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Microsoft PDC 2008

Agenda

- **Today, Quad-Core AMD Opteron™ "Barcelona"**
- **Peeking in the Future of Opteron, "Shanghai" and beyond**

Today,
Quad-Core AMD Opteron™
“Barcelona”

Quad-Core AMD Opteron™ Processors

More than just four cores

- **Significant CPU Core Enhancements**
- **Significant Cache Enhancements**

Outstanding Performance

- **Native Quad-Core**
  - For faster data sharing between cores

Optimal Virtualization

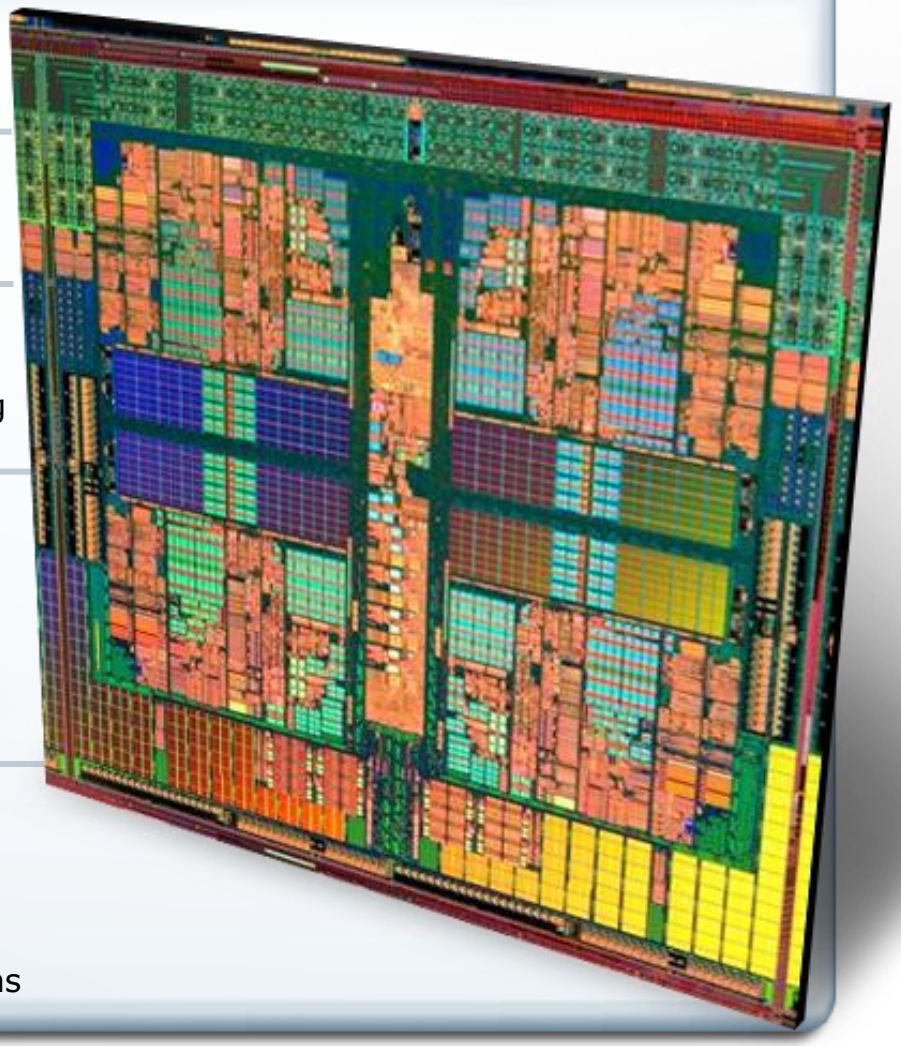
- **AMD Virtualization™ technology**
  - Now with Rapid Virtualization Indexing for virtual environments

Investment Protection

- **Stable Platform**
  - Socket F (1207) compatibility
  - Leverage existing platform infrastructures
  - Consistent thermal envelopes

Power Efficient

- **Performance/Watt leadership**
  - Performance enhancements without increased power consumption
  - Unique power management innovations



