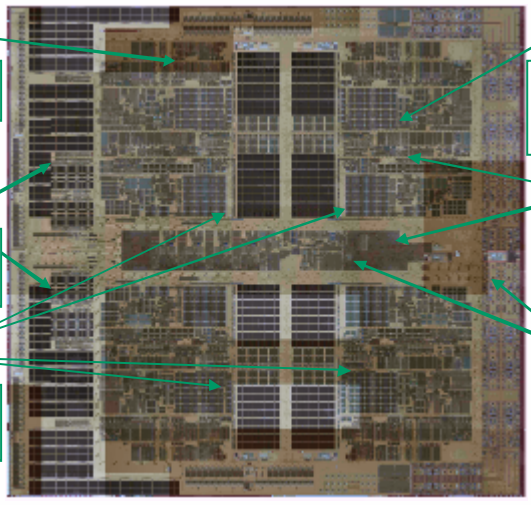
AMD Smarter Choice

Third-Generation AMD Opteron™ "Barcelona" Processor

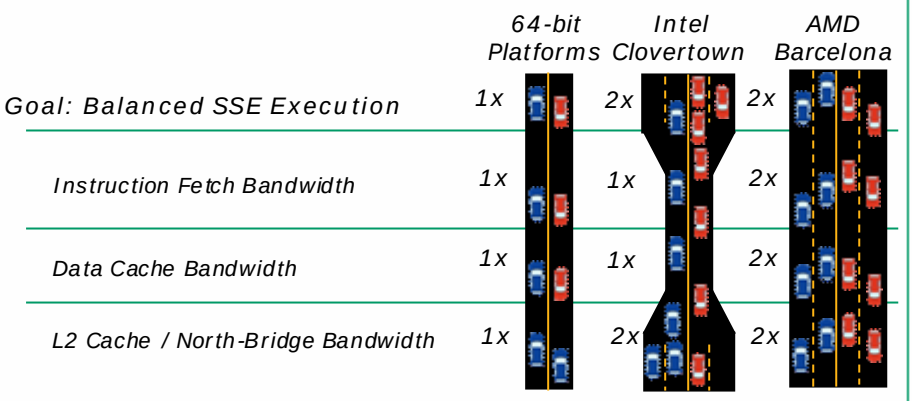
AMD Japan
Product Marketing
Hiroyuki Yamano

AMD Quad-Core Processor Architecture
A Closer Look at 'Barcelona'



'Barcelona' … Not Just Four Cores

Comprehensive 128-bit SSE Upgrades



- Barcelona doubles Instruction and Data pipelines … Intel's pipeline doesn't
  - Helps keep 128-bit SSE pipeline full for optimum performance
- Dedicated 36-entry floating-point scheduler can reduce application latency
  - Intel 32-entry scheduler shared between floating-point and integer operations
- Incredible performance boost, per core, on target applications!

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Balanced, Highly Efficient Cache Structure

Dedicated L1

- AMD's 64KB/64KB (Data/Instruction) vs. Xeon's 32KB/32KB
- Allows 2 loads per cycle

Handle Data Quickly and Efficiently

Dedicated L2

- Dedicated cache designed to eliminate conflicts of shared cache structures
- Designed for true working data sets

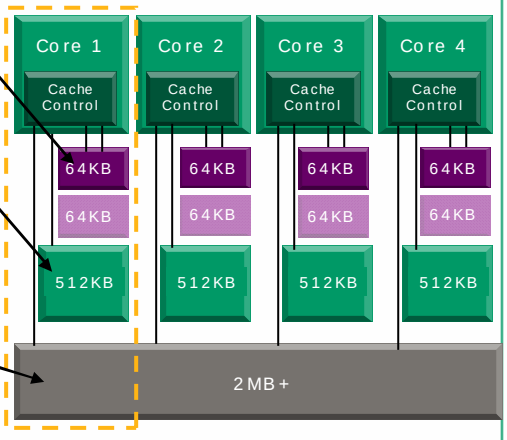
Avoid Thrashing Minimize Latency

Shared L3 - NEW

- Designed for optimum memory use and allocation for multi-core
- Ready for expansion at the right time for customers

Reducing Latency to Main Memory

Efficient memory handling reduces need for "brute force" cache sizes



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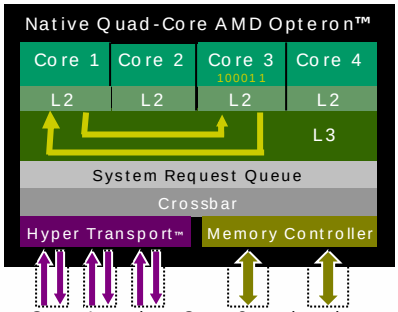
Native Quad-Core Benefit: Faster Data Sharing

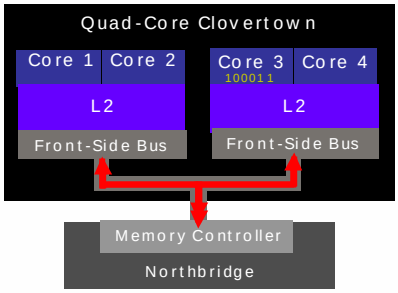
Situation: Core 1 needs data in Core 3's cache … How Does it Get There?



