



IBM System p

THE POWER OF SIX

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Get The Power of Six. . .Take Back Control

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The Power of One!

Full year 2006 revenue share

#1 overall servers

#1 high end servers

#1 UNIX

#1 blades

#1 overall storage

#1 tape

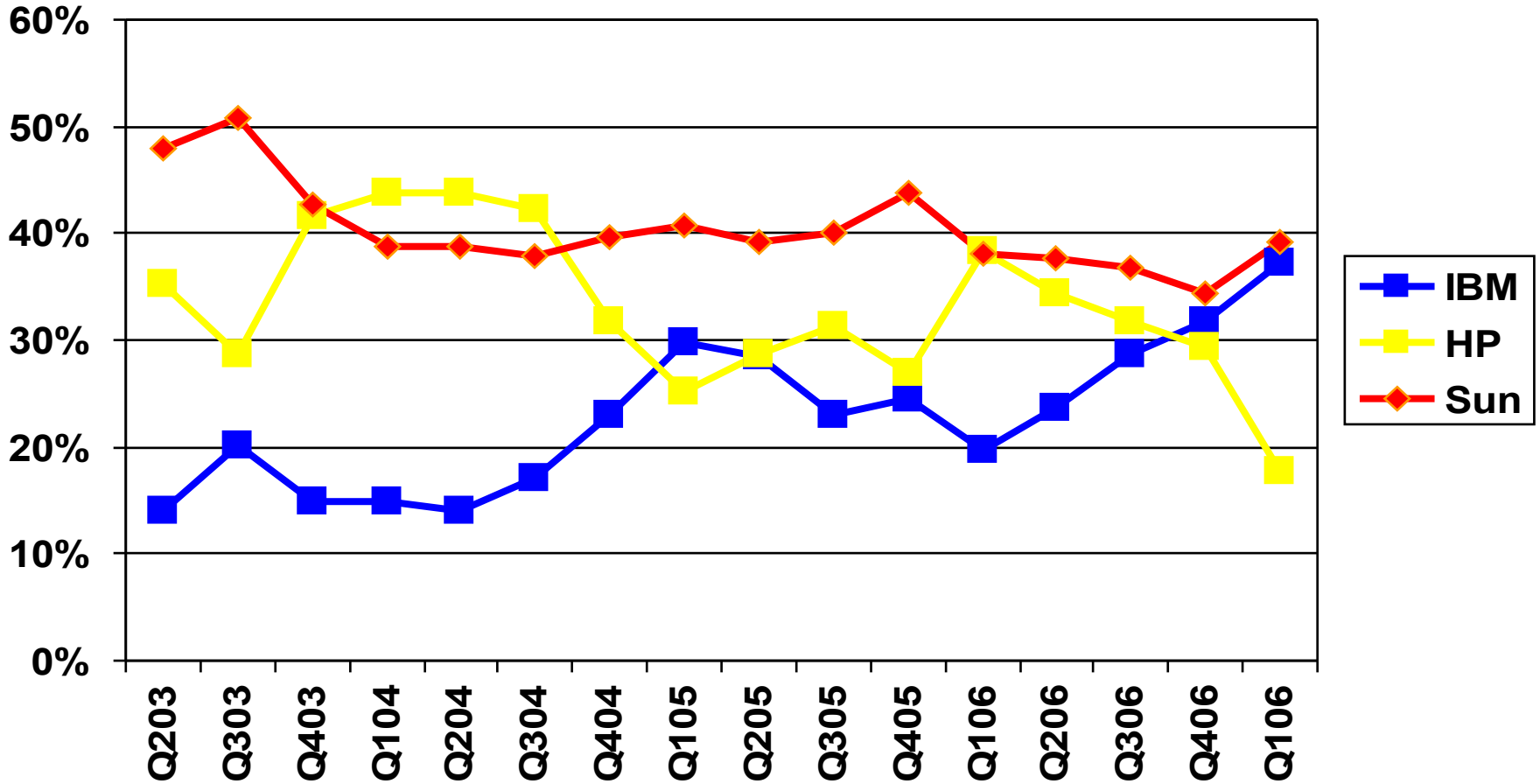
#1 TOP500 worldwide supercomputers

#1 gaming processor chips

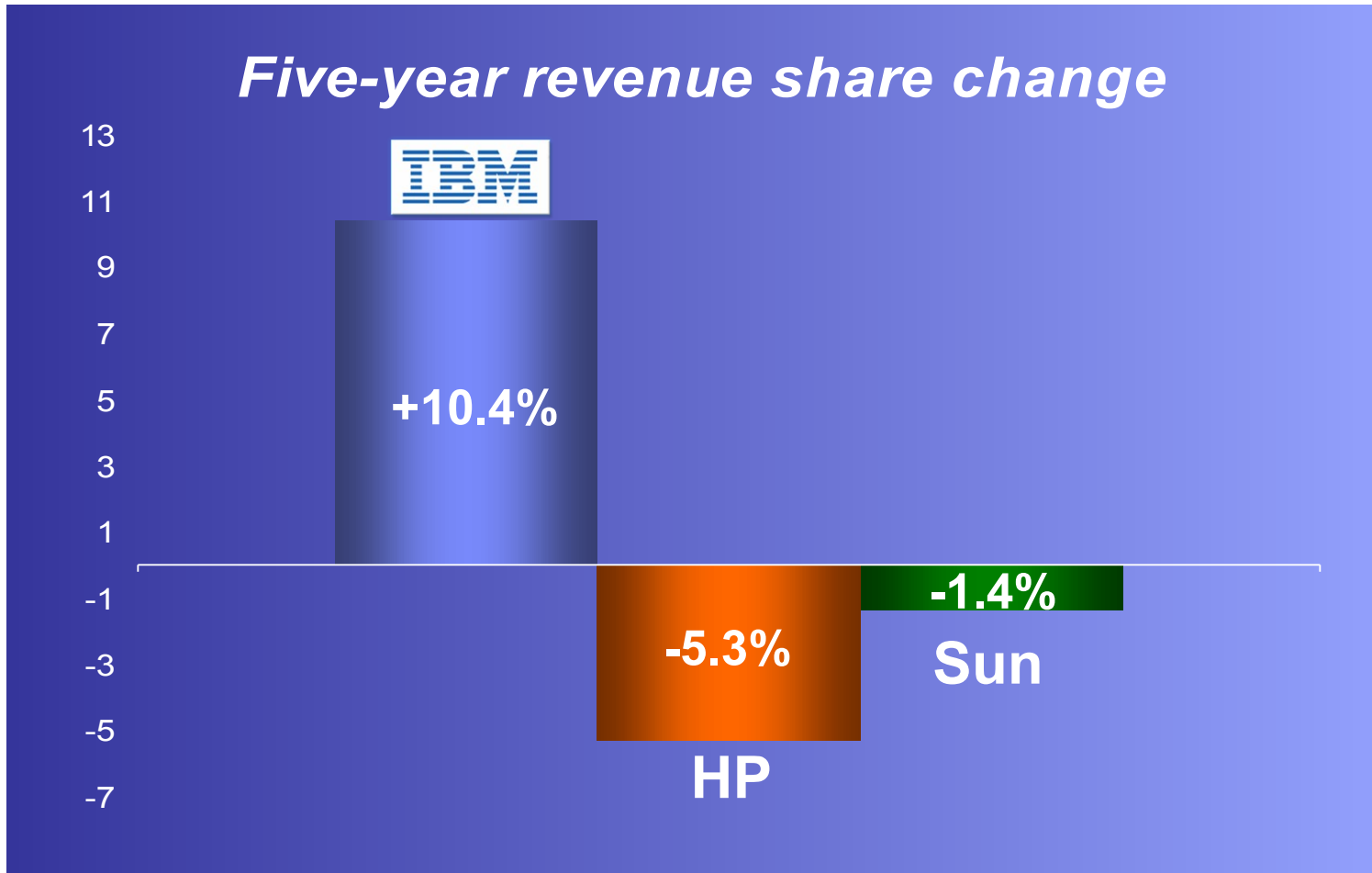


Sources: #1-5: IDC Q406 and FY06 Server Tracker, 02/24/07, "high end" = \$250K+ servers; #6: IDC WW Combined Disk and Tape Storage 4Q06 Market Share Update, 05/03/07; #7: www.top500.org, 11/13/06; #8 & 9: Gartner, Semiconductor Industry Worldwide Annual Market Share: Database, 04/03/07, G00120719 & G00120720

SA Rolling Share - System p



Only UNIX platform to grow over last five years



Source: IDC Server Tracker Q406 and FY06 Server Tracker, 02/24/07, rolling four quarter average