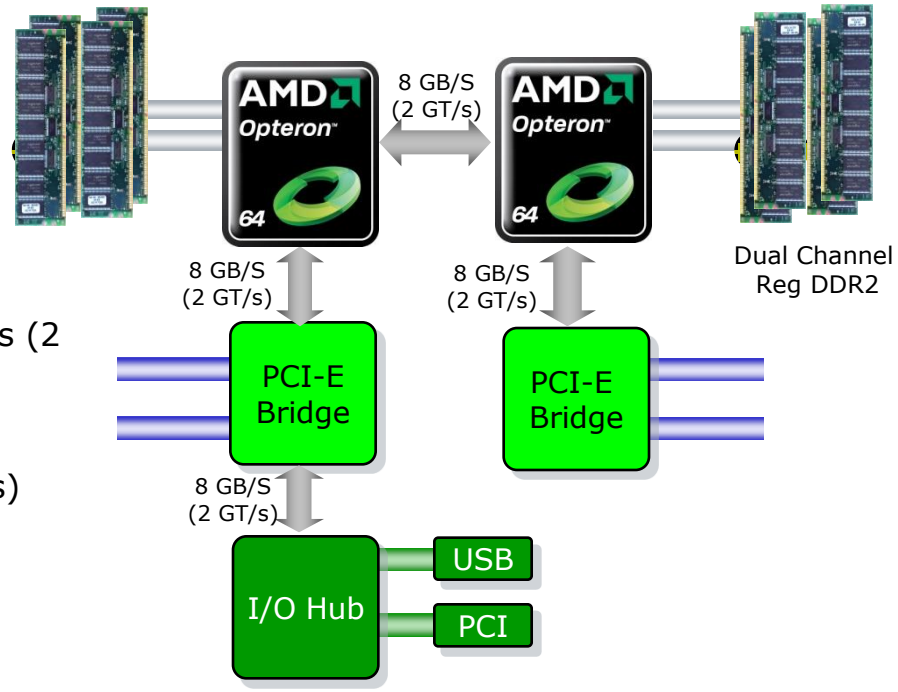
Architecture Enhancements of "Barcelona"

Performance

- **Native Quad-Core**
  - Enhanced CPU IPC
  - 4 x 512KB L2 cache
  - 2MB L3 Cache
- **Direct Connect Architecture**
  - HyperTransport™ Technology 1.0, 8 GB/s (2 GT/s)
- **Floating Point**
  - 128-bit FPU per core (vector instructions)
  - 4 FLOPS/clk peak per core
- **On-Die Memory Controller**
  - 1GB Page Support
  - DDR-2 up to 667 MHz
- **Enhanced Virtualization**
  - Nested Page Tables

Scalability

- 48-bit Physical Addressing



2P Floating Point: Superior Performance & Value

Top SPECfp®_rate2006 Results

Rank	Sponsor	SPECfp_rate 2006 result	Platform	Processors (1kU list price)
1	IBM	90.1	System x3455	2x AMD Opteron™ 2360 SE ($1165)
2	Dell	89.9	PowerEdge R805	2x AMD Opteron™ 2360 SE ($1165)
3	HP	89.3	ProLiant DL385 G5	2x AMD Opteron™ 2356 ($690)
4	HP	89.2	ProLiant DL365 G5	2x AMD Opteron™ 2356 ($690)
5	HP	89.2	ProLiant BL465c G5	2x AMD Opteron™ 2356 ($690)
6	HP	88.9	ProLiant DL185 G5	2xAMD Opteron™ 2356($690)
7	HP	88.8	ProLiant DL165 G5	2x AMD Opteron™ 2356 ($690)
8	Dell	88.5	PowerEdge T605	2x AMD Opteron™ 2356 ($690)
9	Dell	88.3	PowerEdge R805	2x AMD Opteron™ 2358 SE ($873)
10	Supermicro	88.1	X7DWN+	2x Intel Xeon E5472 ($1022)

