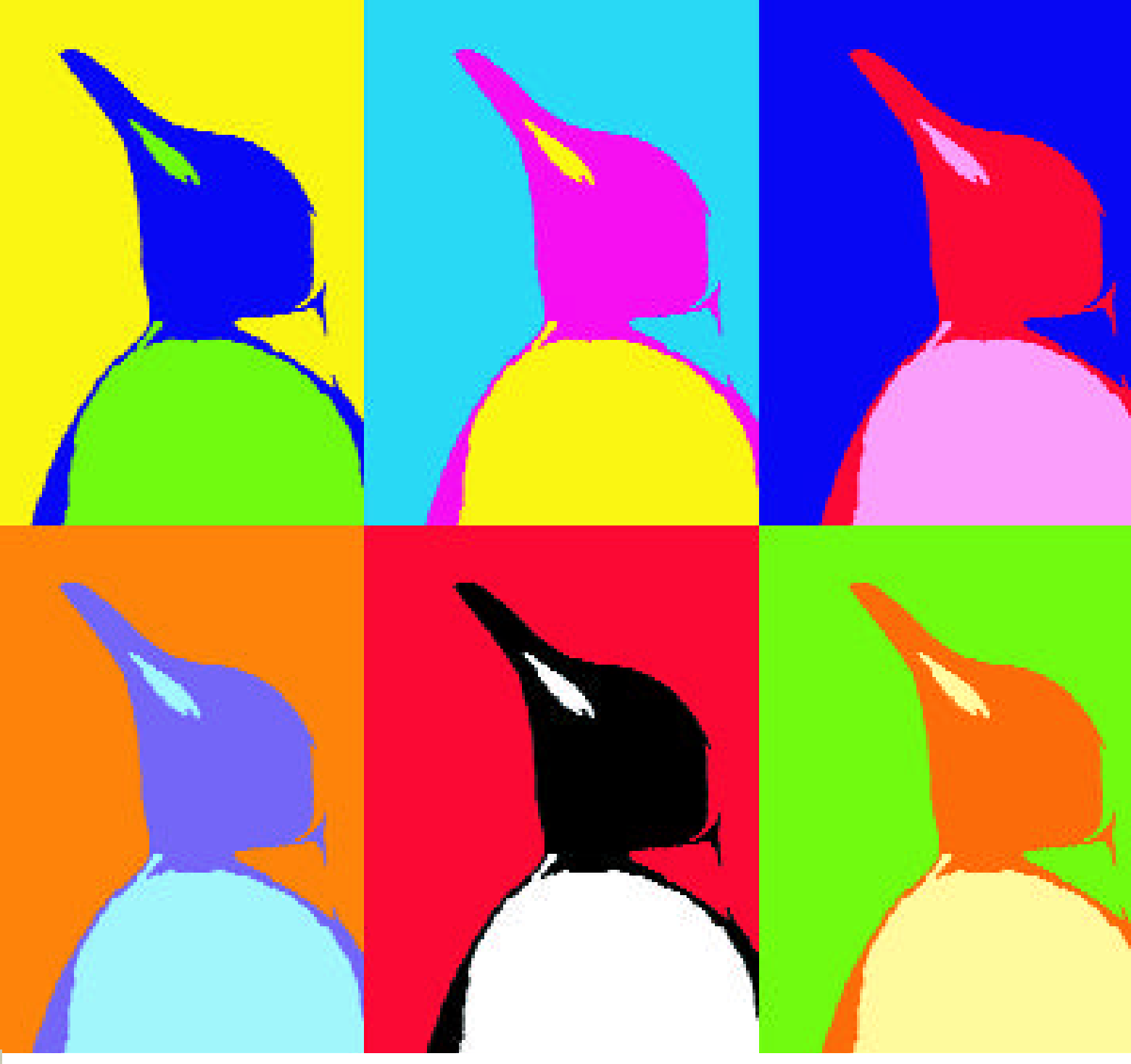
Linux on POWER

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

BY JIM UTSLER



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

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

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

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

The Power of POWER

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

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

POWER is proving to be the microprocessor of choice for customers who need the highest levels of memory and performance in small devices and technologies. POWER licensees ranging from cash-register manufacturers to desktop computer developers, including, most notably, Apple (whose PCs run on POWER) use POWER. In fact, Apple, which uses the POWER 970 in its new line of G5 desktop computers, helped Virginia Polytechnic Institute and State University (otherwise known as Virginia Tech) take the third spot on the latest list of the top 500 supercomputers in the world.