Today's challenge

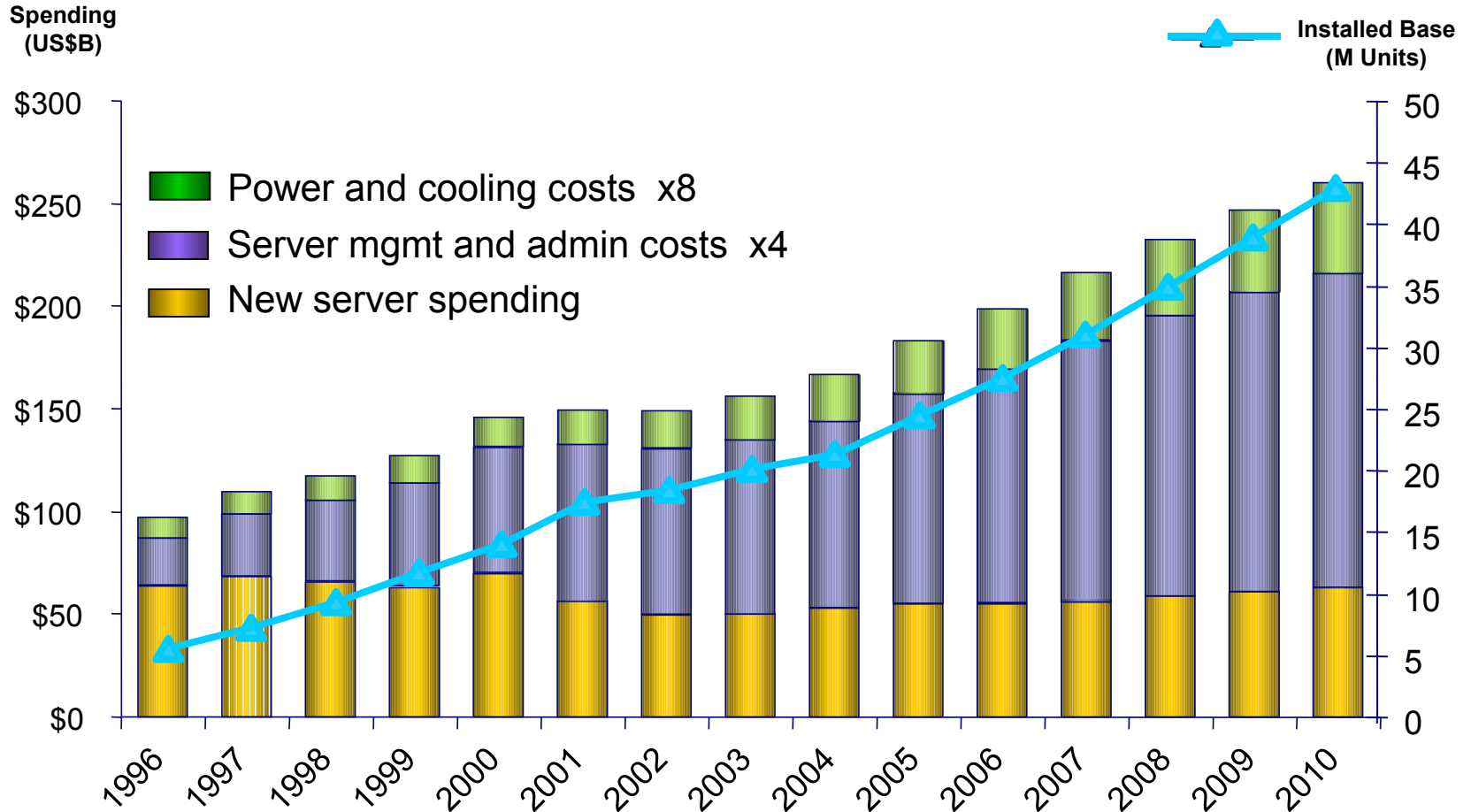


Infrastructure complexity
is raising costs and
constraining growth

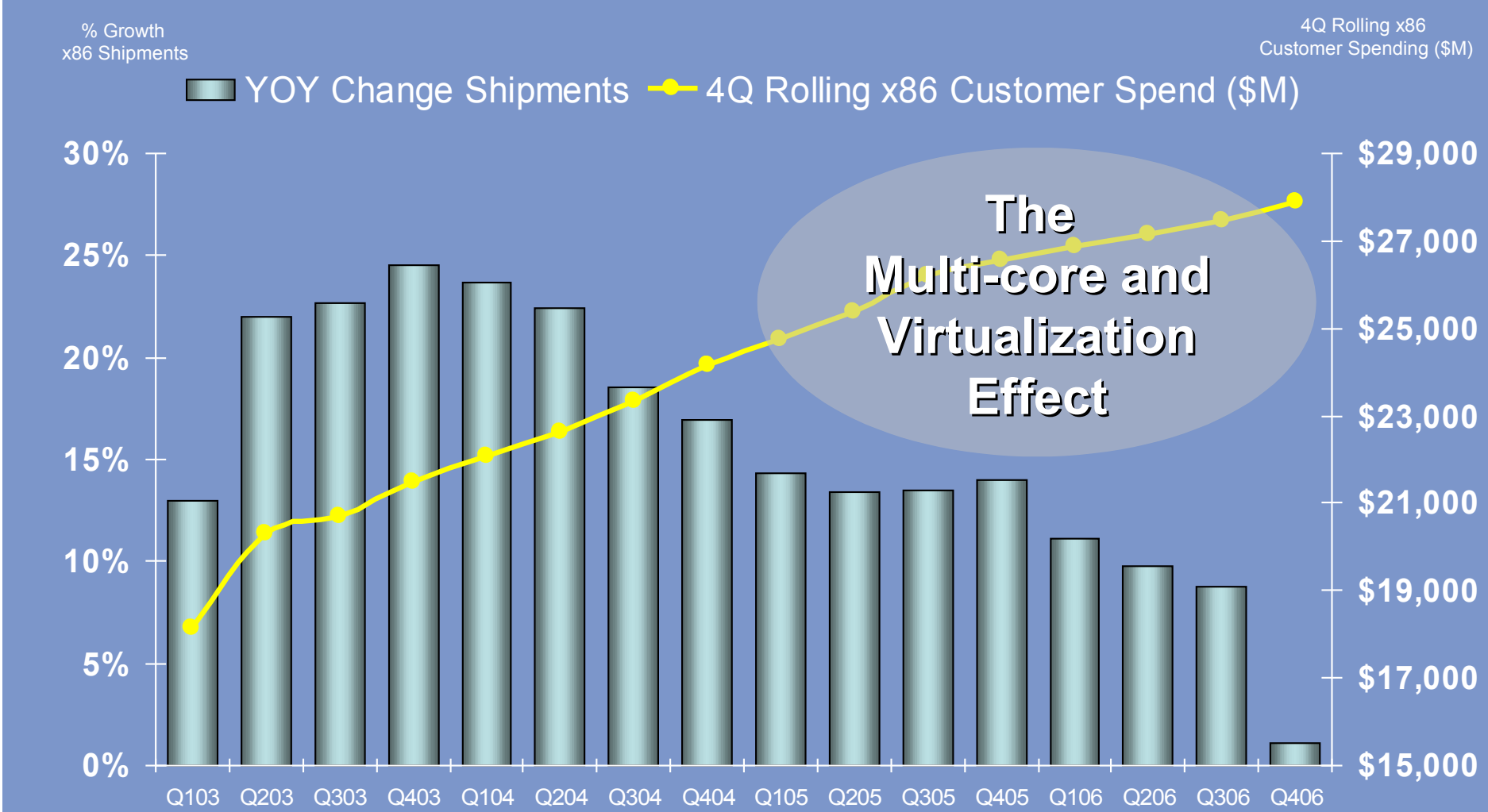


Half of every dollar today is spent on energy for hardware

This is expected to increase by 54% over the next four years



The virtualization effect



Source: IDC, "Virtualization and Multicore Innovations Disrupt the Worldwide Server Market," 3/07

Growing System p in 2007 and beyond

+ Grow core business – Unix and Linux

- UNIX Migrations from Sun Solaris and HP/UX
- Consolidations to save – space, energy, resources

+ Expand in underserved markets

- Select country focus, SMB, telco and BI

+ Participate in new application spaces

- Linux x86 Consolidation
- System p SOA Entry Points

1Q07 System p highlights: Executing the growth strategy

IBM System p	Sun UNIX	HP Business Critical Servers
14%	-1%	-6%

Gained revenue share vs. competitors

- *Share growth in all 3 quarters since IBM POWER5+ transition*

Double-digit growth in high end volumes and revenue

Significant revenue growth in multiple sectors

- *Led by Mid-Market (SMB) and Financial Services Sector*

Performed well in key growth markets

- *Central Europe, Latin America, ASEAN*

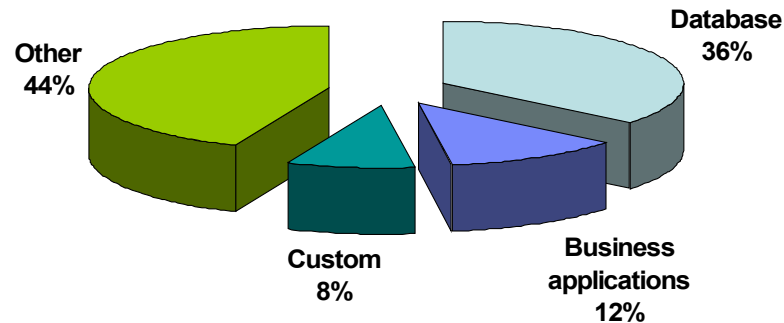


Source: Quarterly Financial reports

Our performance and virtualization leadership made it necessary to create migration and consolidation factories

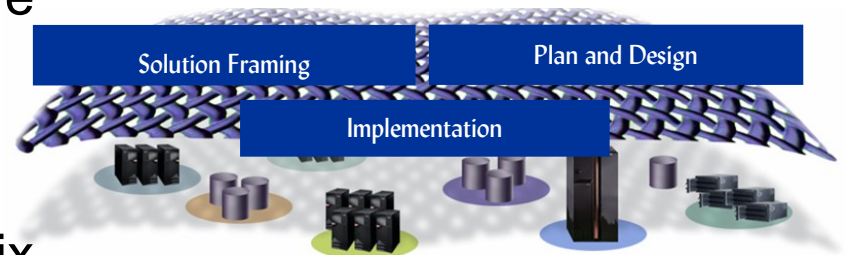
Our migration factory:

completed more than 430 UNIX migrations in 2006
 – 80% from Sun and HP*



Our server consolidation factory provides:

- Assessments to project TCO savings
- Deployment plans for non-disruptive consolidation and migration
- Services to help with virtualization provisioning and orchestration
- Adding x86 consolidation to the mix



* Source: IBM internal data.



IBM System p

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IBM STG Migration Factory - UKISA

- Announced: January 2007
- Dedicated to UKISA
- Logical Combination of Migration Resources for UKISA
- Single Focal point:

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Notes mail: Adrian R Tunningley/UK/IBM@IBMGB

Rick Murphy

AMS Migration Specialist

Phone: +44-7967 018 098

E-mail: murphy1@us.ibm.com

IBM Migration Factory objectives

To help mitigate the cost migrating to an IBM platform.



The Migration Factory's guiding principles

- **Provide and leverage many years of application migration experience**
- **Focus on the use of tools, metrics and automation to reduce the cost of migrating from one platform to another**
- **Help mitigate and reduce the risk in migrating from one platform to another**
- **Support success through process, expertise and project management**

“Proven, Repeatable, Definable”

Experience across all industry sectors

Banking and finance



Manufacturing



Telecommunications



Education



Chemical and petroleum



Aerospace and defense

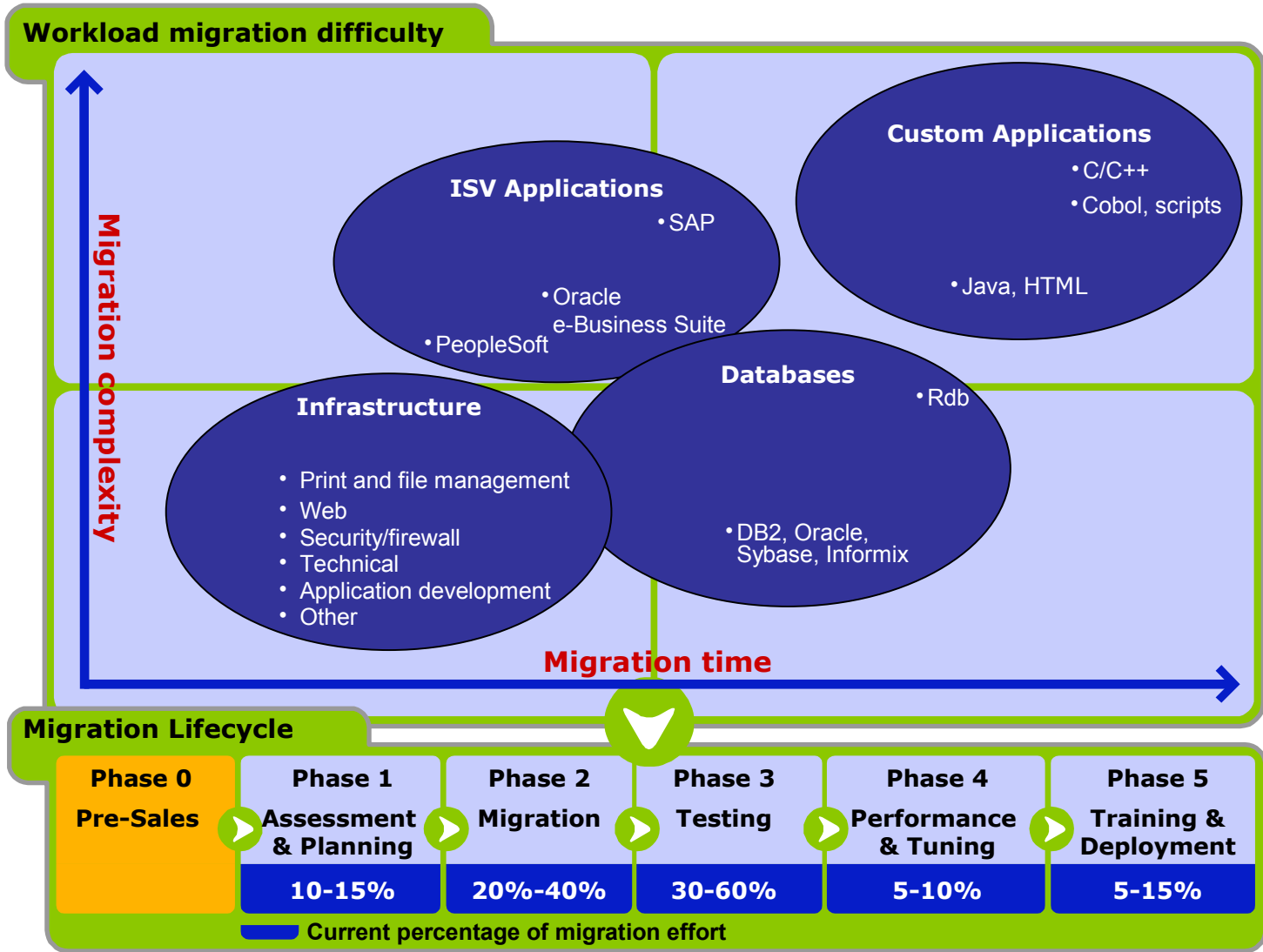


... and more.

