



**Introducing 45nm Quad-Core AMD Opteron™
Processors HE and SE Models**

Neil Kelly, AMD

Today's IT Challenges and Economic

Customers need to manage the bottom line . . .

- Virtualization as strategy to drive IT efficiency from enterprise to mid-market
- Demand for energy efficiency requires a full set of options for differing workloads
- Leveraging a balanced approach to optimize cost efficiency

. . . while investing for the future

- Advanced features allow the ability to leverage new technology into next-generation environments



What Customers Are Asking for.....

Integrating next-generation technologies in cost-effective and non-disruptive manner

with efficient platforms that support high performance virtualization

while drawing the lowest possible power at the wall

with the broadest set of hardware and software partners

45 nm Quad-Core AMD Opteron™ processors; less power, higher performance and more choices

The Fusion of AMD Opteron™ Processor and Virtualization



- Extends AMD's unique virtualization capabilities to more processor choices
- Up to 44% better performance to power ratio with new AMD Opteron™ HE processors¹
- Low-power AMD Opteron HE processors provide AMD's highest performance per watt
- AMD Opteron HE model can offer up to 33% more performance per watt over similarly configured Intel Xeon model processors²
- New power management features further extend energy efficiency
- Global OEM system availability expected Q1
- New higher performance AMD Opteron SE processors offer up to 25% performance increase over previous generations³

¹AMD Opteron™ processor Model 2376 HE compared to AMD Opteron™ processor Model 2350 HE. For backup and configuration information see slides 12, 13. ²AMD Opteron™ processor Model 2376 HE compared to Intel Xeon model L5420. For backup and configuration see slides 14, 15. ³AMD Opteron™ processor Model 8386 SE compared to AMD Opteron™ processor Model 8360 SE. For backup and configuration information see slide 19.

AMD continues to deliver on virtualization leadership



The Fusion of the AMD Opteron™ processor and

virtualization.

