mvXCell-8i

IBM PowerXCell™ 8i accelerator board

The
acceleration
of your
impressions

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- ■ **PCI Express accelerator board with IBM PowerXCell™ 8i processor**
- ■ **180 GFLOPS SP / 90 GFLOPS DP**
- ■ **4 GB DDR2 memory**
- ■ **2 Gigabit Ethernet ports**

mvXCell-8i

more and up-to-date infos see ▼

www.matrix-vision.com/mvXCell

The mvXCell-8i brings the outstanding processing performance of the 2nd generation of the Cell/B.E. processor into every system with a PCIe x16 slot.

The new Cell/B.E. processor drives the RoadRunner with over 1 Petaflop/s to be the fastest computer of the world, while the first Cell/B. E. processor made the SONY

Playstation 3 faster than any PC. For this reason, the Cell/B.E. processor is also suitable for PC based image processing and visualization with high processing demands.

Super computer capabilities on one board

The mvXCell-8i is based on the PowerXCell™ 8i processor and provides five times the double precision-performance floating-point math compared to the original Cell/B.E. processor and achieves 180 GFLOPS single precision and 90 GFLOPS double precision as a maximum peak. Furthermore, it uses a double-data-rate two (DDR2) memory interface of 4 GB. Both features are needed for image/movie processing and codecs that need high-definition and real-time.

Ease of use and reduced costs

The mvXCell-8i is a double-wide PCIe board, which can be simply integrated into PC workstations. For this reason, it reduces hardware costs and operational cost significantly compared to large scale clustering systems.
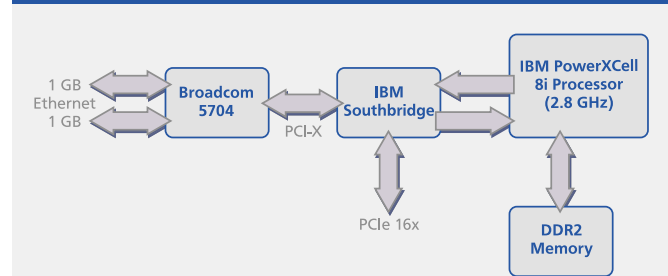
Runs Linux and development environment

The mvXCell-8i runs Fedora7 as the local operating system. To develop Cell applications, the Software Development Kit (SDK) for Multicore Acceleration v3.0 from IBM can be used.

2 Gigabit Ethernet ports

Two Gigabit Ethernet LAN ports offer large bandwidth of 125 MB/s in each case for external communication.

Architecture of mvXCell-8i

1 GB Ethernet / 1 GB → Broadcom 5704 ← PCI-X → IBM Southbridge ← → IBM PowerXCell 8i Processor (2.8 GHz)

PCIe 16x

DDR2 Memory

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mvXCell-8i

Features

CPU

Type	IBM PowerXCell™ 8i Processor
Cores	1 PPU + 8 SPE
Clock	2.8 GHz
Memory interface speed	800 MHz
I/O interface speed	5.0 GHz
Performance	180 GFLOPS SP / 90 GFLOPS DP

Memory

DDR2	4 GB with ECC, bandwidth 25.6 GB/s
Transfer rate	800 Mpbs
Channels	2
Data path	16 bytes per channel
FLASH	32 MB
NVRAM	1 MB

Cell companion chip

Type	IBM Southbridge DD3.0
Transfer rate	10 GB/s at 2.5 GHz

PCIe

Lanes	x16, graphics slot
Modes	Root complex or Endpoint

Interfaces

LAN	2 x 1 Gbps Ethernet
UART	1 internal connector, RS232 levels

Configurations

Accelerator	Windows / Linux host
Standalone	Linux, with or without a passive backplane

Software

Local	Boot loader, diagnostics	
SDK	IBM SDK for Multicore Acceleration v3.0	
Host interface	Linux:	IBM DAV, PCIe virtual Ethernet driver
	Windows:	IBM DAV

