Cell Processor and Playstation 3

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February 24, 2009

- Cell systems
- Bad news
- More bad news
- Good news
- Q&A

IBM Blades

- QS21
  - Cell BE based.
  - 460 Gflops Float
  - 20 GFLops Double
- QS22
  - PowerXCell 8i based
  - 460 GFlops Float
  - 200 GFlops Double

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  - No SPU Double precision improvements expected from IBM

Playstation 3

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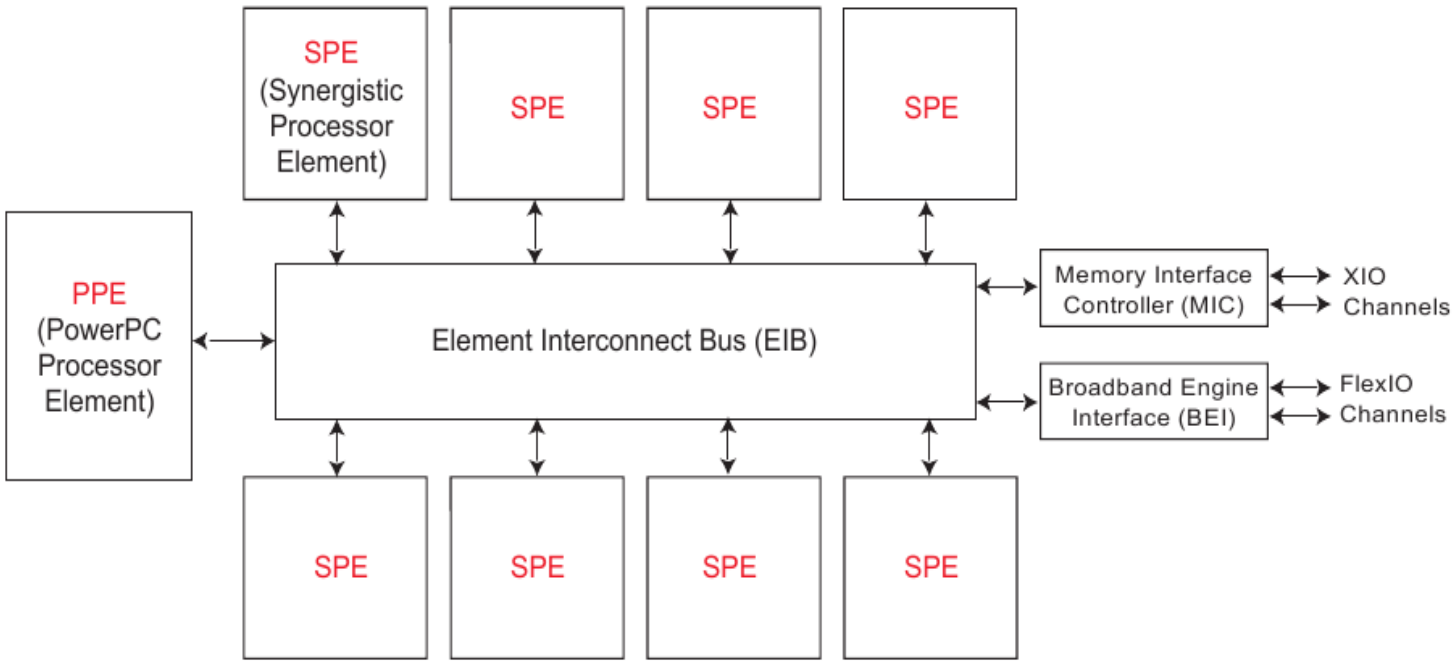
- 1 TFlop on a chip

