

Irving Wladawsky-Berger, vice president, Technical Strategy and Innovation, IBM, discusses Linux and Innovation [Page 42](#)



Steve Evans, vice president of information services, PGA TOUR, shoots a hole-in-one with Linux [Page 58](#)



AUGUST 2005



LINUX

Executive Report from IBM

Business, Industry & Government in an On Demand World

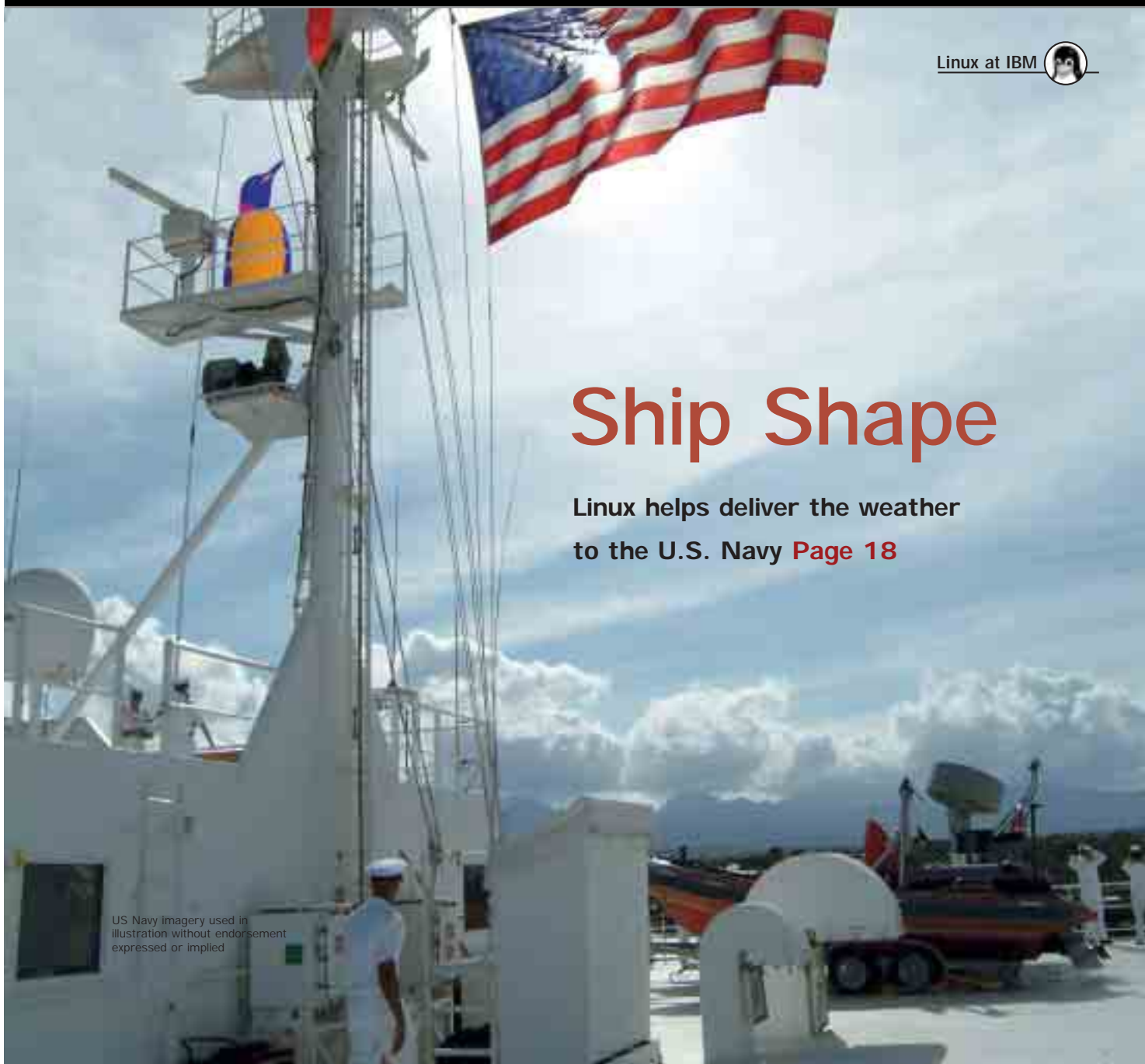
Linux at IBM



Ship Shape

Linux helps deliver the weather to the U.S. Navy [Page 18](#)

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LINUX

Executive Report from IBM

TABLE OF CONTENTS



Cover Story

Calm Waters [▫] 18

The U.S. Navy's Fleet Numerical Meteorology and Oceanography Center looks to both grid computing and Linux clusters to forecast the weather.
By Jim Utsler

Features

The County is Open [▫] 24

Flintshire County Council consolidates its server infrastructure with the help of Linux. *By Elliot King*

Cleared for Takeoff [▫] 30

MLT Vacations, Inc. moves its reservation system to Linux. *By Elliot King*

Eliminating the Complexity Option [▫] 36

Sal. Oppenheim cashes in on a grid-computing network using Linux.
By Winn Hardin

Open Community [▫] 42

Linux matures and finds a following. *By Caroline Joyce*

Performance Up, Complexity Down [▫] 48

At St. Galler Tagblatt, IT innovation never stops. *By James Mathewson*



Page 18



Page 48



Page 24



Page 30

Illuminating Linux ⁿ **54**

A specialty lighting company makes the move from Dell to Linux on POWER. *By Ryan Rhodes*

Linux on the Links ⁿ **58**

PGATOUR.com relies on IBM technologies to give fans a unique view of the game. *By Neil Tardy*

Departments

Executive Viewpoint ⁿ **6**

Good Migrations

Industry Watch ⁿ **8**

Linux migration involves starting small and adding as you go

Trends ⁿ **12**

Six simple rules to follow for a successful Linux migration

Linux Line ⁿ **63**

IBM customers discuss the benefits of open source



Page 54



Page 58

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Page 12

LINUX

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Good Migrations

IN THE ANIMAL KINGDOM birds, fish and a host of other species participate in the act of migration. Animals move on an annual basis from one geographical location to another. Each animal variety has a migratory pattern that's distinct and ideal for that species' success.

Migration also takes place in the business world, particularly in that area often referred to as information technology. Companies and organizations, due to a variety of factors, are often faced with the decision of whether to move to a new technology. An increasing number of businesses, governments and academic institutions are experiencing successful migrations to Linux* from UNIX*-based servers and Windows*-based servers.

What's more, the nature of these migrations is evolving. A few years ago, Linux migrations were generally seen on the edge of networks (file, print and Web servers). Today, however, we're beginning to see organizations migrating core business applications to the Linux environment.

Clearly, Linux is maturing. In recent years, most customers were migrating to Linux to save costs. And saving costs is—and will always be—a strong reason to migrate to Linux. However, a recent Chadwick Martin Bailey, Inc. and IDG study (highlighted on page 9) indicates that the top three reasons organizations are now migrating to Linux are reliability, security and performance.

Migrations from other operating systems (OSs) to Linux are underway as well. Is there a pattern for migration success? Thankfully, the answer is “yes.” In this issue of the *Linux Executive Report*, you'll learn the secrets of migration success from organizations and businesses that span a variety of industries and geographies.

Successfully migrating from a UNIX-based server or Windows-based server can and is being done on a regular

basis. The benefits of these migrations are multifold. In this magazine, you'll read about how the U.S. Navy is experiencing greater performance and flexibility with Linux clustered servers. A county council in the United Kingdom is consolidating servers and delivering the mobile-technology solutions to its constituents by migrating to Linux. MLT Vacations, Inc. reduced the number of its servers, cut software costs, improved scalability and increased availability by moving to a Linux technology-based environment. Now those are some good migrations.

However, that's just the beginning. There are many migration success stories out there, some of which are highlighted in this publication. Perhaps your business is next.

We hope you gain valuable insight from this edition of the *Linux Executive Report* and that your organization will soon realize the measurable results a Linux solution can deliver.



Scott Handy
Vice President, Worldwide Linux, IBM



SMOOTH MOVES

Linux migration involves starting small and adding as you go

BY EVELYN HOOVER

MIGRATING to Linux* is a matter of starting small—taking baby steps, if you will—and then progressively migrating additional applications, according to Dan Olds, principal analyst with Gabriel Consulting Group. With 12 years in the technology field under his belt, Olds has watched Linux move into the corporate mainstream and believes making the move to Linux can be easier than you might think. To find out more about his thoughts on Linux migration, the *Linux Executive Report* recently caught up with Olds.

Q: What business benefits can be gained from migrating to Linux? What are some of the reasons businesses take that path?

A: The first one that comes to mind is lower cost, and it can be lower across a number of different factors. Cost isn't just one thing; it's made up of sub-costs. One of the first things to look at with Linux is that you can use less-expensive hardware. That's one of the reasons UNIX* has lost market share to Linux. Instead of running a rather expensive RISC* UNIX box, you can accomplish the same work using a considerably less expensive, smaller Intel* or AMD system. That same lower hardware acquisition cost also flows through to maintenance costs. The amount of money you pay every month to your vendor to come in and fix things when they break is less. Of course, Linux isn't a complete substitute for UNIX—there are still quite a few things you can do on a UNIX system that can't be accomplished using Linux.

The other thing you hear about so much is the costs associated with operating systems and software. Absolutely that can be cheaper with Linux, but, for business customers, these savings probably will not be profound. I believe most business customers will utilize Linux distributions that provide enterprise-level support, which costs money. Application costs absolutely can be lower, but again you have sort of a continuum there. Sure you'll run Apache, which is basically free, but when it gets down to starting to do database loads and things like that—more important applications—you would probably find business customers tending to opt for supported applications from bigger industry names, from the standpoint of reliability and the ability to have support on demand.

One of the big business benefits that's fueling the approach to Linux is it allows customers to depend less on vendors, ISVs, et cetera. In many cases, customers feel they're being held hostage by some of these vendors and Linux gives them a viable alternative.

It's a bit easier to pick and choose the applications that you want. You're not beholden to use a certain family of applica-

tions that work together. Linux applications are generally built on open standards, and they're a bit more interchangeable.

Q: Let's talk about the migration process. How easy can it be to migrate to Linux?

A: It can be very easy. It really depends on what you're trying to migrate. If you're migrating the edge-of-network functions, well-known applications and functions that internal IT has a lot of familiarity with, it's not hard at all, particularly if the datacenter has some experience with UNIX. That would smooth the way quite a bit. Linux isn't UNIX, but it's not all that much different either.

If we're talking to a client that's considering migrating to Linux but hasn't looked at it before, my advice is to take the easy route and use a vendor to help smooth the way. There are still many vendors—IBM is one of them—who will go in and help customers do this for a low cost and sometimes no cost at all. If you're looking to deploy a new application on Linux, particularly if it's coupled with a hardware buy, the vendors are more than happy to help out.

There aren't any unique difficulties associated with migrating to Linux. I would've said something different two or three years ago because there weren't as many applications and there weren't as many examples of people who have made the transition. That's changed quite a bit. The real key in Linux migration is that you want to pick the right app, and you want to pick the right Linux distribution. For business customers who are moving into Linux for the first time, we would advise our clients to stick with the larger Linux players—Red Hat and SUSE LINUX—because of the support they provide. The support on one of these distributions isn't free, which can negate some of the cost savings, but it's important to have someone to backstop behind you if there are problems. The same thing with applications; stick to larger, better-known applications for your first projects. And there are a lot of skilled people out there who know Linux. It's much easier to find the talent than it was before.

Q: What can a business do to lay the groundwork to make migration easier?

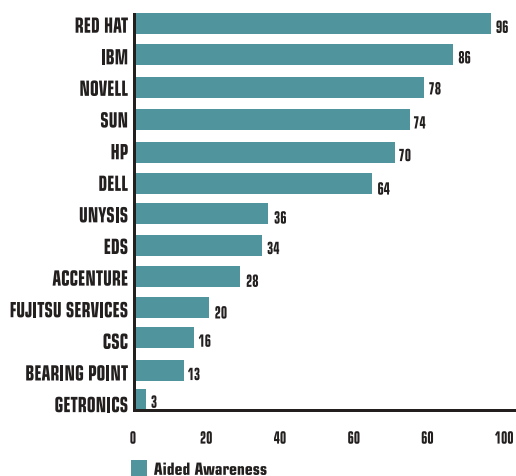
A: In my mind, it really comes down to good common sense and good project-management skills. It's really not any different from the migration from say one UNIX to another UNIX. The key is to have a good plan. You want to pull in all of the interested parties, keep everyone informed

and most importantly, don't try to bite off more than you can chew. Don't go in and try to do an entire enterprise-wide Linux switchover in a couple weeks. And don't start with your most important mission-critical set of applications. Start small and easy, build the experience, understand

what Linux does well and what it just isn't ready for yet. Walk before you run, and crawl before you walk.

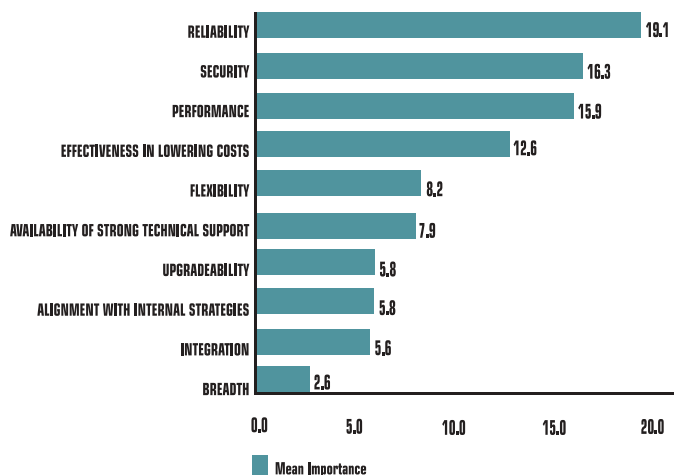
Evelyn Hoover is executive editor at MSP TechMedia. Evelyn can be reached at ehoover@msptechmedia.com.

LINUX SERVICES VENDOR AWARENESS: ALL RESPONDENTS



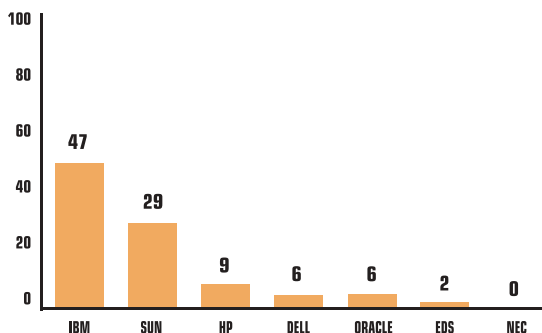
Respondents were asked to indicate which Linux services vendors they were aware of.

DECISION CRITERIA FOR LINUX PRODUCTS AND SERVICES: LINUX USERS AND PLANNED USERS



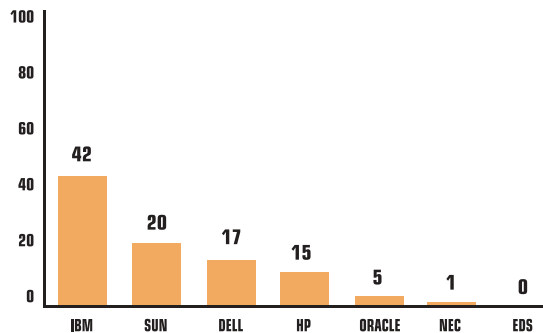
Respondents were asked to define the most important attribute when considering use of Linux products or services.

