



IBM @server BladeCenter JS20

Meeting the need for a 64-bit Linux environment.

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Executive summary

With a following that began initially among developers, Linux interest and adoption has rapidly expanded into commercial applications. By 2002, Linux had progressed to a mainstream information technology (IT) platform for infrastructure. IT managers worldwide realized that Linux provided a foundation on which they could build an infrastructure that is more responsive, flexible, based on open standards and capable of delivering services on demand.

New Linux deployments have not been just for traditional infrastructure workloads. Organizations have begun to deploy Linux for business applications as well. Driving this expansion is the awareness that Linux has already proven its value in driving down costs, improving reliability and offering more choice to organizations, enabling them to enhance their infrastructures. Organizations have realized that Linux can deliver the same value in enterprise-class computing environments and have begun looking to Linux for their future computing needs.

Many of these organizations, such as those in the life sciences and financial industries, as well as those in higher education, are already running 64-bit applications, with most running on UNIX®. These organizations are now looking for a Linux platform that is capable of running 64-bit applications. In addition, there is increasing need for 64-bit performance in applications such as database solutions, research and analytical applications.

This paper examines the factors driving the need for 64-bit Linux. It describes how IBM has combined its 64-bit IBM POWER™ architecture and IBM @server® BladeCenter™ technology to create the IBM @server BladeCenter JS20, a 64-bit Linux blade that is affordable, scalable and manageable. It also presents application examples that illustrate the power of the JS20 blade for a 64-bit Linux environment.

64-bit computing: the next wave for Linux

The rapidly growing popularity of Linux is generating increasing interest in 64-bit Linux computing. Even analysts are referring to 64-bit Linux as the next wave of computing. The increasing interest is driven by a variety of factors, including:

- **Large databases.** *The growth in customer-based marketing and decision support is generating huge data stores. Large databases require more than 4GB memory; increased memory densities and lower memory prices make more than 4GB practical. Computers with 64-bit technology can address more memory directly while operating on more data simultaneously. As a result, they can provide faster performance.*
- **Multimedia.** *The popularity of multimedia applications is increasing dramatically and multimedia processing—whether to render, store or stream—is optimized with 64-bit computing technology.*
- **Ports of 64-bit UNIX applications to Linux.** *Because of the similarity of Linux to UNIX, many software developers are porting their UNIX applications to Linux to tap the advantages of Linux. Some of these applications are 64-bit and require a 64-bit Linux environment.*
- **Server consolidation.** *There is a growing trend to consolidate installations on more capable, centralized servers. Consolidation increases server utilization and simplifies server management and administration. Virtualization (the ability to run multiple images on a single server) is a key enabling technology for consolidation and a 64-bit Linux kernel can better manage more resources—such as physical and virtual memory needed for multitasking and multiple images—than a 32-bit kernel.*

IBM brings 64-bit Linux to BladeCenter

Recognizing the strategic importance of 64-bit computing and Linux to its clients, IBM has introduced the IBM @server BladeCenter JS20 that combines 64-bit POWER architecture with BladeCenter technology. The result is a strong environment for 64-bit Linux that delivers the combined advantages of BladeCenter and POWER.

BladeCenter advantages

BladeCenter offers industry-leading server, networking, storage and applications integration; leadership performance density; simplified management—all while maintaining high and affordable availability. BladeCenter permits clients to use Linux, Microsoft® Windows® and IBM AIX® operating systems as well as Intel®- and POWER-based servers, offering flexibility and choice.

Hi-density BladeCenter architecture packs easily scalable power into a small space.

Within a single BladeCenter chassis, clients can mix 64-bit POWER processor-based JS20 blades with 32-bit Intel Xeon™ processor-based HS20 and HS40 blades—in any combination. Each chassis includes AMD Hypertransport, Gigabit Ethernet, Myrinet® clustering and Fibre Channel connectivity and an integrated systems management processor—all shared by the blades for maximum efficiency.



A single 19-inch 42U rack with six BladeCenters can contain up to:

- 84 blades
- 168 processors
- 96GB of memory
- 6.7TB of storage



The tight integration of BladeCenter – the core of its value – is designed to permit BladeCenter to deliver significant business benefits, including:

- **Simplified infrastructure.** *With BladeCenter, clients can consolidate applications and workloads to help reduce operational costs as well as space, power and cooling requirements.*
- **Simplified management.** *BladeCenter permits integrated management across all blades and operating environments through IBM Director. The result is dramatically simplified management that can translate into lower costs and can free time for IT staff to focus on strategic issues.*
- **On demand computing.** *The flexibility and scalability of BladeCenter, combined with the availability of intelligent management tools such as IBM Director, provide a solid foundation for on demand computing. On demand computing helps organizations maintain agility and ensure optimum utilization of their IT resources.*