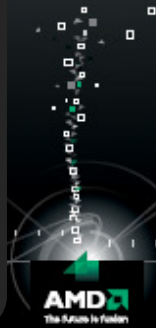


Virtualization performance leader across 2P, 4P and 8P servers¹

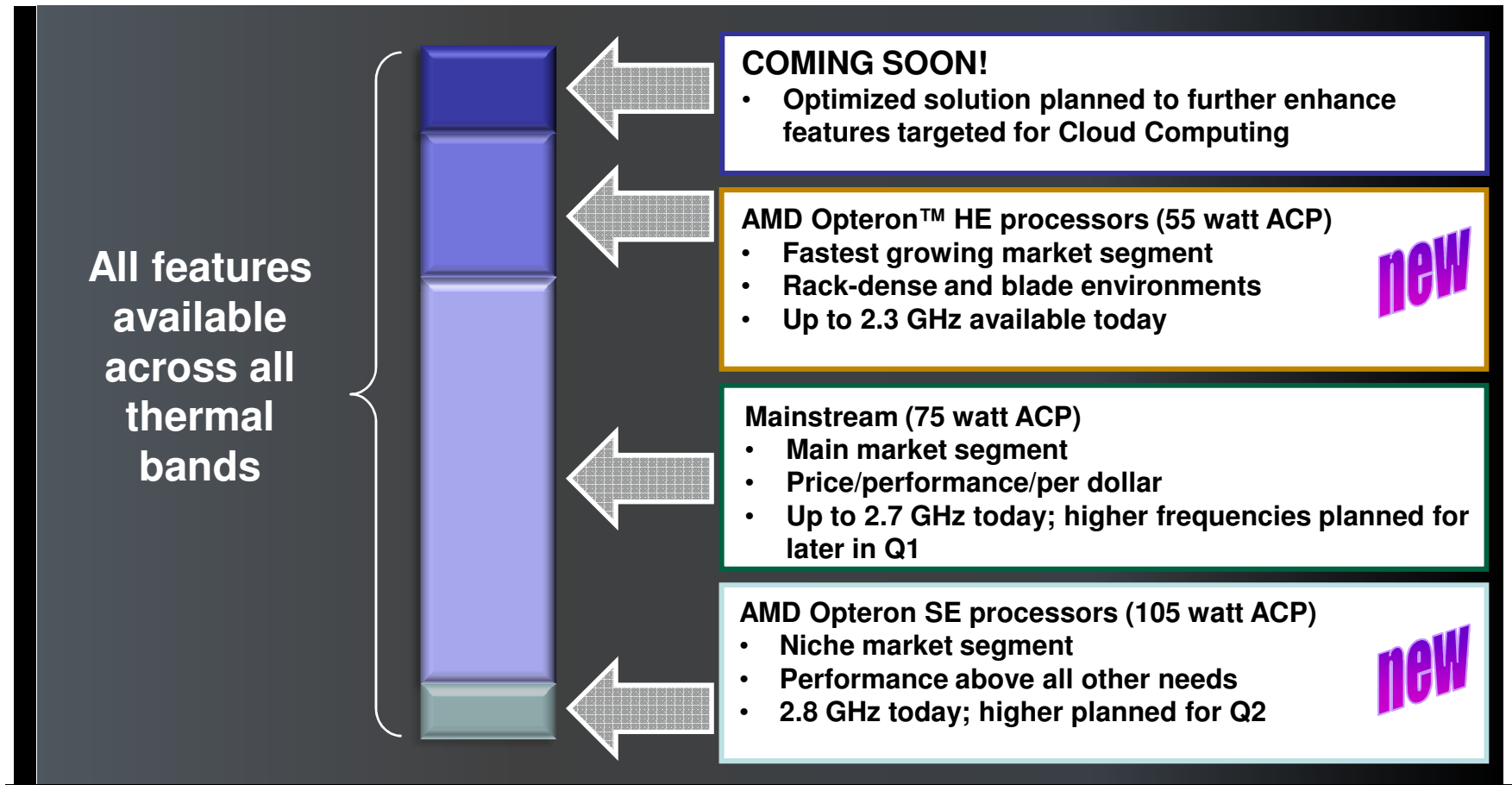
6 systems from global OEMs optimized for virtualization

Dell PowerEdge R905 chosen as best virtualization server by leading IT publication²

Ability to migrate live virtual machines across heterogeneous hardware environments



Choice of 45nm Quad-Core AMD Opteron™ Processor for differing workloads and virtualized environments



Across 2P, 4P, 8P

Extending our Leadership in Power Efficiency

Independent Dynamic Core Technology

AMD CoolCore™ Technology

Dual Dynamic Power Management™

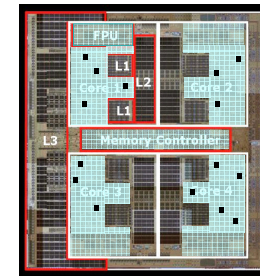
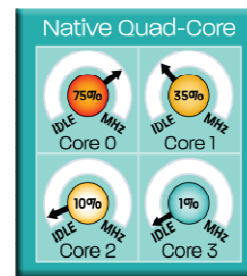
Energy Efficient DDR Memory

New Today:

Up to 44% better performance to power ratio than previous generation*

AMD PowerCap manager allows the user to set a fixed limit on power consumption

Extension of AMD CoolCore™ technology to L3 cache

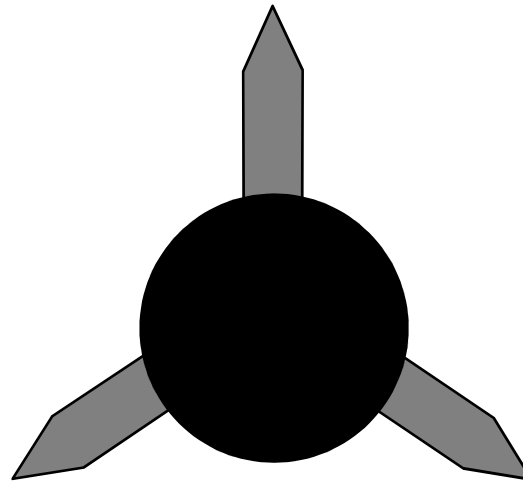


*Enhanced AMD Opteron™ processor Model 2376 HE (“Shanghai”) compared to AMD Opteron™ processor Model 2350 HE (“Barcelona”) using server-side Java workload. For backup and configuration information see backup slides 12, 13.