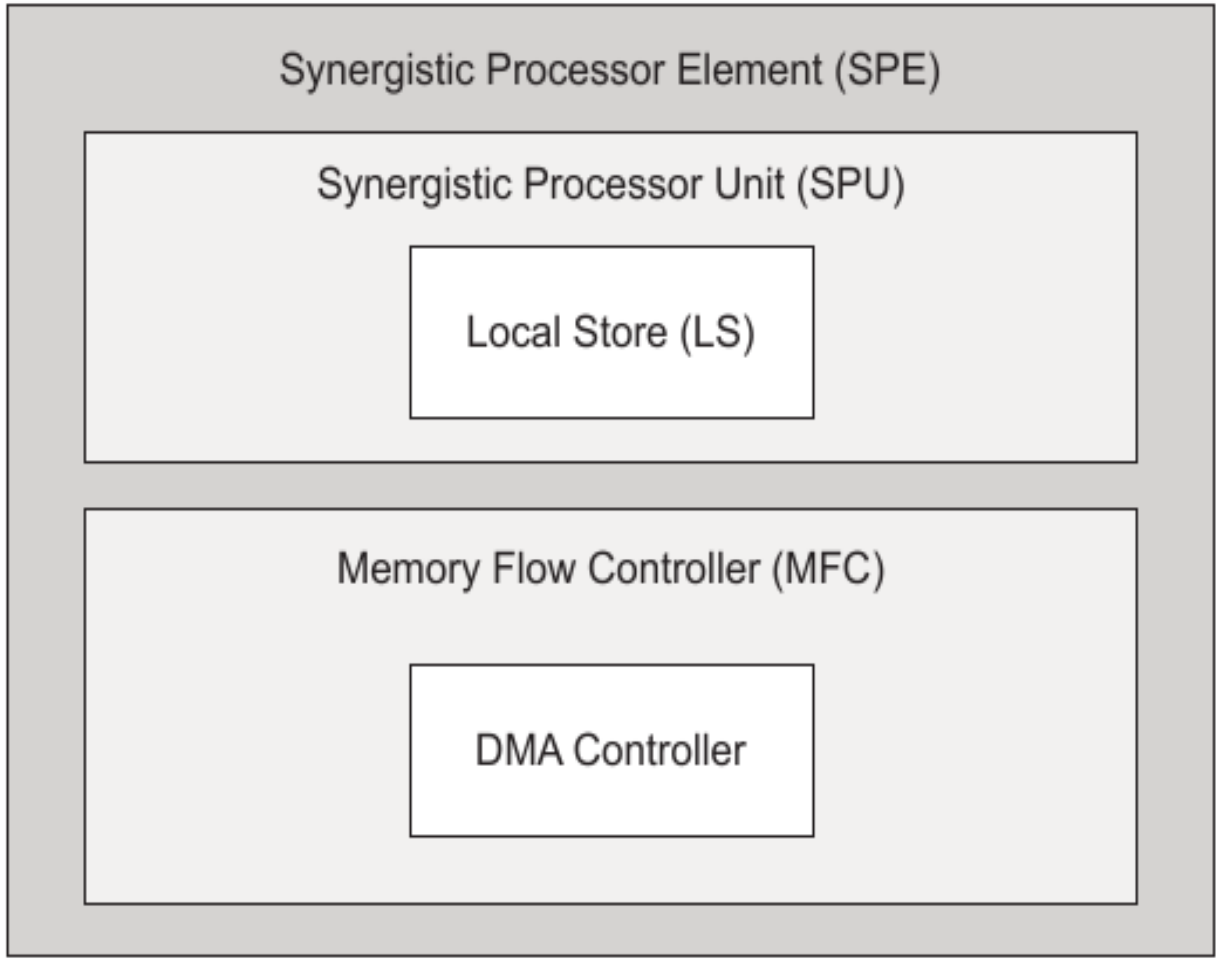
Cell Broadband Engine



¿How does it compute?

- PPU starts a program
- PPU loads an SPU context on a thread
- SPU context loads all necessary data into its LS
- SPU executes context
- SPU ends the task and returns control to PPU

Overview


Synergistic Processor Element (SPE)
Synergistic Processor Unit (SPU)
Local Store (LS)
Memory Flow Controller (MFC)
DMA Controller

PPE	PowerPC Processor Element
PPU	PowerPC Processor Unit
EIB	Element Interconnect Bus
SPE	Synergistic Processor Element
SPU	Synergistic Processor Unit
MFC	Memory Flow Controller
DMA	Direct Memory Access
SIMD	Single Instruction Multiple Data

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  - Data should be aligned by hand
- MFC is a DMA controller
  - Data moved with DMA primitives.
  - No data scheduling
  - No data implicit copying.

SIMD Programming

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  - That can take us ages

PPU and SPU code

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- SPE have LS (register based)

PPU and SPU code

- PPE have L1 and L2 cache.
- SPE have LS (register based)
- Their ssembly has nothing to do
  - They are compiled separately.
  - PPU code cannot be reused.

PPU code libraries

- BLAS (Basic Linear Algebra Subroutines)
- LAPACK (Linear Algebra Package)
- FFTW (The Fastest Fourier Transform in the West)
- C and Fortran interfaces
- Fortran interface is not complete

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- C and Fortran interfaces
- Fortran interface is not complete
- Almost all we need is in Cell SDK!

Thin ice

- PPU code means no SPU control.
- Data must be aligned too using `posix_memalign`.
- If SPU control is needed PPU code cannot be used at all
- Tells us what we can or cannot do
- BSC has been using those for about 2 years.

Optimizing compilers

- Cell Superscalar
  - Alpha state
  - OpenMP-like annotations
  - BSC
  - Free Software
- XL compilers for Multicore Acceleration
  - Alpha state
  - OpenMP support
  - MASS (Mathematical Acceleration Subsystem)
  - Worth the money

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- PPU code is possible
- SPU code is not possible *for us*
- 2 options:
  - Cell SDK for Multicode Acceleration
  - Optimizing Compiler (WAIT)
- Get a good C book.

Q&A