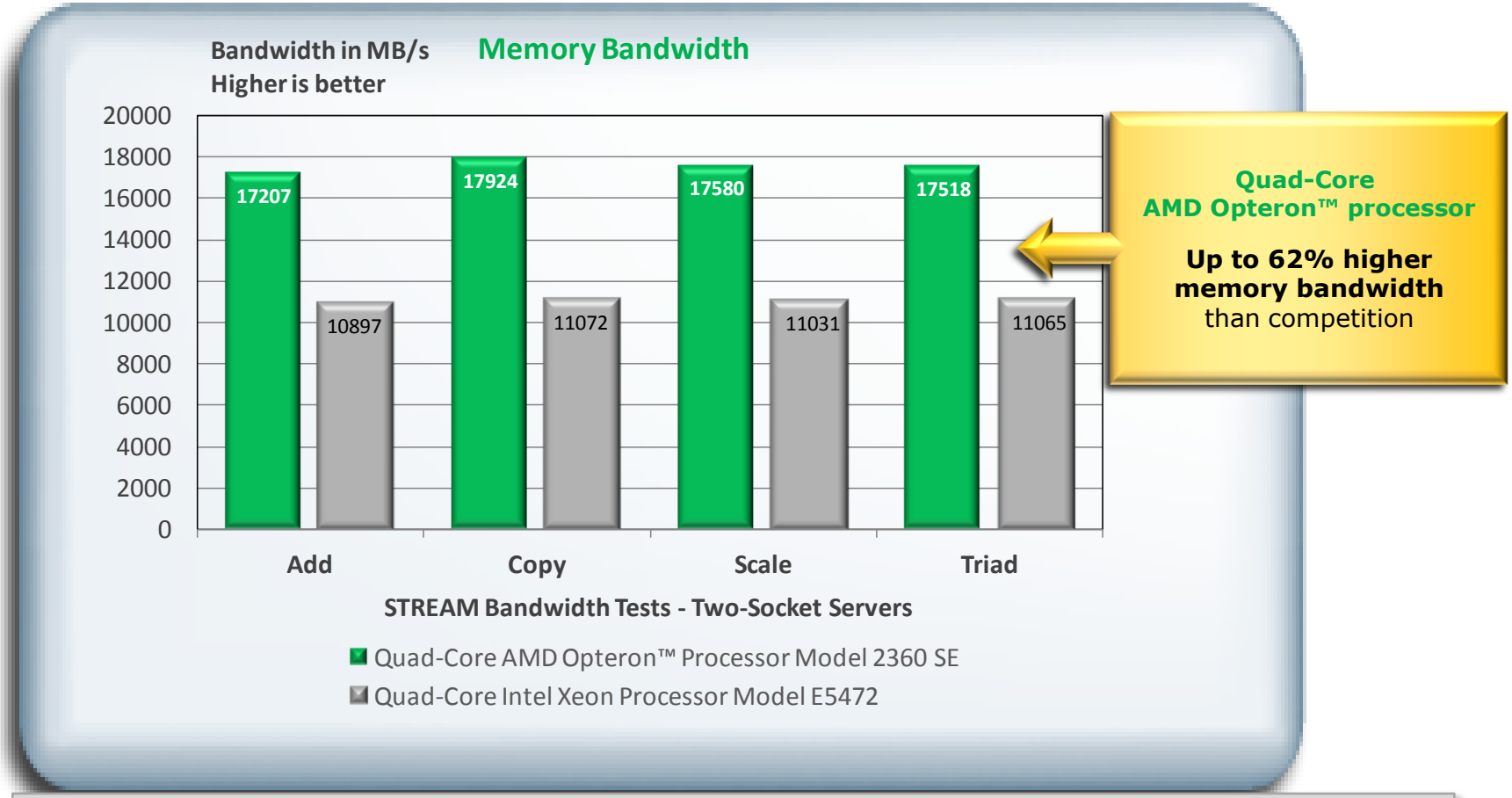
Quad-Core AMD Opteron™ processor

Superior performance at a **price** that is up to **32% lower**

ISV application description: CPU2006 is SPEC's next-generation, industry-standardized, CPU-intensive synthetic workloads that stress floating point performance on the system's processor, memory subsystem, and compiler performance/optimization.
Benchmark description for SPECfp®_rate2006: These benchmarks are provided as source code and require the user to be comfortable using compiler commands as well as other commands via a command interpreter using a console or command prompt window in order to generate executable binaries.

