IBM

IBM Power Systems

- Total Cost of Ownership

Management
Energy
Security
Availability
Operating Systems
Virtualization

IBM®
Systems Software

Steven J Fier
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Certified POWER System Sales

Agenda

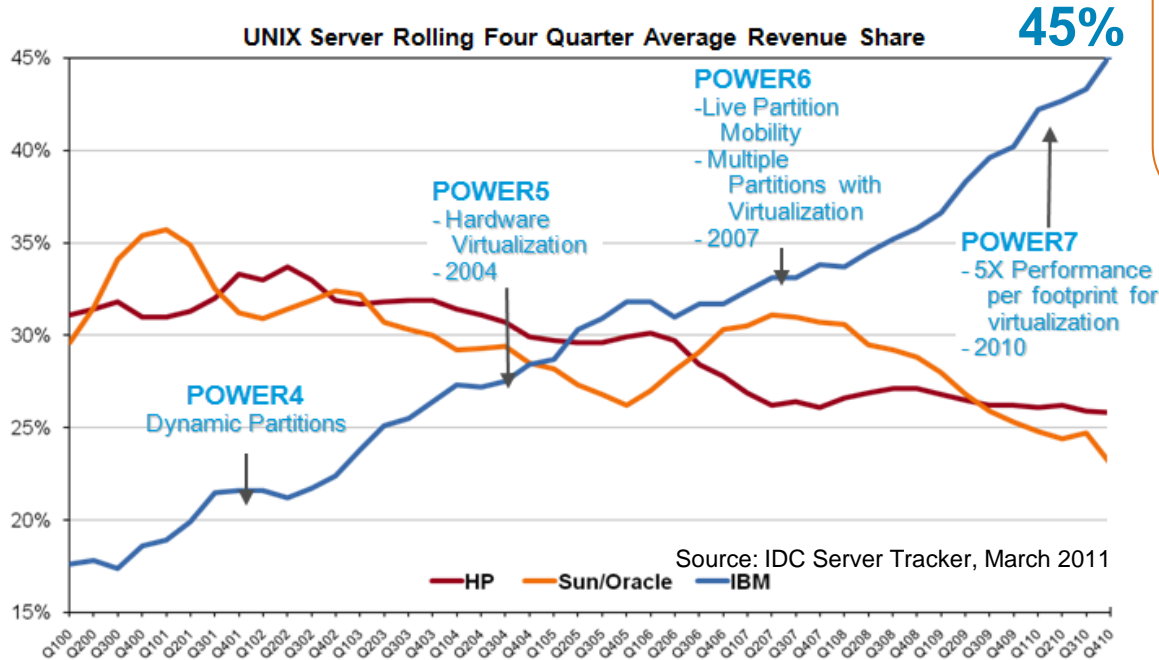**Total Cost of Ownership**

- **Market landscape of TCO and cost relationships**

- **Cost reduction and Cost avoidance**

- **Business value and Return on Investment**

- **Hardware value for Software ROI and lower TCO**

    - IBM Blue Stack, Oracle Red Stack and VMware

        - Total Cost of Ownership in a virtualized environment

IBM's ten-year march to UNIX leadership
The largest shift of customer spending in UNIX history

45%

UNIX Server Rolling Four Quarter Average Revenue Share

POWER6
-Live Partition
Mobility
- Multiple
Partitions with
Virtualization
- 2007

POWER5
- Hardware
Virtualization
- 2004

POWER7
- 5X Performance
per footprint for
virtualization
- 2010

POWER4
Dynamic Partitions

Source: IDC Server Tracker, March 2011

HP — Sun/Oracle — IBM

Q100 Q200 Q300 Q400 Q101 Q201 Q301 Q401 Q102 Q202 Q302 Q402 Q103 Q203 Q303 Q403 Q104 Q204 Q304 Q404 Q105 Q205 Q305 Q405 Q106 Q206 Q306 Q406 Q107 Q207 Q307 Q407 Q108 Q208 Q308 Q408 Q109 Q209 Q309 Q409 Q110 Q210 Q310 Q410

http://www.ibm.com/systems/migratetoibm/factory/

3,500+

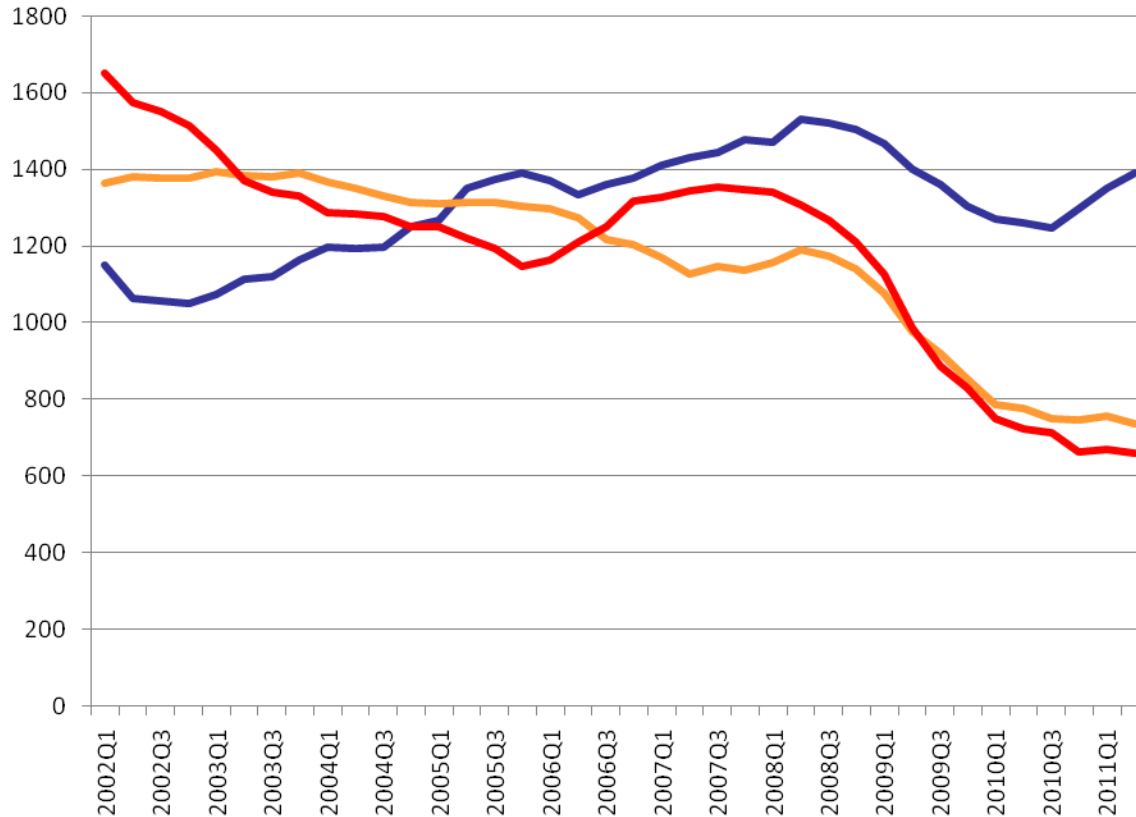### Successful Power migrations to date.