Migration Factory core competencies

- Common source platforms
 - **Sun Solaris**
 - **Tru64 UNIX**
 - **HP-UX**
 - **Sequent DYNIX/ptx**
 - **SGI Irix**
 - **DG-UX**
 - **Others**
 - **AIX v4.x to 5.x upgrade**
 - **HP 3000 MPE**
 - **HP VMS/OpenVMS**
 - **HP/Tandem NSK**
 - **Windows**
- Custom code porting/migration
 - **C/C++**
 - **COBOL**
 - **Java**
 - **Fortran**
 - **Scripting languages**
- ERP application migration
 - **SAP**
 - **Oracle E-Business Suite**
 - **PeopleSoft**
- Database/data migration, conversion, upgrade
 - **Oracle**
 - **Informix**
 - **Sybase**
 - **DB2**
 - **Rdb**
- Mainframe to Open Systems
 - **IBM, Amdahl, Hitachi, Fujitsu, BULL**
- Server and workload consolidation

How long will it take?



Web Application Servers: A family of three Web tier consolidation solutions

Leadership performance PLUS proven technologies designed to provide infrastructure options for rising energy and administrative costs



- + Large Web server environments [consolidate 25 or more web servers]:
IBM System p5™ 560Q: *leadership UNIX® operating system performer and the ultimate Linux® operating system consolidation server*
- + Medium Web server environments [consolidate 15 or more web servers]:
IBM BladeCenter® JS21 for Web Serving Farms: *affordable alternative to less flexible rack-based x86 servers*
- + Small Web server environments [consolidate 2 or more web servers]:
IBM BladeCenter JS21 system or the IBM System p5 505/505Q models: *start small, with plenty of room for growth*

Consolidate **EIGHT** racks of 320 Dell PowerEdge/860 servers onto **ONE** rack of five System p5 560Q servers*

- *REDUCE floor space by an estimated 87%*
- *REDUCE power consumption by an estimated 66%*
- *REDUCE total cost of acquisition by up to 50%*



320 1U Dell PowerEdge 860 servers

(running 320 Linux LAMP applications)

- Dual Core Intel® Xeon™ 2.66 GHz, 4GB DDR2
- Eight 42U, 19 inch racks
- 640 integrated Ethernet adaptors
- 640 integrated 146GB disk drives
- 14 external 48 port switches

Five p5-560Q systems in ONE rack

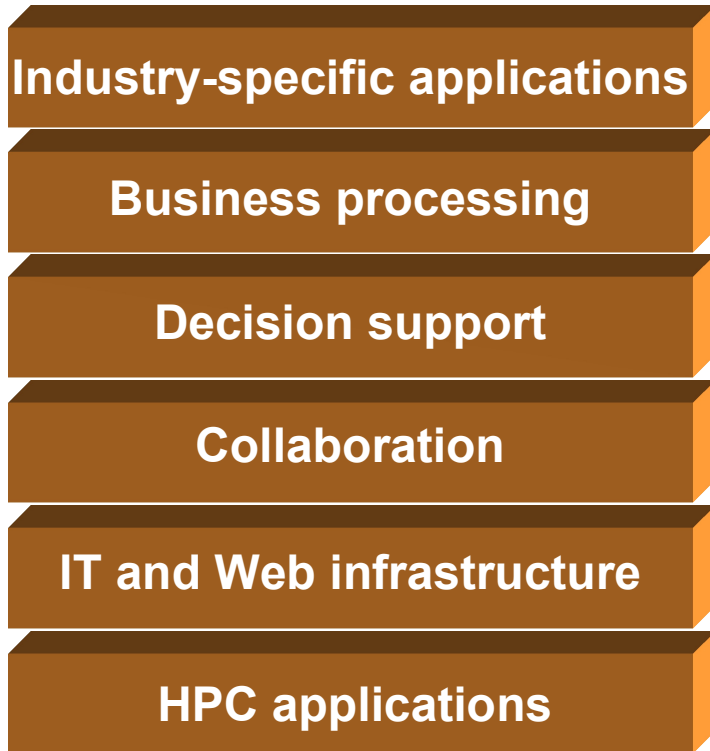
- POWER5 1.8 GHz QCM, 96GB DDR2
- With optional Advanced Power Virtualization
- 50 integrated Ethernet adaptors [**92% fewer**]
- 30 integrated 300GB disk drives [**95% fewer**]
- Two external 48 port switches [**86% fewer**]

*IBM demonstrated running four LAMP applications per 560Q core in a test documented in the IBM white paper "Consolidation Test of LAMP applications on an IBM System p5 560Q Express server," dated February 14, 2007 and posted at http://www.ibm.com/common/ssi/fcgi-bin/ssialias?infotype=SA&subtype=WH&appname=SS_PS_USEN&tmlfid=PSW03009USEN&attachment=PSW03009USEN.PDF

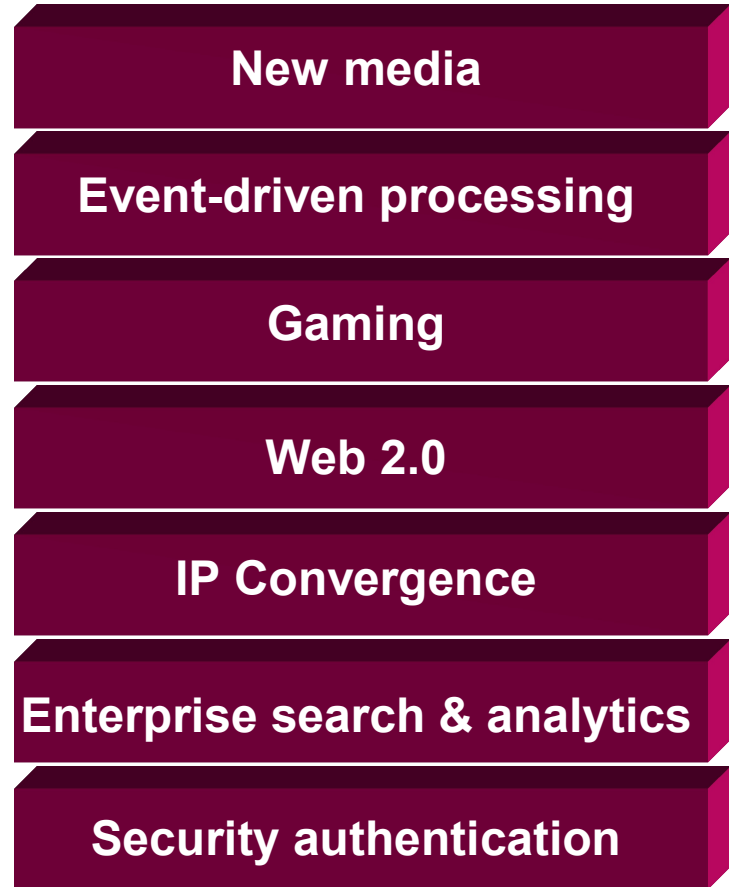
Growth via workload flexibility

System p addresses both classic workloads and emerging applications

Today's workloads

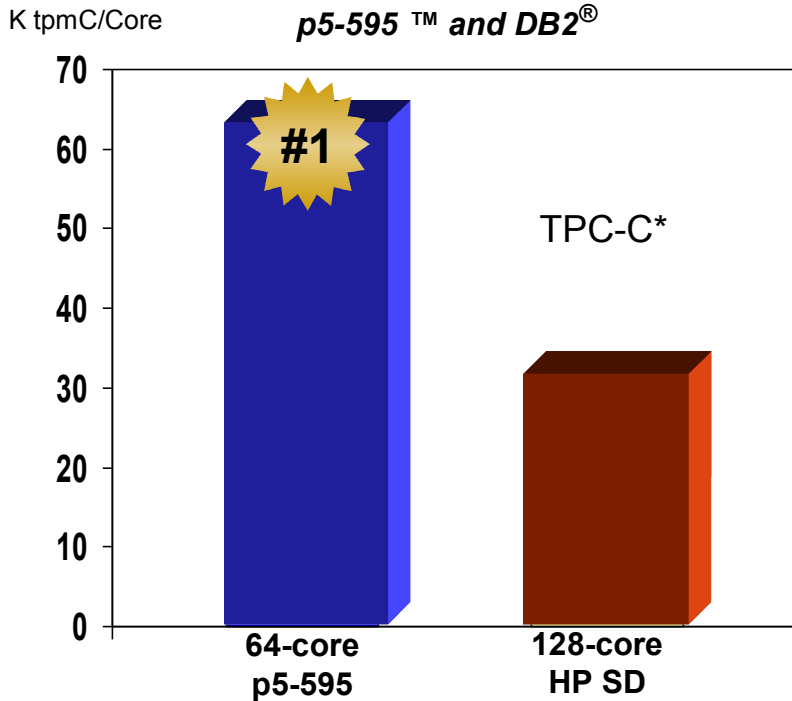


SOA and emerging applications

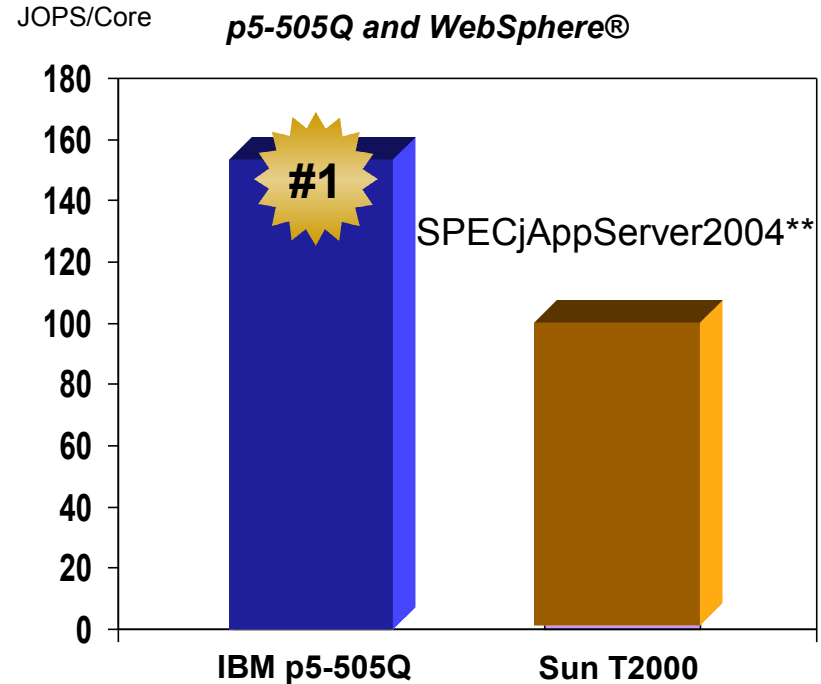


POWER5+ -- nearly 2X transaction performance and scalability per core and 50% more Java™ performance per core

Today's workloads



SOA and emerging applications



*Source: www.tpc.org/ All results as of 03/02/07

System (Processor, Chip/Core/Thread)	tpmC	Avail.	\$/tpmC
IBM p5-595 (2.3 GHz POWER5+™, 32/64/128)	4,033,378	01/22/07	\$2.97
HP Superdome (1.6 GHz Itanium 2, 64/128/256)	4,092,799	8/23/07	\$2.93

**Source: www.spec.org/ All results as of 02/15/06

System (Processor, Memory)	JOPs	Cores	Space
IBM p5-505Q (1.6GHz, 16 GB)	618	4	1U
Sun T2000 (1.2 GHz, 32 GB)	733	8	2U

Today, we are announcing...The POWER of SIX

IBM System p™ 570...with POWER6™ technology!



More than twice the performance and modular flexibility*

System p Virtualization...with Live Partition Mobility*!