The results above are the ten highest SPECfp®_rate2006 results for two-socket x86 processor-based servers published on www.spec.org as of June 23, 2008. Pricing reflects 1kU tray pricing published on www.amd.com and www.intel.com as of June 23, 2008. For the latest results, visit http://www.spec.org/cpu2006/results/.

2P Memory Bandwidth Comparison



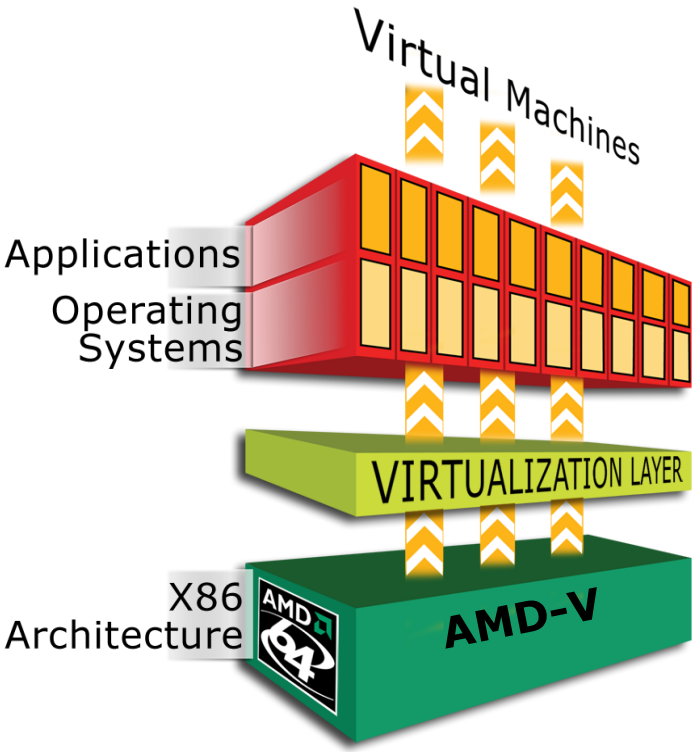
ISV application description: The STREAM benchmark is specifically designed to work with datasets much larger than the available cache on any given system, so that the results are (presumably) more indicative of the performance of very large, vector style applications.

Benchmark description for STREAM: The STREAM benchmark is a simple synthetic benchmark program that measures sustainable memory bandwidth (in MB/s) and the corresponding computation rate for simple vector kernels.

Based on measurements at AMD performance labs as of June 23, 2008.

Virtualization

Quad-Core AMD Opteron™ processor delivers unique functionality that can help reduce complexity and improve performance of virtualized environments



AMD-V™ technology with Rapid Virtualization Indexing (RVI)

- Enhanced application performance using hardware-based virtual memory management

Tagged TLB

- Delivers fast and efficient switching between virtual machines

AMD-V Extended Migration

- Ability to migrate live virtual machines across **all** generations of AMD Opteron™ processors

Stable Platform

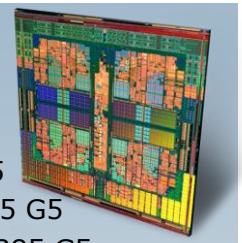
Platforms in Market *(as of May '08)*

2003 vs.

IBM eServer 325

1st Generation
AMD Opteron™

2008



PE 2970
PE 6950
PE M605
PE T605
PE R805
PE SC1435
PE T105
PE R905
DELL

X4600
X4240/4140
X4440
X2200
X4500
X4200/4100
X2100
Blade X6440/6220
Blade X8440
Sun microsystems

DL785
DL585 G5
DL385 G5
DL365 G5
DL185 G5
DL165 G5
BL465c G5
BL685c G5
ML115 G5
xw9400
xw4550
hp