AMD Opteron™ processors enable servers with unique balance for computing environments

Performance leadership today for workloads that matter most to customers

Optimal Performance



Power Efficiency

Energy efficient processors can provide businesses with power savings

Total Cost of Ownership

Seamless integration of current and next generation features

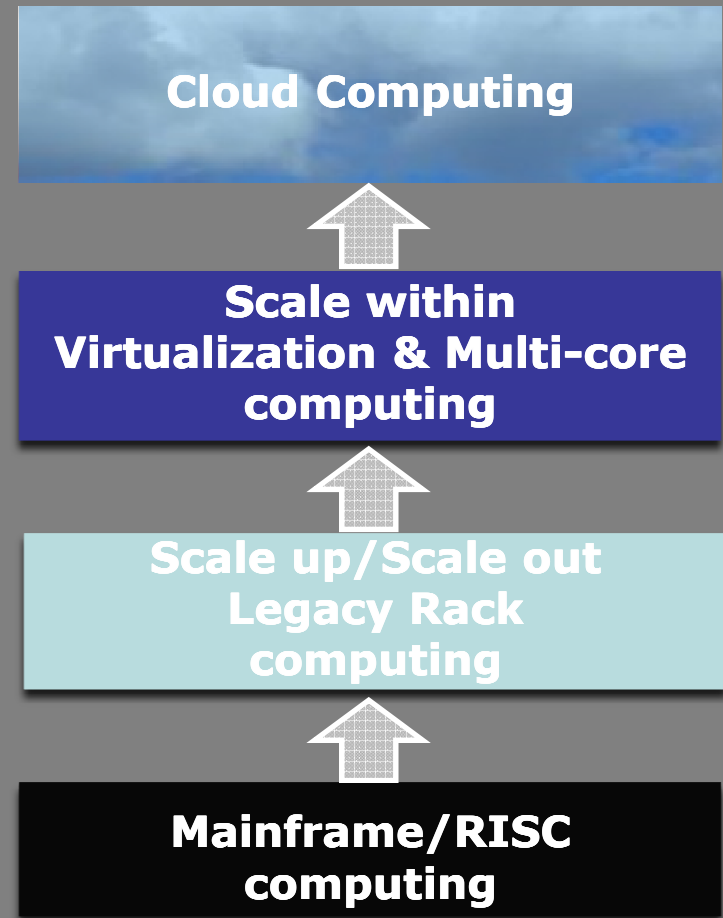
Enabling Next-Generation Web Technologies Like Cloud Computing

AMD's virtualization innovations and energy efficient products enable Cloud Computing

Quad-Core AMD Opteron™ processors drive some of the world's largest web clusters:

- **LinkedIn**
- **STRATO AG**
- **Rackspace Managed Hosting**
- **eHarmony**

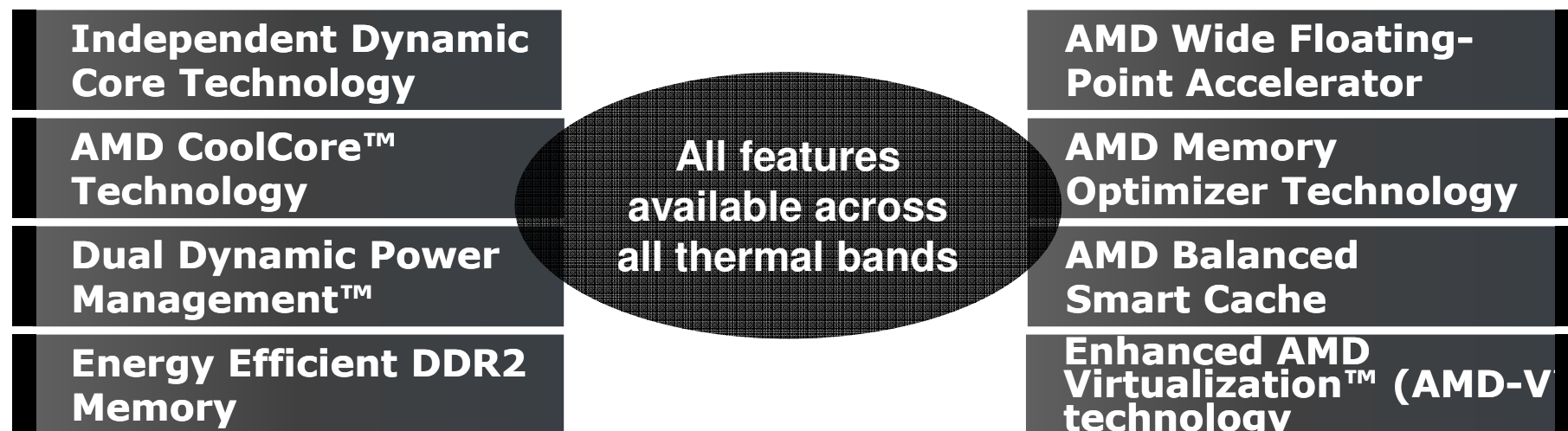
AMD is the processor provider for Windows® Azure™ Compute Service



Backup

Choice of Quad-Core Opteron™ processors without compromise

Power Band	ACP rating	Primary Use
Quad-Core AMD Opteron™ HE processor	55 watts	Dense computing environments with power constraints
Quad-Core AMD Opteron™ processor	75 watts	Mainstream and general purpose computing
Quad-Core AMD Opteron™ SE processor	105 watts	Heavy workload environments where peak performance is paramount



Performance to Power Ratios 'Shanghai' HE vs. 'Barcelona' HE

Low power processor-based platforms

"Shanghai" **55W ACP**

up to 44% higher performance to power ratio over highest performing "Barcelona" HE

Low Power Band

"Barcelona" **55W ACP**

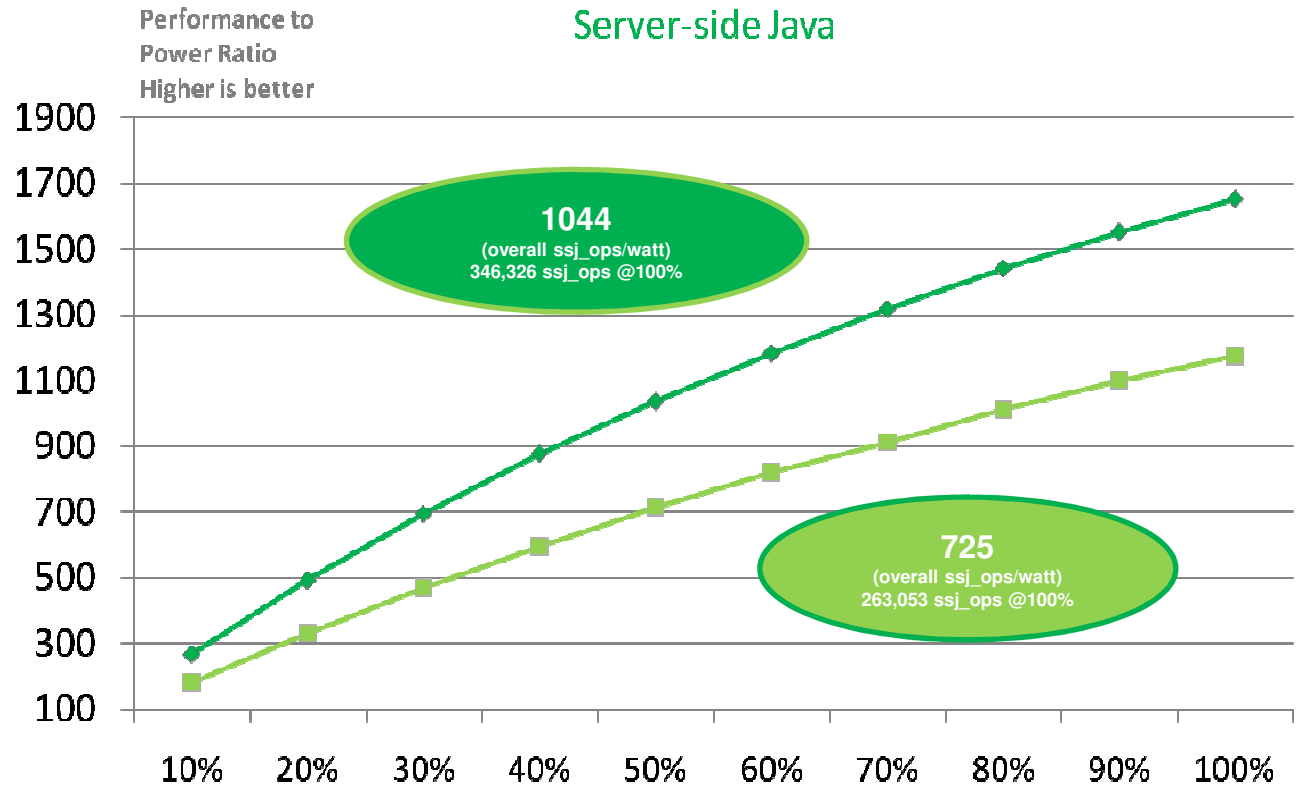
Both using identical platform configuration.