- The pace is accelerating & exceeding expectations: 500+ migrations to Power in 2009, over 1,000 in 2010

- Over 90% come from HP-UX or Oracle Solaris, along with x86 consolidations

- POWER grew 5% in 4Q10, to 45% market share

3

Numbers don't lie

Ten Year Unix Systems Revenue - 4QRA

**2011 Q2
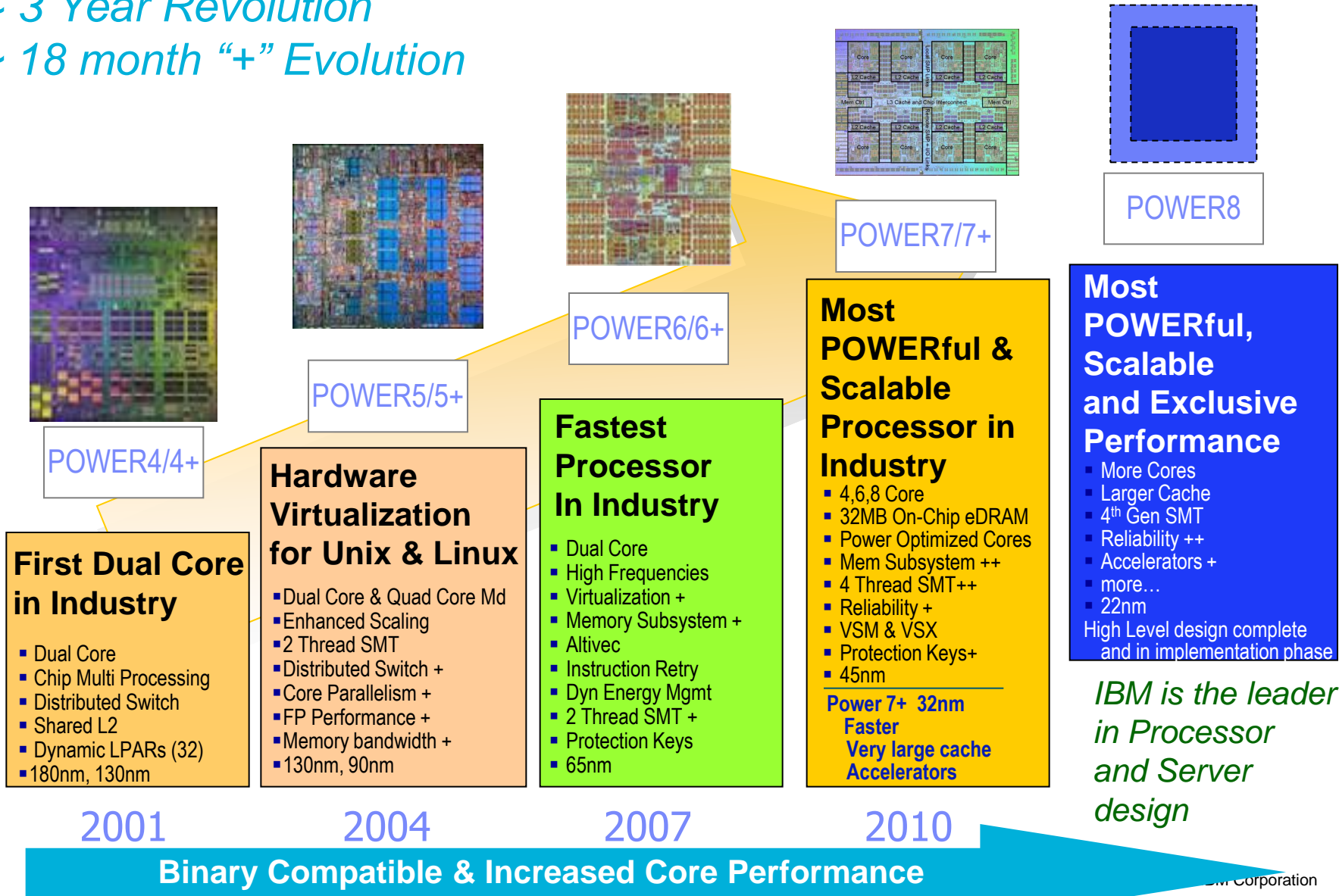IBM $1.375B
Oracle $719M
HP $644M**

Legend:
- IBM
- Hewlett-Packard
- Sun/Oracle

IBM is a growth platform with rising star increased investment
HP and Sun continue decline with cash cow divest strategy
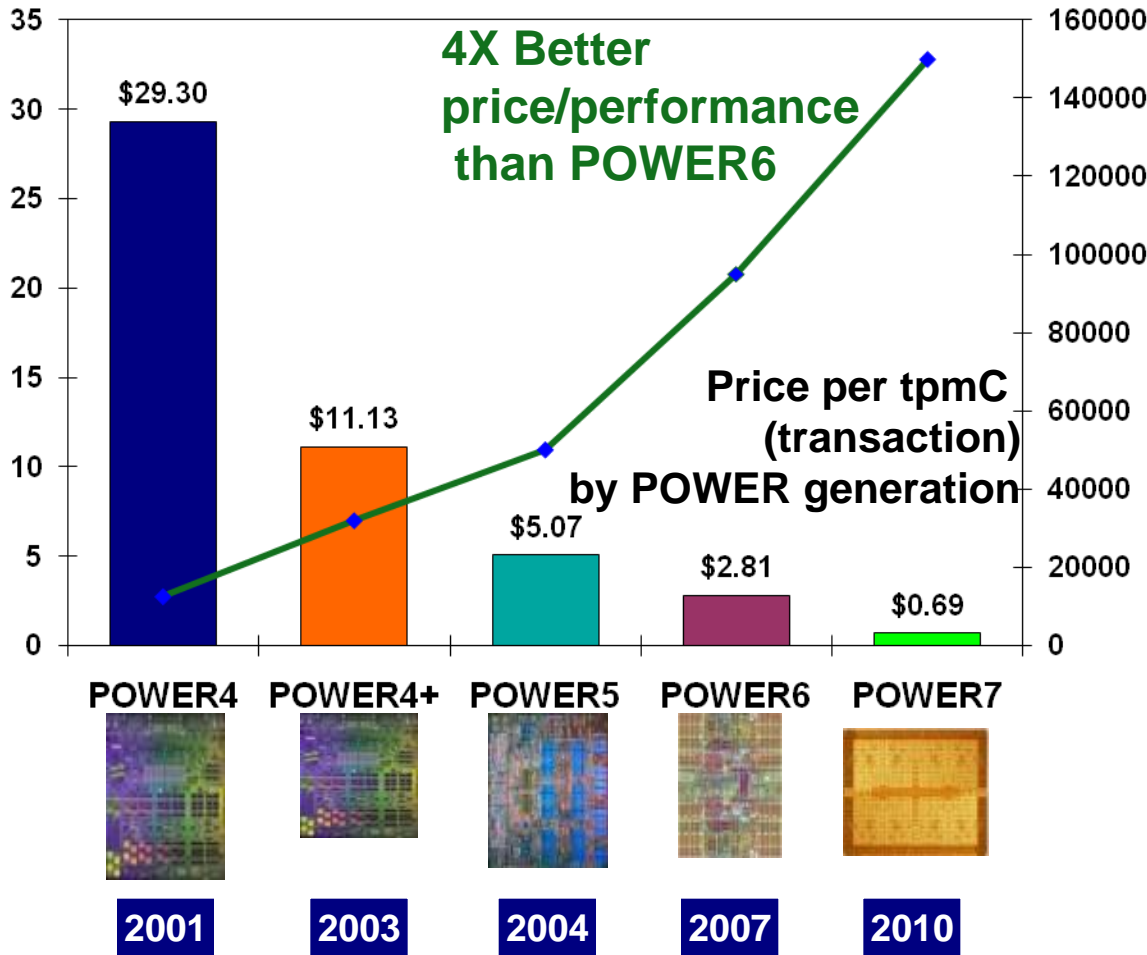
4

IBM POWER Processor Roadmap

~ 3 Year Revolution

~ 18 month "+" Evolution

POWER8

POWER7/7+

POWER6/6+

POWER5/5+

POWER4/4+

Most POWERful, Scalable and Exclusive Performance

- More Cores
- Larger Cache
- 4th Gen SMT
- Reliability ++
- Accelerators +
- more…
- 22nm

High Level design complete and in implementation phase

IBM is the leader in Processor and Server design

Most POWERful & Scalable Processor in Industry

- 4,6,8 Core
- 32MB On-Chip eDRAM
- Power Optimized Cores