DECISION CRITERIA — SECURITY: LINUX USERS AND PLANNED USERS



For each attribute, respondents were asked to select the company they believe best meets that attribute.

DECISION CRITERIA — RELIABILITY: LINUX USERS AND PLANNED USERS



For each attribute, respondents were asked to select the company they believe best meets that attribute.

Note: These charts were taken from a March 2005 independent study titled, "Linux and the Brands that Deliver," which was conducted by Chadwick Martin Bailey, Inc., a Boston-based market research and consulting firm, and IDG Global Solutions.



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Easy Migrations

**Six simple rules to follow for a successful
Linux migration** BY JOE MCKENDRICK

B

y now, you've likely heard numerous success stories about Linux* in the trade press and at analyst presentations. The open-source operating system (OS) is platform independent, highly scalable, secure and can save some money in the long run from the expensive restrictive licensing arrangements and hardware requirements imposed by proprietary OSs.

Now it's time for members of your organization to roll up their sleeves and put Linux into action in the enterprise.

The value proposition of Linux is enticing; it's being deployed within many enterprises to support DNS/DHCP, Web servers, firewalls, e-mail servers and Java* 2 Platform, Enterprise Edition (J2EE) application servers. In addition, Linux is moving up the enterprise-technology stack, serving as a potential replacement of proprietary UNIX* systems, such as HP-UX on the HP 9000, Solaris on Sun* Sunfire machines and various other platforms.

Migrations to Linux are reaching deeper into the enterprise, observes Dan Kusnetzky, program vice president for system software at Framingham, Mass.-based IT analyst firm IDC. For example, in its most recent Linux adoption survey, IDC found that 27 percent of organizations were hosting a database on Linux. "If we go back to the study we did a year and a half prior to that, database was only 14 percent of the study. In the study prior to that, database was only 7 percent," says Kusnetzky. "The evolutionary process is happening largely the same way it happened with other operating systems."

These findings are also reflected in other studies from across the industry. For example, a study of 252 enterprises by Peerstone Research Inc. found that 30 percent of companies

running ERP and similar large-scale enterprise applications expect to run them on Linux within five years—up from about 5 percent doing so today.

Of course, making a move between OSs is never simple. A migration needs to be carefully planned, and organizational issues must be considered. Though Linux has enormous benefits, these benefits have to be effectively communicated to stakeholders throughout the organization. The following are six simple rules that will help guide the course of a successful Linux migration.

RULE 1: Know Where You Stand.

Before undertaking a migration, companies should estimate the costs and issues incurred if things are kept as they are. Factors to weigh include the costs of scheduled hardware purchases, software licenses to support new versions of applications and OSs. Ongoing administration and maintenance must be weighed into the total estimate as well. Analyst firms calculate that roughly two-thirds of the costs associated with IT systems come from maintenance, administration and support with software. Hardware costs account for the remaining one-third.



RULE 2: Understand Where and How Linux Can Make a Difference.

Cost estimates are a key part of any migration proposal and justification to management. Several factors should be weighed in terms of cost of ownership or ROI, including hardware, OS licensing fees, support and maintenance costs.

Even with Linux having non-existent or low up-front licensing fees, a recent study by Robert Frances Group (RFG) found that OS licensing cost savings were rarely cited as a major contributor to ROI by companies making Linux migrations. The consultancy reports that costs savings resulted from the efficiency, flexibility and manageability of Linux. The real system software cost savings found by the survey was in the support costs associated with major Linux deployments. Linux adopters have been taking advantage of the additional support flexibility that an open-source software product provides.

“The costs of upgrading and license management are a non-factor in most Linux installations,” says Evan Leibovitch, president and board chair of the non-profit IT Certification Linux Professional Institute. “A single Linux system administrator can keep a larger number of systems going than a typical Windows* administrator can. Even if the costs for Windows administrators and Linux administrators are the same, the Linux person is going to be able to administer more systems.”

“No matter how a company factors its ROI, it will save using Linux because it runs on industry-standard commodity hardware,” says Stuart Cohen, CEO of Open Source Development Labs (OSDL). “Because Linux and other open-source technologies allow for customization within the enterprise, the ROI calculation is based on different factors for different companies. The added flexibility of Linux and open source, and the freedom from vendor lock in, are important benefits but hard to clearly quantify in traditional ROI and TCO [total cost of ownership] analysis. But they definitely translate into substantial savings for the customer.”

RULE 3: Make Sure You Have the Right Skills in Place.

Maintenance and support is delivered by current staff, which may be unfamiliar with Linux. As a rule of thumb, it's generally easier for the UNIX shops to make a transition to Linux than for the Windows shops. “We're finding that one of the larger—especially recently—demands for administrations with Linux skills are from UNIX people who want LPI certification to be able to demonstrate to an employer that they also know the differences and the nuances of a Linux system,” says Leibovitch.


For companies that are mainly Windows sites, the transition can be seamless as well. “Every option that has existed in the Windows world still exists in the Linux world,” says Leibovitch. “If somebody needs the kind of corporate-level handholding that they've relied on in the Windows world, major companies such as IBM and a number of others will be more than happy to come in and give the kind of first-class level support for Linux that a corporate customer might come to expect. There's a growing support infrastructure out there.”

RULE 4: Start With Small, Incremental Steps.

IT industry consultants frequently caution companies against attempting to “boil the ocean” when bringing in new technology, which applies to Linux migrations as well. For organizations making their first move to Linux, experts advise starting with a pilot project or small application to kick off a phased approach.

Typically, organizations don't rush into a wholesale OS migration across an entire organization. “We don't generally see people rushing away from anything they're doing,” Kusnetzky says. “If they've got something that's working, unless there's a very strong reason to change, they're going to leave it alone. If they've got something that is not working, then they're going to follow those rules and try and change as little as possible to try and make it work.”

A suitable place to start a Linux migration is edge-of-the-enterprise applications, such as Web servers, firewalls, and DNS/DHCP. “Start with a limited workload for a first migra-



tion,” advises OSDL’s Cohen. “Be sure to work with a system vendor who is familiar with open source and has previous experience helping organizations who had similar migrations. You also have to be prepared to undertake some custom development work.”

Ultimately, as an organization gets comfortable and confident with Linux, the open-source OS can be deployed in more complex projects. “Slowly, as you get the legs under you, you work your way up to more complicated things, such as moving your e-mail server, or taking DB2* from one platform to another,” Anindya Mukherjee, senior manager of OEM alliances for Bakbone Software, says. “The goal is to keep the application the same, to avoid any knowledge transfer on the part of end users. End users shouldn’t really have to know or care where an application is residing, as long as they can get access to it.”

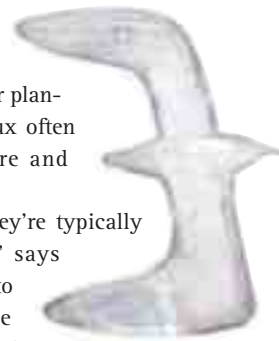
RULE 5: Remember, Not Every System is a Candidate for Linux Migration—Yet.

The success of a Linux migration depends largely on where the migration is coming from; a migration from a Windows system

may be more difficult and require greater planning. Industry experts observe that Linux often requires a different corporate culture and employee skill base than Windows.

“When we see Linux migrations, they’re typically from a proprietary UNIX platform,” says Mukherjee. “We rarely see a Windows to Linux migration. Typically, it’s not the platform that drives the decision as much as the maintenance costs or lack of applications support, or other things that a proprietary platform doesn’t provide.”

This isn’t to say that Linux won’t offer a compelling advantage to Windows sites in the future. One only needs to look at recent IT history to recognize a familiar pattern taking shape. “Linux is following the same trajectory of adoption that both Windows and UNIX took 10 to 15 years ago,” says Kusnetzky. “These operating environments started as an interesting technology for research, scientific and academic institutions, and radiated out from there. It starts in some basic infrastructure use—file services, print services or some computationally intensive application. And as it gains trust, it moves from there up the stack of software.”



In addition, some industry experts believe that over the long run, many Windows professionals may find the transition easier than originally thought. "It's naturally easier to go from a UNIX to Linux system, versus Windows to Linux, simply because UNIX systems have so many core design philosophies in common with Linux," says Leibovitch.

However, Leibovitch believes that Windows professionals may be able to catch on quickly to the ways of Linux. "There are a lot of similar principles between Windows and Linux," he says. "They're both using the same TCP to connect to the Internet; they're still using most of the same mail and Web protocols. Most Linux systems, in fact, use Windows file-sharing and printer-sharing techniques. So the transition from a Windows to Linux system isn't as onerous as a lot of people may think."

In many cases, as migrations move forward, organizations will be supporting mixed environments. "We have a customer that's going to be rolling Linux out, and they're finished in November with all their stores. However, they're going to continue to be a Windows shop on the corporate side," says Jim Melvin, CEO of SIVA Corporation, an IBM* business partner that provides solutions to the restaurant industry.

Mixed environments no longer pose the inter-systems communications challenges they once did, Melvin relates. "The communications are such now between those types of environments, that's not really a problem anymore," says Melvin. "I can just as easily get data off an AS/400* [server] as I can get off an HP box or a Windows server box somewhere." This enables organizations to keep applications where they run well, he says.

RULE 6: Imagine the Possibilities—and Make Linux a Catalyst for Change.

In some cases, companies have been running legacy systems for years because they work. Mainframes continue to be the backbone of many datacenters. At the other extreme, many companies run critical systems on DOS-based PC terminals, simply because they continue to run well. Linux provides opportunities for not only bringing such systems into the 21st century, but to also better support business processes that may have been restrained by older systems.

Migrating to Linux may provide the following benefits:

Modernization: "Many of my largest customers today are still on DOS and never migrated to Windows because of concerns about stability," says Melvin. Many of these clients are looking to migrate their DOS systems to Linux at this time, Melvin adds. "They're all looking at Linux as the operating system of choice for their in-restaurant terminal applications because of the stability that it offers. It's a locked-down environment, it's going to run, and it's going to stay up and running."

Server consolidation: "Linux is making the mainframe more acceptable. So not only can it handle all of the big tasks, it can now run multiple instances of Linux," says Kusnetzky. As a result of such consolidation, Linux can cut more deeply into hardware prices and software licensing prices, agrees Mukherjee. "If you have multiprocessor systems that use per-processor pricing, then Linux prices are going to be cheaper. Because of the efficiencies of Linux, you can consolidate applications on a single server," he adds.

Virtualization: Moving to Linux will also allow organizations to better leverage virtualization. "Whether accomplished through virtual machine technology, or some kind of clustering and availability technology, the more that people adopt a virtualized environment, the more likely they'll only need a commoditized operating system and underlying hardware," says Kusnetzky.

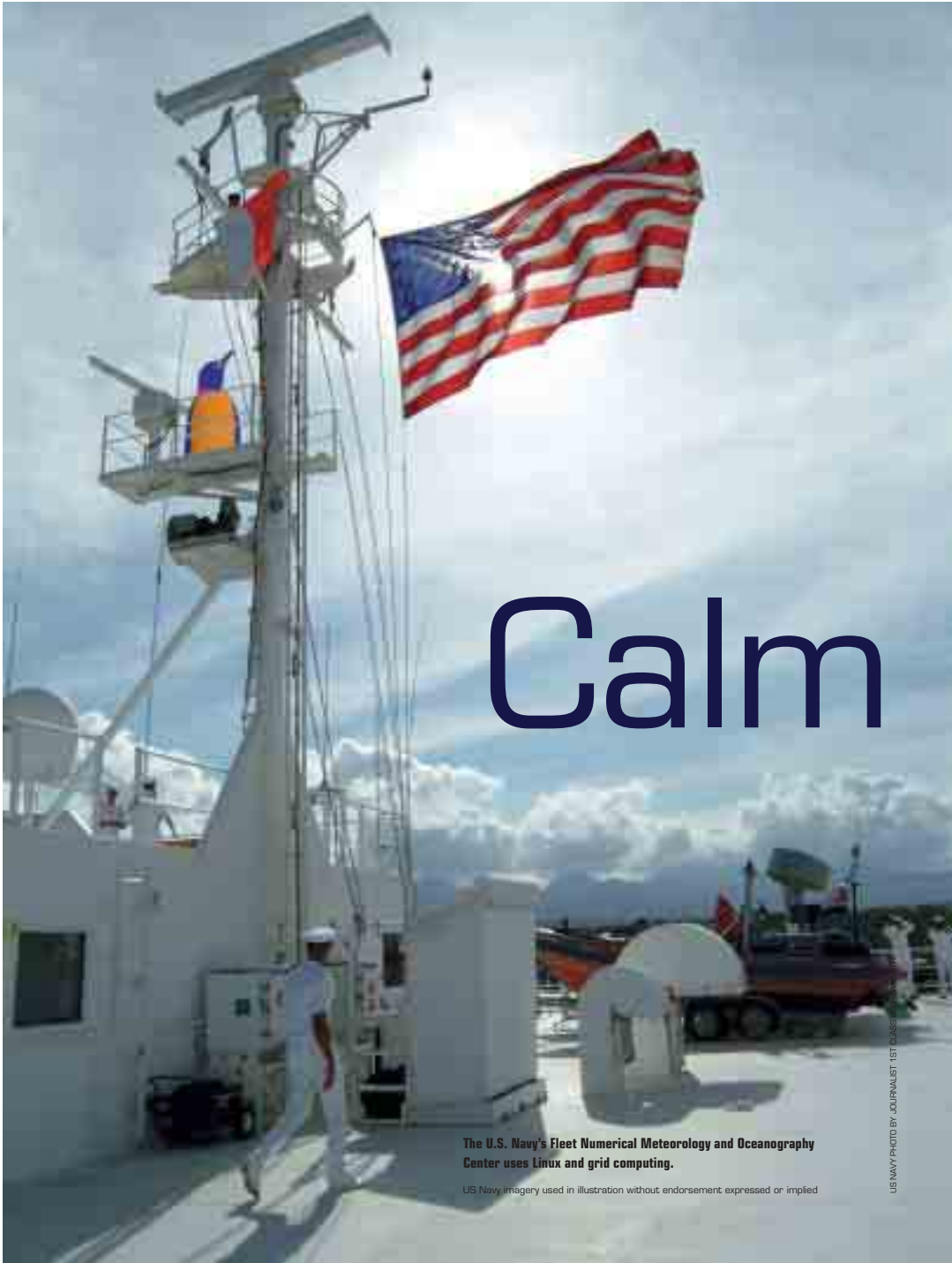
Compliance and data backup: Numerous compliance requirements require organizations to be able to backup large quantities of data, including non-traditional data types, such as e-mail and instant messaging. "Replication technologies now allow you to do multiplatform replication from your systems over to Linux servers," says Mukherjee. "You can store replicated data at a fifth, or even a tenth of the cost of replicating on your current platform."

Web services and service-oriented architecture (SOA): Another trend that possibly will make OS choices irrelevant—and thus favor commodity systems such as Linux—is the move to Web services and SOA. "We're taking applications apart, and rebuilding them as Web services-based components," says Kusnetzky. "The more people focus on Web services-oriented architectures, the less they care about the operating system and hardware underneath."

A New World

A migration to Linux opens up a world of new possibilities for organizations. Significant savings can be realized by avoiding vendor lock-in, licensing fees and forced hardware upgrades. In addition, by migrating to Linux an organization can lay the groundwork for new initiatives such as server consolidation, compliance management and SOA. To be successful, a migration needs to be carefully planned and organizational resources marshaled.