Low Power Band

Using the exact same platform
Same # of CPUs, chassis, hard disk, power supply and # of DIMMs

*See next slide for detailed config info.

Performance to Power Ratios Server-side Java



SPECpower™_ssj2008: Target Load Points

- ◆ Low Power Quad-Core AMD Opteron™ processor Model 2376 HE 'Shanghai' (2.3GHz)
- Low Power Quad-Core AMD Opteron™ processor Model 2350 HE 'Barcelona' (2.0GHz)

SPEC and the benchmark name SPECpower_ssj are trademarks of the Standard Performance Evaluation Corporation. For the latest SPECpower_ssj2008 benchmark results, visit http://www.spec.org/power_ssj2008.

SPECpower_ssj® Configurations

Shanghai 2376 HE vs. Barcelona 2350 HE & Barcelona 2356

“Shanghai”

SPECpower_ssj2008

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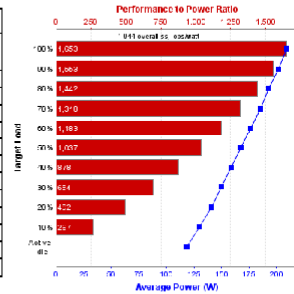
SPECpower_ssj2008

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Supermicro, Inc. AS-1021M-UR+B				SPECpower_ssj2008 = 1,044 overall ssj_ops/watt			
Test Sponsor:	Advanced Micro Devices	SPEC License #:	49	Hardware Availability:	Dec-2008		
Tested By:	Advanced Micro Devices	Test Location:	Austin, TX, USA	Software Availability:	Oct-2008		
System Source:	Single Supplier	Test Date:	Dec-19, 2008	Publication:	Unpublished		

Benchmark Results Summary

Performance Target Load	Actual Load	ssj_ops	Power Average Power (W)	Performance to Power Ratio
100%	99.5%	346,326	210	1,653
90%	90.1%	313,652	202	1,553
80%	80.1%	278,698	193	1,442
70%	70.2%	244,295	185	1,318
60%	60.1%	209,146	177	1,183
50%	50.0%	174,056	168	1,037
40%	40.2%	139,707	159	878
30%	30.0%	104,215	150	694
20%	20.0%	69,493	141	492
10%	10.0%	34,846	130	267
Active Idle		0	119	0
Σ ssj_ops / Σ power =				1,044



System Under Test	
Hardware	
Hardware Vendor:	Supermicro, Inc.
Model:	AS-1021M-UR+B
CPU Name:	AMD Opteron 2376HE
CPU Characteristics:	Quad-Core, 2.3GHz, 6MB L3 Cache
CPU Frequency (MHz):	2300
CPU(s) Enabled:	8 cores, 2 chips, 4 cores/chip
Hardware Threads / Core:	1
CPU(s) Orderable:	1,2 chips