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

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

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

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

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

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

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

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

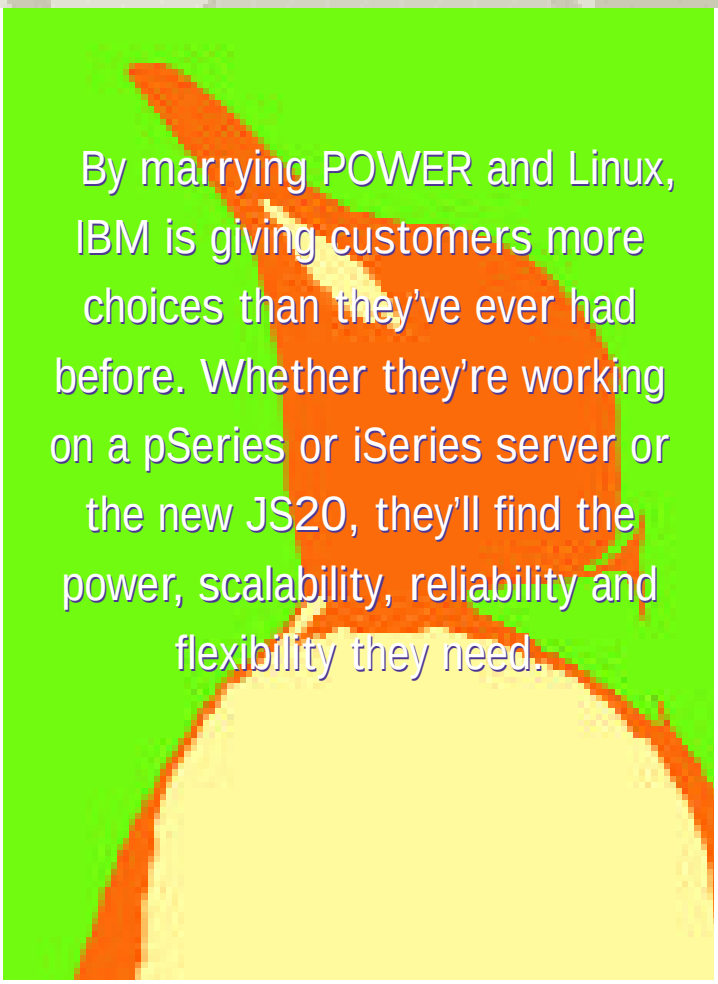
A Step Up

This philosophy of choice is, of course, a key notion behind the entire Linux on POWER effort. With increasing numbers of customers switching from whatever flavor of UNIX* to Linux, as evidenced by the IDC Linux-versus-UNIX server numbers, IBM has decided to capture its share of the growing Linux-loving market—and the opportunity to do so has never been better. According to Connors, "We're seeing a phenomenon at the entry level, where Linux is gaining strength in the Intel world, including the xSeries*, and taking away share from low-end entry Sun* and HP business. We're trying to aggressively address that market shift." To some degree, this is already being accomplished across the entire IBM @server line, including iSeries, pSeries, zSeries and the Intel-based xSeries servers—all of which are capable of running Linux.

Indeed, IBM's xSeries offering, although not based on the 64-bit POWER, is part of IBM's larger goal of providing choice. As customers—UNIX or otherwise—begin transitioning to Linux, they can find any number of offerings that support it. So, for example, if a Windows user wants to move to Linux but maintain a 32-bit environment, the user can do so using the Intel Xeon-based xSeries or the AMD Opteron-based 32-bit/64-bit @server 325. Similarly, UNIX customers operating in a 64-bit environment can easily transition to the pSeries or iSeries servers, or the new JS20 BladeCenter.

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

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



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

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

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

This collaborative group could have gone with Linux on Intel—or even a Windows-type solution—but it was convinced that Linux on POWER was the best way to go, citing its openness, availability, flexibility and scalability. As Jim DeRoest, assistant director of university computing services with the University of Washington, explains, "We've all had experience with POWER-based hardware since the first RS/6000, so we were very comfortable with that decision. And as far as Linux goes, it just seemed like a natural fit, allowing us to keep costs under control and leverage open source applications.

"In addition," he adds, "changing hardware and software configurations on Intel platforms is an issue with Linux distributions. With the pSeries and POWER technology, we know that the architecture is going to remain largely the same from model to model. So if we buy a new machine in a year or two, the hardware configuration will remain the same and the Linux system we're using now will still work a year from now, without the need to add additional Linux drivers."

Give Customers What They Want

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

Jim Utsler, *MSP TechMedia senior writer, has been covering the technology beat for several years. He can be reached at jjutsler@provide.net.*