Joe McKendrick is a research consultant specializing in IT and organizational development trends, authoring special reports for IDC and Gartner. He's contributing editor to *Database Trends & Applications* and editor of *Data Center Trends & Applications*. Joe can be reached at joe@mckendrickresearch.com.



Calm

The U.S. Navy's Fleet Numerical Meteorology and Oceanography Center uses Linux and grid computing.

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US NAVY PHOTO BY JOURNALIST 1ST CLASS

**The U.S. Navy's Fleet Numerical
Meteorology and Oceanography
Center looks to both grid computing
and Linux clusters to forecast
the weather**

BY JIM UTSLER

Waters

FEWER THINGS are more important to sailors and pilots than up-to-date weather forecasts. After all, the weather can make or break operational plans, with cloud cover, for example, forcing a change in flyover locations or targeting, or poor sea conditions altering the timing or type of naval maneuvers.

That's why the Fleet Numerical Meteorology and Oceanography Center (FNMOC), a U.S. Navy activity, has deployed an SGI and IBM® @server pSeries® technology-based high-performance computing (HPC) environment that helps it make sure U.S. military forces have the latest information about both current and future weather conditions. FNMOC is also developing an xSeries® technology-based Linux® cluster that allows it to display, animate and distribute the output from its weather-prediction models and related data to users worldwide.

Notably, FNMOC is approaching this environment with not only power, but also cost and flexibility in mind. That's why some of its efforts, especially pertaining to the second itera-

tion of its Applications, Transactions, Observations Subsystem (ATOS2), are focusing on Linux, with the organization realizing that spending can be kept in check by deploying open standards-based technologies. Similarly, FNMOC is considering moving to an HPC grid sharing computing resources with other HPC centers. In the longer term, it's also looking into utility-type computing, with a company such as IBM hosting its applications in an on demand environment, thereby lessening its capital investment in hardware while allowing it to keep up with the latest technologies.

Keeping an Eye on the Weather

The Monterey, Calif.-based FNMOC, along with the related Naval Oceanographic Office, is part of the larger Naval Meteorology and Oceanography Command, which, according to Mike Clancy, Chief Scientist and Acting Technical Director at FNMOC, "provides an asymmetric war-fighting advantage to U.S. forces through the application of oceanography,

meteorology, geo-spatial information and services and precise time and astrometry.” FNMOC, he continues, “is concerned mainly with running operational weather-prediction models, which involves acquiring and processing meteorological data from ships, aircraft, buoys, land stations and satellites. The weather prediction support we provide helps give Naval forces a direct advantage in speed, access and persistence for any combat operation they may be called upon for.”

Joint forces deployed worldwide can access accurate weather data from FNMOC in support of a variety of missions and day-to-day operations. For example, an aircraft carrier located in the Arabian Gulf accesses FNMOC forecasts to schedule strikes in certain locations. “FNMOC is most likely going to be involved in providing the tailored forecasts for specific missions and regions of operations,” says Nancy Brittle, IBM grid sales executive for the Americas.

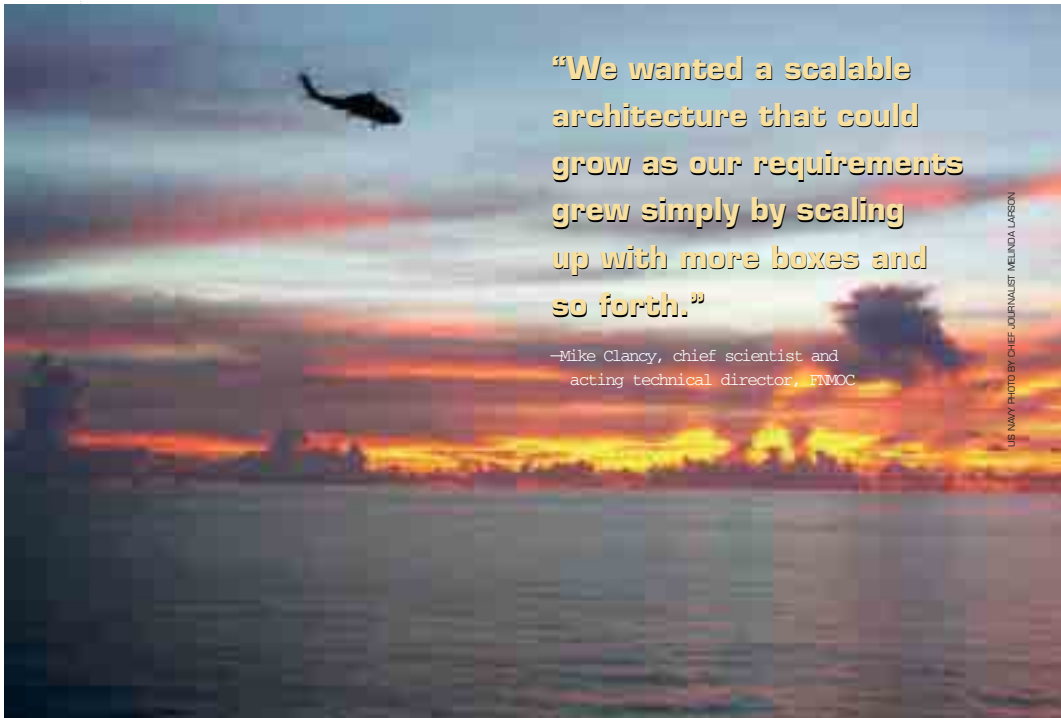
That data is processed within FNMOC’s HPC environment, which currently includes four SGI clusters (running the Trusted Irix, or TRIX, operating system, or OS) and two pSeries technology-based clusters, the latter of which are comprised of two AIX* technology-based pSeries p655s.

“We’ll hopefully run some flavor of Linux in the future,” remarks Chuck Kleinschmidt, FNMOC’s director of Enterprise High-Performance Computing.) The total capacity of this HPC environment is around 4.4 TFLOPS peak, although Clancy adds that FNMOC projects a need for additional horsepower in the future. “By the end of the decade, in the next five years or so, our needs are going to be approaching 20 TFLOPS peak,” he says.

This requirement for increased processing continues to become important as users demand more detailed and timely weather forecasts. As a result, information gathered from various sources must be processed and made available to users as quickly as possible. To do this, FNMOC added to its already beefy HPC environment by introducing the two pSeries servers, adding capacity for not only current needs, but also projected future requirements.

FNMOC cites the flexibility of the pSeries platform as one of the reasons it decided to introduce it into its HPC environment. When it needs more computing horsepower, as Clancy indicates it will in the near future, the organization can easily add additional pSeries servers or even tap into IBM’s capacity on demand (CoD) offerings by, for example, turning

An SH-60B “Seahawk” helicopter from Helicopter Anti-submarine Squadron Lite 45 (HSL-45) Det. 1, flies over the calm South China Sea at sunset after leaving the flight deck of the USS Fort McHenry (LSD 43).



“We wanted a scalable architecture that could grow as our requirements grew simply by scaling up with more boxes and so forth.”

—Mike Clancy, chief scientist and acting technical director, FNMOC

U.S. NAVY PHOTO BY CHIEF JOURNALIST MELINDA LARSON



Out on the Pacific ocean, Boatswain's Mate 2nd class Joseph Prosa mounts a chain host on the fantail, while an E-2C Hawkeye comes in for a landing aboard the nuclear-powered aircraft carrier USS Nimitz (CVN 63).

processors on an off when needed. "We wanted a scalable architecture that could grow as our requirements grew simply by scaling up with more boxes and so forth," Clancy remarks.

As an added—but no less important—benefit, its HPC environment is now more closely matched to those of other, similarly charged organizations, such as the National Oceanic and Atmospheric Administration's (NOAA's) National Centers for Environmental Protection (NCEP) and the Department of Defense's (DOD) Air Force Weather Agency. As Kleinschmidt points out, "The pSeries platform is common to these other weather centers."

This allows the organizations to more closely collaborate in a grid environment, with each of them sharing information and computing resources when needed. "They're working together to better share data and processing, incrementally deploying grid technology to address some of their operational concerns," says Mike Osias, an IBM technical architect assigned to government projects.

Currently, FNMOC and three additional production centers in the U.S. are on a two-year rotating IT-refresh cycle. That model, however, results in a "three- to five-year payback period," Kleinschmidt says. In the short term, FNMOC and other DOD organizations have begun sharing these resources across these production centers, creating an HPC grid that lessens their capital expenditures. "Ultimately, however," Kleinschmidt adds, "we'd like to move to an expense-type model, with a utility provider such as IBM hosting the systems." This would not only negate the need for the two-year technology-upgrade cycle and the associated capital costs, but also allow FNMOC to keep up with the latest computing technology.

Around the World

Working in tandem with FNMOC's HPC environment is an xSeries Linux cluster that includes, according to Earl Ravid, FNMOC's ATOS2 project manager, under 300 xSeries boxes with a total processor count of 530. This will be replacing the current HP- and Sun*-based ATOS by the end of the year, he adds.

In the FNMOC environment, raw numbers produced by the HPC systems are moved to a database that resides between the

being easily understood graphical representations of the forecast data. As Ken Pollak, deputy ATOS2 project manager, explains, "After the HPC side reads the observational data, crunches the numbers and does a weather or oceanographic forecast, the results are written to a database. When that's done, the data is automatically available on ATOS2 so we can process the gridded fields from the models and create pictures, animations and a variety of other required products that we then make available to our users."

These users, which include both military and civilian customers, can then access this information when needed, gathering, for example, detailed information about weather forecasts for specific regions of the Arabian Gulf. The information itself is pulled from a DOD-sponsored "worldwide communications circuit called SIPRNET," Clancy says. SIPRNET, he explains, "is basically a classified version of the Internet and it allows us to send secure information over a network. Much of our information goes out around the world via SIPRNET."



Aerographer's Mate 3rd Class Moses Campbell tests the winds in order to update weather reports aboard the Nimitz-class aircraft carrier USS Harry S Truman (CVN75).



Electronics Technician 1st Class Mark Caprio from Jacksonville, Fla., checks radar equipment high above the guided missile destroyer weather deck.

FNMOC's move to the Linux cluster was a matter of economics and portability. "They looked at the operating-system cost component and were looking for ways to mediate some of that pain," notes John Cary, IBM client manager for U.S. Navy Accounts in the Western Region. "That's what drove them to Linux."

Using Linux and Linux-based applications, FNMOC can now move to different platforms as technology progresses rather than tied down to a particular hardware base. "We're not dependent upon a single proprietary operating system," Pollak notes. "And because we've moved to an open-source environment, we can use just about any commodity-based piece of hardware and Linux will run, giving us flexibility when we're scaling up to meet capacity changes or considering a hardware refresh."

In keeping with its tradition of being an early technology adopter, FNMOC has long been a proponent of service-oriented architectures (SOAs), and it's pushing to include more SOA capabilities into its IT environment. "We really wanted to move the Navy distribution framework into a more e-business-like framework," Clancy says. "And it seems like that's been a good move because the Navy is moving in that direction—toward a more business-oriented, services-oriented architecture approach in its fielding of the next generation SIPRNET, which is called the FORCEnet."

Using SOA, FNMOC may also be able to host other organizations' applications at its facilities. For example, another group wouldn't necessarily have to purchase its own IT equipment and hire IT staff to maintain it; rather, it could use FNMOC's Linux cluster to host its applications, lessening costs in terms of both servers and human resources. "The Navy is mandating that we direct our IT resources toward a service-oriented architecture, and that implies that we would be in a position to host other people's applications at our facility, assuming we have the excess capacity," says Ravid. "All they would need is a good, solid connection to our capabilities and we would get economies of scale because we would be getting better use of our cluster and they wouldn't have to invest in new IT assets."

Riding the Waves

Thanks to new and emerging technologies—both hardware- and software-based—FNMOC is better able to help the U.S. Navy and others receive reliable weather forecasts. And because it's building a scalable HPC environment and a similarly scalable and open-source SOA, it will be able to more easily look toward the future, supporting current military needs as well as those planned as a part of the Navy's Sea Power 21 doctrine.

An important component of Sea Power 21 is the concept of Sea Basing. Under this concept, a fleet of ships and

US NAVY PHOTO (LEFT) BY PHOTOGRAPHERS WAVE AND CLASS; FELIX GARZA; US NAVY PHOTO (OPPOSITE PAGE) BY PHOTOGRAPHERS WAVE, AFMAN, CHRIS THAMANN

Air Traffic Controller 2nd Class Robert Mutter (standing) trains Air Traffic Controller Airman Vector on Aircraft scopes in the Control Center on the USS Theodore Roosevelt (CVN 71).



platforms constituting a “sea base” will be deployed near an adversary to support large and sustainable forces offshore. Both air and land operations will then be launched from these bases. “The idea is to be able to conduct a complete operation from bases that are located in international waters,” Clancy says. “And of course, the weather plays a very significant role in this because you need to understand the weather and sea conditions in order to design these ships and platforms so they can operate safely and effectively in specific environments. And when they’re deployed, they need to be kept out of harm’s way caused by potentially dangerous weather. So we’re working for not only the here and now, but also the future, and a robust IT infrastructure is critical to the success of programs such as this.”

By keeping up with and sometimes spearheading the latest scientific and technology trends, FNMOC continues to help ensure that the U.S. military has the most accurate and secure weather information anywhere on the globe.

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Flintshire County Council consolidates its
server infrastructure with the help of Linux

The County is **Open**





Flintshire County Council in the United Kingdom chose Linux to keep the county up and running.

BY ELLIOT KING

What began as an effort to upgrade and consolidate an existing @server iSeries* and pSeries* infrastructure supporting business-critical systems unveiled an open-source solution. In the end, Flintshire County Council chose the Linux* operating system (OS) as its new supported platform, opening a range of possibilities.

United Kingdom's Flintshire County Council in North East Wales serves as the local authority for 147,000 inhabitants. With an annual budget of around \$273 million, the council is responsible for the upkeep of the county's schools, environment and local road network. The council's 7,500 employees provide many social services, collect taxes and maintain Flintshire County's extensive range of leisure facilities.

To adequately support all of these functions, the council maintains approximately 350 business-critical information systems including systems that manage finance, revenue collection, benefits, social care, housing management and school support. The system applications were running on a variety of OS/400*, AIX* and Microsoft* Windows* servers.

Around a year ago, the council decided it was time to consolidate its server infrastructure. “We were an existing iSeries and pSeries customer,” says John Thomas, operational services manager for Flintshire County Council. “Both of those platforms [iSeries and pSeries] have their own strategic directions. We were keen on trying to bring them together to improve manageability and we could see that was what IBM—one of our key strategic technology providers—was doing.”

The idea was that Flintshire would upgrade two iSeries 825 systems to two @server i5 570 systems. The i570s employ IBM* POWER5* microprocessors, the ninth generation of 64-bit processors from IBM. The POWER5 architecture represents a new

“**Both of those platforms [iSeries and pSeries] have their own strategic directions. We were keen on trying to bring them together to improve manageability and we could see that was what IBM—one of our key strategic technology providers—was doing.**”

—John Thomas, operational services manager, Flintshire County Council

approach to enterprise computing, enabling Linux, AIX and i5/OS* to run natively and share fractions of a processor. When Flintshire upgraded its iSeries servers, it was able to consolidate an older AS/400 720 and several AIX systems running on end-of-life RS/6000* SP hardware onto the new platform.

The new infrastructure promised several benefits including increased capacity and improved resilience since the two servers would be installed in separate datacenters and mirror each other. Moreover, since the entire infrastructure would reside on a single physical server, management would be simplified.