- Mem Subsystem ++
- 4 Thread SMT++
- Reliability +
- VSM & VSX
- Protection Keys+
- 45nm

Power 7+ 32nm
Faster
Very large cache
Accelerators

Fastest Processor In Industry

- Dual Core
- High Frequencies
- Virtualization +
- Memory Subsystem +
- Altivec
- Instruction Retry
- Dyn Energy Mgmt
- 2 Thread SMT +
- Protection Keys
- 65nm

Hardware Virtualization for Unix & Linux

- Dual Core & Quad Core Md
- Enhanced Scaling
- 2 Thread SMT
- Distributed Switch +
- Core Parallelism +
- FP Performance +
- Memory bandwidth +
- 130nm, 90nm

First Dual Core in Industry

- Dual Core
- Chip Multi Processing
- Distributed Switch
- Shared L2
- Dynamic LPARs (32)
- 180nm, 130nm

2001   **2004**   **2007**   **2010**

Binary Compatible & Increased Core Performance

IBM

IBM POWER7
➔ Dramatic Price Performance improvements

4X Better price/performance than POWER6

Price per tpmC (transaction) by POWER generation

POWER4 — $29.30
POWER4+ — $11.13
POWER5 — $5.07
POWER6 — $2.81
POWER7 — $0.69
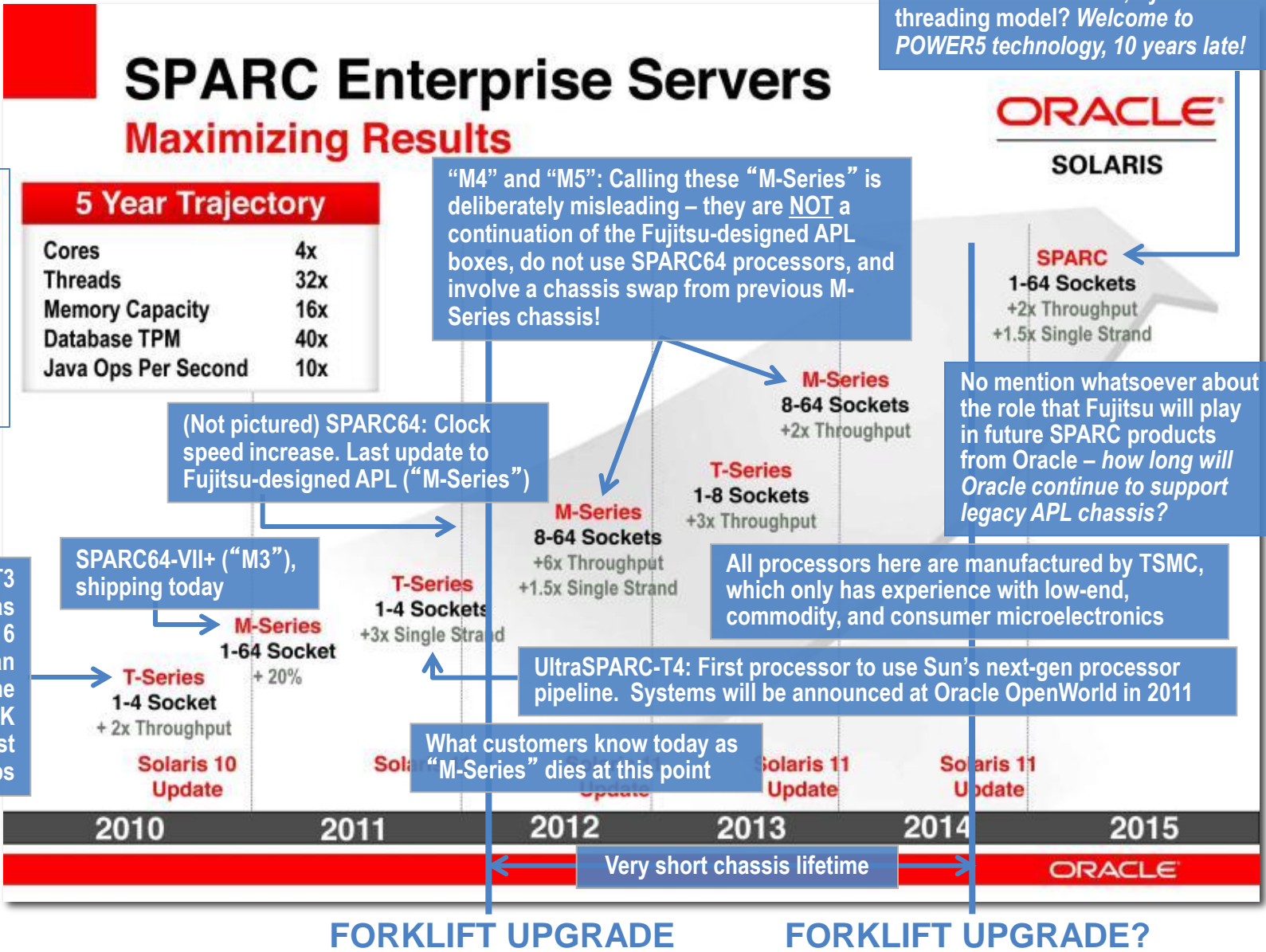
2001 — 2003 — 2004 — 2007 — 2010

