

## CASE STUDIES

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### **Integrating Linux into IBM's On Demand Vision from the End-User Perspective**

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## INTRODUCTION

IDC conducted a series of interviews earlier this year to prepare an IDC White Paper titled *Integrating Linux into IBM's On Demand Vision*. The following Case Studies are the result of original interviews conducted by IDC with a variety of IBM clients. Background information may have been provided in some cases by IBM, but all performance metrics, cost savings, and other data points were supplied by end customers.

As IDC stated in its White Paper, IBM's strategy for integrating Linux and its four key platforms into its on demand grid-enabled infrastructure is bold and comprehensive and offers a tremendous potential value for existing customers. The value proposition has the potential to be strong for noncustomers and customers that wish to use one of these platforms for consolidation purposes, as some of the case study companies in the next section show.

## CASE STUDIES

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### **Linux on zSeries: Retailer Boscov's Puts the Brakes on IT Spending with Linux**

When it comes to the retail business, a core tenet is to enable and encourage customers to increase their spending, but to hold the line on spending of your own. When Boscov's Senior Vice President and CIO Harry Roberts realized he was buying a new 4-way server every month and adding IT staffers at a rate of one per year, he knew he had a problem on his hands.

Boscov's, a chain employing 10,000 people at 40 store locations through the mid-Atlantic region of the United States, was on a client/server-oriented architecture trajectory left over from the 1990s — one that had promised but not delivered cost control. The situation dated back to a decision in 1995, when the company, which had been a mainframe shop for the past 30 years, concluded that the application software future of the mainframe environment was bleak. At that time, Boscov's embarked on a two- and three-tier architecture strategy designed to ensure its ability to move beyond the aging COBOL and CICS applications that had served the company well for decades.

During the late 1990s, after the company completed an expensive round of Y2K preparations, its CFO stepped back and asked why the IT infrastructure was so expensive to maintain. A detailed analysis found that the distributed systems infrastructure was as high as the cost of the existing mainframe environment and was not producing the cost savings that had been expected.

Roberts, who joined the company after the shift to a distributed architecture had been initiated, was charged with figuring out how to manage the sprawl and spiraling costs. But it wasn't until he attended LinuxWorld Expo and saw IBM Chairman and CEO Sam Palmisano speak on the importance of Linux that Roberts fully understood how serious IBM was about this new alternative solution.

Boscov's purchased a new z900 in 2001, which solved some immediate headroom problems the company was facing. More important, that system marked the beginning of Boscov's foray into Linux. Initially, the company tried out Linux on the zSeries as a consolidation engine for simplistic tasks such as print and file serving.

"We were having blue screen problems with the NT systems," says Roberts. "Applications that were ported over to Linux ran well, and we had no more problems. That was enough for us to take a bigger leap."

### **Boscov's**

Boscov's, a retail chain employing 10,000 people at 40 store locations through the mid-Atlantic region of the United States, was struggling with high IT costs associated with its distributed systems infrastructure. After doing some evaluation on the cost savings of running SUSE Enterprise Linux on IBM zSeries, Boscov's found the numbers so encouraging that it eventually implemented an enterprisewide rollout of Linux. The company built its ebusiness framework with IBM WebSphere Commerce for Linux and uses a storage area network (SAN) based on IBM TotalStorage Enterprise Storage Server (ESS) for storage support. Boscov's currently has about 100 instances of SUSE Enterprise Linux running aboard its zSeries system, including development, test, quality assurance, and production. Those instances replace about 80 discrete four-way systems. Between the full-time equivalents not hired and servers that Boscov's didn't have to buy, the company is quickly approaching a seven-figure savings, driven primarily through the move to Linux. "I don't think we've seen the full potential of Linux yet. Everybody is looking at the lower cost footprint," says Senior Vice President and CIO Harry Roberts. "We, as IT execs, need to position ourselves so we can take advantage of the lowest cost of operation that is out there."

After doing some evaluation on how the cost savings of supporting those workloads on Linux on zSeries compared with Windows NT 4 on discrete systems, Roberts found numbers so encouraging that he decided to explore what else could be done to leverage Linux. Roberts' team embarked on a clandestine operation to move some additional applications from Windows to Java on Linux. After completing the move, the two environments were running in parallel for four months. "In four months, we never had a blip. That sold us on Linux," Roberts explains.