Steady Migration

Flintshire kicked off the migration project last September. A pair of identically configured i570 systems were delivered, and the most up-to-date versions of the OSs—i5/OS V5R3 and AIX 5.3—were installed. Both machines went live in early November. Within three days, the first AIX application, which manages the scheduling of school buses, was in operation. “It was not the most critical application,” Thomas says, “but an important one. And one that we felt comfortable with.”

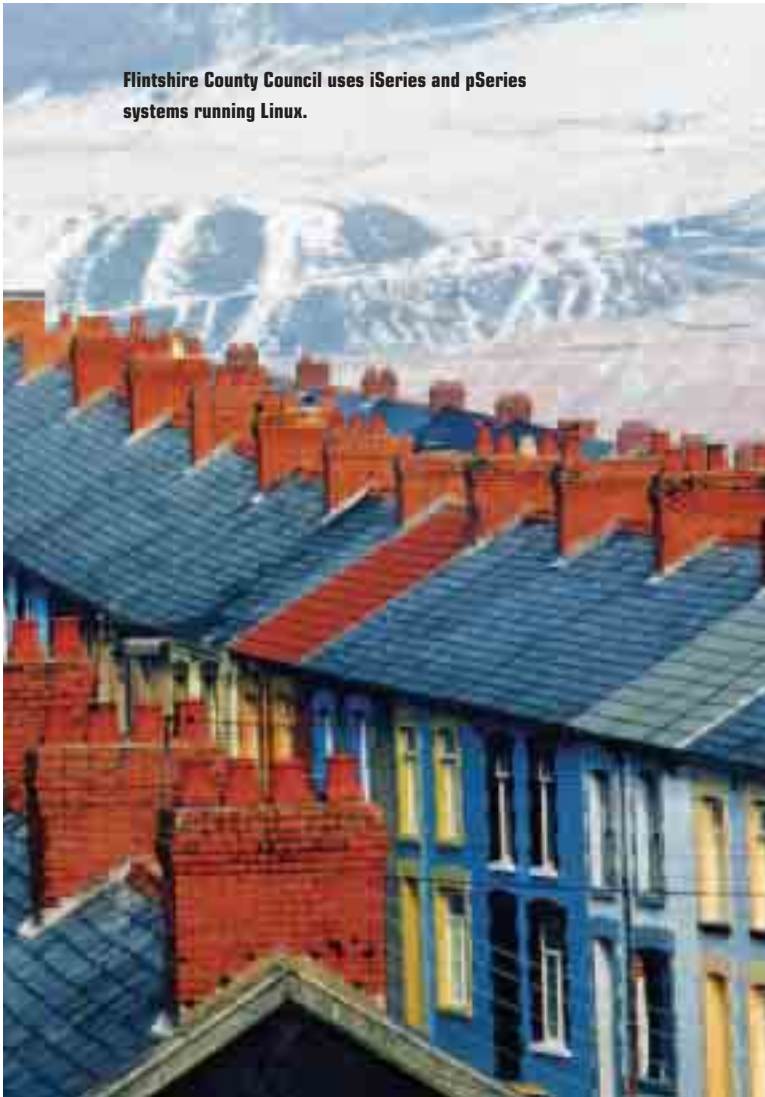
From that point, Flintshire steadily migrated its applications to the new infrastructure. The i570s were selected to run clustered, fully redundant Domino* partitions, serving 2,500 Lotus* Notes* clients supported by 300 Domino databases. Additionally, several major financial and administrative systems formerly running on the AS/400 720 have been migrated. “Since March we have not run any applications on the RS/6000 platform,” Thomas notes.

In many ways, Flintshire’s server-consolidation effort followed a predictable trajectory: A longtime IBM customer that has a close relationship with IBM steps up and moves to the latest, state-of-the-art technology. However, this trajectory takes a twist.

As a part of its server-consolidation effort, the council was also looking to migrate file and print serving from a Novell infrastructure to Windows. But, Thomas says, “What I didn’t want to do is to replace a large number of Novell servers with an even larger number of Windows servers.”

Since the council had made a strategic commitment to Active Directory, a component of the Windows 2000

Flintshire County Council uses iSeries and pSeries systems running Linux.



architecture, Thomas knew that he had to support a Windows front end for file and print serving. But he wanted to explore the possibility of using Linux for the file- and print-serving platform and seamlessly integrating it with the Windows infrastructure. “We did not have any Linux [instances] at all in the shop,” he says. “But we put it in as something we would like to do.” In reality, his plate was full with the rest of the migration project.

Last January, working with its key IBM business partner, Real Solutions, Flintshire installed its first Linux partition using SUSE LINUX and Samba, an open-source software solution that integrates Windows file and print serving with other OSs. “We did not have a lot of experience in this area, but were advised that SUSE was right for us,” Thomas says.

After installing and configuring the file-serving capability, Thomas tested it for several months. “We got the integration with Active Directory working seamlessly and felt comfortable with the technology,” he says. “We feel very comfortable delivering the file serving underpinning our Windows 2000 file-serving infrastructure on a Linux partition.”

Reaping the Benefits

The move to Linux as the platform for file serving has dramatically increased the IT infrastructure’s service level. By allocating

a Linux partition on the second i570, Thomas is able to offer resilience and high availability that wasn’t previously possible. “If a file server went down, it may have been only one of 30, but for the people who used it, it was all they had,” he says.

The new setup includes automatic failover between servers. While still in the pilot stage, Thomas is evaluating data-replication technologies including rsync, the open-source data-replication solution.

In essence, the move to Linux as the underlying platform has shifted file serving from being a departmental solution to an enterprise solution. “We have gone from a situation in which I had racks of Novell-based servers and was looking to put in racks of Windows servers to provide the same level of service to having one Linux partition. And with a second Linux partition, we’re adding value,” he notes. Moreover, the Windows servers that would’ve been used to support file serving have been redeployed to other uses, resulting in a significant net savings in investment.

Despite the lack of Linux experience, with the help of mentoring and consulting from both IBM and Real Solutions and receiving formal training, Flintshire’s IT team has acquired the necessary skills to support the infrastructure relatively easily. Traditionally, Thomas notes, support was organized according to computer platform. There were teams for the iSeries, pSeries and



xSeries*/Windows environments. With the phasing out of the pSeries platform, the AIX support team assumed responsibility for Linux. "What they are now is a UNIX* support team," Thomas says. "A lot of what they see in Linux is familiar to them."

Because AIX is a stable and robust UNIX environment, the biggest concern was the stability and functionality of Linux. Would it be as good as AIX? "To be fair," Thomas says, "Linux is very good."

Extending the Reach of Linux

As the comfort level with Linux has grown, Thomas has begun to consider other uses for the platform. "We've become so comfortable in such a short period of time with Linux on POWER5 that we're starting to look at using it in a wider strategic manner," he says.

The pilot project is using Linux as the platform of a WebSphere* Portal project. "The idea is that we are looking to deliver all our technologies in a completely mobile way," Thomas says. "We try to use thin clients. We use Citrix a lot. We try to avoid client/server applications."

The WebSphere Portal initiative is an expansion of that effort. "It's about making everything available via a Web browser to every device," Thomas says. "It's about bringing together all the business applications and providing a truly mobile environment."

IBM WebSphere Portal technology offers several advantages for the project including single sign-on (SSO) for applications and the capability for users to configure their screens. "When you start to take people's applications away from the desktop, you can't be too rigid," Thomas says. "People don't like that. [WebSphere] Portal allows users to tailor their interface."

Ironically, prior to the consolidation project, Flintshire wasn't considering Linux as the platform for the WebSphere Portal project. But given the new infrastructure, Linux can provide more processing power at a lower cost.

In the current setup, each i570 has 18 partitions made up of 10 i5/OS partitions, six AIX partitions and two Linux partitions. "We have load balancing, failover and dynamic CPU assignment," Thomas points out.

Since 90 percent of the business applications now run on this platform, Thomas can allocate the processing muscle according to demand. Moreover, processing power can be shared across partitions. Consequently, when batch processing occurs each night, processing power from partitions not supporting batch applications can be used. "It is an extremely flexible environment," he says.

In the final analysis, the move to incorporate Linux into the infrastructure raised little controversy at Flintshire. Linux has a high profile in the public sector in the United Kingdom.

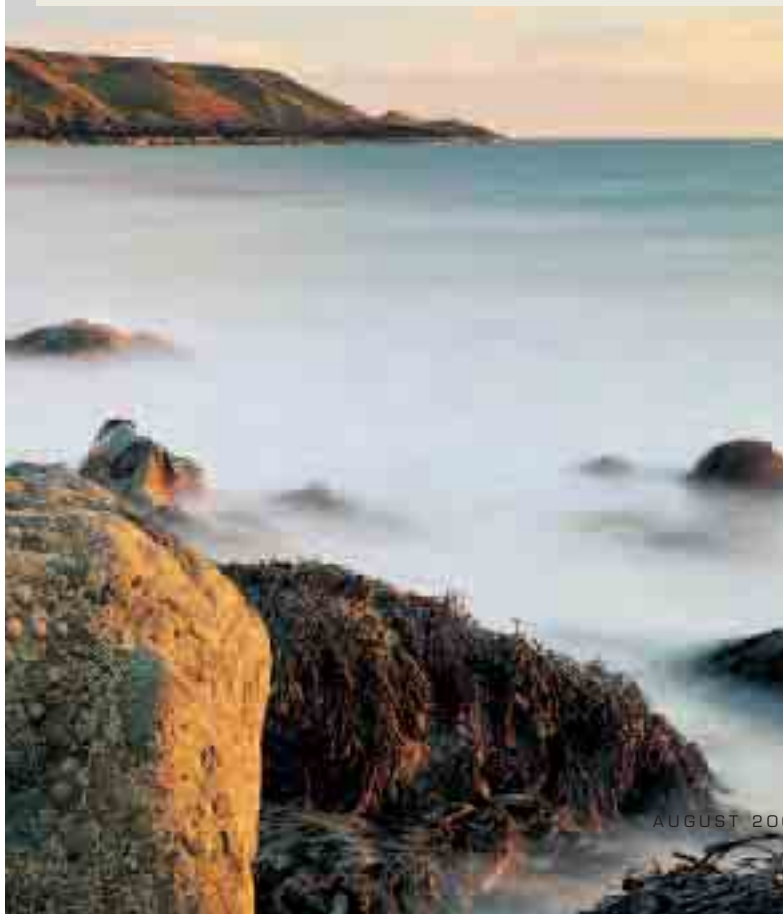
“We’ve become so comfortable in such a short period of time with Linux on POWER5 that we’re starting to look at using it in a wider strategic manner.” —John Thomas

"There has been a big push toward open source led by the central government," Thomas says. In addition, several neighboring local governments have incorporated Linux in a limited way and Thomas consulted with them.

A Wide-Open Future

And though perhaps not originally foreseen or planned, the move to Linux promises to have a significant long-term impact. "Within our IT strategy, we only support certain operating systems," Thomas says. "We now support Linux. It opens up a whole new raft of applications. If we are comfortable with an application, it could wind up on Linux."

Elliot King is an associate professor at Loyola College in Maryland where he specializes in new communication technology. Elliot has written five books and several hundred articles about the emergence and use of new computing and communication technology. Elliot can be reached at eking212@comcast.net.



Clear



ILLUSTRATIONS BY ROGER BEERWORTH

ed for Takeoff

**MLT Vacations, Inc. migrates
its reservation system to Linux**

BY ELLIOT KING

Founded as a retail travel agency in 1969, MLT Vacations, Inc. is one of the largest providers of vacation packages in the United States. The company has two primary product lines: Worry-Free Vacations offers charter vacation packages from seven U.S. cities to destinations throughout the United States, Mexico and the Caribbean; NWA WorldVacations provides vacation packages via regularly scheduled NWA flights to destinations in North America, the Caribbean, Europe and Asia. Headquartered near Minneapolis with an operations center in North Dakota, MLT Vacations has approximately 500 employees and serves more than 1 million travelers annually. Both lines of vacation packages are sold through travel agents worldwide.



The Architecture

MLT Vacations' IT architecture was set up around multiple single-node database servers running Oracle 8i on Sun* Solaris servers. For several years, the company purchased its software licenses on a two-year term basis; when those licenses came up for renewal, the company had to make a decision to ensure that it was licensed appropriately.

At the time, several of the company's primary systems were reaching capacity. "They were maxed out in terms of the number of CPUs that we could put into the chassis," says Chris Corona, manager of systems services at MLT Vacations, Inc. "We needed to do something from a hardware standpoint."

The company had several options. One was to purchase larger, more powerful hardware, but that would require a significant investment. Corona says the company established two goals. "We wanted to minimize the cost involved when we needed to repurchase licenses. And we wanted to come up with a solution that would be scalable in the future and keep us from running into a capacity issue over the next several years." They were also looking to reduce costs in hardware and hardware support, as well as in operating system (OS) and OS support.

Corona, who joined MLT Vacations in 2003, was charged with managing the process, which involved conducting the testing and exploring whether a clustered-database approach would be effective. Then, depending on the results, his group would implement the new system.

The efforts began in early 2004 by comparing how

the new options in the Intel* arena stacked up to the Sun hardware currently in place. Evaluating Linux* was also high on the agenda. "Linux was one of the first assumptions," Corona says. "We wanted to look at it because it tied into our ability to reduce costs. Linux is a less costly option for purchase and support."

MLT Vacations already had experience with a UNIX* technology-based OS so the company saw the move to Linux as incremental. "Linux and Solaris are similar enough to each other that you can make the move without too much effort," Corona says. "And watching the Linux environment over time, it's now at the point the industry seems to accept that it's stable and enterprise-ready."

Weighing the Options

In its research, MLT Vacations estimated the potential performance boost and an expected price/performance level with a new environment. In May 2004, in conjunction with IBM* resellers with whom it had worked in the past, MLT Vacations conducted a proof of concept with a test cluster consisting of multiple dual-processor IBM @server xSeries* x345/x335 servers running Red Hat Linux. "We were looking at Xeon versus the Opteron processors, 32-bit versus 64-bit," Corona says. "At the time we did our evaluation, the Xeons offered a lower price/performance." He opted for the xSeries system, he added, because it fit in terms of price, options and upgradability. Because of the pricing, Corona opted to build wider rather than deeper—using more two-processor systems than four-processor systems.

Moreover, IBM was a known quantity to Corona. He had worked with the hardware in the past and MLT Vacations had trusted relationships with IBM resellers. "We looked at the blades,



but wanted to go with a platform that was well known to us and with which we had experience,” Corona says.

The choice of Red Hat was dictated by several considerations. Not only was it loaded on the IBM platform, MLT Vacations’ IT staff had prior experience with it and it proved to be stable.

The test cluster was designed to support MLT Vacations’ primary revenue-generating database—its reservation system. “Our core business is reservations,” Corona says. “We maintain inventory in our reservation system.” The database holds approximately 150 GB of information.

The reservation system is an in-house application, known internally as Suntrac. With Oracle serving as the back-end database, Suntrac is core to the business. “If it goes down, we’re basically still in the water until we can get it back up,” says Corona. Even though reducing hard-

ware and software costs and creating a scalable infrastructure were the main motivating factors for the effort, the need for high availability (HA) was also a major priority.

The proof of concept was followed by a couple of months of functional and stress testing. “Everything lined up with what our assumptions were,” Corona says. The application could work with a clustered database environment; performance based on the hardware specifications proved to be acceptable.