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“Barcelona HE”

SPECpower_ssj2008

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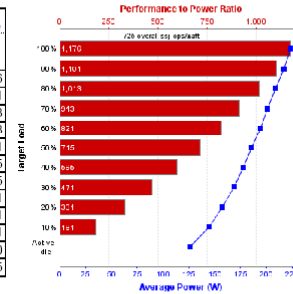
SPECpower_ssj2008

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Supermicro, Inc. AS-1021M-UR+B				SPECpower_ssj2008 = 725 overall ssj_ops/watt			
Test Sponsor:	Advanced Micro Devices	SPEC License #:	49	Hardware Availability:	Dec-2008		
Tested By:	Advanced Micro Devices	Test Location:	Austin, TX, USA	Software Availability:	Oct-2008		
System Source:	Single Supplier	Test Date:	Jan 6, 2009	Publication:	Unpublished		

Benchmark Results Summary

Performance Target Load	Actual Load	ssj_ops	Power Average Power (W)	Performance to Power Ratio
100%	99.3%	263,053	224	1,176
90%	90.1%	238,785	217	1,101
80%	80.0%	211,937	209	1,013
70%	69.4%	183,877	201	913
60%	60.1%	159,389	194	821
50%	50.2%	133,056	186	715
40%	39.9%	105,644	178	595
30%	30.0%	79,529	169	471
20%	19.6%	51,965	157	331
10%	9.9%	26,198	145	181
Active Idle		0	126	0
Σ ssj_ops / Σ power =				725



System Under Test	
Hardware	
Hardware Vendor:	Supermicro, Inc.
Model:	AS-1021M-UR+B
CPU Name:	AMD Opteron 2350 HE (B3)
CPU Characteristics:	Quad-Core, 2.0GHz, 6MB L3 Cache
CPU Frequency (MHz):	2000
CPU(s) Enabled:	8 cores, 2 chips, 4 cores/chip
Hardware Threads / Core:	1
CPU(s) Orderable:	1,2 chips

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“Barcelona”

SPECpower_ssj2008

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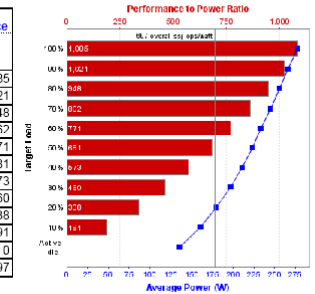
SPECpower_ssj2008

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Supermicro, Inc. AS-1021M-UR+B				SPECpower_ssj2008 = 697 overall ssj_ops/watt			
Test Sponsor:	Advanced Micro Devices	SPEC License #:	49	Hardware Availability:	Dec-2008		
Tested By:	Advanced Micro Devices	Test Location:	Austin, TX, USA	Software Availability:	Oct-2008		
System Source:	Single Supplier	Test Date:	Jan 6, 2009	Publication:	Unpublished		

Benchmark Results Summary

Performance Target Load	Actual Load	ssj_ops	Power Average Power (W)	Performance to Power Ratio
100%	99.7%	301,617	278	1,085
90%	89.8%	271,675	266	1,021
80%	80.3%	242,831	256	948
70%	69.8%	211,169	245	862
60%	59.6%	180,156	234	771
50%	50.2%	151,940	223	681
40%	39.9%	120,581	210	573
30%	30.0%	90,841	197	460
20%	20.1%	60,815	180	338
10%	10.1%	30,598	160	191
Active Idle		0	135	0
Σ ssj_ops / Σ power =				697



System Under Test	
Hardware	
Hardware Vendor:	Supermicro, Inc.
Model:	AS-1021M-UR+B
CPU Name:	AMD Opteron 2356 (B3)
CPU Characteristics:	Quad-Core, 2.3GHz, 6MB L3 Cache
CPU Frequency (MHz):	2300
CPU(s) Enabled:	8 cores, 2 chips, 4 cores/chip
Hardware Threads / Core:	1
CPU(s) Orderable:	1,2 chips

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Performance to Power Ratios Competitive View