The company currently has about 100 instances of SUSE Enterprise Linux running aboard its zSeries system, including development, test, quality assurance, and production. Those instances replace about 80 discrete 4-way systems.

Roberts says that between the full-time equivalents not hired and servers that Boscov's didn't have to buy, the company is quickly approaching a seven-figure savings, driven primarily through the move to Linux. "Right now, I have saved about six man years at an average of \$720,000, including overhead," says Roberts. Currently Boscov's has two-thirds of its server farm running on Linux.

Still, Roberts is not done cutting costs. He currently has about 40 distributed servers that will be consolidated down to about 25 systems. "What's stopping us now are some applications are not yet certified on Z/Linux and a few special requirements that are better on distributed systems," he notes.

He says that next on his agenda is to review system provisioning through an evaluation of capacity on demand. As a retailer, the company faces a huge sales spike that consumes twice the number of mainframe million instructions per second (MIPS) from early November through the end of December. The big challenge, here, is to find application software that can be acquired with licensing that allows scaling up and down usage. In addition, Roberts plans to evaluate a migration strategy for migrating existing COBOL applications using tools from Micro Focus or Acucorp, so those applications can be rehosted aboard partitions running Linux.

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### **Linux on Grid: Progressive Broker Charles Schwab Accelerates Client Service Response Using Grid**

The financial services industry has long been aggressive about using technology to create competitive advantage. However, imagine if you could implement new technology that fundamentally changes your broker's interaction with clients from a two-step, I'll-get-back-to-you-with-the-results customer service model to a no-delay, on-the-spot model.

That's exactly what brokerage firm Charles Schwab did with an application that it grid-enabled using IBM technology. The application, one that creates a Monte Carlo simulation of the potential performance of a portfolio of investments, was the cornerstone of the company's first venture into grid computing. A Monte Carlo simulation is the classic application that maps to a grid architecture, since it is highly computation intensive, requires multiple iterations, and needs to be solved in the shortest period of time possible.

Charles Schwab's challenge was simple: The company wanted financial portfolio simulations to complete more quickly so that a large number of iterations could be run without costing the company a lot of money. Equally important, the company wanted to minimize the time its 2,000 brokers — high value employees — spent waiting for results from the simulation. Of course, a supercomputer could handle such a task, but not at an efficient cost. Schwab's vision was to run this application aboard Intel-based hardware running a commercial distribution of Linux.

The company procured eServer xSeries servers from IBM and Red Hat Enterprise Linux Advanced Server and uses IBM's grid software tools. An application being used by Charles Schwab was restructured, with financial analysis separated from the math routines, so the math components could be written using C++. That caused some rethinking of the application architecture, but in the end, the performance improvements justified the investment.

The system went online in December 2003, and the results are impressive. Brokers would typically have to initiate simulations and follow up with customers after results were in. The processing time alone took between 8 or 10 minutes and up to several hours. By comparison, a broker can now initiate a simulation while on the phone with a customer and typically within 30 seconds have a response to supply to the customer.

The business benefit to Charles Schwab is that the interaction with the client and the level of service provided make the best use of clients' time, position Charles Schwab as a responsive investment consultant, and, most importantly, open the potential to increase the amount of business that each customer does with Charles Schwab.

### Charles Schwab

The challenge for financial services industry leader Charles Schwab was simple: The company wanted financial portfolio simulations to complete more quickly (seconds instead of minutes or even hours) so that a large number of iterations could be run without costing the company a lot of money. Equally important, the company wanted to minimize the time its 2,000 brokers — high value employees — spent waiting for results from the simulation. The company procured eServer xSeries systems from IBM and Red Hat Enterprise Linux Advanced Server and uses IBM's grid software tools. The system went online in December 2003, and the results are impressive. Brokers would typically have to initiate simulations and follow up with customers after results were in. The processing time alone took between 8 or 10 minutes and up to several hours. By comparison, a broker can now initiate a simulation while on the phone with a customer and typically within 30 seconds have a response to supply to the customer. The business benefit to Charles Schwab is that the interaction with the client and the level of service provided make best use of the clients' time, position Charles Schwab as a responsive investment consultant, and, most importantly, open the potential to increase the amount of business that each customer does with Charles Schwab.

Given the company's experience, Barbara Hodgkinson, vice president of organic IT, says the concept could be extended to serve business applications. "Even if you couldn't benefit from parallelization, you could still break the work up into tasks that can be distributed over the grid," she notes.