AMD Opteron 64

X3755
X3655
X3455
IBM

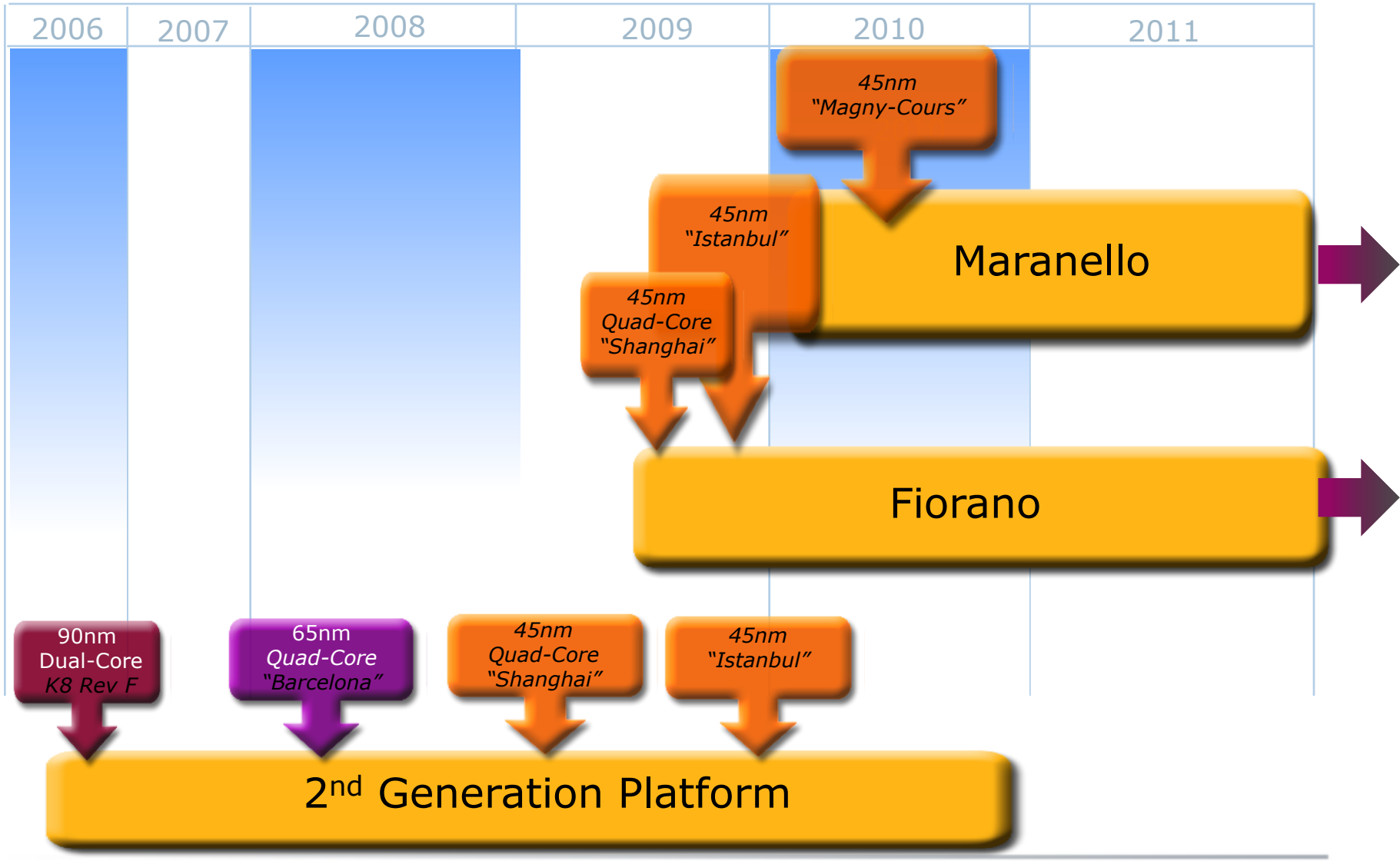
Econel 230R
RX 330S1
BX630 S2
FUJITSU COMPUTERS SIEMENS