Extending the most complete virtualization offering for UNIX and Linux

IBM  ... with binary compatibility!

The next evolution of UNIX with new workload partitions, manageability and security

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Ten years ago...

Deep Blue changed the world's perception of what a computer can do



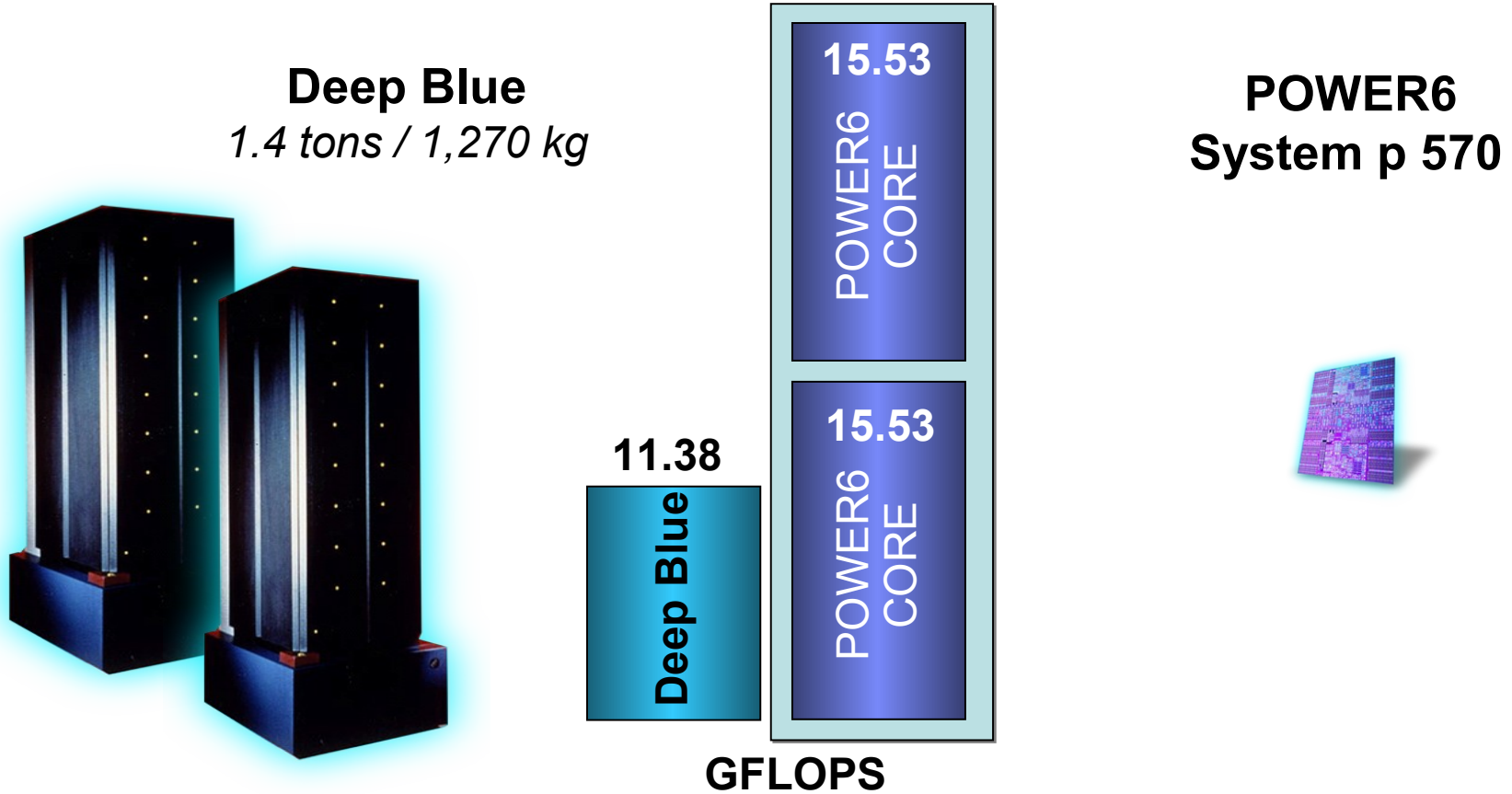
May 11, 1997

*Equitable Center
New York City*



IBM POWER™ technology: 10 years of innovation

Each core of IBM POWER6™ exceeds the performance of Deep Blue



Deep Blue
1.4 tons / 1,270 kg

POWER6
System p 570

11.38

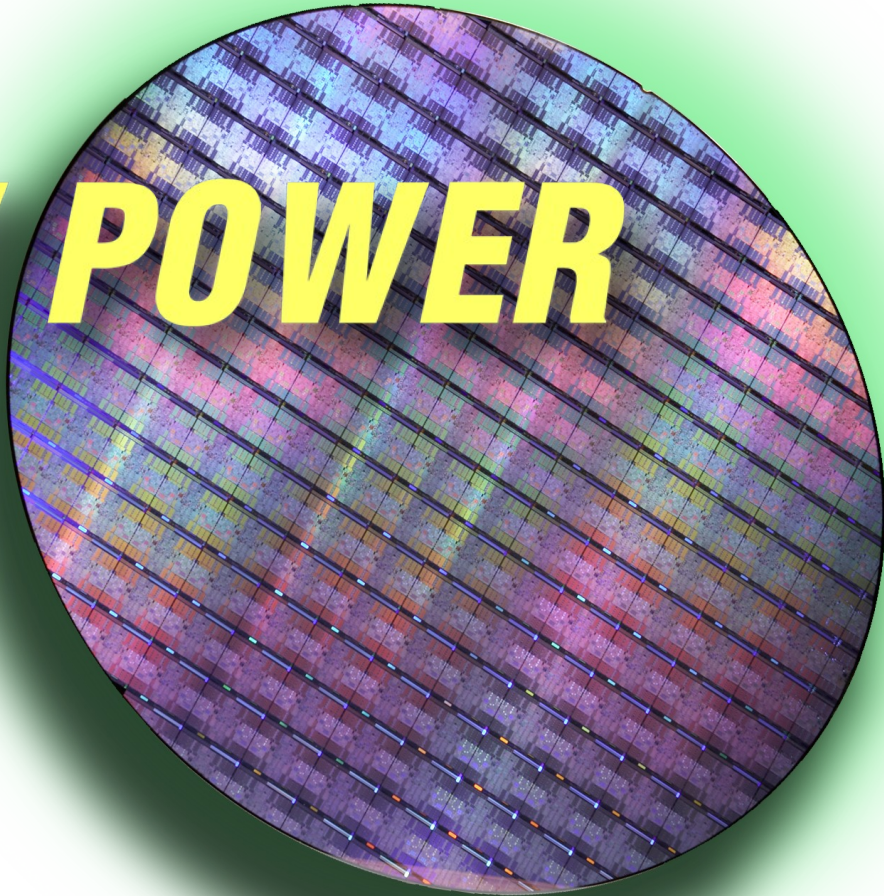
15.53

15.53

GFLOPS

Source: <http://www.top500.org/list/1997/11/100> IBM DEEP BLUE 1.2 GHz, 32 NODE SP2 P2SC, Rpeak: 15 GFLOPS, Rmax: 11.38 GFLOPS; IBM POWER6 CHIP, 4.7 GHZ 2 CORE, Rpeak – 37.6 GFLOPS, Rmax: 30.5 GFLOPS; to be submitted 5/21/07

THE NEW POWER



POWER6 – Balanced Performance clients can count on

- Ultra-high frequency dual core
 - 7-way superscalar, 2-way Enhanced SMT core
- Balanced design with highest system bandwidth
 - 2X Memory Bandwidth (> 10 GB/sec)
 - 3X SMP and I/O Bandwidth (>45 GB/sec)
- Integrated Accelerators:
 - Decimal floating point for business applications
 - AltiVec vectorized math common for 3D modeling (HPC)
- Full error checking and recovery
- Dynamic power saving
- **Consistent, predictable delivery**