The project was approved by senior management at the company. “There was never a question as to whether [Linux] was the right technology,” Corona says. “Other questions arose and we answered them to the satisfaction of those who asked.” After all, the platform had been tested in house for a reasonable period of time and there were many other examples of Linux being used successfully.

“There was never a question as to whether [Linux] was the right technology.” —Chris Corona, manager of systems services, MLT Vacations, Inc.

At this point, MLT Vacations began preparing to move the legacy system to the new production environment. The first step was upgrading to Oracle 9i, which was a requirement for moving to the clustered infrastructure. “We focused a fair amount of time on testing,” Corona says. “And through our functional and stress testing, we had a version of the database that was 9i.” Basically, MLT

The final pieces of the new environment included reworking the storage infrastructure and load-balancing on the front end. In the past, MLT Vacations had relied on direct-attached storage as well as a Hitachi storage area network (SAN). “We brought in a pair of Brocade Fibre Channel switches,” Corona says. The new setup could be managed better and increased the systems’ data integrity.

“Everything has performed very well. It works and works stably.” —Chris Corona

Vacations was testing three environments: the original platform; the original platform with the upgraded database; and the clustered environment. The most complex part of the upgrade was the planning and the coordination among the database administrators and other parties involved in the process.

As MLT Vacations became more involved with a clustered environment, it quickly learned that the file system needed to be managed in a way that would allow several database servers to access the same files. There were several options to do this, including using raw partitions or the native clustered file system in the database. However, a consultant and an IBM reseller recommended technology from PolyServe. PolyServe’s Matrix Server is a symmetric cluster file system that enables scalable data sharing, HA services that increase system uptime and cluster and storage-management capabilities for managing servers and storage as one entity.

Corona opted to use PolyServe’s quick-start program in which the company installed the product as an evaluation. “From a project management standpoint,” Corona says, “I knew that I could get the environment built that much quicker by having that piece done by somebody who knew how to do it. Without having to research it, we could get the testing done.”

PolyServe emerged as an important partner in the project. A cluster is a dynamic environment with several key components. Often, when problems emerged, it wasn’t clear to whom MLT Vacations should turn, and PolyServe offered valuable support. The PolyServe product integrates tightly with Oracle, and PolyServe professionals could answer questions that perhaps could have been directed to Oracle. “They really earned the business and that’s why we decided to go with them in the production platform,” Corona says.

To manage the load balancing on the front-end of the database, the company opted for Big IP from F5 Networks.

It took approximately four months for MLT Vacations to upgrade its database and migrate to the new cluster. This included building and testing the hardware infrastructure and then testing how to best execute the migration.

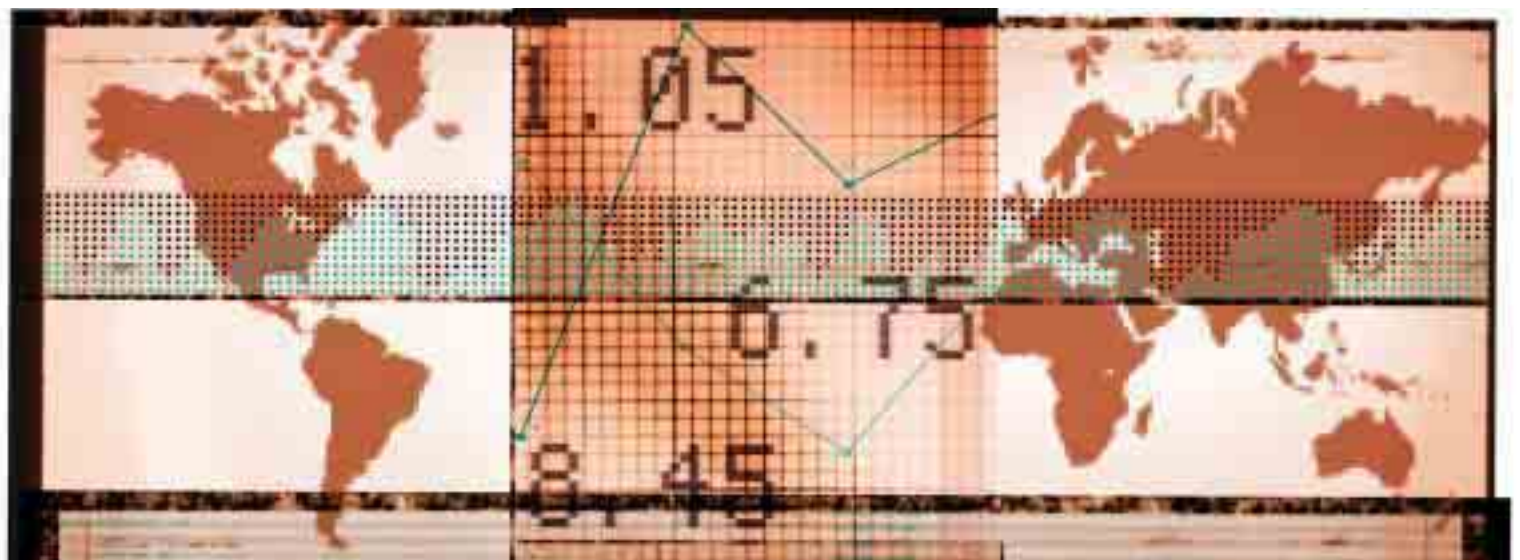
Testing how to migrate the environment proved to be one of the critical aspects of the process. “In our testing, it was going to take anywhere from 10 to 20 hours to actually move the data over, which was longer than the upgrade,” says Corona. If once the migration was complete and a problem emerged a few days later, it could have required moving back to the old environment, which would take another 10 to 20 hours. Through testing, the migration time for the reservations database was reduced to 12 hours.

That’s the Ticket

The migration, which in addition to the reservation systems included the financial system, a data warehouse and smaller, supporting databases, is now complete. In total, seven databases are running on the production cluster and another 10 to 15 on a development cluster. “Everything has performed very well,” Corona says. “It works and works stably.”

As for the move from Solaris to Linux, Corona notes, “there are some differences. They aren’t huge but they are valuable to know. But it was not a difficult transition. I wouldn’t be afraid of it. It has met our needs.”

Elliot King is an associate professor at Loyola College in Maryland where he specializes in new communication technology. He’s written five books and several hundred articles about the emergence and use of new computing and communication technology. Elliot can be reached at eking212@comcast.net.



Sal.Oppenheim cashes in on a grid-computing network using Linux

BY WINN HARDIN

ELIMINATING THE COMPLEXITY OPTION

SINCE SAL.OPPENHEIM OPENED its doors in 1789, its private bankers have helped investors capitalize on new business developments by carefully choosing new equity products that grow wealth. As testament to its financial skill, Sal.Oppenheim, located in Cologne, Germany, has grown from one small building and a handful of employees to 3,100 employees, managing more than 100 billion (roughly \$122 billion USD) in assets throughout 20 offices in Germany and Europe.

The past 215 years have taught Sal.Oppenheim to anticipate change and prepare accordingly. With this in mind, Sal.Oppenheim chose a new stock investment product—complex basket options—to help protect and grow its customers' wealth.

Now, nearly a year into the product launch and IT expansion, the company's on demand grid-computing network using open-source Linux* operating systems (OSs) will meet

its computational needs for the new basket options at one-fifth the price of UNIX* technology-based proprietary solutions, while paving the way for future growth.

More for Less

Options are similar to stocks except that when an investor buys an option, he or she promises to buy or sell a company stock at a future date if it reaches a certain price. Complex basket options take this investment vehicle a step further by using complex stochastic volatility models to value options based on multiple companies, or a "basket" of assets, spreading the investor's exposure across a wider area. These complicated equity investments come in many varieties based on the type and number of companies included in the fund and how the payoff is determined. The complexity of a basket option poses a challenge for banking institutions that need to fix these option prices in real-time.

“When we decided to introduce more complex products in the financial area, we saw that we would need a tremendous amount of computational power,” says Arno Radermacher, head of technical applications and systems at Sal.Oppenheim. “In 2003, we had our first contact with grid computing and on demand capacity made possible through open-source operating systems like Linux. After we decided to offer basket options, we had to expand our IT infrastructure and were faced with a choice: extend our traditional, proprietary symmetric multiprocessor (SMP) IT infrastructure running on UNIX variants like [Sun*]

Solaris, or enter a new on demand grid-computing infrastructure type that would give us greater flexibility at a better price.”

Adapting new technologies always poses a risk for a company. Productivity, performance and up-time must not only be maintained, but also increased, while the cost-per-transaction drops. Unlike stand-alone proprietary computing systems from sole source vendors, grid systems running open-source Linux promote interoperability among different hardware and software vendors by providing a common software environment. Interoperability leads to competition among suppliers. Competition spurs increased performance while unit costs drop. The result is more options for the IT customer to meet today’s needs while accommodating tomorrow’s growth.

In short, Radermacher determined that an on demand infrastructure running Linux would save the bank millions during the lifetime of the basket option product line, but it would require expertise the company didn’t possess.

Radermacher to look at grid computing versus traditional SMP networks in 2003. When Sal.Oppenheim decided in 2004 to add basket options to its product portfolio, Radermacher decided in favor of flexibility and on demand computing, which meant a grid-computing environment running on an open-source OS. Radermacher and his consultants chose SUSE LINUX 8.0 and set the second half of 2005 as the launch date for the new product line. That gave Radermacher approximately 18 months to design, deploy and test a major new computing network that would form a cornerstone to the Sal.Oppenheim product portfolio.



When we decided to introduce more complex products in the financial area, we saw that we would need a tremendous amount of computational power.”

—Arno Radermacher, head of technical applications and systems, Sal.Oppenheim

“We scanned the market in Germany and found some good companies that could help us, like IBM (Armonk, N.Y.) and EDS (Berlin, Germany). After a few weeks of investigations, we decided that this is the time to enter this new technology. The new basket options products were a big enough opportunity to accept the risks of moving to a new IT infrastructure. Our cost comparison business cases showed a 10-times savings in acquisition and operational costs with an on demand grid model compared to our traditional SMP model. We’ve revised that to a five-times savings, and we’re convinced this was the right way to go.”

Even with the guidance of EDS and an outside consultant specializing in grid computing, Sal.Oppenheim faced challenges adapting to a grid-computing environment. Both grid and proprietary networks share a similar five-layer structure. Moving from the lowest layer to the highest layer, both networks have a hardware or platform layer, an OS layer for that platform, a cluster layer to organize several machines into a group, a grid layer that includes all of the clusters, and finally, an application layer—in this case the options-pricing program from INC .

“The complexity of our grid deployment came from using different vendors for single pieces,” Radermacher explains. “There are a lot of interdependencies between different software programs on the different layers. You have one program that’s certified to version 1.5 of another software, but another program is not. But if you look at IBM* hardware, you receive the hardware, OS and system management

Learning Curves

Sal.Oppenheim set an aggressive timeline for the project. Spiraling IT costs prompted



all from IBM. We haven't had problems with these three layers, but more with the [grid management] and [application] layer. But we've solved the outstanding issues and are moving forward."



Ready for What's Next

A major benefit to open-source Linux is that while it allows for future growth, it also accommodates systems running non-proprietary OSs. "While the main part of our service is running on a Linux distribution, perhaps a third of the systems are running Microsoft* Windows* NT* or Server 2003." The move to Linux preserved these pre-existing IT investments while providing interoperability as new nodes and clusters are added to the grid.

"Another advantage is that we can connect our grid together with Imagine, our trading and risk-management software application," Radermacher says. "Today the software is running on Solaris, but in the future, with our experience with Linux, we'll have the opportunity to run this software on Linux."

The SUSE LINUX 9.0 distribution has increased the number of parallel CPUs in a single computer to 64, which allows more users to tie on demand computing grids running Linux to large databases without spreading the database across multiple machines and running into high licensing fees. SUSE LINUX 8.0 accommodated up to eight CPUs. Large databases, such as the pair that store Sal.Oppenheim's trade and risk-management operations, use up to 24 CPUs per machine. The newest distribution of SUSE LINUX (version 9.0) easily accommodates applications that require that kind of computational power in a single machine.

"Oracle offers a license that can spread a database across multiple systems, but it's very expensive," Radermacher says. Similarly, using Microsoft licenses for the grid OS would have been cost-prohibitive, he says. While cost was a primary reason to move toward Linux, the adoption of Linux by ISVs is another. "Imagine is going to Linux and away from Solaris," Radermacher says, "and while we haven't made a final decision to move Imagine from Solaris to Linux, now we have the experience and capability."

Using Linux in a computing grid based on desktops, workstations and servers takes the complexity out of the machine and makes it much easier to operate and work on, and therefore, more cost-effective." —Arno Radermacher

As Radermacher looks back on his Linux experience and readies for the final product launch, he expects that grid-computing environments made possible through open-source OSs like Linux will gain popularity. "It's important to move toward Linux today, but not necessarily a must," Radermacher says. "When you install big SMP machines with many processors in a single unit, you have to pay for the complex infrastructure inside the machine—the switches, the backplane, etc. But using Linux in a computing grid based on desktops, workstations and servers takes the complexity out of the machine and makes it much easier to operate and work on, and therefore, more cost-effective."

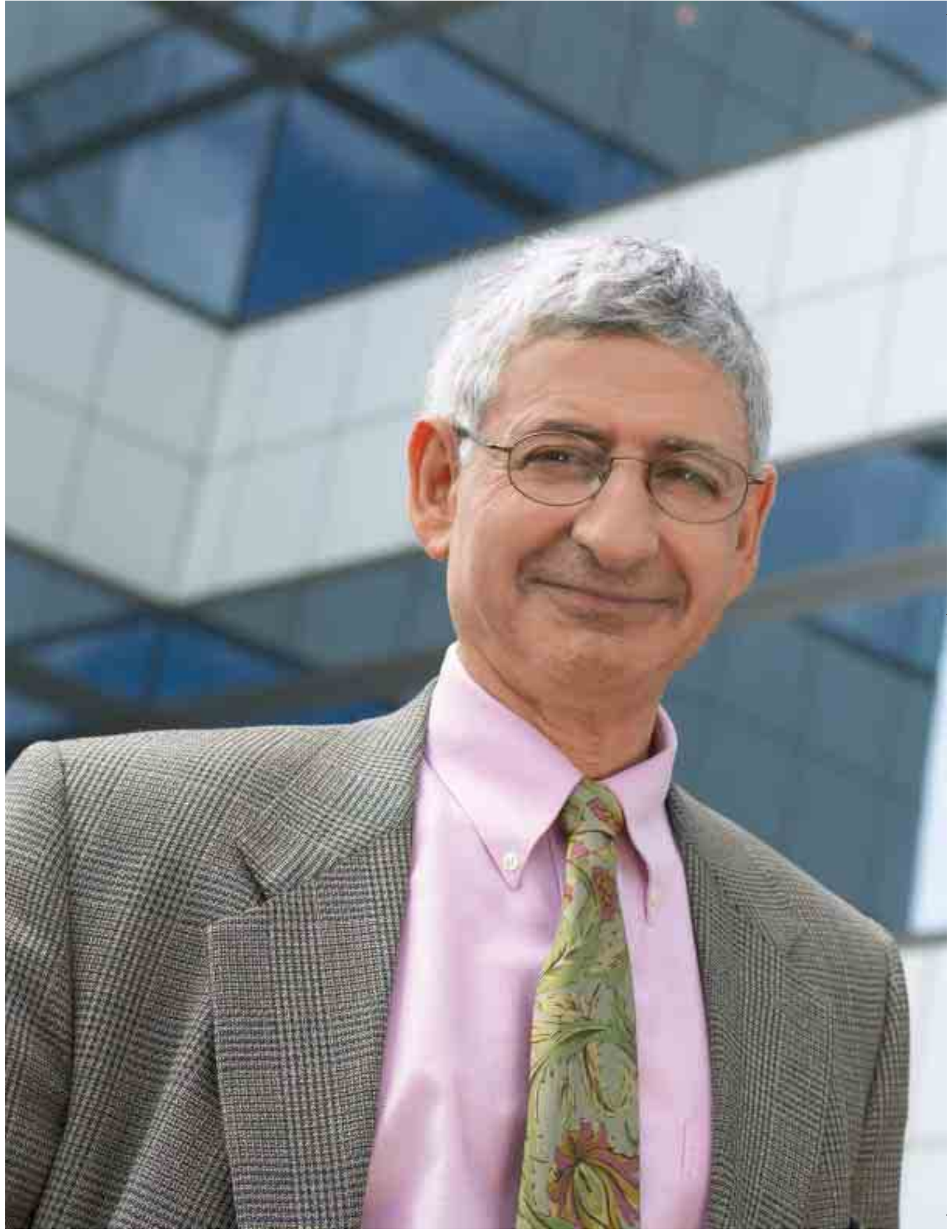
"Plus they make hundreds of thousands of these systems versus just a few thousand SMP machines. That lowers the platform costs while maintaining computational power," says Radermacher.