Low power processor-based platforms

“Shanghai” **55W ACP**

up to 33% higher performance to power ratio over Harpertown @ 2.3 GHz

Low Power Band

“Harpertown” **50W TDP**

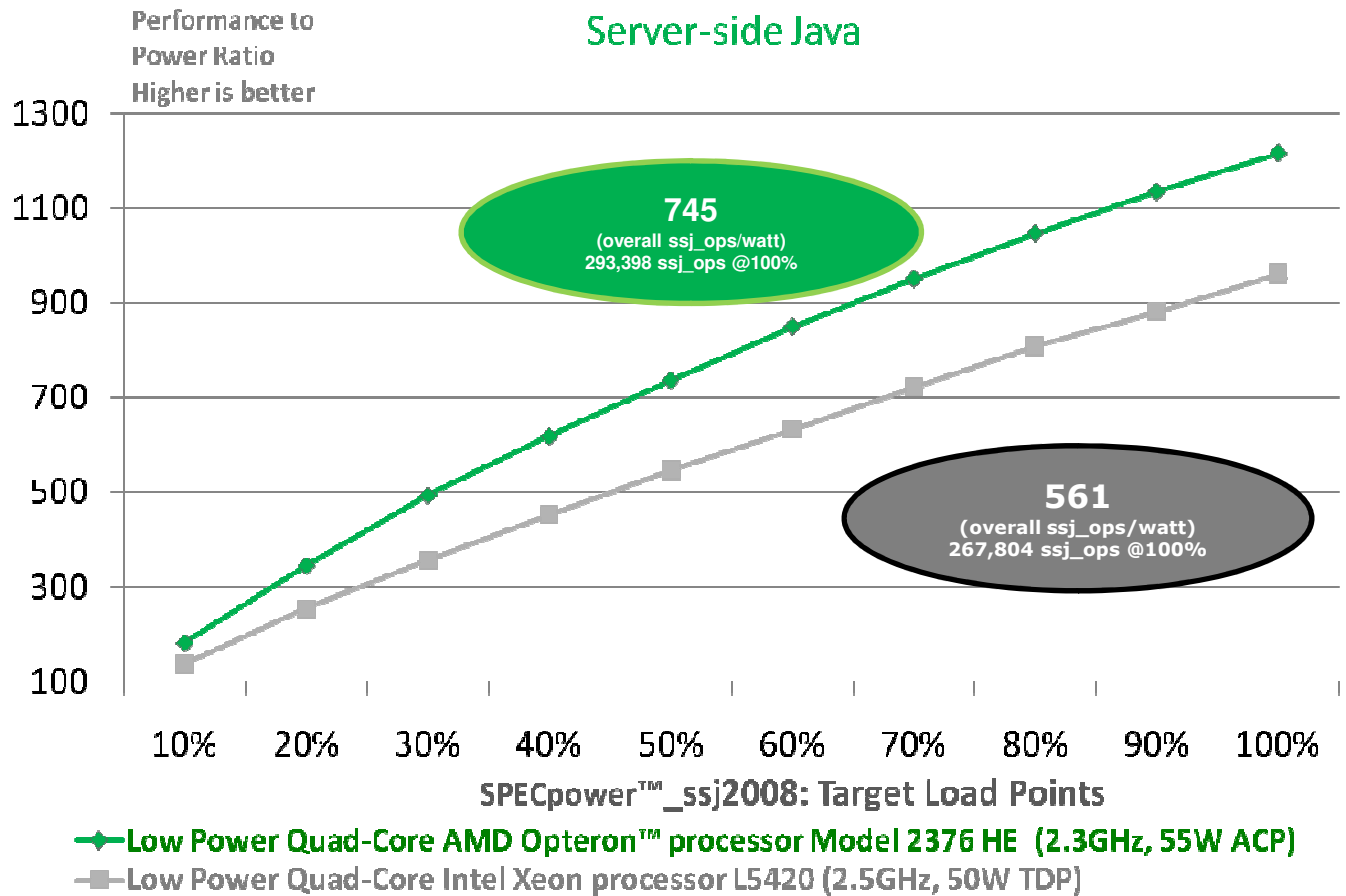
34W to 49W higher power consumption across load points while using a mainstream platform with low power memory

Low Power Band

Similarly configured platforms
Same # of CPUs, chassis, hard disk, power supply and # of DIMMs

*See next slide for detailed config info.