1. Core 1 probes Core 3 cache, data is copied directly back to Core 1

This happens at processor frequency

Result: Improved Quad-Core Performance



1. Core 1 sends a request to the memory controller, which probes Core 3 cache
2. Core 3 sends data back to the memory controller, which forwards it to Core 1

This happens at front-side bus frequency

Result: Reduced Quad-Core Performance

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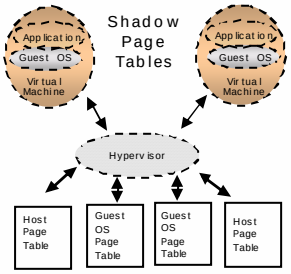
AMD-V™ Enhancements: Rapid Virtualization Indexing

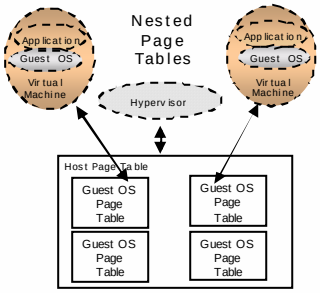
Reduced Overhead for More Efficient Switching

Dual Core



- Provides the guest OS with the illusion that it is managing its own world
- Page tables are actually kept up by the hypervisor in software
- Requires more software intervention from the hypervisor

Quad Core



- Each guest physically has their own world to manage
- Memory look ups done in hardware which can be faster than software management
- Requires less hypervisor intervention

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Better Power Savings
With Dual Dynamic Power Management™

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Enables more AMD PowerNow!™ power saving opportunities

Component Activity		Associated Core Voltage and Frequency by Platform				Example Workloads
Cores	Memory	Unified		DDPM		
Busy	Busy	High Volts	High MHz	High Volts	High MHz	Virtualization, Multi-Tasking, Data analytics, Rendering, HPC
Idle	Idle	High Volts	Low MHz	Low Volts	Low MHz	Idle
Idle	Busy	High Volts	High MHz	Low Volts	Low MHz	DMA-based I/O (network traffic), web serving with a TOE, idle socket in a multi-socket system

DDPM can offer 66% more power savings!

Many Workloads Benefit!

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Improving Processor Power Management
with AMD PowerNow!™ Technology enhancements

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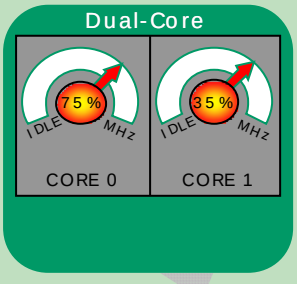
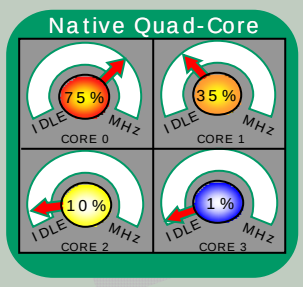


MHz and voltage is locked to highest utilized core's p-state



MHz is independently adjusted separately per core. Voltage is locked to highest utilized core's p-state

Native Quad-Core technology enables enhanced power management across all four cores

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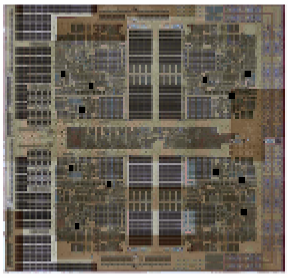
Reducing Power with Advanced Logic Design

- Advanced logic design with additional clock gating
  - Hardware shuts down clock to areas of logic that are not used to reduce processor power consumption
    - Coarse Gaters
      - Shut down entire blocks of logic at a time
    - Fine Gaters
      - Shut down pieces of logic when appropriate



Example only: does not reflect actual areas of clock gating

Reducing power consumption is a high priority in AMD processor designs

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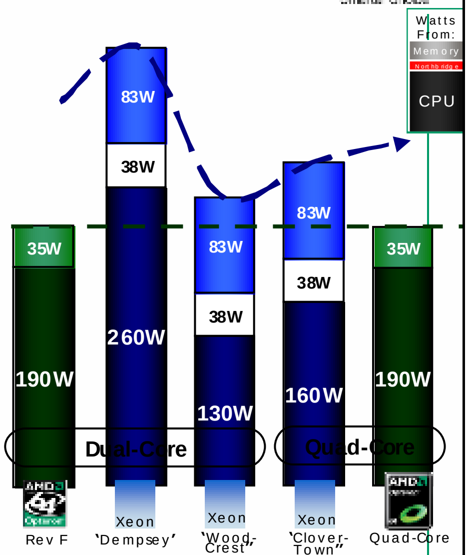
Seamless Quad-Core Power Migration Path

