IBM

IBM BladeCenter QS21

For many years, organizations have relied on performance gains from increasing clock speeds of "traditional" microprocessor architectures. However, in recent years this approach has been challenged by the physical limitations of semiconductors and by traditional processor architecture implementations. Issues with power consumption, heat dissipation and memory latencies have led to diminishing returns on performance. High performance computing (HPC) cluster applications such as digital content distribution, digital video surveillance, electronic design automation, image and signal processing, and scientific research, may need a fundamentally new technology and approach to the system-level architecture to achieve the desired level of performance.

Cell/B.E. multi-core innovation
Enter the IBM BladeCenter® QS21 based on the multi-core Cell Broadband Engine (Cell/B.E.) processor. When used to complement

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Highlights

- **Second generation blade system based on Cell Broadband Engine™ Processors**

- **Significant performance acceleration of targeted workloads**

- **High-performance blade solution for graphics-intensive and high performance computing (HPC) applications**

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systems based on traditional processors, the QS21 can yield application results faster and with more fidelity. This can enable organizations to get information faster to facilitate important business decisions.

Optimized for tough signal processing and HPC workloads

Part of the BladeCenter family of products, the new QS21 is a high performance blade that extends and deepens the IBM Power Architecture™ solution portfolio by providing a new level of parallelism and performance to targeted workloads. The Cell/B.E. multi-core processor architecture helps the QS21 accelerate key algorithms such as 3D rendering, compression, and encryption and enables companies to create and run highly visual, immersive, real-time applications—this performance offers significant potential benefit to companies in aerospace and defense, health care, life sciences, digital media, electronics, government, education and other industries.

Breakthrough performance

The QS21 relies on two 3.2 GHz Cell/B.E. processors. The Cell/B.E. processor's breakthrough multi-core architecture and ultra high-speed

BladeCenter S chassis

communications capabilities deliver vastly improved, real-time response. By incorporating advanced multiprocessing technologies, the Cell/B.E. processor is especially suitable for high performance workloads.

The Cell/B.E. processor is an asymmetric multi-core processor that is optimized for parallel processing and streaming applications. Unlike symmetric multi-core, cache-based architectures which may not be able to efficiently handle streaming applications, the Cell/B.E. processor is designed to offer very high performance and fast response. The Cell/B.E. processor

includes a Power Processor Element (PPE) and eight highly optimized SIMD engines called Synergistic Processor Elements (SPE).

Cell/B.E. processor performance is about an order of magnitude better than traditional processors for media and other applications that can take advantage of its SIMD capability. The PPE is intended to run the operating system and coordinate computation. Each SPE is able to perform mostly the same as, or better than, a General Purpose Processor (GPP) with SIMD running at the same frequency. A key performance advantage comes from its eight de-coupled SPE SIMD engines with dedicated resources including large register files and DMA channels.

In fact, the Cell/B.E. processor was shown to have a significant performance advantage in MPEG decoding. One SPE alone was capable of achieving performance very close to that of a general purpose processor running at the same frequency. In cryptography, each SPE in Cell was shown to achieve performance up to 2.3 times better than a traditional processor running at the same clock rate.

High performance density and flexibility
The QS21 provides very high performance in less physical space. With its peak performance of approximately 460 GFLOPS, clients can achieve 6.4 TFLOPS (peak) in a single BladeCenter H or HT chassis and 25.8 TFLOPS in a standard 42U rack.

The QS21 offers a great deal of flexibility. Coupled with the robust BladeCenter H or HT chassis which offers advanced high-speed communication fabric, the processing power of the QS21 can be fully leveraged by compute-intensive applications. And coupled with the versatile BladeCenter S chassis which offers internal storage facilities, the QS21 can be your powerful desk side computing work horse. The Dual Gigabit Ethernet and optional dual-port 4x InfiniBand® adapters connect through PCI-Express, allowing the

QS21 to connect to a substantial number of host systems with extraordinary throughput. The addition of an optional I/O buffer is designed to further accelerate applications that are designed to leverage it.

Compared to the rigid pipelines and fixed functions of many graphics processors, the BladeCenter QS21 is more robust. Unlike specialized add-in floating-point accelerators it is able to also boost performance on fixed-point arithmetic through the use of the eight powerful SPEs and their SIMD execution units. The capabilities of the QS21 complement blade servers based on Intel® Xeon®, AMD Opteron™ and IBM POWER™ processors. Blades can be inter-mixed in the BladeCenter chassis so you can build an efficient infrastructure for your multi-platform environment.

Enhanced operating system and developer support
The Red Hat Enterprise Linux® 5[1] (RHEL) operating system is supported on QS21. You can leverage a broad ecosystem of hardware and software vendors committed to RHEL along with the extraordinary performance of

Cell/B.E. RHEL also offers industry leading security, auditing, file system and virtualization capabilities to support your applications.

The IBM Software Development Kit for Multicore Acceleration[2] includes an Eclipse-based Integrated Development environment, libraries and frameworks, performance tools, and example code. In addition, the IBM XL C/C++ compiler and XL Fortran[2] have been optimized for Cell/B.E. code development.

The RHEL operating system, the IBM SDK for Multicore Acceleration and the IBM compilers have been closely integrated to make it easier than ever to leverage the power of the Cell/B.E. processor for your applications.

Power and cooling benefits
Because the BladeCenter infrastructure uses super energy-efficient components and shared infrastructure architecture, you can realize lower power consumption when compared to many alternative designs.

When combined with other IBM server products based on Intel Xeon, AMD Opteron, and IBM POWER processors, the QS21 can round out a flexible, robust, very high performance heterogeneous cluster solution.

IBM BladeCenter QS21 at a glance

Form factor	Single-wide blade server for BladeCenter
BladeCenter compatibility	BladeCenter H, BladeCenter HT and BladeCenter S
Processors	3.2 GHz Cell/B.E. Processors
Number of processors	Two standard, each with one PPE core and eight SPE cores
L2 cache	512 KB per Cell/B.E. Processor, plus 256 KB of local store memory for each SPE
Memory	2 GB (1 GB per processor)
Internal storage	None
Optional external storage	BladeCenter boot disk system (1726-22B)[3]
Networking	Dual Gigabit Ethernet
I/O upgrade	Serial Attached SCSI (SAS) daughter card connected via PCI-X (CFFv) (39Y9190) BladeCenter PCIe expansion unit (43W4391)
Optional connectivity	Dual-port DDR InfiniBand 4x HCA connected via PCI-Express (43W4423)
Operating systems	Red Hat Enterprise Linux 5[1]
Warranty	1-year

For more information

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  services.html

[1] For detailed technical specifications refer to **ibm.com**/systems/bladecenter/hardware/servers/qs21

[2] For detailed technical specifications refer to **ibm.com**/technology/cell/software.html

[3] The BladeCenter H and BladeCenter HT chassis only.

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