Performance to Power Ratios Server-side Java



http://www.spec.org/power_ssj2008

SPECpower_ssj® Configurations

Shanghai 2376 HE vs. Harpertown L5420

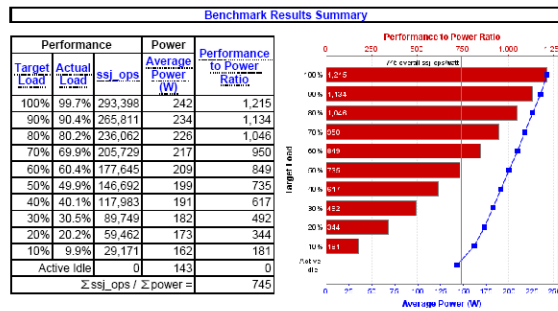
“Shanghai”

SPECpower_ssj2008

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SPECpower_ssj2008
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Supernmicro, Inc. 2021M-UR+		SPECpower_ssj2008 = 745 overall ssj_ops/watt	
Test Sponsor:	Advanced Micro Devices	SPEC License #:	49
Tested By:	Advanced Micro Devices	Hardware Availability:	Dec-2008
System Source:	Single Supplier	Test Location:	Austin, TX, USA
		Software Availability:	May-2008
		Test Date:	Jan 6, 2009
		Publication:	Unpublished



System Under Test

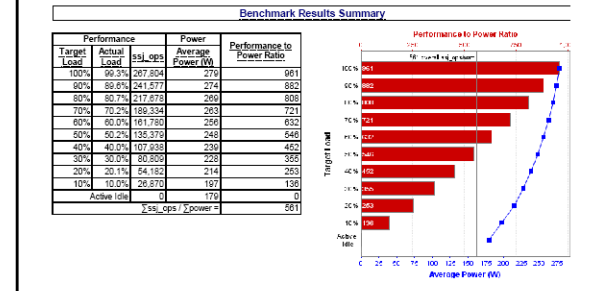
Hardware	
Hardware Vendor:	Supernmicro, Inc.
Model:	2021M-UR+
CPU Name:	AMD Opteron 2376 HE
CPU Characteristics:	Quad-Core, 2.3GHz, 6MB L3 Cache
CPU Frequency (MHz):	2300
CPU(s) Enabled:	8 cores, 2 chips, 4 cores/chip
Hardware Threads / Core:	1
CPU(s) Orderable:	1,2 chips

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“Harpertown”

SPECpower_ssj2008
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Supernmicro Inc. 6025W-NTR+		SPECpower_ssj2008 = 561 overall ssj_ops/watt	
Test Sponsor:	Advanced Micro Devices	SPEC License #:	49
Tested By:	Advanced Micro Devices	Hardware Availability:	Apr-2008
System Source:	Single Supplier	Test Location:	Austin, TX, USA
		Software Availability:	May-2008
		Test Date:	Aug 4, 2008
		Publication:	Unpublished



System Under Test

Hardware	
Hardware Vendor:	Supernmicro Inc.
Model:	6025W-NTR+
CPU Name:	Intel Xeon L5420 (2.8GHz)
CPU Characteristics:	Quad-Core, 2.5GHz, 12MB L2 Cache
CPU Frequency (MHz):	2500
CPU(s) Enabled:	8 cores, 2 chips, 4 cores/chip
Hardware Threads / Core:	1
CPU(s) Orderable:	1,2 chips
Primary Cache:	32 KB L1 + 32 KB D on chip per core
Secondary Cache:	12 MB L2 on chip per chip, 8 MB shared per 2 cores
Tertiary Cache:	None
Other Cache:	None
Memory Amount (GB):	16
# and Size of DIMM:	8 x 2048 MB
Memory Details:	EDR5-667 CL5 LP FB-DIMM, slots 1A/B, 2A/B, 3A/B, and 4A/B populated

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