As grid computing nears plug-and-play compatibility, companies are moving away from costly proprietary systems. IT networks are changing from necessary cost centers to tools that give a business the competitive advantage. Once strangled by maintenance costs that increase as different platforms are introduced to the network, open-source OSs and on demand computing is affordably connecting datacenters and arming businesses with the information they need to predict and prepare for—instead of reacting to—changing business conditions. Software vendors who are reluctant to spend the additional capital certifying their programs to new platforms are responding to Linux with the inevitability of the spring thaw.

Companies worldwide are learning the lessons of Sal.Oppenheim and other major corporations: Linux can save money today and make money tomorrow.

Winn Hardin has authored more than 2,000 published articles, including 800 technical articles. He's been a freelance writer since 1998 and has written for many technical publications. Winn can be reached at winn@hardingroup.com.







**Linux
matures
and finds a
following**

BY CAROLINE JOYCE

Open Community

When you think about open-source computing, one of the first things that come to mind is Linux*. The open-source operating system (OS) is gaining ground and has earned a reputation around the world. Irving Wladawsky-Berger, vice president, Technical Strategy and Innovation, IBM, attributes the success of the OS to this growing community of Linux contributors. The *Linux Executive Report* recently spoke with Wladawsky-Berger about the past, present and future of Linux.

PHOTOGRAPH BY JOHN MOWERS

Irving Wladawsky-Berger discusses the success of the Linux operating system.

Q: Irving, your title has changed since you last talked with the *Linux Executive Report*. You're now vice president, Technical Strategy and Innovation. What new responsibilities have come with this title?

A: First of all, as the title suggests, I look at the overall technical strategy across the company—what we're doing in systems and software. But what I'm spending much of my time on is the major technical elements driving services and solutions. This is one big area of major change. I'm particularly focusing my time on the marketplace where some profound things are going on. The marketplace is where our constantly advancing technology meets market changes and evokes new business demands for incredibly sophisticated solutions. This is where the greatest innovation is taking place.

Incremental changes are more orderly. People understand what they are—both the people building them in our labs and our customers. The drastic changes are a little harder to understand. You know, like when the Internet came along—what does it mean? Or when Linux or on demand came along—what do they mean? So, I'm particularly focused on some of the more profound changes that are generating major innovation in the marketplace.

Q: How do you define what IBM's innovation initiative means to customers? How do you see Linux fitting into that picture?

A: In a way, innovation means that we help our customers exploit the best possible technologies to get the maximum business value. We help our customers do what they need to do to be competitive and—hopefully—leaders in their industry by helping them take advantage of IT. Now, Linux has a major role in that effort because it opens up new opportunities. For example, the world of inexpensive supercomputing based on clusters and blades has totally grown up around Linux. The opportunity to use large numbers of inexpensive microprocessors as clusters to solve new problems in engineering, healthcare and pharmaceuticals has emerged all because of Linux. A big part of pervasive computing consists of embedding microprocessors complete with operating systems and applications into the physical world. You find them in everything from automobiles and oil-drilling rigs to medical equipment and consumer entertainment devices. Much of this is enabled by Linux and many infrastructure applications are based on Linux as well. So, when I think of Linux, I sort of think of it the way I think of TCP/IP; they

Irving Wladawsky-Berger speaks at the first Red Hat users' conference in June.



both enable lots of new products to come to market. People don't have to think about what's the right networking protocol—they use TCP/IP. Likewise, people don't have to think about what's the right operating system—they use Linux.

Q: How much would you say Linux has gained in maturity since you first led the initiative at IBM?

A: Well, we started the major Linux initiative in January 2000; that's when I came to work at the Systems Group for Sam Palmisano to run our Linux initiative. At the time, Linux was like a young rookie with incredible promise and we really liked how good the community was. The reason IBM embraced Linux was because our top people told us this was really good and it had very big potential in a number of areas. But at the time, Linux had its limits. It ran on 1- or 2-way systems, for example, and had very few applications on it.

The picture today is dramatically different. Linux is a very good, reliable operating system up to 8-way SMPs (symmetric multiprocessors) and is even able to run on 16-ways quite well. And given the power of microprocessors today, an 8-way SMP is a pretty powerful system. Linux has improved immensely in terms of reliability and security; it's a very good commercial system. I mean, it isn't quite up to AIX*, i5/OS* and z/OS*,

especially on large SMPs, but it does incredibly well. The support for Linux has gotten much better across the world; for example, the number of people who are trained on Linux is much, much higher, the ecosystem of ISVs and channel partners that support Linux has increased by leaps and bounds. So, Linux today is dramatically more mature than when we started in January 2000.

Q: What are you hearing from customers about its value, growth and future?

A: You know it's very interesting. When we first started, we had to convince customers that they should pay attention to Linux because it was going to be very important. By 2005, you have to be somebody in a very obscure portion of a very obscure country not to have heard about Linux. I think customers accept Linux as a strategic force in the information-technology industry. They may wonder where it best fits, given their unique requirements, but the conversations are very different than they were at the beginning. We've spent time with our customers, helping them understand the value of, let's say, Linux versus AIX and when one is better than the other. We've spent time with customers contrasting Linux versus Windows* and clarifying when one is more appropriate

than the other. Linux is now a conventional element of the normal development of their infrastructure. It's accepted by an increasing number of our customers as a serious building block of the infrastructure.

Q: How do you think Sun* moving Solaris to open source will affect the Linux momentum?

A: That's a very interesting question. In my mind, the key to an open-source project is the quality of the community behind it. When we at IBM choose to join an open-source community, whether it is Linux, grid, Apache or—more recently—the Geronimo community that's building an open Web application server based on Apache, it's the quality of the community that drives the decision. How good are the people? How diverse are they? What kind of resources do they have? The better the community, the more likely we are to join it.

Now that's very different from a vendor saying they're going to let other people look at their source code. Because, by and large, the only people interested in a proprietary product are the existing people who work with it. And even then, the product wasn't designed to be worked on by people outside of the company. So it's difficult to look at that. That's a long way of saying I don't see the Solaris move as coming anywhere near to the community that Linux has built up. It'll probably be of value to some parts of the Solaris ecosystem, so it's probably a good step for Sun, but I honestly doubt that you'll see the large numbers of smart people in other companies and universities help build this offering like they do with grid, Apache and Linux.

Q: You've referred to the "commoditization" of the operating system. What implication does that have for Linux, software developers and users?

A: I would say, rather than commoditization of the operating system, that there are a few components that are fairly standard; people don't even think about it—that's sort of the starting point. TCP/IP for networking is one of those standard components. It's hard to imagine a product that needs to communicate that doesn't start out with TCP/IP. If people are building some kind of Web server, Apache has far and away the most popular following, so people always start with Apache as the Web server of choice. Now what we are seeing is more and more that—everything else being equal—people will pick Linux as their starting operating system for their new application, especially a brand-new business that may be leery about license fees and royalties. Plus, Linux is supported by a large ecosystem and you have people learning about it in universities around the world. On top of that, Linux is very inexpensive. You essentially only have to pay for support.

Therefore, Linux has become part of the standard that's taken more or less for granted, especially for many new products,

businesses and vendors. You may wind up saying, "OK, for this particular product maybe I need AIX, maybe I need Windows, maybe I need z/OS or maybe Solaris." But the starting point of the conversation is Linux. So, in that sense, Linux really has become a standard operating system. And the fact that it runs on every single microprocessor and runs on systems from small, embedded ones to nodes in very large supercomputers means that it has wide applicability. I might add that Linux will even run on architectures that haven't even been developed yet. The implications are huge; that's why Linux has continued to develop a bigger and bigger following. Month by month and year by year, more and more applications become available on Linux and more and more businesses use Linux.

Q: How does Linux migration enable customers to focus more on innovation and companies to become an On Demand Business?

A: Well, I think that by embracing Linux in the infrastructure, customers get a certain freedom. For example, often customers pick Linux because they want the freedom to run it in a small distributed system and later move it to a partition in a large mainframe or partition in a big pSeries* or iSeries* [system]. They don't need to think very hard about it with Linux. They know that freedom is there. That freedom then lets customers focus their energies where they are needed: on customers, the right business processes, greater efficiencies and the right business model.

Q: What kind of influence is Linux having on grid computing?

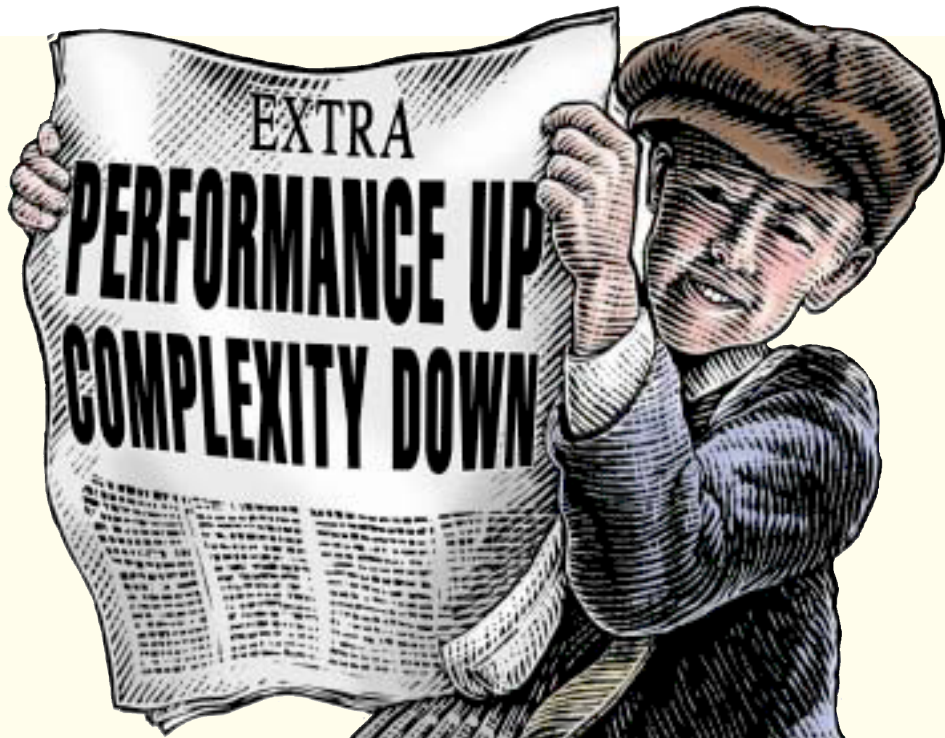
A: Linux has a very big influence on grid computing. First of all, a lot of the same communities that are at the leading edge of grid computing—the world of research, universities, supercomputing—are the same communities that have embraced Linux. So there is a natural affinity for grid to be built on Linux. Even though one of the powers of grid protocols is that they run on every single operating system, they don't need to run on Linux. Then, like Linux, the grid protocols are developed in an open community. So again we have very smart people from around the world in a community collaborating on development. It's the same powerful model that's so appealing in the Linux community and it's being applied to the grid community. I think that over time we'll learn what kinds of changes to make in Linux to better support grid computing, especially some of the virtualization requirements of grid computing. We'll see features like the POWER* hypervisor moving into Linux or even related products. So, there's a lot of affinity both for cultural reasons as well as for business reasons.

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At St. Galler Tagblatt, IT innovation never stops

BY JAMES MATHEWSON

THE DAILY NEWSPAPER BUSINESS can be tough. From the constant phone chatter of the reporter's pit to the frantic pace of the layout and production crews, there's little time to take a breath. St. Galler Tagblatt of St. Gallen, Switzerland, the largest newspaper in eastern Switzerland, is no exception. Its 108,000 print subscribers and burgeoning mass of online devotees depend on a well-oiled machine to deliver the news they need to their doorsteps and PCs. Add radio, TV stations and a partnership with its major shareholder, Zurich-based Neue Zuercher Zeitung (NZZ), and you have a highly complex enterprise of more than 1,000 employees.



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e are an innovative thinking company and look to use leading-edge technology in new projects. We chose 64-bit technology for better processing power and Linux with the open-source MaxDB database to consolidate the running costs of our IT systems.”

—Erich Giesinger, head of IT services, St. Galler Tagblatt

To keep the presses running and the news flowing takes more than a great team of reporters, editors, sales people and production managers. It takes a lot of IT personnel. In this case, 20 dedicated administrators, programmers and IT directors ensure that the information systems keep this organization running at peak performance. In this environment, downtime isn't an option and architects must keep the infrastructure performing as fast as the latest technologies will allow.