2001

POWER4™



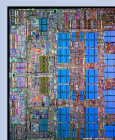
2003

POWER4+™



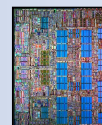
2004

POWER5™



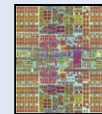
2006

POWER5+™

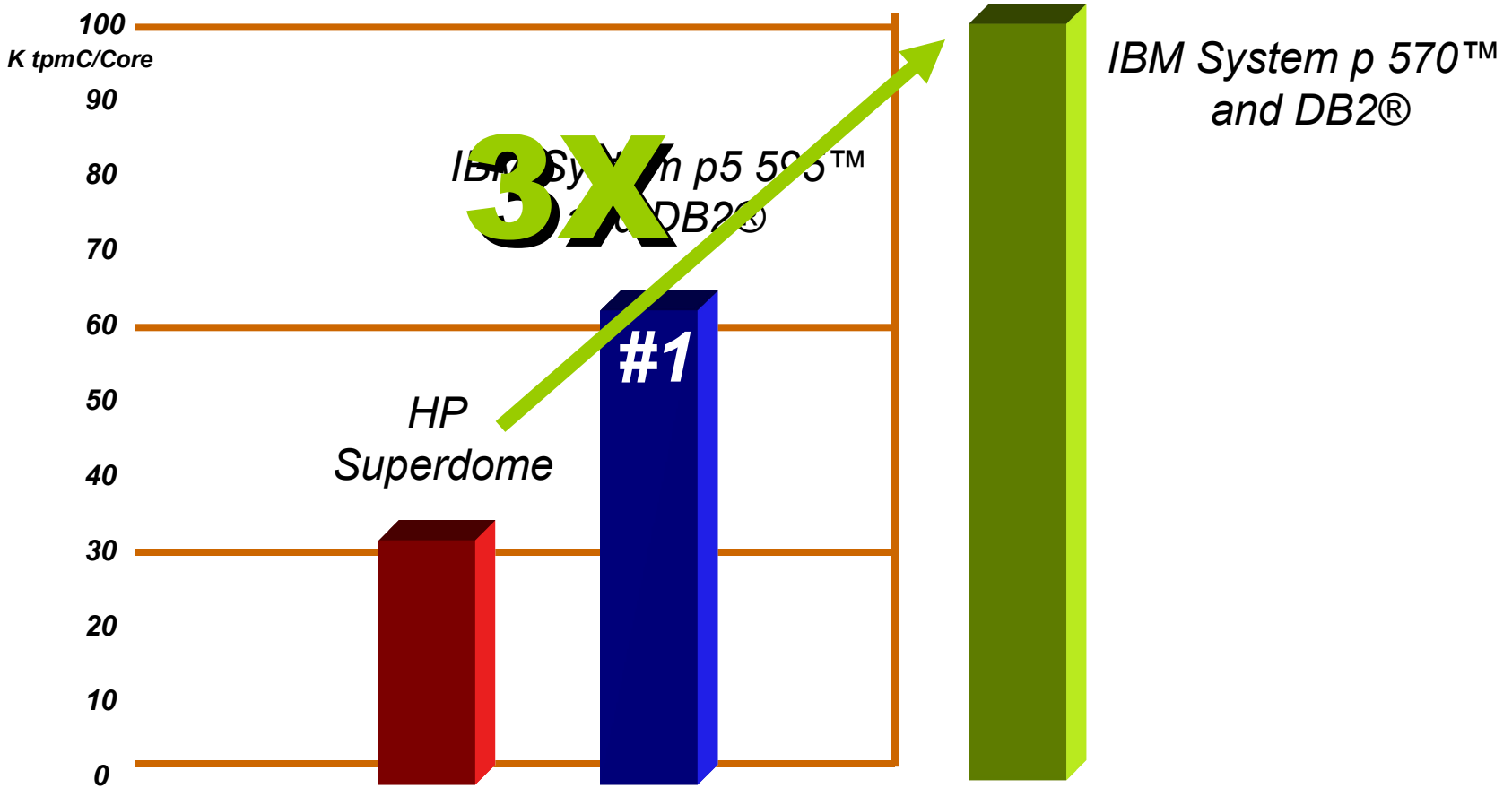


2007

POWER6™



System p with POWER6+

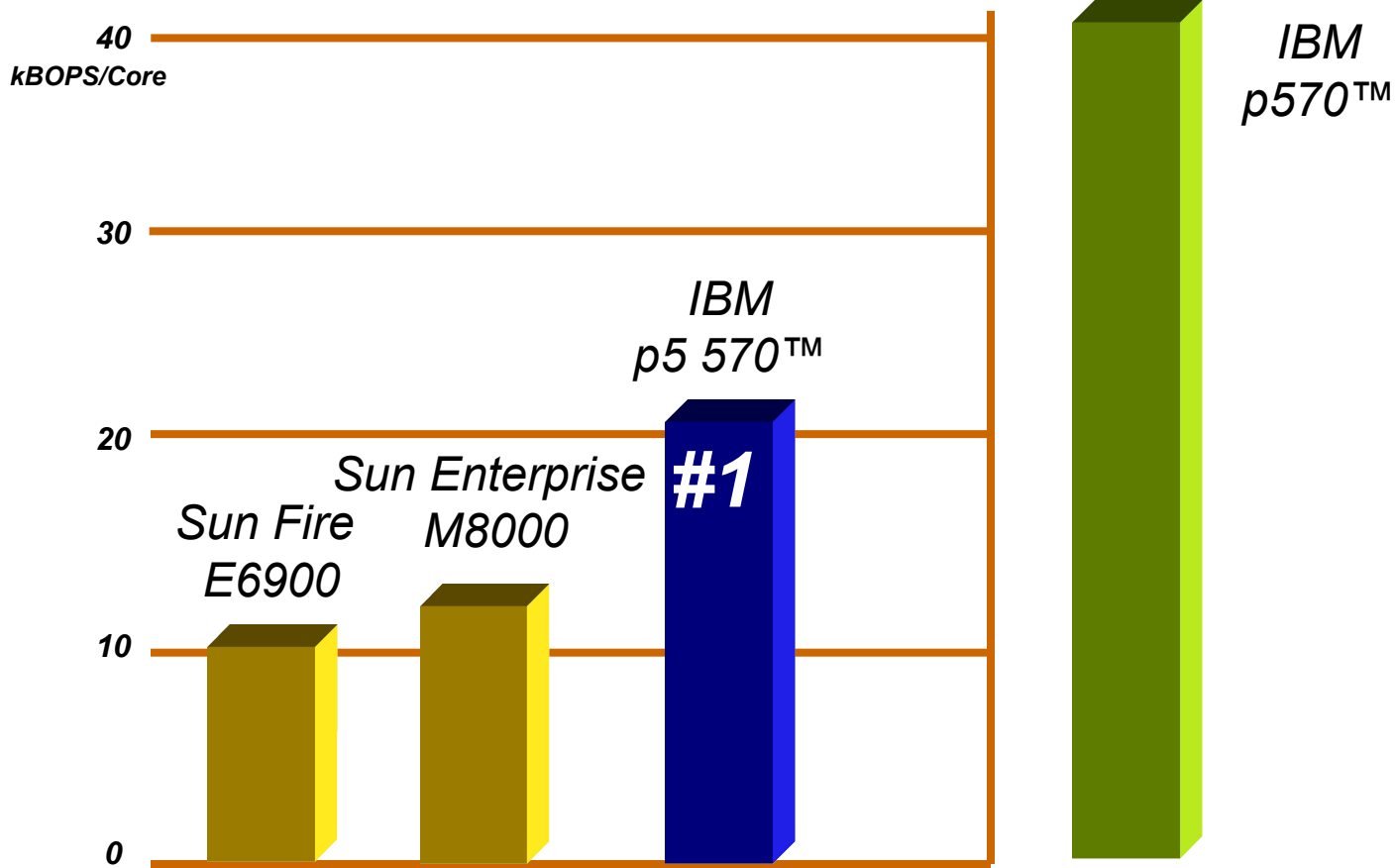


TPC-C*

System (Processor, Chip/Core/Thread)	tpmC	Avail.	\$/tpmC
IBM p570 (4.7 GHz POWER6™, 16/32/64)	1,616,162	11/21/07	\$3.54
IBM p5-595 (2.3 GHz POWER5+™, 32/64/128)	4,033,378	01/22/07	\$2.97
HP Superdome (1.6 GHz Itanium 2, 64/128/256)	4,092,799	8/23/07	\$2.93

*Source: www.tpc.org/ All results as of 05.21.07

System p with POWER6+



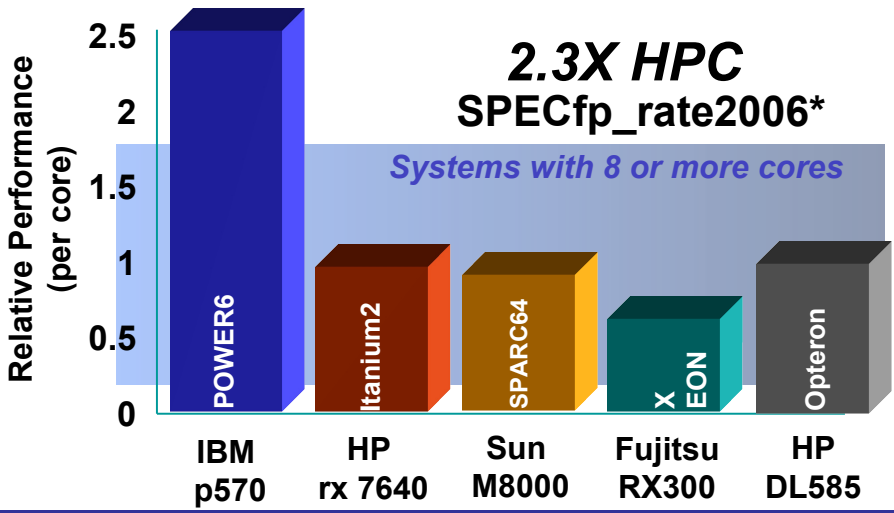
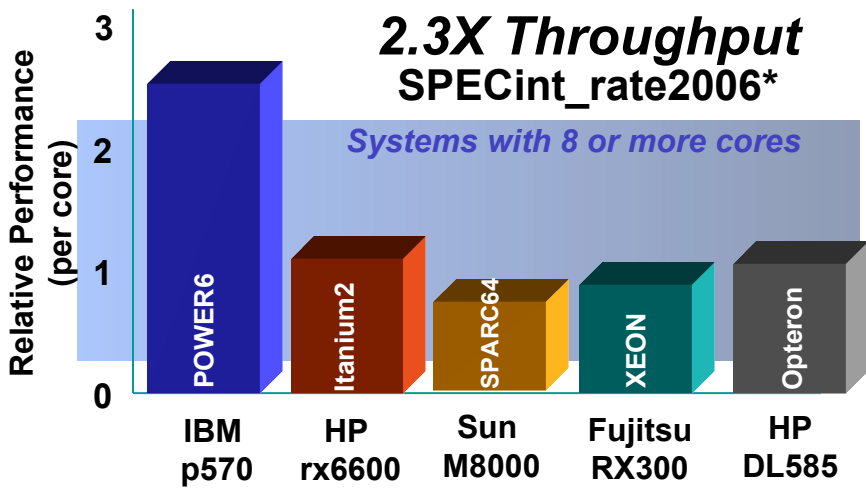
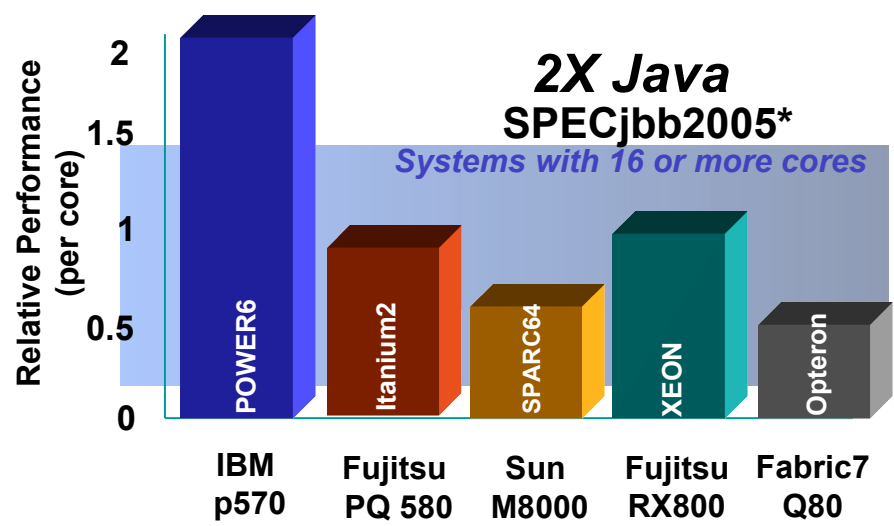
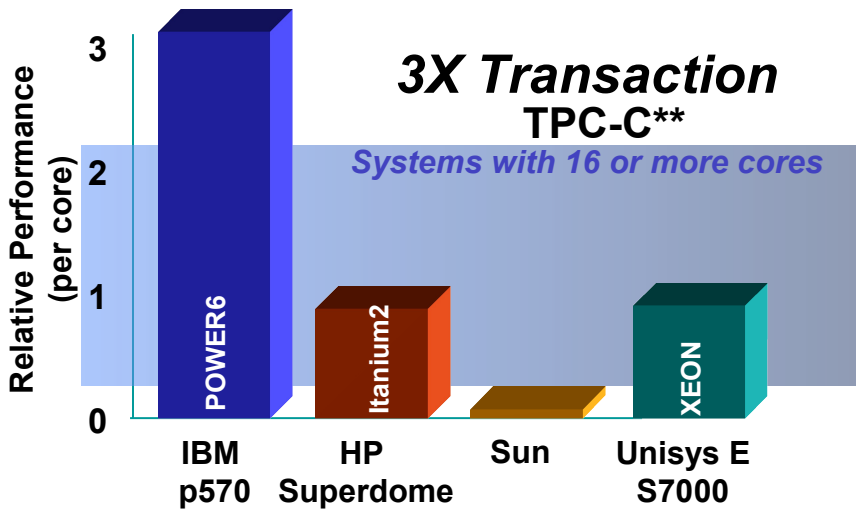
SPECjbb2005**

System (Processor, Cores)	BOPS	Date.	BOPs/JVM
IBM p570 (4.7 GHz POWER6™, 16-core)	691,975	May - 2007	86,497
IBM p5-570 (2.2 GHz POWER5+™, 16-core)	326,651	March - 2006	40,831
Sun Fire E6900 (1.95 GHz UltraSPARC VI+, 48-core)	354,733	April - 2007	22,171
Sun Enterprise M8000 (2.4 GHz SPARC64 VI, 32-core)	440,207	May - 2007	27,513