The company also utilizes the inherently distributed nature of grid capabilities and has its application spread across two datacenters that are 30km apart. "We have shown we can have half the grid go away and still run on the other half." Hodgkinson also sees benefit in extending the grid concept to data grids: "We need the ability to access heterogeneous databases from a grid."

Despite the success of accelerating such a critical application, return on investment (ROI) remains a critical consideration. Charles Schwab sees the increasing sophistication as a major hurdle to be managed through selection of the automation technology. "We don't think that [a] manual process can keep up with the complexity

or growth of systems that we expect. We have to go to more automated processes to manage what we have to manage with a reasonably sized workforce," says Hodgkinson.

Currently Charles Schwab offers investment analysis and simulation to online customers using self-serve facilities on the Charles Schwab Web site. As this move progresses, the variability of the simulation volume is likely to become far less predictable. While the company is not yet using any dynamic provisioning and management tools, such resources will be critical as it moves its investment analysis tools into the next phase of deployment. Charles Schwab is already evaluating tools for deployment to complement the launch of its online version of the portfolio analysis tool.

Hodgkinson offers the following advice for others that are considering implementation of a grid environment: "It's probably good to evaluate the applications that are a fit for the grid. An application will benefit if it makes a lot of requests for compute-intensive work. It will really benefit if it can be parallelized. In the financial services area, it happens to be very useful."

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## **Linux on iSeries: GHY International Speeds International Shipments and Limits Server Sprawl with iSeries**

GHY International is a customs broker that services its customers by expediting shipments between Canada and the United States. The company has 100 employees spread across eight locations in Canada and the United States, with the IT budget and relatively small IT staff that typifies focused operations of this size. Yet, GHY needs to service customers in two countries with high levels of performance and fast application response and to capitalize on opportunities to grow its business.

GHY is a long-time iSeries customer, with experience dating back to its first iSeries deployment in the late 1980s using direct-attached terminals accessing a custom RPG application. That application, which enables employees of GHY to process shipment documents required by customs between Canada and the United States, has been maintained and upgraded over the years and today continues to be one of the company's more critical applications.

Not unlike many iSeries shops, GHY found its business practices changing with the introduction of PCs into the workplace and adopted a pure TCP/IP network to connect its iSeries system and its PCs in the early 1990s — well before pure IP usage was trendy. Yet, the introduction of PCs was paralleled by a diversification of its IT infrastructure, as servers running Windows and SCO Unix found a home in the company's environment.

Then Linux entered — through the back door. Nigel Fortlage, GHY's vice president of IT, recalls that he hired an 18-year-old Linux advocate who showed him what Linux could do. Before long, the company was running its email system on Linux and found uses for Apache, Perl, PHP, and more.

The company eventually concluded that Linux fit the bill as the primary server for a critical imaging application, which ensured that Linux would have a permanent home within the company's infrastructure. That application today accesses 1.5 million scanned images and 300,000 transactional files.

However, the company's IT staff of three found itself increasingly spread thin by the expanding collection of servers with which it had to contend, with more than 90% of the staff's time being consumed by maintenance of the servers and client systems. Fortlage said the company did an analysis of its iSeries system — three systems running Windows NT, one system running SCO Unix, and two systems running Red Hat Linux — and realized that a system outage had the potential to severely affect the company's business operations.

Fortlage initially considered adding redundant systems, which would have likely taken the company up to 16 servers and required doubling the IT staff size. After a management discussion of the problem and the potential cost of the proposed solution, Fortlage went back to square one, with the mandate to evaluate other options to provide the redundancy and lower the management burden — without raising staffing costs.

Turning to IBM for help, Fortlage reconsidered the options to simplify his environment. The solution turned out to be a consolidation of a different form: a physical consolidation of the heterogeneous environment aboard a pair of iSeries platforms.

The first system, an iSeries 270, runs Lotus Domino as well as the company's internally developed customs applications. The system is configured with two integrated xSeries servers running Windows 2000. The second system, an iSeries 820, is used only for Linux partitions — with the requisite OS/400 LPAR in place mainly to manage the system resources. GHY now has seven copies of Red Hat Enterprise Linux running on the iSeries 820, including LPARs running Squid for Web proxy, DNS, and firewall services. The company has retired all of the other Intel x86 hardware in its datacenter.