BladeCenter offers high resiliency with its industry-leading Linux reliability, availability and serviceability (RAS). The many RAS features of BladeCenter include:

- **Fault avoidance.** *In designing BladeCenter, IBM minimized the number of components and selects highly reliable components to reduce the occurrence of faults.*
- **Fault tolerance.** *BladeCenter provides a number of fault-tolerant features: It includes error mitigation technology internal to chips. It has no single point of failure, employing redundant power, blowers, network switches and mid-plane wiring. It permits hot-plug replacements of most elements to enable replacement of failed components without interrupting service. In addition, BladeCenter provides self-healing capabilities in main storage, including error checking and correction (ECC), IBM Chipkill™ technology, and scrubbing and redundant bit-steering. Processor and memory boot-time deallocation (Persistent Processor Deallocation) further increases fault tolerance.*

- **Proactive troubleshooting and repair.** Each BladeCenter chassis includes a system management module to permit proactive troubleshooting and repair. (An optional second system management module is available for redundancy.) The management module helps increase server availability by continuously monitoring the system and advising of potential system failures or changes. In addition, concurrent runtime diagnostics for power and cooling permit troubleshooting without disrupting service.
- **Fast, effective problem resolution.** Capabilities such as Light Path Diagnostics, Automatic First Failure Data Capture and diagnostic fault isolation permit fast and effective problem resolution.

Added value of the POWER-based JS20 blade

The IBM @server BladeCenter JS20, based on POWER architecture, adds substantial value to BladeCenter.

- **Mature 64-bit architecture.** POWER architecture is now in its fifth generation and field-proven by more than 13 years of use. POWER is pervasive in the industry and has been used in 64-bit production servers by many Global 1000 clients since 1997. These clients include some of the world's most prestigious organizations such as Apple, Nintendo, Sony, Disney and the Library of Congress¹.
- **32-bit compatibility.** A major factor in the appeal of POWER architecture is that it offers a clean, Linux Standards Base (LSB) compliant 32-bit Linux environment. In fact, 32-bit compatibility has been part of the POWER architecture since its original design, with no performance degradation when running 32-bit applications. POWER also permits concurrent execution and interoperability of 32- and 64-bit applications, a key enabler for the transition to pervasive 64-bit computing. With POWER, organizations can implement a 64-bit Linux environment today, even though they may not yet need 64-bit capability. They can easily transition later to the 64-bit environment, protecting their investment while permitting them to move at a pace best suited to their needs.
- **Wide Linux support.** The JS20 blade supports all popular Linux distributions including Red Hat[®], Inc., and SUSE LINUX. In addition, Red Hat Linux and SUSE LINUX offer a 64-bit kernel that supports both 32- and 64-bit applications. This duality leverages the ability of the POWER processor to run 32-bit and 64-bit Linux applications concurrently.

- **64-bit computing at 32-bit computing price levels.** Built on the 64-bit POWER architecture, the JS20 blade shares the economies of scale made possible by the use of POWER technology in volume businesses. As a result, the JS20 blade offers 64-bit power at costs comparable to those of Intel Architecture 32-bit (IA-32) technology, bringing the price of 64-bit enterprise servers down to the price points of 32-bit systems.
- **Leadership 64-bit price/performance.** The JS20 blade offers industry-leading price/performance and shows significant advantages over competing 64-bit technologies.
- **Fast floating point performance.** The JS20 blade delivers the fast floating point performance required for large, deep-computing cluster clients such as those found in bioinformatics, proteomics, fluid dynamics and financial analysis. It supports Single Instruction Multiple Data (SIMD) technology that employs data parallelism and vector processing to boost performance. Data parallelism speeds performance in situations in which the same instruction sequence is applied to a large amount of data.
- **High RAS.** The JS20 blade reinforces the high RAS of BladeCenter with a number of features designed to improve data reliability and reduce downtime, including:
 - ECC DIMMs with memory scrubbing and ECC L2 cache
 - CPU failure recovery in SMP configurations that forces the failed processor offline, automatically reboots the server, generates alerts and continues operation with the working processor
 - Dual gigabit Ethernet connections to support failover, adapter fault tolerance and load balancing or teaming
 - First-Failure Data Capture that collects information about system state and identifies failing components
 - Hot-swap of all blades and BladeCenter modules

- **Simplified management.** *The JS20 blade includes an integrated management processor that interacts with the BladeCenter management module to provide management information and capabilities such as:*
 - Power on/off indication
 - Keyboard/video/mouse connection
 - VPD serial number and configuration data
 - Bios levels
 - Error logs and alerts including temperature, L2 cache errors, DIMM errors, hard drive errors and Light Path Diagnostic alerts
 - Status of indicator lights on front of blade
- **High scalability.** *The JS20 blade helps reduce infrastructure costs by providing enterprise-class scale-out processing.*
- **Flexibility.** *The JS20 blade permits concurrent execution of 32- and 64-bit Linux applications, enabling organizations to move to the 64-bit Linux environment at a pace most comfortable to them.*
- **Support for both Linux and UNIX.** *The JS20 blade supports both Linux and AIX, giving clients a choice and permitting clients who have already invested in UNIX solutions to leverage their skills and resources.*