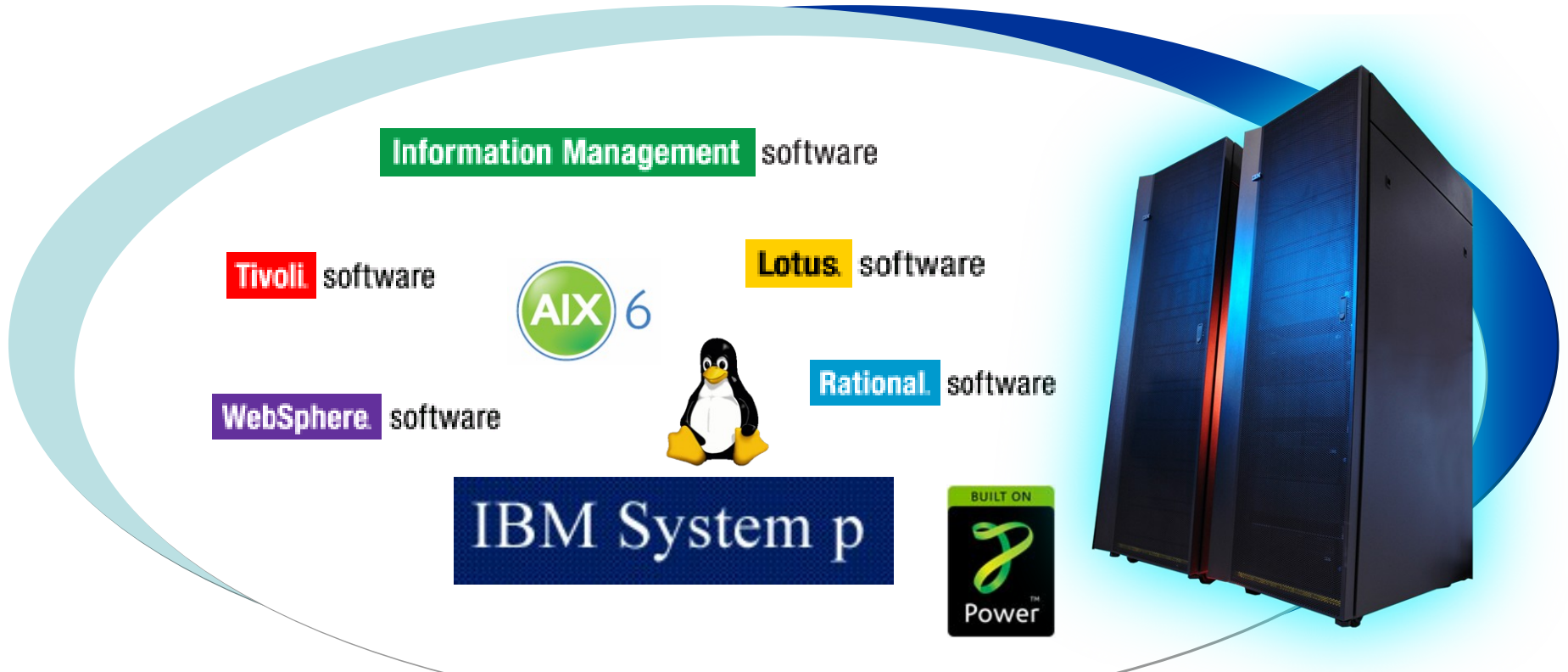
**Source: www.tpc.org All results as of 05/21/07



The IBM POWER6 "Grand Slam" for major workloads



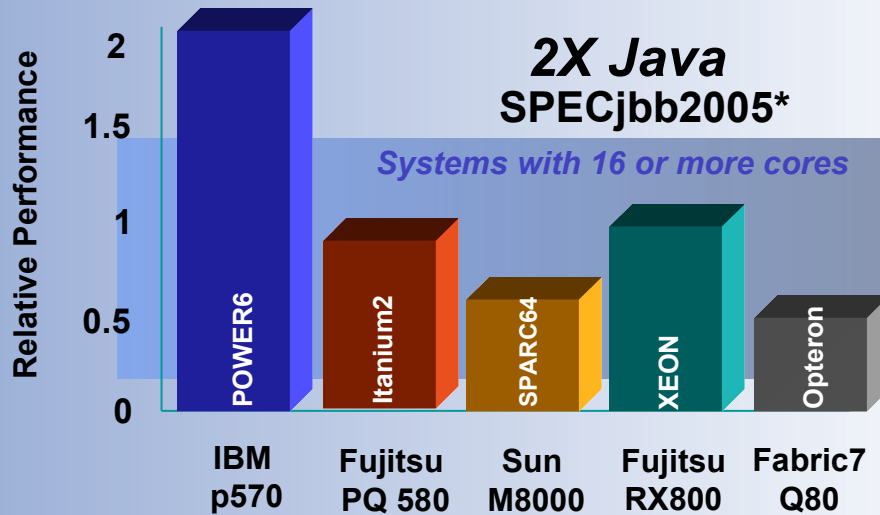
IBM Software and System p



Delivering faster ROI and sustained value at reduced risk

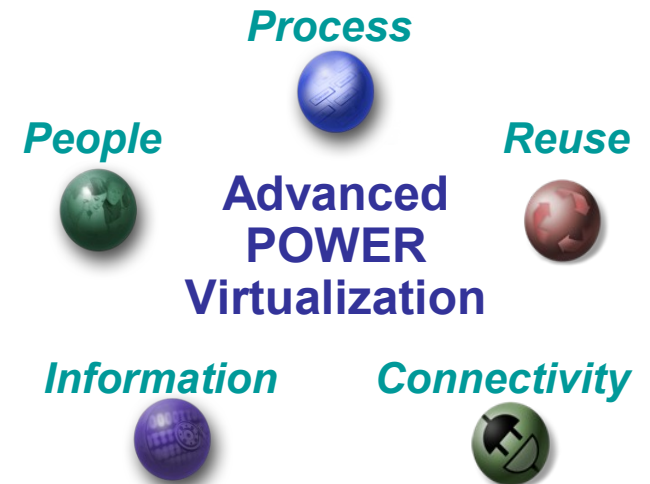
IBM WebSphere® optimized for System p

Performance Leadership



SOA Affinity

IBM System p Configurations for SOA Entry Points



*Source: <http://www.spec.org/> IBM p570 POWER6 results to be submitted by 5/21/07; All other results as of 04/27/07.

New IBM System p 570

Modular design for scale-out economics and scale-up performance

- **Modular building block design**
 - Start with 4 cores, grow to 16
- **All 3 speeds are faster than competition**
 - 3.5, 4.2 and 4.7 GHz POWER6™
- **More memory per core – than anyone**
 - Up to 768 GB max, 48GB/core!
- **Full binary compatibility for investment protection**
 - Existing Apps and AIX 5.2 AND AIX 5.3 run on POWER6
- **Price-reduced POWER5+ 570s for customer flexibility**
 - IBM System p5 570™ is now 20-25% more affordable
 - Upgrades to POWER6 – buy now, upgrade when ready



Advancing the most complete virtualization for UNIX and Linux

IBM virtualization leadership AND performance for the price influence decisions to migrate from Sun and HP to System p

Eliminate Planned Downtime

New! *Dynamically move running workloads from one server to another without application disruption -- individual apps or entire partition*

Improve efficiency via consolidation

New! *Advanced features like multiple shared processor pools and shared dedicated capacity*



New Capabilities

- Live Partition Mobility*
- Live Application Mobility*
- x86 Linux Application Support*
- Over 20 more new key features

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Live Partition Mobility on IBM System p*

Move running UNIX® and Linux® operating system workloads from one POWER6™ processor server to another!



Virtualized SAN and Network Infrastructure

- First to support both UNIX and Linux on the same system
- Designed for high CPU and I/O intensive workloads
 - *Four times the number of CPUs (16 to 4)***
 - *12 times the amount of memory/core (48 to 4)****

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Previewing 6

Investing in the future of the #1 UNIX

Just a few examples of dozens of new features:



Virtualization

- Workload Partitions
- Live Application Mobility between systems

Security

- Encrypting Filesystem

Continuous Availability

- Concurrent AIX Updates

Manageability

- System Director Console for AIX

***A first for AIX! Open Beta:
Downloadable AIX coming this
summer for customers and ISVs***



Advantage you!... with the POWER OF SIX



Checkmate server sprawl with the . . .

PERFORMANCE OF SIX

Checkmate planned downtime with the . . .

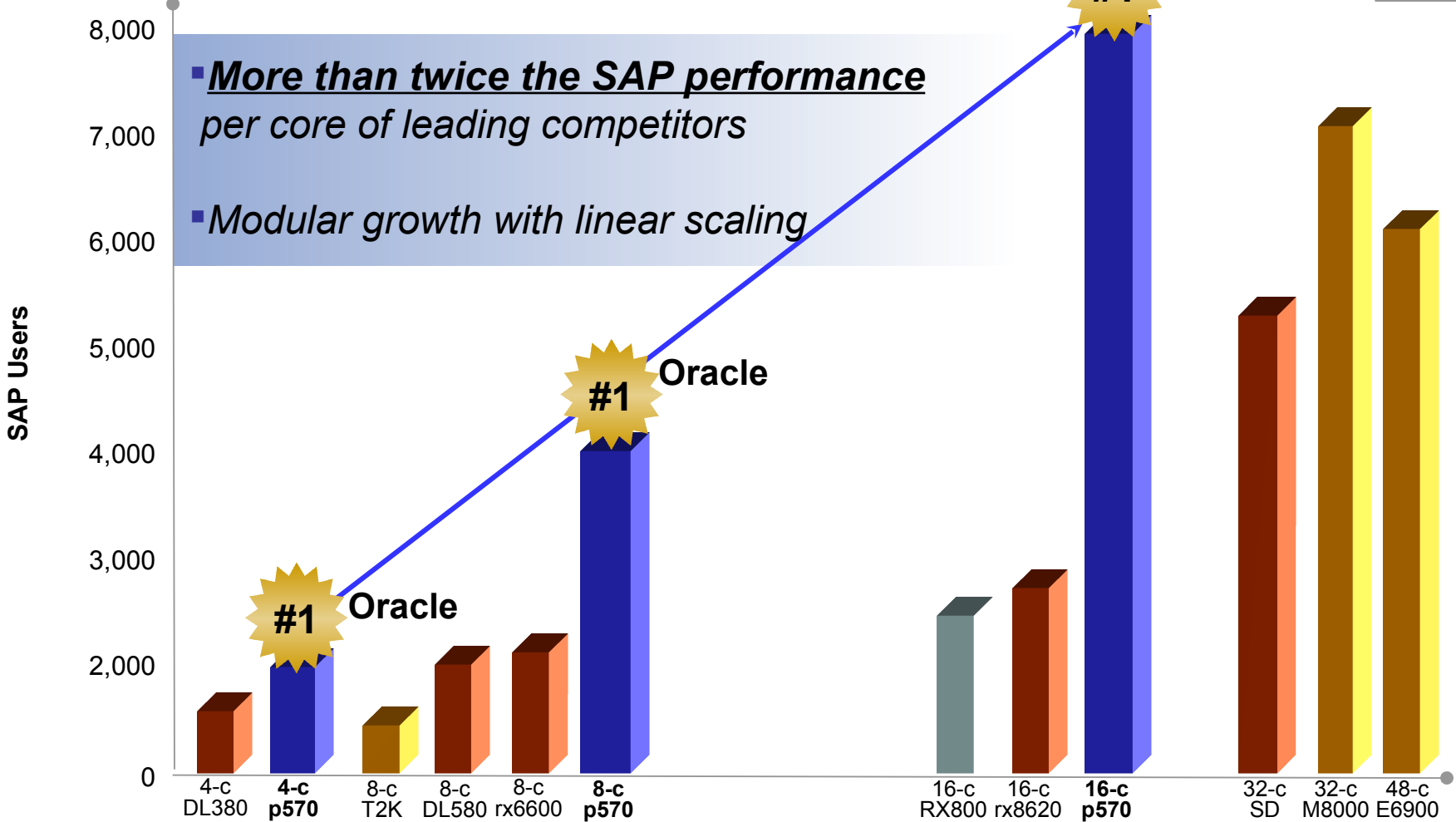
AVAILABILITY OF SIX

Checkmate energy costs with the . . .

