratios makes these servers an outstanding choice for scaling out with Linux* and Levanta Version 3 software."

Akmal Khan, CEO, San Francisco

Hansa Business Solutions

"We needed to develop and test the scalability of our software, so that we could ensure its suitability for the larger clients we were aiming at. We also wanted to consolidate our own systems onto fewer servers, and to increase security by moving our e-mail onto a Linux* server.

"We have already seen improved performance and availability, and we can configure both the iSeries* [server] and the software to get even better results. The other main benefit is that we haven't suffered from any viruses for a long time."

**Stephen Jay, UK managing director,
United Kingdom**

Ortiz y Cia SA

"We already used Linux* and thus knew of its great stability. SAP, combined with IBM* and Linux, offered the best deal in terms of price and performance. The surprise was that the advantage in terms of total cost of ownership with this solution was substantial. We also had a quote from other vendors offering proprietary systems, and the IBM SAP and Linux package was remarkably better priced. The licensing and updating costs were far lower than those of the competition."

**Dario Farias, network administrator and project manager,
Argentina**

ONLINE: For the *Linux Executive Report* in its entirety, with updated topic information, newsletters, additional customer references and end-to-end solutions, please visit **www.ibm.com/linux.**