- **POWER7 is competitive price/performance leadership for TPC-C**

- **Power 780 has one of the 10 lowest $/tpmC on tpc.org**
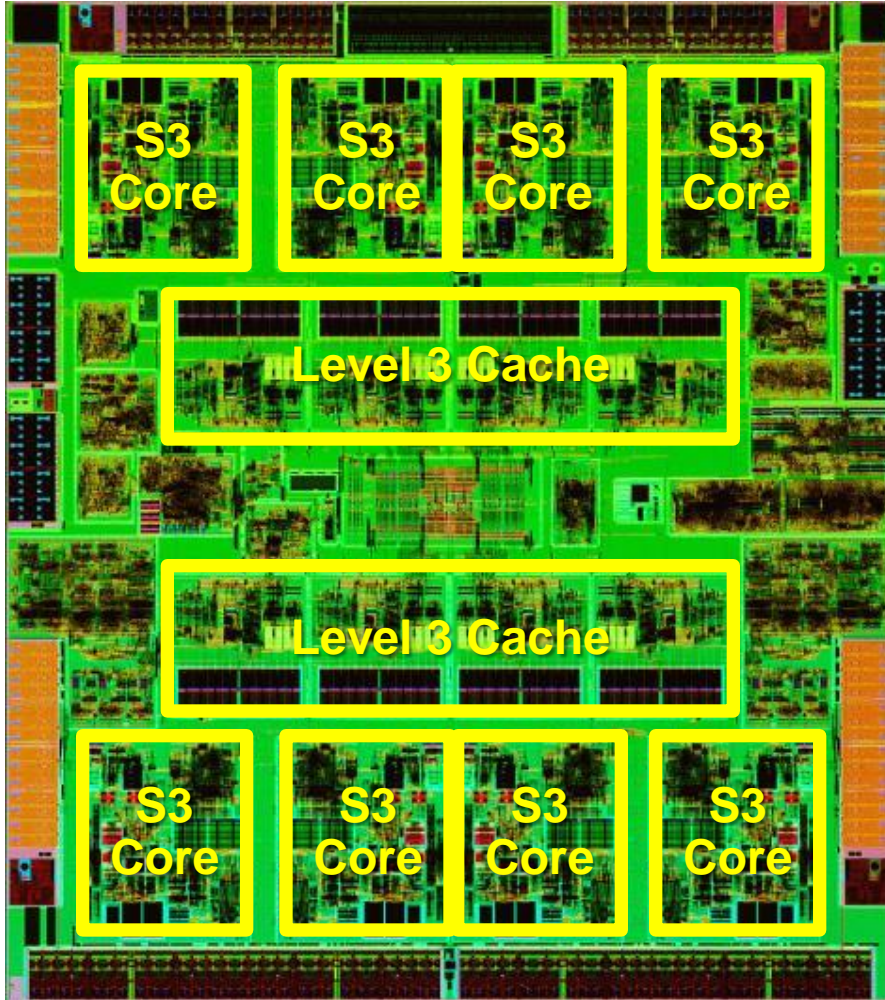
- **Power 780 has best performance per core**

SPARC Roadmap: What you need to know

No more "M-Series"/"T-Series": Is this a new combined, dynamic threading model? *Welcome to POWER5 technology, 10 years late!*

SPARC Enterprise Servers
Maximizing Results

ORACLE
SOLARIS

All trajectory comparisons are wishful objectives done relative to Sun's existing SPARC baseline, not to POWER or x86! IBM and Intel blow SPARC away today, does Oracle think that the competition will stand still for the next five years?

5 Year Trajectory

Cores	4x
Threads	32x
Memory Capacity	16x
Database TPM	40x
Java Ops Per Second	10x

"M4" and "M5": Calling these "M-Series" is deliberately misleading – they are NOT a continuation of the Fujitsu-designed APL boxes, do not use SPARC64 processors, and involve a chassis swap from previous M-Series chassis!