### **GHY International**

GHY International is a customs broker that services its customers by expediting shipments between Canada and the United States. GHY concluded that Linux fit the bill as the primary server for a critical imaging application the company needed, which ensured Linux would have a permanent home within the company's infrastructure. To simplify its environment, GHY International physically consolidated the heterogeneous environment aboard a pair of iSeries platforms. The first system, an iSeries 270, runs Lotus Domino as well as the company's internally developed customs applications. The second system, an iSeries 820 — with the requisite OS/400 LPAR in place mainly to manage the system resources — is used only for Linux partitions. The system leverages Red Hat Enterprise Linux and includes LPARs running Squid for Web proxy; DNS and firewall services; a critical, document imaging application; and the corporate Web site. That critical document application today accesses 1.5 million scanned images and 300,000 transactional files. The bottom-line results include an out-of-pocket cost savings of \$30,000 on the hardware acquisition and a 14% underbudget result for the year's IT expenses. But more important, the IT staff of three continues to support the infrastructure. The better news is that staff members now find that they spend only 5% of their time supporting the servers. Thus, they have time to focus on end-user issues and attend to another important list: requests for improvements and new features in the company's applications.

The ability to allocate resources to a given LPAR has been a benefit. Fortlage says that, when traffic increases, his employees "simply turn up the dial" while maintaining a consistent response time to internal users. The next phase of operations calls for the company to work toward having a single iSeries box run all of its applications, so that a second system can be deployed to enable the high availability that is becoming increasingly important.

The bottom-line results, says Fortlage, include an out-of-pocket cost savings of \$30,000 on the hardware acquisition and a 14% underbudget result for the year's IT expenses. More importantly, the IT staff of three continues to support the infrastructure. The better news is that the staff members now find themselves only spending 5% of their time supporting the servers, leaving room to focus on end-user issues. They're also attending to another important list: requests for improvements and new features in the company's applications.

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## **Linux on xSeries: McCamish Systems Provisioning Racks to Insure Customer Success**

### **McCamish Systems**

McCamish Systems provides outsourcing solutions and software products to companies that are in the life insurance and financial services industries. The company's model is outsourcing solutions, which includes moving toward an xSeries rack or blade configuration and FAST700 Storage. The FAST700 benefits include storage redundancy, no single point of failure, and scalability, while xSeries provides the ability to compartmentalize the customer's configuration on a single xSeries server running Linux. This model greatly simplifies the security audit requirements and eliminates any competition for resources between different customers' applications. Another benefit is that business continuity services for xSeries platforms are affordable to acquire and easy to locate. Today, this company is representative of the leading edge of Linux adoption. With a move toward Linux as the primary operating system running its mission-critical business operations, McCamish Systems is able to support customers including 5 out of the industry's top 10 insurance companies in the country, one of the nation's top 3 banks, and one of the industry's largest financial services companies.

## **Linux on IBM pSeries: Archiving Video History in a Distributed Environment**

Time has proven that carefully preserved historical archives can become priceless jewels in the future. Under a recent initiative started by the United States Library of Congress, a new catalog and directory archive slated to provide reference to sites that preserve film, television and digital video images is being created.

The planners overseeing the creation of the archive have made some decisions that are likely to become historical in their own right — including a technology selection calling for Linux aboard IBM pSeries hardware.

The archive is designed to house the locations of images and film that are resident in libraries, museums, national archives and broadcasting companies, and it is expected to grow into what may be the world's largest reference repository for moving images.

This archive is called the Moving Images Collection (MIC) and will become part of the Library of Congress' permanent archives. The Library of Congress will make this collection available to users via the Internet.

The infrastructure being developed to house the directory and catalog archive is being created through a joint effort at three universities — Rutgers University, the University of Washington in Seattle, and the Georgia Institute of Technology Interactive Media Technology Center. The effort is being funded under a

\$900,000 grant from the National Science Foundation. The project came out of a pilot initiative by The Association of Moving Image Archivists (AMIA), which was funded by a grant from the National Film Preservation Board of the Library of Congress.

The choice to use Linux, while not so surprising given the Internet-centric nature of the archive, becomes more interesting because of the relative newness of Linux aboard IBM pSeries hardware.