In addition to the typical back-end systems for accounting, human resources and payroll, St. Galler Tagblatt must also worry about the ever-shifting subscriber databases, both in print and online. And

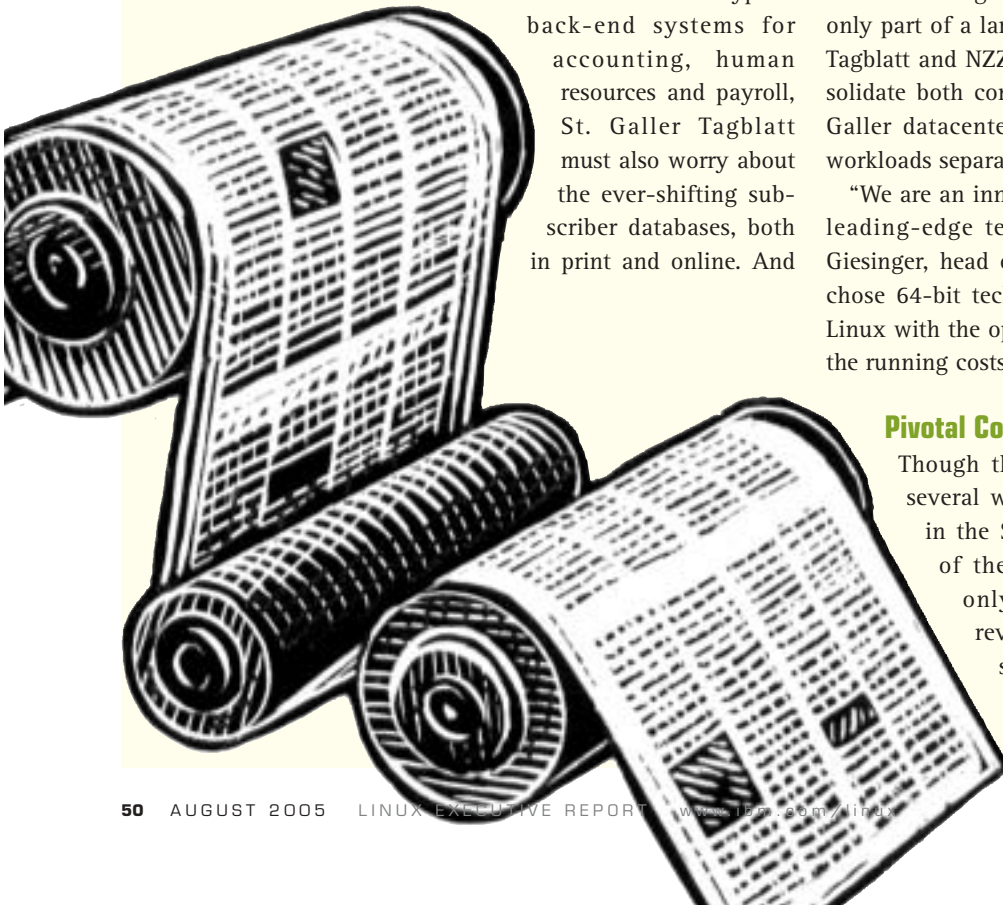
a recent subscriber database consolidation with NZZ, which boasts more than 150,000 print and thousands more online subscribers, required a strong combination of hardware and software value. The choice included 64-bit IBM® @server xSeries® Model 455 servers (one for each company's subscriber databases) running Novell SUSE LINUX® 8 and the open-source database technology MaxDB® (formerly SAP DB), which connects to the SAP applications.

The subscriber system migration is just the first of several workloads migrating to SAP on Linux. The migration is only part of a large strategic partnership between St. Galler Tagblatt and NZZ, in which the Zurich datacenter will consolidate both companies' Windows® workloads and the St. Galler datacenter will consolidate both companies' SAP workloads separately.

“We are an innovative thinking company and look to use leading-edge technology in new projects,” says Erich Giesinger, head of IT services for St. Galler Tagblatt. “We chose 64-bit technology for better processing power and Linux with the open-source MaxDB database to consolidate the running costs of our IT systems.”

Pivotal Cogs in the Machine

Though the subscriber databases are only two of several workloads spread across dozens of servers in the St. Galler datacenter, they're pivotal cogs of the St. Galler Tagblatt/NZZ machine. Not only do subscriptions themselves bring in revenue, but advertising representatives also sell ads on the basis of the publications' subscription numbers. Advertisers pay to



get response for their ads and response is directly proportional to the numbers and demographics of a publication's subscriber database.

According to Giesinger, readers can order subscriptions for the publications online and the SAP application can process the request the same day. Also, the new system handles the growing numbers of online subscriptions for both publications. NZZ (www.nzz.ch) already has a premium online subscription publication (www.nzzglobal.ch) in addition to its free Web site. St. Galler Tagblatt has the free Web site (www.tagblatt.ch), though it too plans to launch a subscription service of premium online content in October. In addition, both media companies have several other custom and weekly publications that complement their daily offerings. All of these subscriber databases and their associated applications run on the 4-way xSeries servers.

Giesinger says subscriber management is more efficient with the new SAP system running under Linux. He says subscriber management has become a just-in-time process, which improves efficiency and saves costs.

"We can ship the newspaper in batch jobs, and subscribers can stay in the system until the address is prepared," he says. "Because of the new system, we can send the addresses directly to the print machine on the newspaper a lot faster than we did before. This speeds up the printing process and ultimately reduces costs."

Complex Migration

Giesinger says the migration from Oracle on HP-UX to SAP on Linux had its moments, and required a full complement of partners to get the most out of the combination of technologies. But once completed, the workloads running on the new 64-bit Linux server demonstrated three-fold performance improvements with standard tuning parameters set.

The first partner in the mix was the xSeries reseller, Bechtle Data AG, which suggested the x455 servers based on low total cost of ownership (TCO) and delivered the servers to meet that requirement. That was the easy part. Migrating the operating system (OS), applications and backup storage area network (SAN) system proved to be challenging.

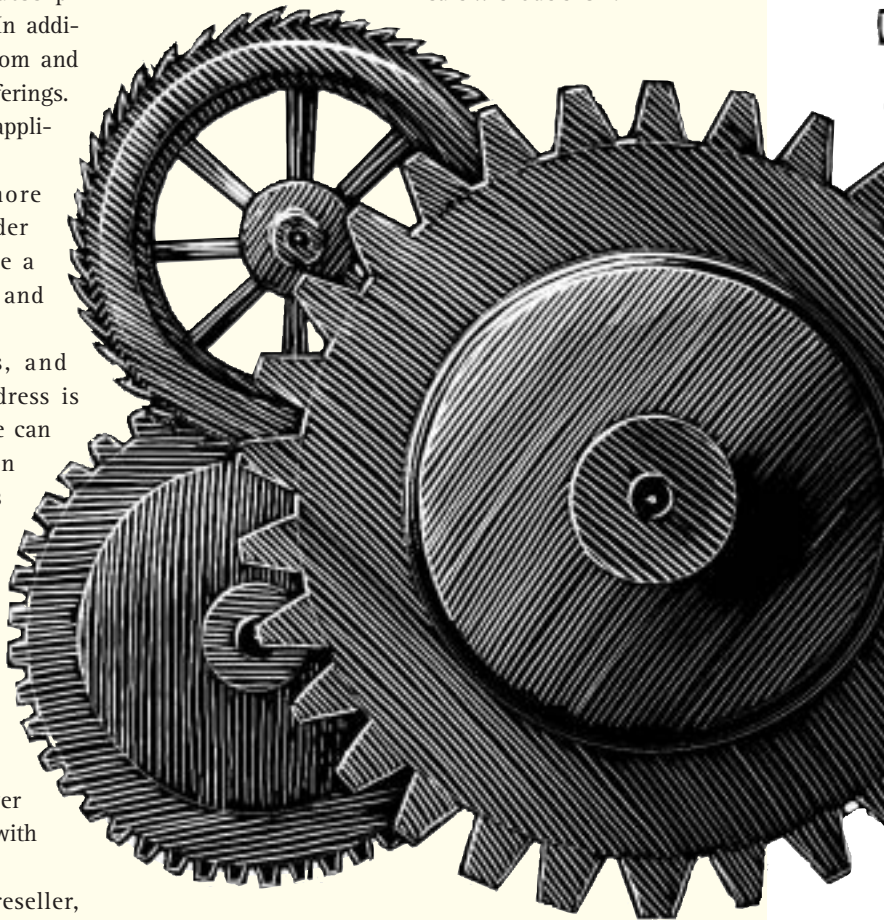
"Frankly, the migration was not very easy," he says. "Oracle and SAP use different indexes, so we had a performance problem in the beginning. But consultants from SAP saved us by helping us make the right indexes on the database. Once we did that, it performed much better."

As challenging as the database migration was, the SAN integration was much trickier, says Giesinger. "We didn't

have the know-how with Linux and MaxDB to implement the backup system on our SAN," he says. "Our StorageTek library was not supported."

Giesinger says, once again, a strategic partner stepped up to help with the migrations. This time, TDS Multivision AG, which led the migration efforts, suggested new firmware on the drives in the disk array. When that change was made, the database and SAN system integrated smoothly.

"Partners helped us at every stage, especially with tuning," says Giesinger. "It would have been much more difficult without them."



Availability on Demand

Besides performance, the other main reason for the strategic investment is high availability (HA). For this portion of the job, St. Galler Tagblatt turned to LifeKeeper for Linux from SteelEye Technology Inc. This cluster software can coordinate up to 32 computers and has certified kits for managing, controlling and protecting large numbers of applications. Clusters provide failover: In case one server goes down, others are available to seamlessly take over their workloads. With LifeKeeper cluster technology, enterprises can approach 99.7 percent uptime.

While availability on the subscriber database is critical, the other aspects of St. Galler Tagblatt's solution are mission critical. When the other parts of the company's SAP back-end systems—finance, controlling, asset management and human resources, advertisement management and sales, billing of shipping charges, collection, and accounting for various subsidiaries—come online, the HA cluster solution will be put to the test.

"We regard SAP as a strategic partner to our company," explains Giesinger. "We will be converting all our operational business processes to SAP software in the medium term."

xSeries Scalability

Giesinger says the decision to run the subscriber workload on xSeries servers was based on IBM's leadership in Linux development and the TCO of Linux on Intel*. In addition, "before the company had HP-UX," Geisinger says "we ran SAP on AIX* with IBM machines and we were always satisfied." He added that the company was especially pleased with IBM's service and support.

The xSeries platform also sets scalability standards in the 4- to 16-way Intel server market with its high-performance Enterprise X-Architecture with XpandOnDemand processors. The Enterprise X-Architecture is similar to other IBM @server

“**B**ecause of the new system, we can send the addresses directly to the print machine on the newspaper a lot faster than we did before. This speeds up the printing process and ultimately reduces costs.”

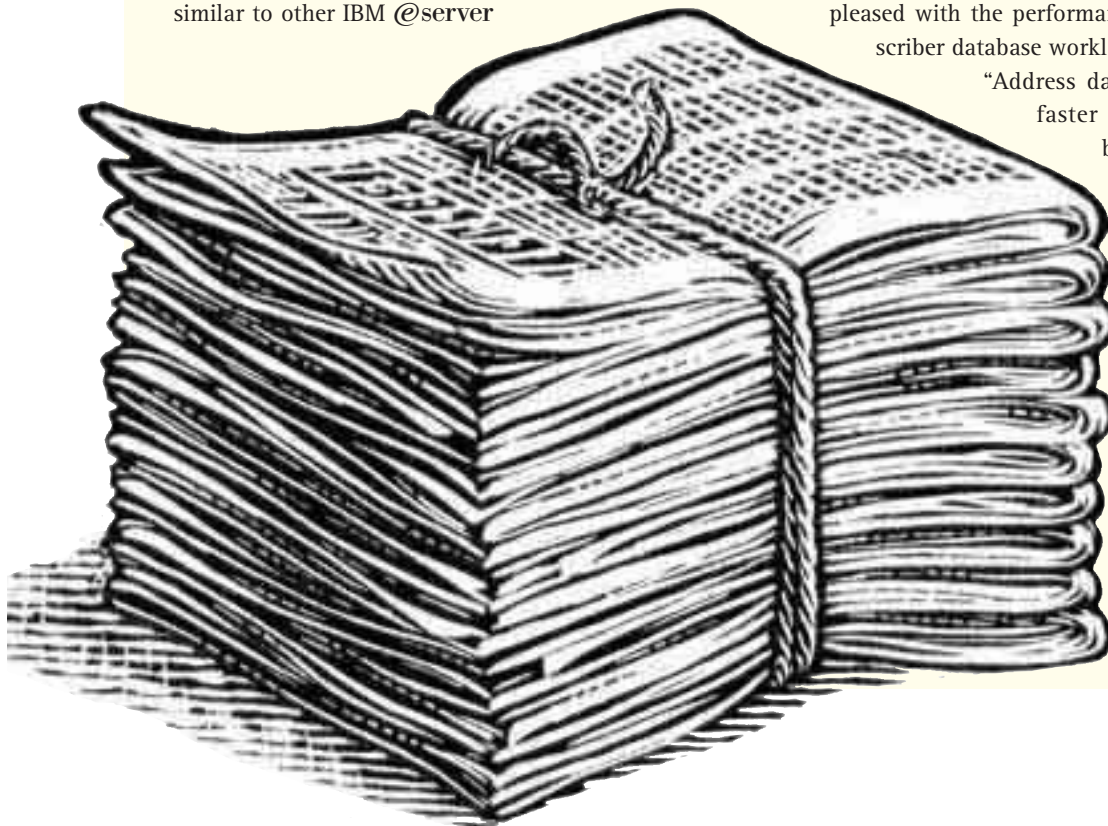
—Erich Giesinger

Capacity on Demand (CoD) offerings, which allow enterprises to only pay for the computing power they need, when they need it. Each 4-way processor node contains processors, cache, memory and storage that can stand alone as a single server or be connected to other nodes to become 8-, 12- or 16-way servers.

As St. Galler Tagblatt and NZZ continue to grow their media empires in northern and eastern Switzerland, Giesinger and his crew of IT architects can keep the presses running and the sales orders flowing without worrying about running out of server capacity. In the short term, he's pleased with the performance increases with only the subscriber database workload migrated.

"Address data is now prepared three times faster than before, and our Internet-based processes have also become a lot faster," he says. "The users are finding the new system very easy to use, and it also allows us sufficient leeway for future growth—one of our central concerns."

James Mathewson is a freelance writer and editor at large for ComputerUser magazine and the editor of IBM's Virtual Innovation Center for Hardware (VIC-H) Web site.



ILLUMINATING





LINUX

**A specialty lighting company
makes the move from Dell to
Linux on POWER**

BY RYAN RHODES

EVERYTHING looks different under natural light. Many a time I've purchased something from a large retail outlet bathed in buzzing fluorescent light, only to get my purchase home and realize that it looks totally different—and usually terrible—in the light shining through the windows of my home.

More specifically, natural daylight is easier on the eyes when performing complex and detailed tasks that typically involve working with minute components. Such tasks can include needlework and miniature model crafting and tasks that require precise color matching, such as dental work and creating prosthetic devices. For such professional or hobby work, a traditional light bulb typically won't suffice.

Seeing the Light

Enter The Daylight Company Ltd., a London-based business specializing in “daylight simulation effect” light bulbs and quality magnification equipment. Using the company's specialized lighting and magnification offerings, hobbyists and professionals alike can leverage the benefits of working under perpetual natural light conditions.

Thanks to an IBM® pSeries® server, Linux® and POWER4® microprocessor technology, The Daylight Company is leveraging benefits of its own, not the least of which being a fast and stable company server environment that effortlessly links to branches in both the United States and Australia.

“We wanted everyone at all our branches operating on the same accounting, ERP and CRM (customer relationship management) system that we’d been working with in our London headquarters,” says Lee Raynor, the company’s finance director. “And we wanted to speed up communications and data transactions between the branch offices, as well as fix some database issues we’d been experiencing.”

As a company serving a relatively niche, yet necessary, market, The Daylight Company is a somewhat smaller business, consisting of about 25 employees worldwide, accessing the company’s server. Niche though it is, the company is a significant player in the craft-lighting industry and has the order processing and server requirements of companies three or more times its size.

Previously based on a Dell server running Windows® 2000, The Daylight Company’s UK office ran an ERP and CRM solution called HansaWorld Enterprise (www.hansaworld.com), a solution they wanted to maintain and extend to their U.S. and Australian offices.



The Daylight Company specializes in “daylight simulation effect” light bulbs, which are used for cosmetic treatments.

but they said their experiences with IBM machines and Linux yielded the best results they had seen. More specifically, they steered us to pSeries servers as the platform that would likely provide optimal results.”

Implementing the solution proved to be almost impossibly seamless. According to Raynor, implementation basically involved plugging the new server into place and everything ran swimmingly from there. Well, maybe not that seamless, but it was pretty close.

The main reason for the lack of transition headaches stemmed from the fact the company extensively tested the system before going live in a production environment. Raynor says they wanted to have as many bugs shaken out as they possibly could to help ensure as effortless a transition as possible.