EFFICIENCY OF SIX

PERFORMANCE OF SIX -- for server sprawl

“Grand Slam” leadership provides more than 2X better business application performance



- More than twice the SAP performance per core of leading competitors**
- Modular growth with linear scaling**

Source: www.sap.com/benchmark/ All results as of 04/27/2007; see accompanying table for additional detail

ISVs and System p

Collaborative Innovation

"In recent testing, we demonstrated how KANA IQ can take advantage of IBM's Advanced POWER™ Virtualization and micro-partitions to help reduce overall system resources" --**Charlie Isaacs, CTO**

"IBM has tested the System p 570 server using the Oracle Application Standard Benchmark and the results demonstrate outstanding performance. -- Carolyn Chambers, Group Vice President, Application Platforms, Quality and Release

"SAS is pleased to team with IBM to offer SAS BI solutions that run on IBM's next generation of System p™ server." -- Scott Van Valkenburgh, Director of Global Platform and ISV Partners

"In a recent test of the Sybase Risk Analytics Platform using our Sybase IQ analytics engine, the new 8-core system demonstrated a 58 percent performance improvement in mixed query workloads over the IBM System p5™ 570 server based on POWER 5+™ processor technology." -- Raj Nathan, SVP and Chief Marketing Officer

"The enhancements continue to demonstrate IBM's leadership in UNIX® servers... We are looking forward to supporting the first p570 customers." -- Douglas Kim, Managing Director, Global Partners and Alliances, PegaSystems

ORACLE®



"SAP NetWeaver 7.1 implements industry standard support for Hardware Decimal Floating-Point (DFP). The new POWER6 hardware DFP acceleration feature provides an ideal hardware environment for the execution of SAP-related DFP operations." -- Stephan Rossius, Senior Vice President, Global Partner Management

"Cerner has tested the IBM POWER6™ processor-based system and will support it for our clients on the day of availability." -- Eric Stevens, Project Manager

KANA



AVAILABILITY OF SIX: roadmap to continuous availability

System p virtualization technologies may help to **reduce your cost of downtime by up to 59%** vs. a conventional UNIX environment*

- **Reduce unplanned downtime** with new, mainframe-inspired reliability features
- **Reduce planned downtime** with Live Partition and Application Mobility

System Reliability Enhancements

- Processor Instruction Retry
- Storage Keys

Improving Application Availability

- Live Partition Mobility**
- Live Application Mobility**

Improving Serviceability

- AIX Concurrent Maintenance
- System Concurrent Maintenance
 - Hot Node Add
 - Cold Node Repair



*"Impact of IBM System p Server Virtualization," Transforming the IT Value Equation with POWER6 Architecture. International Technology Group, 05/2007. Study methodology: Companies in financial services, manufacturing and retail with \$15 Billion+ revenues focusing on UNIX® large enterprise environments with multiple, broad-ranging applications. Study compared the cost of the company's workloads running on multiple vendor servers and employing minimal virtualization to the cost of the company's workloads running on p 570 (POWER6 processor-based) as well as POWER5+ processor-based servers – all using Advanced POWER Virtualization [APV]. APV is standard on System p5 590 and 595. Other System p servers have the option to add APV except the System p5 185. This cost analysis was performed for financial services, manufacturing and retail example environments with an overall average savings of up to 72% in TCO savings by virtualizing and consolidating on the System p servers. Total Cost of Ownership may not be reduced in each consolidation case. TCO depends on the specific customer environment, the existing environments and staff, and the consolidation potential. ** All statements regarding IBM future directions and intent are subject to change or withdrawal without notice and represent goals and objectives only. Any reliance on these Statements of General Direction is at the relying party's sole risk and will not create liability or obligation for IBM.

EFFICIENCY OF SIX – reduce energy costs

Innovation in “green” system design for data center energy management

- More Work per Watt reduces power at the system level
- Virtualization enables consolidation of under-utilized servers
- POWER6 with EnergyScale™ technology enables dynamic power saving and management



Energy efficiency *technology innovations*



Energy Management

- IBM Director with PowerExecutive
- Power Configurator to plan your power usage
- Leadership virtualization capabilities extend beyond simple partitioning
- Tivoli® Enterprise Management

PowerExecutive



Power Configurator

Virtualization



Energy Technology

System designs

Leadership compute power per kilowatt

Virtualization

Standard feature in most systems



Power Architecture™

Processor efficiency management

X-Architecture™

Processor efficiency management



IBM power supplies

Measurement built in

Rear Door Heat Exchanger

Thermal management innovation



BladeCenter®

Energy Efficiency from the ground up

Calibrated Vector cooling

Reduces wasteful air movement

IBM Cool Blue™ Portfolio

Potentially save an average of 72% in datacenter costs* with the *Performance, Availability and Efficiency of Six*

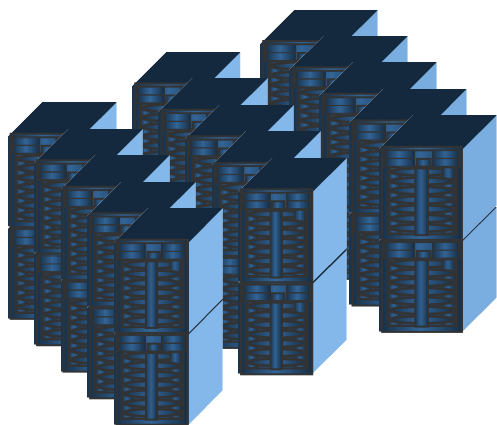
Categories	Savings	Factors
Maintenance	86% - 94%	Fewer, newer servers reduce maintenance contract costs.
Software support	82% - 84%	Fewer software copies & CPUs result in lower license, update & support costs.
Personnel	36% - 50%	Fewer physical servers, reduced diversity & improved automation reduce system administration-related personnel costs.
Facilities	65% - 70%	Fewer physical servers, smaller footprints, & greater energy efficiency reduce data center occupancy, power & cooling costs.
Average	72%	

*Impact of IBM System p Server Virtualization, "Transforming the IT Value Equation with POWER6 Architecture. International Technology Group, 05/2007. Study methodology: Companies in financial services, manufacturing and retail with \$15 Billion+ revenues focusing on UNIX® large enterprise environments with multiple, broad-ranging applications. Study compared the cost of the company's workloads running on multiple vendor servers and employing minimal virtualization to the cost of the company's workloads running on p 570 (POWER6 processor-based) as well as POWER5+ processor-based servers – all using Advanced POWER Virtualization (APV). APV is standard on System p5 590 and 595. Other System p servers have the option to add APV except the System p5 165. This cost analysis was performed for financial services, manufacturing and retail example environments with an overall average savings of up to 72% in TCO savings by virtualizing and consolidating on the System p servers. Total Cost of Ownership may not be reduced in each consolidation case. TCO depends on the specific customer environment, the existing environments and staff, and the consolidation potential.

Save more than \$100K per year on energy and space costs!

*Based on new IBM p 570 performance and efficiency**

**30 Sun Fire V890 systems
at 20% utilization**



Two IBM System p 570 systems at 60% utilization



- **Save up to 90% cost of floor space**
- **Save up to 90% cost of energy**
- **Save up to 90% on per core SW costs**

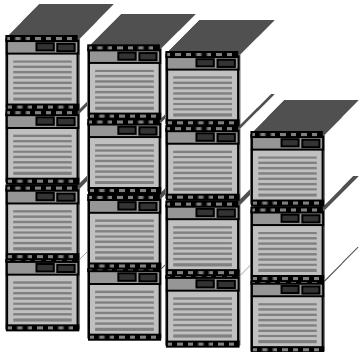
- **480 total cores @ 1.5 GHz**
- **\$5,625 annual space costs @ \$62.50 sq ft**
- **\$113,607 annual energy costs @ \$0.09 / kWhr**

- **32 total cores @ 4.7 GHz**
- **\$375 annual space costs @ \$62.50 sq ft**
- **\$13,667 annual energy costs @ \$0.09 / kWhr**

*Datacenter floor space cost was estimated as of 5/3/2007 based on Alinean, Inc.'s ROI Analyst software. Energy cost of \$.0928 per kWh is based on 2007 YTD US Average Retail price to commercial customers at \$.0928 per US DOE at http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.htm as of 05/18/2007. The reduction, if any, in floor space, power, cooling and software costs depends on the specific customer, environment, application requirements, and the consolidation potential. Sun system power requirements based on http://www.sun.com/products-n-solutions/hardware/docs/html/817-3956-12/system_specs.html#pgfid-1001301. Air conditioning power requirement estimated at 50% of system power requirement. SPEC® results source: www.spec.org as of 05/22/2007: System p 570 (16-core, 8 chips, 2 chips per core, 4.7 GHz); SPECjbb2005 691,975 bops 86497 bops/JVM; Sun Fire v890 (16-core, 8 chips, 2 chips per core) 1.5 GHz SPECjbb2005 117,986 bops, 29,497 bops/JVM

Why buy fifteen HP systems when you can get better performance AND reduce costs with only two IBM p 570s?

FIFTEEN 16-core HP Integrity rx7640 systems



- 240 total cores @ 1.6 GHz
- \$38,538 annual energy costs @ \$0.09 / kWh
- \$1,500 annual space costs @ \$62.50 sq ft

TWO 16-core IBM p570 systems



- 32 total cores @ 4.7 GHz
- \$13,254 annual energy costs @ \$0.09 / kWh
- \$375 annual space costs @ \$62.50 sq ft

- *Gain up to 14% performance advantage, and*
- *Save up to 85% cost per core in software fees*
- *Save up to 75% cost of floor space*
- *Save up to 65% cost of energy costs*

*Datacenter floor space cost was estimated as of 5/3/2007 based on Alinean, Inc.'s ROI Analyst software. The reduction, if any, in floor space, power, cooling and software costs depends on the specific customer, environment, application requirements, and the consolidation potential. SPEC® results source: www.spec.org as of 05/22/2007: System p 570 (16-core, 4.7 GHz): SPECint_rate2006: 478, HP Integrity rx7640 16-core, 1.6 GHz SPECint_rate2006: 167 Energy cost of \$.0928 per kWh is based on 2007 YTD US Average Retail price to commercial customers at \$.0928 per US DOE at http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.htm as of 05/18/2007

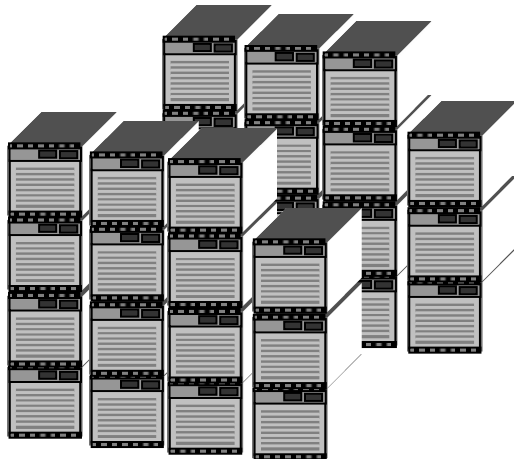
Now you may be able to save even more!

Voith consolidated on System p5 570s saving*:

- 70-80% on energy costs
- 30% on SW costs

Twice the performance at almost the same energy

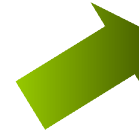
30 HP systems
Capacity = 50,000 SAPs



Four IBM System p5 570 servers
Capacity = 80,000 SAPs

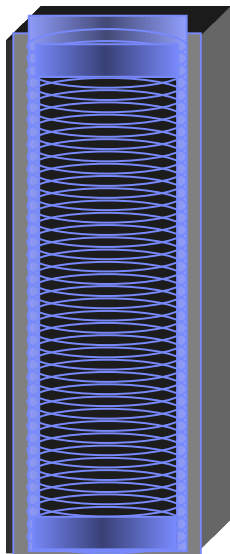


Two POWER6 System p 570s
Capacity = 80,000 SAPs



Get 39% more Java application performance by migrating from a 32-core Sun Fire E6900 to an 8-core System p 570

And potentially save. . .