SPARC
1-64 Sockets
+2x Throughput
+1.5x Single Strand

No mention whatsoever about the role that Fujitsu will play in future SPARC products from Oracle – *how long will Oracle continue to support legacy APL chassis?*

(Not pictured) SPARC64: Clock speed increase. Last update to Fujitsu-designed APL ("M-Series")

M-Series
8-64 Sockets
+2x Throughput

T-Series
1-8 Sockets
+3x Throughput

UltraSPARC-T3 processor was supposed to be 6 months earlier than this due to the cancellation of ROCK when Sun last showed roadmaps

SPARC64-VII+ ("M3"), shipping today

M-Series
1-64 Socket
+ 20%

T-Series
1-4 Sockets
+3x Single Strand

M-Series
8-64 Sockets
+6x Throughput
+1.5x Single Strand

All processors here are manufactured by TSMC, which only has experience with low-end, commodity, and consumer microelectronics

T-Series
1-4 Socket
+ 2x Throughput

UltraSPARC-T4: First processor to use Sun's next-gen processor pipeline. Systems will be announced at Oracle OpenWorld in 2011

What customers know today as "M-Series" dies at this point

Solaris 10
Update

Solaris 11
Update

Solaris 11
Update

2010	2011	2012	2013	2014	2015

ORACLE

Very short chassis lifetime

FORKLIFT UPGRADE   **FORKLIFT UPGRADE?**

UltraSPARC-T4

- A transitional SPARC processor based on a new "S3" (formerly "VT") core, pin-compatible with T3
  - Only the cores and L3 cache changed
  - Half the number of cores vs. T3
  - The rest of the chip is identical to T3
  - Designed for fast time-to-market
- Designed specifically for multi-threaded, throughput-oriented workloads like web and app servers
  - Many cores and threads
  - Very small caches
  - Will probably handle small or medium OLTP workloads reasonably well
  - Definitely not suited for data warehousing or business analytics
- However, Oracle will position T4 systems as a general-purpose computing platform suitable for a growing variety of workloads

IBM Chip technology vs. Oracle SPARC CMT T4

IBM Chip Technology Lead
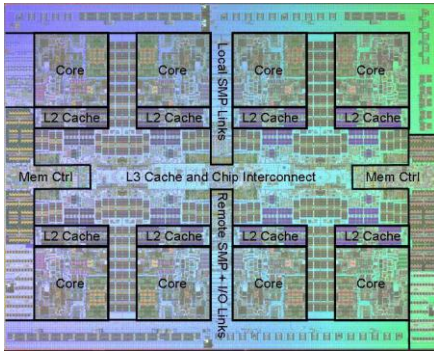
2-4X
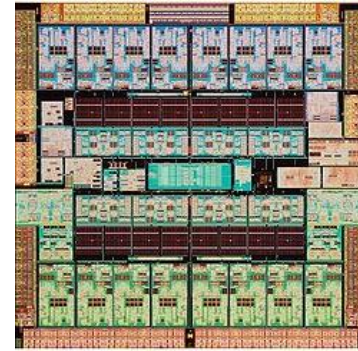
IBM POWER7 - 2010
45nm
Octo-core
4GHz
2 GHz Interconnect
L2 2MB, L3 32MB
4 - Simultaneous Multi-Threading
Scale to 32 Sockets / 256 Cores
Hardware Virtualization
Switch on every chip with
    direct connection fabric

Sun SPARC T4
40nm
8 Simplified cores
3GHz
?MHz interconnect
L2 128KMB, L3 4MB
8 – Sharing Threads
Scale to 4 Sockets, 32 cores
Limited Thread based partitioning

IBM POWER is the undisputed leader
in server technology

IBM

More SAP performance than any system in the industry

20% more performance … one-fourth the number of cores vs. Sun M9000

37,000 SAP users on SAP SD 2 Tier

#1 Overall

New HP Nehalem-EX

Power 780 with DB2®

#1 4-socket

1.5X

| Sun T5440 SPARC *4/32/256* | HP DL580 G7 Nehalem-EX *4/32/64* | Power 750 POWER *4/32/128* | HP DL980 G7 Nehalem-EX *8/64/128* | Power 780 POWER *8/64/256* | Sun M9000 SPARC *32/128/256* | Sun M9000 SPARC *64/256/512* |

← 4 sockets → ← 8 sockets → 32 sockets 64 sockets

SAP Users

40,000 / 30,000 / 20,000 / 10,000 / 0
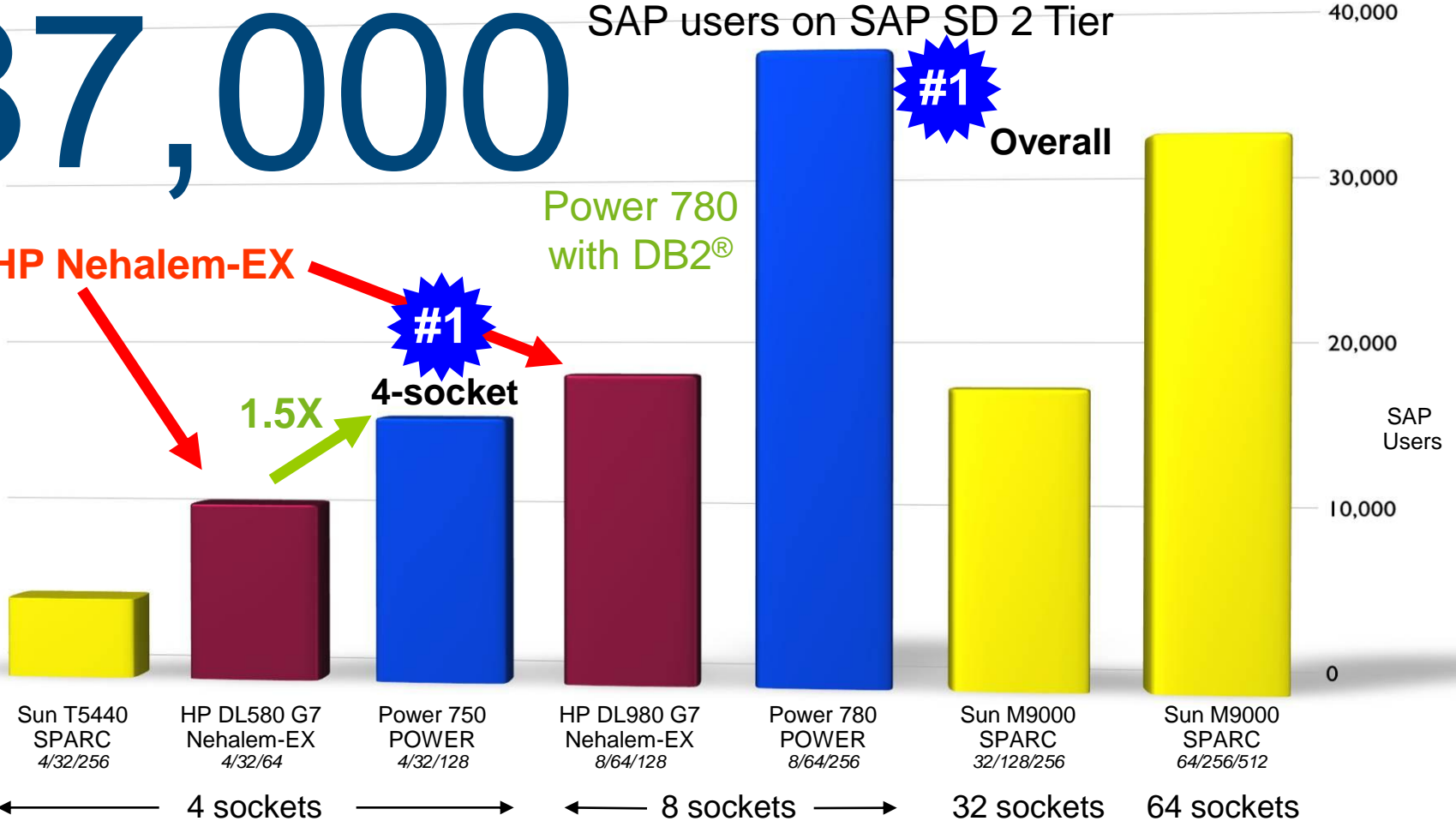
Systems are listed with processor chips/core/threads under system name; IBM Power System 780, 8p / 64–c / 256–t, POWER7, 3.8 GHz, 1024 GB memory, 37,000 SD users, dialog resp.: 0.98s, line items/hour: 4,043,670, Dialog steps/hour: 12,131,000, SAPS: 202,180, DB time (dialog/ update):0.013s / 0.031s, CPU utilization: 99%, OS: AIX 6.1, DB2 9.7, cert# 2010013; SUN M9000, 64p / 256–c / 512–t, 1156 GB memory, 32,000 SD users, SPARC64 VII, 2.88 GHz, Solaris 10, Oracle 10g , cert# 2009046; All results are 2-tier, SAP EHP 4 for SAP ERP 6.0 (Unicode) and valid as of 7/13/2010; Source: http://www.sap.com/solutions/benchmark/sd2tier.epx - See Power 780 benchmark details for more information