IBM @server BladeCenter JS20

The IBM @server BladeCenter JS20 can have up to two 1.6 GHz IBM PowerPC® 970s and supports SIMD (Single Instruction Multiple Data (VMX)) for fast performance. It can include up to 4GB DDR ECC memory and two internal IDE disks. It has integrated dual Gigabit Ethernet connections and two high-availability, mid-plane connections. The JS20 blade supports all popular Linux distributions including Red Hat Linux, SUSE LINUX and Turbolinux, and it supports both 32- and 64-bit Linux applications.



Putting the JS20 blade to work

The JS20 blade provides a solution for organizations that would benefit from a 64-bit Linux environment. This includes organizations that:

- *Have applications, large databases or large data warehouse applications with intensive compute, I/O and memory demands that require 64-bit power. This includes applications that involve a high level of analytical computing, requiring the high-performance computing capabilities of SIMD/VMX.*
- *Currently run 64-bit UNIX (Solaris, HP/UX and IBM AIX 5L™) environments and want to transition to Linux.*
- *Need to consolidate and integrate their infrastructure and applications into a combined 64-bit/32-bit blade system.*

Many organizations have decided to deploy the JS20 blade to take advantage of its attractive price, fast performance, high density, low power consumption and potential to lower total cost of ownership. The following section presents three examples of how clients in the life sciences and financial services industries are using the JS20 blade.

In addition to these example applications, clients in other industries are expressing interest in the JS20 blade. Clients in the chemical industry are considering the JS20 blade for computational chemistry. Clients in the petroleum industry are expressing interest in the JS20 blade for seismic and reservoir analysis. And clients in the entertainment industry are considering the JS20 blade for applications such as high-end graphics processing.

Life sciences (Bioinformatics)

Bioinformatics presents unique challenges due to the massive volumes of sequencing data spread across private and public databases. Further complicating the problem is the explosive growth and rapid updates of that data.

To meet the challenge, one company has configured an IBM BladeCenter with JS20 blades to run the BLAST and FASTA applications. BLAST is a program that searches the available sequence databases for protein or DNA sequences. FASTA is a sequence alignment program for performing sequence similarity and homology searching of a query sequence against nucleotide and protein databases. Multiple blades are assigned to each application. Additional JS20 blades are used for management and spares. The JS20 blade leverages the SIMD/VMX capabilities of POWER to deliver fast performance in the demanding bioinformatics environment.

Life sciences (Proteomics)

The JS20 blade is used to run Sequest, a proteomics solution offered by IBM Business Partner Thermo Electron Corporation. Sequest is a complete solution that enables accelerated throughput of increasingly complex, multi-dimensional informatics. It is a scalable solution for computing the large volumes of data typical in most proteomics analyses using LC/MS. Sequest dramatically reduces database search times by harnessing the power of several processing units in one, increasing throughput and saving researchers' valuable time.

Clients can gain an additional performance boost in Sequest by using the VMX instruction set available in the JS20 blade PowerPC 970 processor. No other blade platform offers the VMX instruction set.

Financial services

One of the many ways organizations in the financial services industry are driving revenue growth is by shifting to high-margin products. This shift has heightened the need for sophisticated product pricing, portfolio management and risk simulation. The result is an increased demand for high-performance computing. Clients in the financial services industry are looking to the JS20 blade to meet this demand because of its high-performance computing capabilities, as well as its affordable price and low space, power and cooling requirements.

Clients are deploying the JS20 blade for financial risk analysis and management, using the JS20 blade to discover and analyze risk factors and to provide decision makers with risk/return models. The risk information is used in portfolio management, credit issuance and risk assessment to support insurance actuarial determinations. The JS20 blade is also being used to run predictive models associated with mutual funds and derivatives pricing.

Conclusions

Driven by the rapid growth of Linux and its increasing emergence into business applications, the need for 64-bit Linux is beginning to surface, with some analysts predicting that 64-bit Linux will be the next Linux wave.

IBM has brought Linux to the 64-bit POWER architecture and with the IBM @server BladeCenter JS20, has brought the POWER architecture to the BladeCenter platform. The combination of POWER architecture and BladeCenter technology provide an affordable, scalable and manageable environment for 64-bit computing on Linux, paving the way for the future of on demand computing in the 64-bit Linux environment.

For more information

For more information about the IBM @server BladeCenter JS20 and how it can help you meet your needs for a scalable, affordable and manageable 64-bit enterprise Linux environment, contact your local IBM sales representative, IBM Business Partner or visit:

ibm.com/linux/power



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