Sun Fire E6900

- 32-core, 1.5 GHz (UltraSPARC IV+)
- 28 Rack Units
- 5,945 Volt-Amps
- SPECjbb2005: 248,075 bops (bops/JVM: 31,009)

- *87% cost of floor space*
- *50% cost of energy*
- *75% cost per core SW license*



System p 570

- 8-core, 4.7 GHz (POWER6)
- 8 rack Units
- 2,800 Volt-Amps
- SPECjbb2005: 346,742 bops (bops/JVM: 86,686)

*The reduction, if any, in floor space, power, cooling, and software costs depends on the specific customer, environment, and application requirements. SPECjbb2005 bops source: www.spec.org as of 05/22/2007 **System power requirements based on VA ratings at <http://www.powerware.com/UPS/selector/BuildByDevice.asp> used with permission of Eaton Corporation. Normalized power factor = 1.0

“Checkmate!” with the POWER OF SIX

IBM Innovations

- IBM System p 570 with POWER6 technology
- System p Virtualization
- IBM AIX 6

Address Key Client Challenges

- Reduce Server Sprawl
- Enable a Roadmap to Continuous Availability
- Reduce energy and operational costs





IBM System p

Footnotes



Get The Power of Six. . .Take Back Control

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The IBM POWER6 “Grand Slam” for major workloads

- **SPECjbb2005 comparisons** (Source: <http://www.spec.org/> IBM p570 POWER6 results to be submitted on 5/21/07: All other results as of 04/27/07)
 - IBM POWER6 p570 (8 chips, 16 cores) @ 4.7 GHz with 691,975 bops (86,497 bops/JVM) and 43,125 bops per core
 - Fujitsu PRIMEQUEST 580 (32 chips, 64 cores) @ 1.6 GHz with 1,214,251 bops (75897 bops/JVM) and 18,974 bops per core
 - Sun Fire M8000 (16 chips, 32 cores) @ 2.4 GHz with 440,207 bops (27,513 bops/JVM) and 13,756 bops per core
 - Fujitsu RX800 (8 chips, 16 cores) @ 3.5 GHz with 336,653 bops (42,082 bops/JVM) and 21,041 bops per core
 - Fabric7 Q80 (8 chips, 16 cores) @ 2.6 GHz with 180,418 bops (22,552 bops/JVM) and 11,276 bops per core

- **TPC-C comparisons** (Source: www.tpc.org/ IBM p570 POWER6 result to be submitted on 5/21/07; All other results as of 04/27/07)
 - IBM POWER6 p570 (8 chips, 16 cores, 32 threads) @ 4.7 GHz with tpmC of 1,616,162.84 @ \$3.54 \$/tpmC with availability of 11/21/07 and 101,010.1775 tpmC per core
 - HP Integrity Superdome (64 chips, 128 cores, 256 threads) @ 1.6 GHz with tpmC of 4,092,799 @ \$2.93 \$/tpmC with availability of 8/23/07 and 31,953 tpmC per core
 - Unisys ES7000 (8 chips, 16 cores, 32 threads) @ 3.4 GHz with tpmC of 520,467 @ \$2.73 \$/tpmC with availability of 5/1/07 and 32,529 tpmC per core

- **SPECint_rate2006** (Source: <http://www.spec.org/> IBM p570 POWER6 results to be submitted on 5/21/07: All other results as of 04/27/07)
 - IBM POWER6 p570 (4 chips, 8 cores) @ 4.7 GHz with 242 and 30.25 per core
 - HP rx6600 (4 chips, 8 cores) @ 1.6 GHz with 102 and 12.75 per core
 - Sun Fire M8000 (16 chips, 32 cores) @ 2.4 GHz with 298 and 9.3125 per core
 - Fujitsu RX300 (4 chips, 8 cores) @ 2.66 GHz with 91.2 and 11.4 per core
 - HP ProLiant DL585 (4 chips, 8 cores) with 98.3 and 12.29 per core

- **SPECfp_rate2006** (Source: <http://www.spec.org/> IBM p570 POWER6 results to be submitted on 5/21/07: All other results as of 04/27/07)
 - IBM POWER6 p570 (4 chips, 8 cores) @ 4.7 GHz with 224 and 28 per core
 - HP rx7640 (4 chips, 8 cores) with 90.8 and 11.35 per core
 - Sun Fire M8000 (16 chips, 32 cores) @ 2.4 GHz with 313 and 9.7813 per core
 - Fujitsu RX300 (4 chips, 8 cores) @ 2.66 GHz with 60.9 and 7.61 per core
 - HP ProLiant DL585 (4 chips, 8 cores) with 91.3 and 11.41 per core

* Source: <http://www.spec.org/> IBM p570 POWER6 results to be submitted on 5/21/07: All other results as of 04/27/07;

** Source: www.tpc.org/ IBM p570 POWER6 result to be submitted on 5/21/07; All other results as of 04/27/07



Consolidate **EIGHT** racks of 320 Dell PowerEdge/860 servers onto **ONE** rack of five System p5 560Q servers*

- * IBM demonstrated running four LAMP applications per 560Q core in a test documented in the IBM white paper “Consolidation Test of LAMP applications on an IBM System p5 560Q Express server,” dated February 14, 2007 and posted at http://www.ibm.com/common/ssi/fcgi-bin/ssialias?infotype=SA&subtype=WH&appname=SS_PS_USEN&htmlfid=PSW03009USEN&attachment=PSW03009USEN.PDF. Under this configuration, 64 LAMP applications can be run on a single 16-core 560Q using optional Advanced Power Virtualization, allowing 320 LAMP applications to be run on five System p5 560Q servers. This comparison is based on running a single LAMP application per Dell PowerEdge 860 server. Advanced POWER Virtualization is only standard on the IBM System p5 590 and 595 platforms. It is not available on the IBM System p5 185 platform.
- ** Datacenter floor space usage was estimated as of January 29, 2007 using Alinean, Inc.’s ROI Analyst software. Power consumption estimates for five System p5 560Q servers and 320 Dell PowerEdge 860 servers were based on 2600W per 560Q (IBM Facts and Features at www.ibm.com) and 120W per Dell PowerEdge 860 (Dell Datacenter Capacity Planner as of February 5, 2007 at www.dell.com). To these amounts, 40% was added as an estimate for HVAC (source: Alinean, Inc.’s ROI Analyst software).
- *** As of February 3, 2007, the US List price of the five System p5 560Q servers (configured as shown above), optional Advanced Power Virtualization, OS, rack, and switches was \$979,913 (source: <http://www.ibm.com>) and the US List price of the 320 Dell PowerEdge 860 servers (configured as shown above), OS, racks, and switches was \$1,952,202 (source: <http://www.dell.com>). Prices are subject to change. Both the IBM and Dell configurations include one SUSE Linux Enterprise Server 10 with 3 year standard subscription and support license per server (source: *The reduction, if any, in floor space, power consumption, and overall total cost of acquisition depend on the specific customer, environment, application requirements, and the consolidation potential.*
- **** Image is not a Dell PowerEdge 860.



The IBM POWER6 “Grand Slam” for major workloads

- **SPECjbb2005 comparisons** (Source: <http://www.spec.org/> IBM p570 POWER6 results to be submitted on 5/21/07: All other results as of 04/27/07)
 - IBM POWER6 p570 (8 chips, 16 cores) @ 4.7 GHz with 691,975 bops (86,497 bops/JVM) and 43,125 bops per core
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- **TPC-C comparisons** (Source: www.tpc.org/ IBM p570 POWER6 result to be submitted on 5/21/07; All other results as of 04/27/07)
 - IBM POWER6 p570 (8 chips, 16 cores, 32 threads) @ 4.7 GHz with tpmC of **1,600,000 @ \$x.xx \$/tpmC with availability of xx/xx/07 and 100,000 tpmC per core**
 - HP Integrity Superdome (64 chips, 128 cores, 256 threads) @ 1.6 GHz with tpmC of 4,092,799 @ \$2.93 \$/tpmC with availability of 8/23/07 and 31,953 tpmC per core
 - Unisys ES7000 (8 chips, 16 cores, 32 threads) @ 3.4 GHz with tpmC of 520,467 @ \$2.73 \$/tpmC with availability of 5/1/07 and 32,529 tpmC per core
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* Source: <http://www.spec.org/> IBM p570 POWER6 results to be submitted on 5/21/07: All other results as of 04/27/07;

** Source: www.tpc.org/ IBM p570 POWER6 result to be submitted on 5/21/07; All other results as of 04/27/07



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Revised September 26, 2006



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Revised April 17, 2007



Notes on benchmarks and values

The IBM benchmarks results shown herein were derived using particular, well configured, development-level and generally-available computer systems. Buyers should consult other sources of information to evaluate the performance of systems they are considering buying and should consider conducting application oriented testing. For additional information about the benchmarks, values and systems tested, contact your local IBM office or IBM authorized reseller or access the Web site of the benchmark consortium or benchmark vendor.

IBM benchmark results can be found in the IBM System p and BladeCenter Performance Report at http://www.ibm.com/systems/p/hardware/system_perf.html.

All performance measurements were made with AIX or AIX 5L operating systems unless otherwise indicated to have used Linux. For new and upgraded systems, AIX Version 4.3 or AIX 5L were used. All other systems used previous versions of AIX. The SPEC CPU2000, LINPACK, and Technical Computing benchmarks were compiled using IBM's high performance C, C++, and FORTRAN compilers for AIX 5L and Linux. For new and upgraded systems, the latest versions of these compilers were used: XL C Enterprise Edition V7.0 for AIX, XL C/C++ Enterprise Edition V7.0 for AIX, XL FORTRAN Enterprise Edition V9.1 for AIX, XL C/C++ Advanced Edition V7.0 for Linux, and XL FORTRAN Advanced Edition V9.1 for Linux. The SPEC CPU95 (retired in 2000) tests used preprocessors, KAP 3.2 for FORTRAN and KAP/C 1.4.2 from Kuck & Associates and VAST-2 v4.01X8 from Pacific-Sierra Research. The preprocessors were purchased separately from these vendors. Other software packages like IBM ESSL for AIX, MASS for AIX and Kazushige Goto's BLAS Library for Linux were also used in some benchmarks.

For a definition/explanation of each benchmark and the full list of detailed results, visit the Web site of the benchmark consortium or benchmark vendor.

TPC	http://www.tpc.org
SPEC	http://www.spec.org
LINPACK	http://www.netlib.org/benchmark/performance.pdf
Pro/E	http://www.proe.com
GPC	http://www.spec.org/gpc
NotesBench	http://www.notesbench.org
VolanoMark	http://www.volano.com
STREAM	http://www.cs.virginia.edu/stream/
SAP	http://www.sap.com/benchmark/
Oracle Applications	http://www.oracle.com/apps_benchmark/
PeopleSoft - To get information on PeopleSoft benchmarks, contact PeopleSoft directly	
Siebel	http://www.siebel.com/crm/performance_benchmark/index.shtml
Baan	http://www.ssaglobal.com
Microsoft Exchange	http://www.microsoft.com/exchange/evaluation/performance/default.asp
Veritest	http://www.veritest.com/clients/reports
Fluent	http://www.fluent.com/software/fluent/index.htm
TOP500 Supercomputers	http://www.top500.org/
Ideas International	http://www.ideasinternational.com/benchmark/bench.html
Storage Performance Council	http://www.storageperformance.org/results

Revised December 12, 2006

Notes on performance estimates

rPerf

rPerf (Relative Performance) is an estimate of commercial processing performance relative to other IBM UNIX systems. It is derived from an IBM analytical model which uses characteristics from IBM internal workloads, TPC and SPEC benchmarks. The rPerf model is not intended to represent any specific public benchmark results and should not be reasonably used in that way. The model simulates some of the system operations such as CPU, cache and memory. However, the model does not simulate disk or network I/O operations.

rPerf estimates are calculated based on systems with the latest levels of AIX 5L and other pertinent software at the time of system announcement. Actual performance will vary based on application and configuration specifics. The IBM eServer pSeries 640 is the baseline reference system and has a value of 1.0. Although rPerf may be used to approximate relative IBM UNIX commercial processing performance, actual system performance may vary and is dependent upon many factors including system hardware configuration and software design and configuration.

All performance estimates are provided "AS IS" and no warranties or guarantees are expressed or implied by IBM. Buyers should consult other sources of information, including system benchmarks, and application sizing guides to evaluate the performance of a system they are considering buying. For additional information about rPerf, contact your local IBM office or IBM authorized reseller.

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