The new dynamics of I/T Budgets

Software pricing is a leading factor in hardware selection

2010

Other

Hardware

+/- 10%

10 - 20%

30 - 40%

25 - 50%

People

Software

IDC
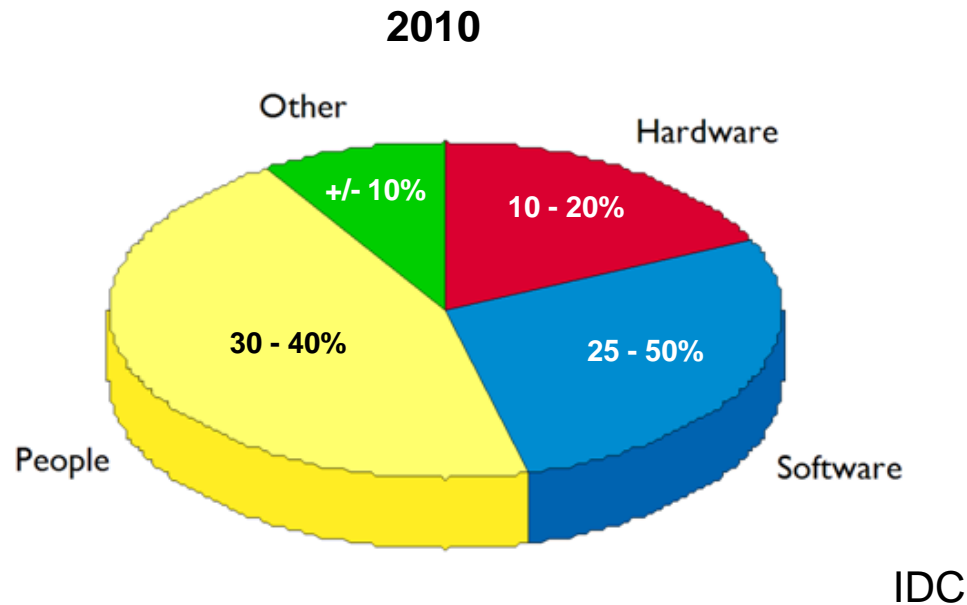
**The new trend is how to buy better hardware
to dramatically decrease people and software costs.**

Cost Reduction, Cost Avoidance and Business Efficiency

Total Cost of Ownership

Return on Investment

Business value

Total Cost of Acquisition "Commodity"

Cost Reduction

Virtualization

Facilities

Systems Mgmt

- Server Consolidation
- Multi-Tier Consolidation
- Networking Elimination
- Maintenance Costs
- Energy Efficient Systems
- Virtualization Mgmt
- Site & Facilities Services

- Systems Management and Automation
- Upgradability
- Power Monitoring
- Storage Virtualization
- Capacity on Demand
- Internal/External Clouds

Cost Avoidance

Dynamic Provisioning

Business Resiliency/ Security

Back-up & Recovery

Facilities

- Reduced Software Licenses
- Facilities Optimization
- Monitoring / Discovery
- Service Mgmt Strategy & Planning
- Data center automation
- Automated Scheduling

- Automation
- Geographically dispersed clusters
- Isolation, Integrity, Identity
- Business Recovery / Continuity
- Business Service Management
- Continuous availability
- Automated archiving

Cost Avoidance:

- **Software capacity licenses:** When you already own the software but need more licenses because you are either out of capacity or a new project is on a separate server which can not leverage the licenses in the virtualized environment.

- **Outages:**
    IT system downtime is leading to the **loss of $26.5 billion** in revenue each year for North American businesses, according to a study from CA Technologies. Downtime reduces the average company's earning power by about 29 percent, the study found. On average, companies suffer from about 10 hours of IT downtime a year -- a total of 1.6 million hours of outage time across the country. The study found that even after service to critical systems is restored, another 7.5 hours of operation is compromised as lost data is recovered -- for a total of another 1.25 million lost hours. Respondents estimated that post-outage impairment cut the ability to generate revenue by an average of 17 percent. Financial services companies **lost an average of $224,297 per year** while public sector losses came in considerably lower, at $99,094 annually.

- **Datacenter Upgrades**
    - Electric / UPS upgrade: $1M to $10M
    - Datacenter thermal upgrade $5M to $20M
    - New datacenter $20M-$100M

Enterprise scalable servers decrease / avoid these costs

13

TCO and Software pricing:

"Total Cost of Ownership –
All software that is priced by Core/Processor should be on
hardware that is refreshed/upgraded every three years or less and
on hardware that can be virtualized with sub-capacity pricing."