The project has split into three components, with the University of Washington responsible for developing the directory to the catalog. Other components include the actual database of archives union catalog, which is being developed by Rutgers University, and a Web-based portal system allowing customized access to the

### **University of Washington**

Under a recent initiative started by the United States Library of Congress, a new archive slated to preserve film, television, and digital video images by cataloging and providing a directory of video collections is being created through a joint effort at three universities — Rutgers University Libraries, the University of Washington in Seattle, and the Georgia Institute of Technology Interactive Media Technology Center. Called the Moving Images Collection (MIC), the archive will become part of the Library of Congress' permanent archives and be available over the Internet. To create a robust and scalable infrastructure for the new system, the University of Washington chose SUSE Linux Enterprise Server running on IBM pSeries hardware. The other major decision was to go with the IBM Directory Server technology running on pSeries p610 systems. The project is well on the road to completion, and the selection of Linux allowed the Library of Congress to save significant dollars in software costs.



archives for many different types of users of the archive, which is under development by the Georgia Institute of Technology.

According to Jim DeRoest, director of streaming media, video, and TV technologies at the University of Washington, the configuration being built at the university incorporates IBM's Directory Server technology in a load-sharing environment. Because of the Internet-centric format of the overall system design, the distributed development at the three universities has little effect on the user experience during the testing phase, despite the spread of physical resources in three corners of the United States.

At the University of Washington, the most critical software development work revolves around designing the directory schema and involves up to four software developers at various times. The directory schema planning involves all three sites, as well as a steering committee of representatives from the Library of Congress and other participating film organizations. Says DeRoest, "A [great deal] of work was involved in designing the schema, and we did a lot of work designing the administrative interface for users who would come in and create a collection presences in the archive. We also did some work developing an authentication system."

The decision to go with Linux was particularly interesting, especially for the University of Washington, which is a major AIX/pSeries customer. DeRoest explains that although both the University of Washington and the Georgia Institute of Technology had a long history of working with POWER hardware and AIX, the Library of Congress had the final say in the architectural decisions as it would ultimately run the service. Part of the decision to go with Linux was driven by the interest in using other open source software as part of the overall solution. PostgreSQL, for example, is used by Rutgers in the database archive design. The project is using SUSE Linux Enterprise Server. Another influencing factor is that ultimately the Library of Congress will be paying for these systems and is going to have to cover support costs.

"Given all our druthers, we would have rather deployed on AIX, but we went with Linux," says DeRoest. While he had some initial concerns about the ability of IBM and SUSE to support their needs as efficiently as IBM could support AIX, his biggest concern was how much overhead would accompany any necessary support handoff between IBM and SUSE. In particular, when support calls move from a Level 1 to a Level 2 or 3 issue, the handoff between IBM and SUSE would take place. "But so far, things have been pretty smooth. Both organizations have been responsive to our problems," he says.

When it comes to hardware support, he says the reliability and scalability of the pSeries hardware is a given. The other major decision made at the University of Washington was to go with the IBM Directory Server technology. The Directory Server configurations are running on pSeries p610 systems, while the PostgreSQL servers and the portal servers are running on p630s.

The deployment today is housed on campus at the three universities in a distributed configuration. "There has been a question whether the Library of Congress wants to even take these systems and centralize," adds DeRoest. "We're just beginning to have conversations with the Library of Congress folks about how they want to move into production with these boxes. They are beginning to think about DR, continuity, etc."

With the universities two-thirds of the way through the two-year project, the initiative is well on the road to completion, and the universities are currently looking at some enhancements to the original project's outline.

In looking back over the progress of developing this new archive, DeRoest notes that the selection of Linux allowed project to save significant dollars, in particular for the database software layer.

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## **Linux on xSeries: Wimbledon Swings and Connects at Unpredictable Demands**

What does one of the world's premier tennis clubs have in common with the United States National Weather Service? The answer is that neither organization can predict with total certainty how much traffic its Web site will receive during certain major events.

However, just as the National Weather Service can expect a downpour of Web visitors during the approach of a hurricane, The All England Lawn Tennis Club can expect a strong level of visitation during its annual Wimbledon Tennis Championships. Although The All England Lawn Tennis Club's IT needs are those of a small/medium-sized business for 50 weeks of the year, the remaining two weeks mirror the profile of a large enterprise.