AMD Validated Solution

XT3™
XT4
CRAY

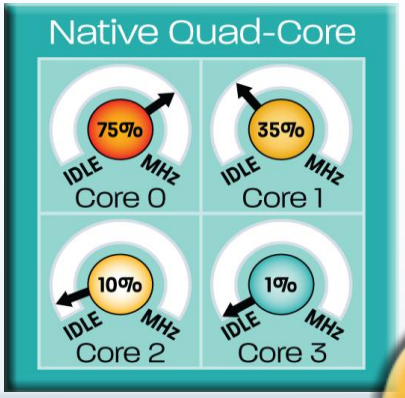
AMD
The future is fusion

Opteron 8000/2000 Series - Platform Progression

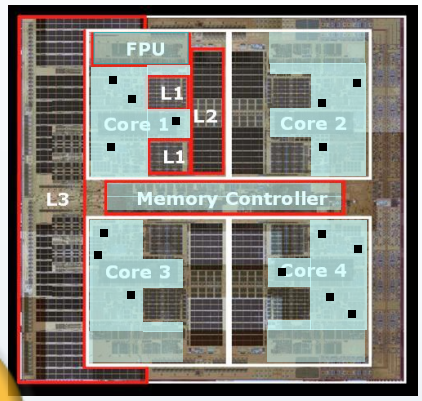


Energy Efficiency

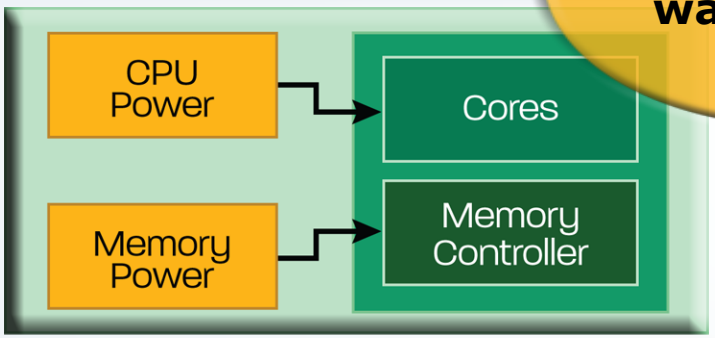
AMD PowerNow!™ Technology



AMD CoolCore™ Technology



Up to 91% more performance per watt vs dual core!