Power

supplemental power connector	max. 150 W

External dimension

Length	111 mm
Width	312 mm

Environs Information

permissible ambient temperature 0..40 °C

Examples and application specific benchmarks
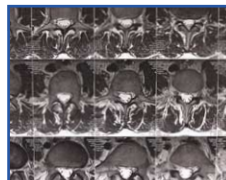
Machine Vision

mvXCell-8i copes with the data flow of four FULL-CameraLink-PCIe frame grabbers. Additionally, two GigE-Ports are predestined for direct connection of GigE Vision cameras. Multiple mvXCell-8i can be installed in a PC to form a preprocessing front end. Compared to a dualcore x86 CPU, mvXCell achieved a speed up of factors ranging from 7 to 32 for typical image processing algorithms.

3D Visualization

Due to the Sony requirements to get the most powerful rendering engine for its PS3, this application is a home play for Cell/B.E. processors. The IBM iRT demo shows real-time rendering of detailed scenes but no pixel is faked with texture mapping. A Cell/B.E.-based system can produce 720p raytraced images at interactive frame rates, even with more than one million polygons.

Scientific Computing

There are two pillars in science: theory and experiment. Now, a third one positioned in-between: scientific computing. To test, for example, a car, a crash test is not needed anymore. Computers can simulate the crashes which saves money and is much easier. According to this, scalable and cost-effective processing power is needed to meet requirements.

Aerospace and Defense

Radar software specialist Chordell Systems Ltd. evaluated the Cell/B.E. for entire synthetic aperture radar (SAR) process stream. In all 3 sections of the SAR routine, a blade with 2 Cell/B.E. CPUs outperformed a dual quadcore Xeon blade by 9 to 11 times. For the entire SAR task, 10 BladeCenter racks of Xeon blades were required to equal 1 BladeCenter rack with 14 Cell/B.E. Blades.
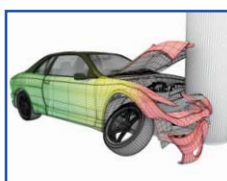
Digital Video Surveillance (DVS)

The mvXCell-8i in connection with mvHYPERION-32R16 is as superior as IBM Cell Blade based DVS systems, relying on the Cell/B.E. quality/bit rate optimized H.264. Due to the SW compression, video analytics can be done in parallel to the compression. H.264 code yields up to 2.5 times the compression ratio of other standards with the same video quality level, saving e.g. disk space.
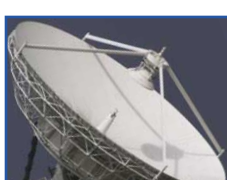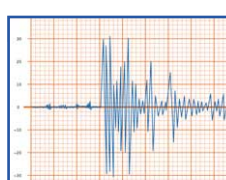
Medical imaging

mvXCell-8i delivers up to 7x improvements in image reconstruction, up to 21x improvements in image registration, and up to 88x performance improvements in visualization. CT scans optimization for Cell/B.E delivered an accelerated image reconstruction processing with approx. 170 times improvement. It lasts 0.28s of a process that required 48 seconds to complete using x86 3.0 GHz CPU.

Financial Modelling

By porting the financial simulation code from a single core x86 and optimizing it to a single Cell/B.E. the Fraunhofer ITWM Cell Competence Center achieved an acceleration of a factor of 160. Accelerated Value at Risk (VaR) calculations by Monte Carlo simulation using the Cell/B.E., compared to Xeon™ 3 GHz and Core2 Duo™ 1.86 GHz show a 10 to 45 fold improvement in execution time.

Seismicdata analysis

Fast Fourier Transformation (FFT) is the most computationally intensive part of seismic imaging. By accelerating FFT processing, the processing times required for seismic imaging applications are significantly reduced. Benchmarks of the FFT performance proved an improvement of the mvXCell of a factor of 13 compared to a 3.6 GHz x86 single core CPU.

Application areas

- machine vision
- medical imaging
- 3D visualization
- microscopy
- compression for surveillance
- digital content creation and distribution
- signal processing for aerospace
- electronic design automation
- video encoding
- seismic processing
- financial modelling
- super computing

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