“The pSeries box arrived ready after having been tested with some of the test data gathered from our offices,” Raynor says. “So, since it’s been installed, we’ve had very few problems with it at all.”

PHOTOGRAPH COURTESY OF THE DAYLIGHT COMPANY LTD.

“They [HansaWorld] said their experiences with IBM machines and Linux yielded the best results they had seen. More specifically, they steered us to pSeries servers as the platform that would likely provide optimal results.”

—Lee Raynor, finance director, The Daylight Company, Ltd.

Seamless Transition

According to Raynor, the original upgrade plan was to install a Windows server. However, after discussions with representatives from HansaWorld, as well as persuasion from representatives from IBM business partner ABS (www.abslimited.co.uk), The Daylight Company opted to adopt an entirely new server environment consisting of a pSeries model 615 POWER4 system running SUSE LINUX Enterprise Server 8.0.

“We knew we wanted to stay with HansaWorld,” Raynor says. “And representatives from their company told us they could only guarantee the database side would run reliably on IBM machines. They did say there were other options,

Also contributing to the rather seamless transition was the company’s office-by-office upgrade approach. Starting with the London headquarters with its 11 users, they then upgraded the Australian office, with its three users and, finally, they tackled the U.S. office with its 11 users. This step-by-step approach helped ensure that any problems encountered during the UK office upgrade wouldn’t occur during subsequent upgrades and minimized overall confusion between sites. And, since most of the employees connect to the server using Windows PCs, few encountered much in the way of interruptions and any internal training that had to be conducted was done to familiarize users outside the United Kingdom with using HansaWorld.

“We got the UK office up and running on the system first, for obvious reasons,” Raynor says. “Then, for training purposes, we brought the smaller Australian office online next. Now, with all three offices online and connected to the UK-based server, we’re enjoying a much faster overall system with outstanding coordination and integration between offices spread across the globe. We’re definitely excited about it. I’ve heard horrendous stories about companies who have gone through this kind of IT adjustment, but I have to say, this was just extremely seamless and straightforward.”

Today, The Daylight Company is up and running with a single pSeries server doing the work of what would’ve been a Windows server system, which would’ve cost considerably more to implement, both in terms of maintenance and IT personnel. Additionally, the company is realizing the licensing cost benefits of a Linux implementation over its previous Windows implementation.

“For a smaller business like ours, the solution has proven quite scalable and cost effective,” Raynor says. “It’s been great for getting management information centralized very quickly, even between distant locations spread between our worldwide offices.”

In addition to the most important aspect of the solution—supporting its field force and effectively running its three remote office branches and worldwide order processing from a single server—the new system seamlessly handles complete company operations on a 24-7 basis.

As an added bonus, the new IT environment also permits users to communicate with one another through an integrated voice over IP (VoIP) system, meaning that company personnel can converse between the United States, United Kingdom and Australia, free of international long-distance fees. According to Raynor, this has been a useful ancillary tool for keeping in close touch with overseas employees and managers.

Bright Future

Moving forward with their Linux on POWER* solution, the company now has the capacity for future growth, something its previous Dell-based system didn’t allow.

“There are plans to tie an office in China to the UK server sometime in the future, which is the only site right now that doesn’t have direct access to the system,” Raynor says. “However, my understanding is that this upgrade can accommodate growth well beyond that. And that’s always good to know. With any new system, you naturally have concerns, but in this case there have simply been no serious problems at all and we’re very happy with the solution.”

Ryan Rhodes is a managing editor at MSP TechMedia. Ryan can be reached at rrhodes@msptechmedia.com.



A photograph of a PGA golfer in a light blue shirt and grey pants crouching on a green, looking towards a hole. In the background, a large crowd of spectators is visible on a grassy bank overlooking a body of water. A banner on the bank reads "THE PLAYERS CHAMPIONSHIP". In the foreground, the back of a caddy wearing a red vest with "PGA TOUR" and a logo is visible, also crouching on the green.

LINUX

PGATOUR.COM relies on IBM technologies to give fans a unique view of the game **BY NEIL TARDY**

A PGA golfer eyes the hole on the famed Island Green at Sawgrass in Ponte Verda Beach, Fla., during the 2005 PLAYERS Championship.



on the LINKS

A PGA TOURCast team member at the 2002 Buick Classic tournament in Rye, N.Y., reports information that fans can access in real time via ShotLink.

PHOTOGRAPH THIS PAGE COPYRIGHT CHRIS COINDON/PGA TOUR VIA WIREIMAGE.COM

THERE'S NO QUESTION technology has transformed the game of golf—just look at golf equipment. Where for much of the last century, steel shafts and wooden club heads were predominant on the course, nowadays graphite shafts and titanium heads are used to provide greater power and durability. Golf balls have evolved as well. Everything from the mixed rubber materials in the cores to the dimples on the refined plastic shells is tweaked to influence how a ball travels in the air and responds on impact. Meanwhile, the now-pervasive use of computer-aided design (CAD) allows manufacturers to determine how a ball or club will perform before you ever remove it from the bag. What happens when you nail the sweet spot—and more importantly (and, probably, more likely), what happens when you slice or hook—is mapped out on a virtual drawing board. For the average golfer, enhancements to club and ball design amount to a few extra yards on the fairway and a general reduction in frustration. However, the full impact of these extensive innovations is showcased at the professional level. At times it seems almost too easy for the guys who routinely launch 330-plus yard drives and can chip with a watchmaker's precision. If you follow the PGA TOUR, you see on a weekly basis how technology has changed the game. But if you haven't visited the official PGA TOUR Web site, PGATOUR.COM, you may not realize that technology is also changing how we watch professional golf, and that a Linux* technology-based IBM* solution plays a prominent part in this.



PGA TOUR staff members watch the progress on Island Green at TPC at Sawgrass.

A New View of the Action

For each PGA TOUR and World Golf Championship Series tournament (44 events a year), fans that pay a subscription fee can tune in at PGATOUR.COM and get a view of the game that's uniquely different than what they see from the gallery or the couch. The viewing experience is the result of a rich multimedia application—dubbed TOURCast—that's provided by IBM Managed Hosting-Linux virtual services. With TOURCast, fans can access a wealth of information. They can graphically track the progress of any player in the field or the action on any hole on the course, shot by shot. They can retrieve a weekend's worth or a season's worth of detailed, customizable statistics (average drive length, putting percentage, etc.) for individual players or for different holes. But what fans don't see is equally important. It's the IBM @server zSeries* server in Boulder, Colo., that handles the subscriber authentication and provides access to TOURCast. The mainframe, which is managed by IBM, features Linux "virtual servers." "From our standpoint it looks just like a regular Linux

machine," says Steve Evans, vice president of information services (IS) for the TOUR. "We can't tell the difference." The difference, however, is substantial. Even though the TOUR's 42-person IT department runs its own datacenter of more than 100 servers, using the IBM mainframe in Boulder makes sense. Just as TOURCast allows fans to watch tournaments the way they choose, IBM Managed Hosting-Linux virtual services allows PGATOUR.COM to expend and pay for only as much computing power as it needs. Not only does PGATOUR.COM skirt the burden of acquiring and deploying a bundle of new, physical servers, it doesn't have to sweat the scalability. Rather than try to project how many Web, database and application servers are enough to accommodate future growth in the TOURCast subscriber base, PGATOUR.COM relies on IBM to manage the ever-fluctuating volumes of customer Web traffic. "Because of Linux and the virtualization capabilities IBM brings to Linux, and because IBM can build a billing model that charges us only for what we use, the business plan works for us," says Evans.

PHOTOGRAPH THIS PAGE COPYRIGHT STAN BADOZ/PGA TOUR VIA WIREIMAGE.COM

Early Adopters

It's probably no coincidence that PGATOUR.COM's use of Linux didn't start with the 2003 debut of TOURCast. Those connected with the Web site—which is a collaboration between the PGA TOUR, Inc., and CBS Sportsline, a provider of online sports news and fantasy sports games—have from the beginning displayed their openness to emerging technologies.

PGATOUR.COM has been hosted on Linux servers since early 2000. Linux is also used to provide mail services and Web-services infrastructure for the TOUR's headquarters. "We ultimately chose Linux because we felt it would be the most cost-effective platform, and we thought it would be more reliable than we had been using," says Evans. "We were successful with that, so from a server standpoint, we've kind of adopted the philosophy, 'if it can be Linux, then it will be Linux.'" The TOUR selected Linux despite the desire of some to go with a UNIX* implementation from HP or Sun* Microsystems or a Windows* technology-based solution from Microsoft*. "We took the step and it was interesting because within a few months everyone who had any apprehension

was pretty happy," says Evans, who adds that CBS Sportsline's own site (sportsline.com) has also since been migrated to the Linux platform. "We probably were pretty early in the curve of adopting Linux, especially for a commercial Web site."

Eager Innovators

Likewise, PGATOUR.COM has a long-standing relationship with IBM—the company is the Official Technology Partner of the PGA TOUR—and reliance on IBM solutions. At every PGA TOUR event, the TOUR brings a trailer housing 17 IBM @server xSeries* servers. These servers perform the statistical computations on the data gathered through ShotLink, a data-management system developed by IBM, the TOUR and others. ShotLink, which is based on xSeries and iSeries* technologies, provides real-time, contextual scoring information for all PGA TOUR events. (The TOUR conducts more than 100 events a year, encompassing not only the PGA TOUR itself but the World Golf Championship Series, the Nationwide Tour and the Champions Tour—formerly the Senior PGA Tour.)



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—Steve Evans, vice president of information services, PGA TOUR



SO WHO'S IN THE TOURCast GALLERY



IT ISN'T JUST THE GOLF FANS who are following the action on PGATOUR.COM's TOURCast. Even the players themselves are logging in. Steve Evans, vice president of IS for the TOUR, says that not surprisingly, most of the online activity from tournament to tournament is from people who want to more closely chart the progress of those at or near the top of the leader board. But the benefit of TOURCast is that it can show you all of the action even if it isn't on TV. "We certainly get a lot of wives and families who follow their player on TOURCast, along with some people who just like certain players," says Evans. "Then we've got players and caddies who've used TOURCast after the round to look at what happened on the course that day, and they tell us that's been helpful.

"For instance, during the first three rounds of THE 2004 PLAYERS Championship, Padraig Harrington thought he was hitting the ball better than his scores of 68, 70 and 73 indicated. He looked up his stats on ShotLink, the data-gathering system that serves as the basis for TOURCast. After discovering that he was consistently missing putts from a certain distance, he put in some overtime on the practice green. In the final round, thanks in no small part to strong putting, Harrington fired a 66 and ascended to a second-place finish.

Other players, however, may find that the technology has its drawbacks, like when they hear from their online galleries. "One of the things players tell us is that they actually get a lot of questions now about shots they hit to places other than the fairway or green," says Evans.

—N.T.

For each event, some 250 to 350 volunteers, or "walking scorers," use wireless handheld devices to record and transmit data—including distance, lie, location and score—from every hole. To supplement this data, sophisticated laser devices are positioned throughout the course to record the exact position of every ball. ShotLink data, naturally, is then presented in TOURCast.

ShotLink is written not for Linux but for Windows 2000. However, Evans points to mitigating circumstances. He notes that ShotLink represented years of development (in contrast to TOURCast, which came together in months).

"We started writing code for ShotLink in early 2000, when we had just started hosting the PGATOUR.COM on Linux," he says. "We just weren't ready to pull the trigger. Had we developed ShotLink a year or two later, it probably would have been in Linux."

But PGATOUR.COM is looking forward to extending its use of Linux and its relationship with IBM to help further transform its TOURCast offering. It's already capitalized on the solution's flexibility, offering TOURCast free of charge during the weeks of the Sony Open and the Wachovia Championship.

Evans adds that PGATOUR.COM is exploring expanding the amount of free content provided through TOURCast. "If we double our subscriber base next week, we know we have the server capacity to handle it," he says. "And we also know that the costs of that growth are less than the incremental cost of our subscription."

Neil Tardy, a freelance writer and editor, has covered technology since 1996. Neil can be reached at editor_njt64@yahoo.com.



ShotLink is based on xSeries and iSeries technology.

PHOTOGRAPH THIS PAGE COPYRIGHT RUSTY JARRETT/PGA TOUR VIA WIREIMAGE.COM



Quotable Quotes

Customers explain the business benefits of deploying Linux

Brabant Water

"The business plan called for a solution that could give us the same or better availability and performance for SAP, with low TCO (total cost of ownership) and greater capacity. The new z900 (zSeries* 900) with Linux* has enabled us to achieve these goals and has provided a flexible, easy-to-manage platform for the future."

Leon Schutte, IT Manager, Netherlands

Triangle

"IXS (Integrated xSeries* Server), IXA (Integrated xSeries Adapter) and iSeries* [systems] have provided an excellent way to reduce costs and simplify our IT infrastructure. By using LPARs (logical partitions) to run SUSE LINUX* and OS/400* on the same system, Triangle can take advantage of the iSeries server's reliability and performance for multiple applications, while the integration with xSeries* [systems] further reduces complexity."

Kevin Drew, Managing Director, United Kingdom

Anaconda Sports

"We made the switch from the Microsoft* 2000 server to Linux*, and are happy with the system change particularly because of the cost avoidance that comes with moving from proprietary software to open source."

Rob Meyer, Director of Internet Services, New York

Endress+Hauser InfoServe

"The migration of our SAP application servers to Linux* on zSeries* [systems] produced an immediate increase in performance, and has made it easier to manage and maintain our systems."

Dr. Jan M. Olaf, Sales and Marketing Manager, Germany

Arup Industrial Engineering Group

"We had extensive experience in the UNIX* arena, so Linux* made sense in terms of both cost-effectiveness and flexibility, and our internal benchmarks showed that the xSeries* [server] would provide the best price-to-performance ratio for our needs."

Brian Walker, Associate Director, United Kingdom

Haverty's Furniture Companies, Inc.

"In the past, they [iSeries* systems] uniformly only ran native apps, but now we have eight Linux* servers running on two production boxes. Pricing also makes it desirable to run Linux on the iSeries [server] and @server i5 systems, as does the platform's speed. You can go to our Web site at havertys.com and be the judge of that."

Ed Clary, Chief Information Officer, Atlanta, Ga.

Brenntag Nordic

"Linux* on iSeries* [systems] has proved to be not only more cost-effective, but also highly reliable, which helps reduce expenditure on maintenance and management."

Michael Langborg, Financial and IT Director, Denmark

Banca Carige

"By combining z/OS* and Linux*, we have a platform that is compatible with existing systems and ready for the future."

Giorgio Seronello, IT Director, Italy

University of North Carolina at Chapel Hill

"Using Linux* with our two IBM* @server xSeries* servers has provided us a higher level of security, ease of networking, support and low cost. With them we have deployed IBM's workflow development tool, WebSphere* Enterprise edition, DB2* and the WebSphere Portal Server to automate our Computer Aided Drug Discovery algorithms. We were also able to take advantage of a 32-CPU Linux cluster by deploying our compute jobs across them and thus, dramatically reducing the computation time."

Dr. Alexander Tropsha, Professor, School of Pharmacy, Chapel Hill, N.C.

Firwood Paints

"Linux* was recommended to us as offering a stable platform for Websphere* and is a truly multitasking system. We wanted a system that required little support; since implementation the operating system has proven reliable and performed well and we would not hesitate to recommend its use."

Martin Wallen, Managing Director, United Kingdom



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