- **IBM "Blue stack" software pricing: PVU pricing Sub-capacity pricing**
  IBM prices software to provide the highest value on IBM hardware

- **Oracle "Red Stack" software pricing: Core factor table, virtualization**
  support and sub-capacity pricing
  Selling around the perceived 2X price on Power vs. x86

- **VMware vs. PowerVM**
  TCA and TCO of Power vs. x86/VMware

IBM Software Pricing: Processor

- PVU pricing http://www-01.ibm.com/software/lotus/passportadvantage/pvu_licensing_for_customers.html

PVU Table per Core

Processor Vendor	Processor Name	Server model numbers	Maximum number of sockets per server	One-Core (1)	Dual-Core (2)	Quad-Core (4)	Hexa-Core (6)	Octi-Core (8)	16-Core (16)	IFL Engine	Proc. Model Number	PVUs per Core
IBM	POWER7 [4]	770,780,795	> 4			■	■	■			All	120
		750,755,775 PS704	4				■	■			All	100
		PS700-703, 710-740	2			■	■	■			All	70

PVU Table per Core (x86)

Processor Vendor	Processor name	Maximum number of sockets per server	One-Core (1)	Dual-Core (2)	Quad-Core (4)	Hexa-Core (6)	Octi-Core (8)	10-Core (10)	12-Core (12)	Processor Model Number[1]	PVUs per Core
Intel®	Xeon® (Nehalem EX)[2]	> 4								6500 to 6599 7500 to 7599	120
		4		■	■	■	■	■		E3-1200 to 1299 E7-2800 to 2899	100
		2								E7-4800 to 4899 E7-8800 to 8899	70

Power delivers higher performance and utilization rates, but the PVU pricing is the same

10 IBM Corporation

IBM

IBM Software on Power System:

- Same PVU pricing as x86 but more value on Power

- Power7 provides 2X added value per license

  - 2X higher performance:
    - 30% - CPU speed
    - 20% - Distributed switch architecture
    - 15% to 30% - Virtualization efficiency
    - 15% - I/O subsystem in hardware and software
    - 10% to 30% - Intelligent 4 thread Simultaneous Multi-threading
    - 10% - Intelligent 32MB Cache
    - 10% - Memory bandwidth
    - 50% -100% - Higher Utilization rates
  - Higher performance per PVU and higher realized value per PVU from higher utilization rates

IBM Software on IBM hardware Power equation:
More performance + higher utilization rates
+ less cores + low virtualization overhead
> 2X times the value per software license

Intel claims "Up to 99% Performance of Power7"

Intel Delivering a New Era of Mission Critical Computing

Xeon® E7 vs. latest SPARC*		Xeon E7 vs. latest Power*
SUN T5440*	SUN M4000*	POWER 750 Express*
Xeon® E7-4800	Xeon® E7-4800	Xeon® E7-4800
Up to **160%** Performance	at **50%** System Cost	Up to **600%** Performance	at **50%** System Cost	Up to **99%** Performance	at **20%** System Cost

Make no Compromises and Save with Industry Standard Intel® Xeon®

Source: Published results as of April 5th 2011. See backup slides for details.
Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products.
* Other names and brands may be claimed as the property of others.

What Intel is not saying:

> The performance claim is for SPECint
>> - only measures integer and does not measure I/O
>
> Their chip has 10 cores vs. Power7 8 cores
>
> IBM software pricing will be at least 25% more expensive on Intel

Running WAS - Save more than $400K in 3-year Total Cost of Acquisition (TCA)!

36 Dell PowerEdge 2950 III at 15% utilization TCA of $1.2 M

- 288 total cores @ 3.0GHz
- $137,520 annual WebSphere Application Server SWMA
- $42,051 annual energy costs @ $0.1021 / kWhr

Lowest cost, most energy efficient

Two IBM Power 740 Express at 80% utilization with PowerVM with a systems TCA of $241K

- 2x16 (=32) total cores @ 3.55GHz
- $21,392 annual WebSphere Application Server SWMA
- $3,489 annual energy costs @ $0.1021 / kWhr

Five Dell PowerEdge R810 systems at 40% utilization with VMware with a systems TCA of $665K

- 80 total cores @ 2.26GHz
- $76,400 annual WebSphere Application Server SWMA
- $10,509 annual energy costs @ $0.1021 / kWhr

■ **Save up to 77% of WAS SWMA**

■ **Save up to 91% cost of energy**

■ **Save up to 94% of floor space**

*Source: STG Study; See chart Notes for sources and substantiation

Comparison of IBM software costs on IBM Power and HP x86

IBM Power7 770

- 7680 PVU's
- 64 Cores / 256 threads
- 3.5GHz
- 24 PCIe slots internal
- 160 PCIe Slots in I/O expansions
- Reliability / Availability / Serviceability
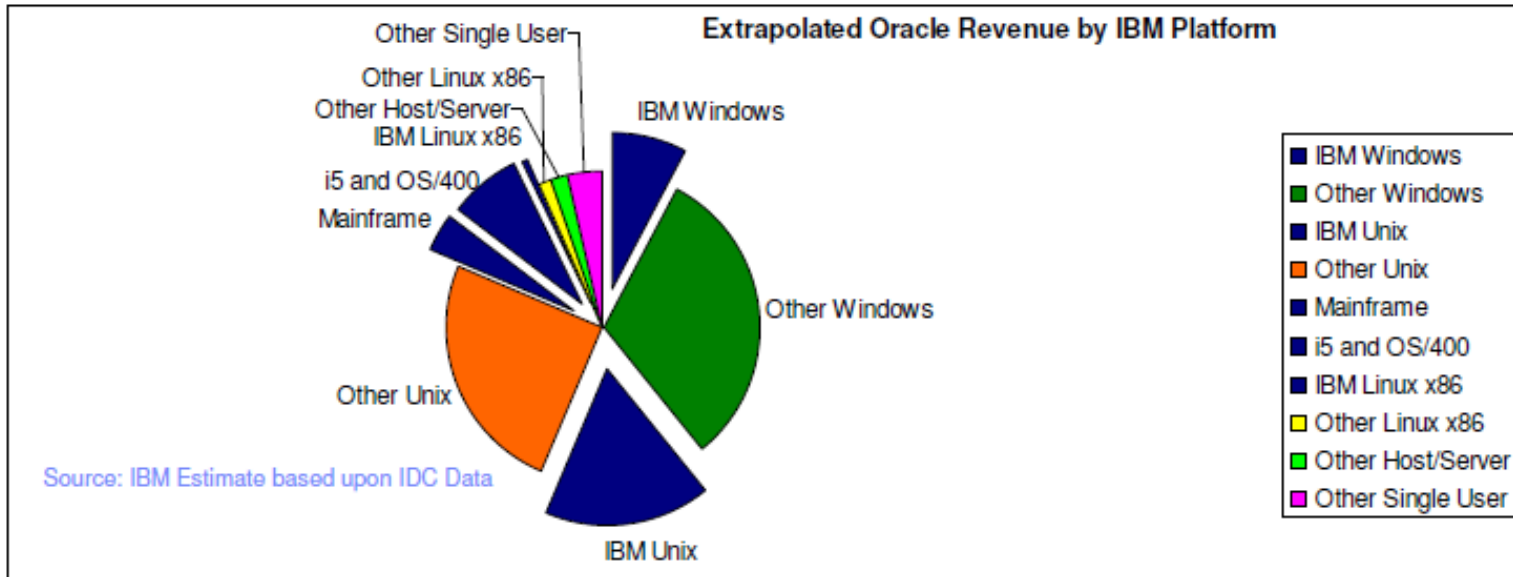- DB2 $405 * 7680 = $3.11M
- WAS ND $184 * 7680 = $1.41M