### **Wimbledon**

The All England Lawn Tennis Club, or Wimbledon as it is known around the world, meets the challenge of unpredictable demand with a Linux solution. During a typical two-week event, as many as 4 million users will make 27 million visits to the Wimbledon Web site. This enormous traffic bulge is not just a spike; rather, it represents many magnitudes of above-average pre- and post-tournament daily traffic. While IBM has any number of solutions that could scale up and down to serve this requirement, the solution deployed included Linux on xSeries, WebSphere Business Integrator, Tivoli Intelligent ThinkDynamic Orchestrator, and DB2, resulting in a three-fold price/performance improvement.

But just how high the visitation will be during that two-week window can't always be predicted. For The Championships, what the final matchups might be and when they're played can combine to create Web traffic variables that simply have to be engineered into the IT infrastructure.

While The All England Lawn Tennis Club knows how to run a world-class tournament, it counts on IBM for its IT infrastructure. IBM's involvement with Wimbledon dates back to 1972 as a hospitality client, but only since 1990 has IBM been a key IT provider for both the club's year-round operations and the annual championship tournament.

What started out in 1990 with IBM using a few PCs to capture basic statistics for the action taking place on the tennis courts for delivery to the attending media has evolved into a sophisticated Web presence. In 1995, IBM established **www.wimbledon.org** for The All England Lawn Tennis Club, and by 2003, it had evolved into one of the industry's largest (if not the single largest) Web-attended sporting events. In addition to the tournament activities, IBM provides the business-oriented IT services for the club on a year-round basis.

Today, IBM's IT services for The Championships include resources designed for access by players, the press, photographers, the onsite audience, and the remote television audience. During a typical two-week event, as many as 4 million users make 27 million visits to the Wimbledon Web site.

This enormous traffic bulge is not just a spike; rather, it represents many magnitudes of above-average pre- and post-tournament daily traffic. While IBM has any number of solutions that could scale up and down to serve this requirement, the solution deployed was Linux on xSeries. IBM is primarily using xSeries 330s and x345 servers for the HTTP Web-serving function. The applications are powered by WebSphere Application Server and run on pSeries 615 servers.

The organization's first deployment of Linux to support the Tennis Grand Slams Web sites took place during 2001. "With Linux, we can get the performance we want while managing the environment and ensuring that the system is secure," explains John Kent, IBM program manager for Worldwide Sponsorship Marketing. "We have three geographically dispersed sites that run Wimbledon.org as a single virtual site. We remotely manage those sites with innovative technology that monitors, manages, and automatically adjusts to the changes in Web site traffic."

One of the more interesting things that IBM is doing with the Wimbledon Web site is an online scoring system that uses push technology to deliver updated scores to Internet-connected desktop users around the world in real time. The three sites that support Wimbledon.org push out updates to as many as 220,000 IBM Real-Time Scoreboards as the action happens. IBM uses the WebSphere Business Integrator Event Broker (formerly called WebSphere MQ Event Broker) technology to accomplish this data delivery.

Feeding the Web server farms is a score-keeping system that uses DB2 on Linux aboard an xSeries server. That system holds the statistics, scores, and point-by-point information that are sent to the users in real time. The data is uploaded to the dispersed sites using WebSphere Business Integrator Event Broker, while the scoring database system is fed by courtside systems.

Wimbledon also uses Tivoli Intelligent ThinkDynamic Orchestrator to manage capacity. "When we get into a situation where we need more capacity, Tivoli automatically allocates additional computing resources to the Web site that was being used by other lower priority workloads. We do our best not to overprovision," says Kent.

Kent says the choice to use Linux on the back-end systems was driven by the need for a lower price point per CPU. "When we compared what we had on an older system against a newer xSeries 330, we saw a three-fold price/performance improvement there."

Over the course of several years, Kent has overseen the migration to the Linux-based systems. "We have a series of applications that used to run in other environments that are now ported to Linux. Just like we encourage our customers to use technology where it makes sense, we do the same thing."

Wimbledon uses both Red Hat and SUSE Linux products. Red Hat runs on the inside/back-end systems, while SUSE is deployed on the external and visitor-facing systems.

Says Kent, "We're not talking about 50 weeks versus two weeks or day versus night; we're talking about one hour versus another. The U.S. may come online when the workday begins because the Web site might be the only access to real-time tournament information. This causes traffic on the Web site to increase by a couple of hundred thousand visits, reaching up to 750,000 visits in the space of 60 minutes. We see this spike day in and day out at Wimbledon, and IBM is able to handle the load. This is what we mean by on demand. People can get what they need, when they want it, and how they want it."

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