Dual Dynamic Power Management™

Low-Power DDR2 Memory

AMD The future is fusion

Peeking into the Future of Opteron, “Shanghai” and beyond

S/W Processor Core Roadmap

MP/DP Platforms - 8000 and 2000 Series

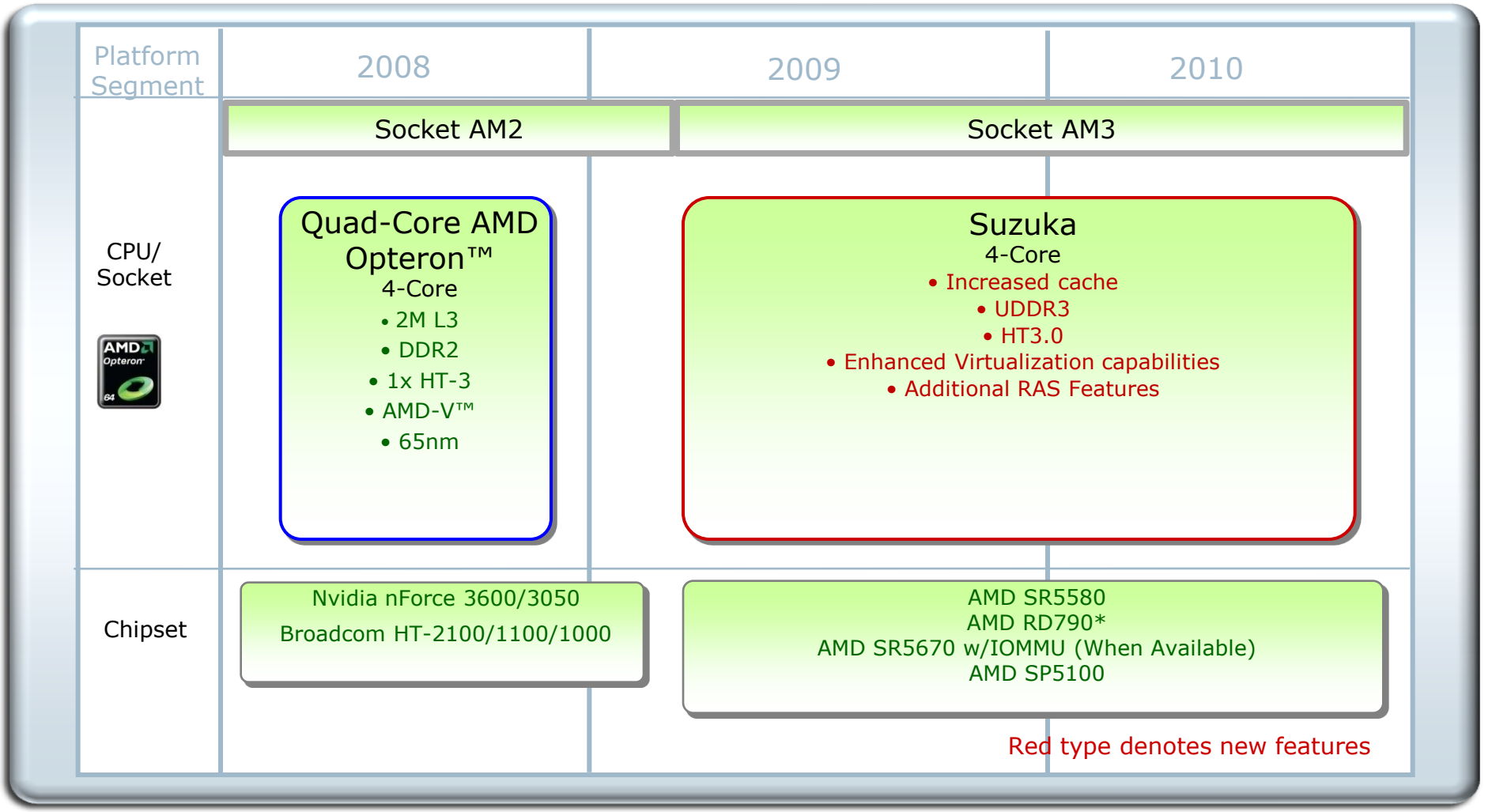
65 nm
45nm

Platform Segment	2008	2009	2010
CPU/ Socket	Socket F(1207)		Socket G34
	Quad-Core AMD Opteron™ 4-Core • 2M L3 • RDDR-2 • 3x HT-1 • AMD-V™ • 65nm •DDR-2 (Dual Channel)	Shanghai 4-Core • 6M L3 • RDDR-2 (Dual Channel) • cHT-3 • AMD-V • 45nm	Istanbul >4-Core • 6M L3 • RDDR-2 (Dual Channel) • HT-3 • AMD-V • 45nm	45nm Increased Core Count • Increased Cache • DDR3 • Hypertransport 3.0 • Enhanced Virtualization capabilities • Improved Manageability
Chipset	Nvidia nForce 3600/3050 Broadcom HT-2100/1100/1000		AMD SR5690 w/IOMMU, AMD SR5670 w/IOMMU, AMD SP5100

Red type denotes new features

Server/Workstation Roadmap
UP Platforms (1000 Series)

65 nm
45nm



AMD The future is fusion

Code Faster, Faster Code

- **Use Visual Studio 2008 which added the /MP flag for 'Build with Multiple Processes'**
- **Develop using the Microsoft's Concurrency Runtime in the next version of Visual Studio "VS10"**
- **Use the Parallel Extensions to .NET Framework for concurrency and improved performance on multi-core systems (ships with "VS10")**

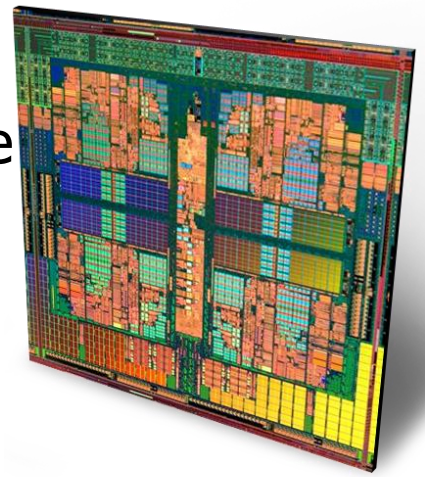
Summary

Performance

- "Barcelona" today, "Shanghai" soon

Software

- Test and optimize on AMD, use AMD CodeAnalyst and Framewave, and use Visual Studio 2008



Stable Platform

- AMD Platforms that leverage existing infrastructure

Energy

- AMD Performance enhancements without increased average power consumption

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