Reduces Operations cost

Consistent power & thermals makes it easier to:

- Plan for long-term infrastructure needs
- Scale applications without increasing power consumption
- Upgrade to new systems without re-arranging racks
- Keep existing AC equipment instead of having costly upgrades



Wattage based on 2P systems with 8 DIMMs at max CPU wattage; Wattage for 'Dempsey', 'Woodcrest' and 'Clovertown' is estimated based on currently publicly available values (see, e.g: http://techreport.com/etc/2006q2/woodcrest/index.x?pg=2 and is subject to change. The examples contained herein are intended for informational purposes only. Other factors will affect real-world power consumption.

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Actual Memory Power Measurements

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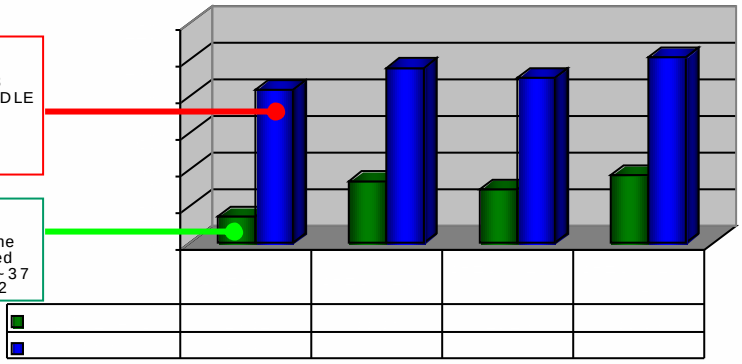
Enormous power and heat penalties for memory capacity using FBDIMM

With 8 DIMMs; FBDIMM consumes ~83 watts during IDLE While only ~14 watts are consumed by DDR2

8x FBDIMMs consume over 100 watts at the highest measured LOAD vs. only ~37 watts for DDR2



1GB DDR2-667 DIMM:
Brand: Micron
Model: MT18HTF12872Y-667D6

1GB 667 FB-DIMM:
Brand: ATP
Model: AP28K72S8BHE6S

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Projected Infrastructure Impact of Quad-Core

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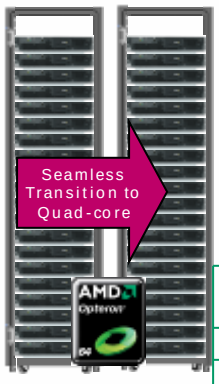
7Kw Power Budget



Dual-core
20 2U Servers
80 total cores

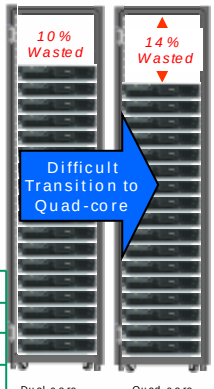
Quad-core
20 2U Servers
160 total cores

- Second-Generation AMD Opteron™ processors with planned upgrade path to quad-core within existing power & thermal envelopes
- Clovertown raises power & thermal requirements within each power band
- Intel customers may be forced to choose between higher power & cooling costs or wasted rack space

Pwr. Band	Intel TDP			AMD TDP		
	Dual	% +	Quad	Dual	% +	Quad
High	80W	50%	120W	120W	0%	120W
Std.	65W	23%	80W	95W	0%	95W
Low	40W	25%	50W	68W	0%	68W

AMD Opteron™ processors Designed to maximize server density and minimize transitions

7Kw Power Budget



Dual-core
19 2U Servers
76 total cores

Quad-core
18 2U Servers
144 total cores

Intel Xeon Can waste data center space and increase transition pain

Wattage based on 2P systems, 8 DIMMs, TDP wattage for 'Dempsey', 'Woodcrest' & 'Clovertown' is estimated based on current publicly available processor and chipset values, AMD estimates, and an incremental 100watts for fans, storage, and power supply. (see, eg: http://techreport.com/etc/2006q2/woodcrest/index.x?pg=2 and is subject to change. The examples contained herein are intended for informational purposes only. Other factors will affect real-world power consumption.

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まとめ

“低消費電力”、且つ“ハイパフォーマンス”な
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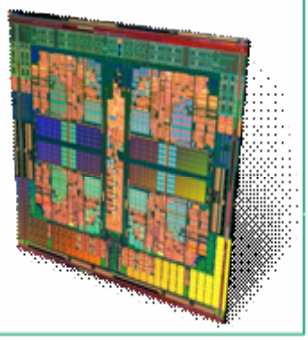
- ◆消費電力・発熱に関心があるお客様
- ◆大容量メモリでアプリケーション
  をご利用になるお客様



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