HP DL980

- 9600 PVU's (25% more licenses required)
- 80 Cores / 160 threads
- 2.4GHz
- 16 PCIe slots max (11 full/5 short)
- DB2 $405 * 9600 = $3.89M ($778K more)
- WAS ND $184 * 9600 = $1.77M ($353K more)

Power Systems provides higher performance and requires less software licenses than x86 servers.

IBM Power Systems is the Leading Unix Platform for Oracle
IBM Total ~ 37% Oracle Ecosystem Share

Extrapolated Oracle Revenue by IBM Platform

Other Single User
Other Linux x86
Other Host/Server
IBM Linux x86
i5 and OS/400
Mainframe
IBM Windows
Other Windows
Other Unix
IBM Unix

Legend:
- IBM Windows
- Other Windows
- IBM Unix
- Other Unix
- Mainframe
- i5 and OS/400
- IBM Linux x86
- Other Linux x86
- Other Host/Server
- Other Single User

Source: IBM Estimate based upon IDC Data

IBM continues to grow hardware revenue and our market share in Oracle's Database, Middleware, and Applications space

IBM has seen 8 consecutive quarters of revenue growth in the Oracle market
(Source: IBM Oracle Alliance Quarterly Revenue Report)

Unix continues to be Oracle's largest revenue generator of SW license revenue
(Source: IDC Tracker, 2010)

IBM continues to take share in the Unix market and now has 40% share
(Source: IDC Tracker, 2010)

IBM

ORACLE®

Oracle Processor Core Factor Table

Vendor and Processor	Core Processor Licensing Factor
SPARC T3 processor	0.25
SPARC64 VII+	0.5
Intel Xeon Series 56XX, Series 65XX, Series 75XX, Series E7-28XX, Series E7-48XX, Series E7-88XX or earlier Multicore chips	0.5
Intel Itanium Series 93XX *(For servers purchased on or after Dec 1st, 2010)*	1.0
IBM POWER6	1.0
IBM POWER7	1.0
IBM System z (z10 and earlier)	1.0

- **Oracle charges a premium for high performance servers which scale and have higher utilization levels with virtualization**

Oracle recommends x86 because they make more money
Two DL980's (80cores) in a RAC configuration = 160 cores *.5 = 80 Licenses

ORACLE United States

| Home | Database | Application Server | Enterprise Manager | E-Business Suite | Media Packs | On Demand | Documentation |

Product	Unit Price	Quantity		Total Price
Oracle Database Enterprise Edition (Processor; Perpetual)	US$47,500.00	80	🗑	US$3,800,000.00
✔ First Year Support	US$10,450.00			US$836,000.00
Oracle Real Application Clusters (Processor; Perpetual)	US$23,000.00	80	🗑	US$1,840,000.00
✔ First Year Support	US$5,060.00			US$404,800.00
Oracle Database Vault (Processor; Perpetual)	US$23,000.00	80	🗑	US$1,840,000.00
✔ First Year Support	US$5,060.00			US$404,800.00
Oracle Advanced Compression (Processor; Perpetual)	US$11,500.00	80	🗑	US$920,000.00
✔ First Year Support	US$2,530.00			US$202,400.00
Oracle Partitioning (Processor; Perpetual)	US$11,500.00	80	🗑	US$920,000.00
✔ First Year Support	US$2,530.00			US$202,400.00

Promotion Code [_____] [Apply]

☑ **Include First Year Support for License Products**

Subtotal: US$11,370,400.00

X86 reliability requires Oracle RAC
Oracle's lack of sub-capacity pricing on VMware forces licensing of all cores for all software

Market Positioning of Virtualization Offerings

- **IBM System z – mission critical & highest business value – the Gold Standard but still improving**

- **IBM PowerVM – databases, enterprise applications, and data centric applications – the gold standard for Unix**

- **EMC VMware – standard for x86 virtualization – infrastructure and small apps – security, RAS, and scaling limitations – expensive, limited Oracle supt.**

- **Red Hat KVM – lower cost alternative to VMware – very capable, open source technology but offerings are still immature**

- **Microsoft Hyper-V – still lagging but improving – bundled with Windows**

- **Oracle VM for x86 – Xen based, little acceptance by market or by open source community**

- **Oracle VM for SPARC – very limited capabilities (sharing, mobility, etc.) – HW threads get bound to LDOMs, major restrictions on LDOM mobility**

- **HP Integrity VM – hosted hypervisor – MS, Red Hat, & Oracle dropped support**

Market Positioning of PowerVM and VMware

PowerVM

- Virtualization and partitioning since 2001
- Microcode/eeprom hardware implementation
- Enterprise mission critical platform that hosts multi-tier consolidation
- I/O subsystem is managed in separate hardware and software partitions
- Scalability: from 1 thread to 1024 simultaneous treads (32 chips / 256 cores)
- Integrated in hardware and additional enhancements priced as features
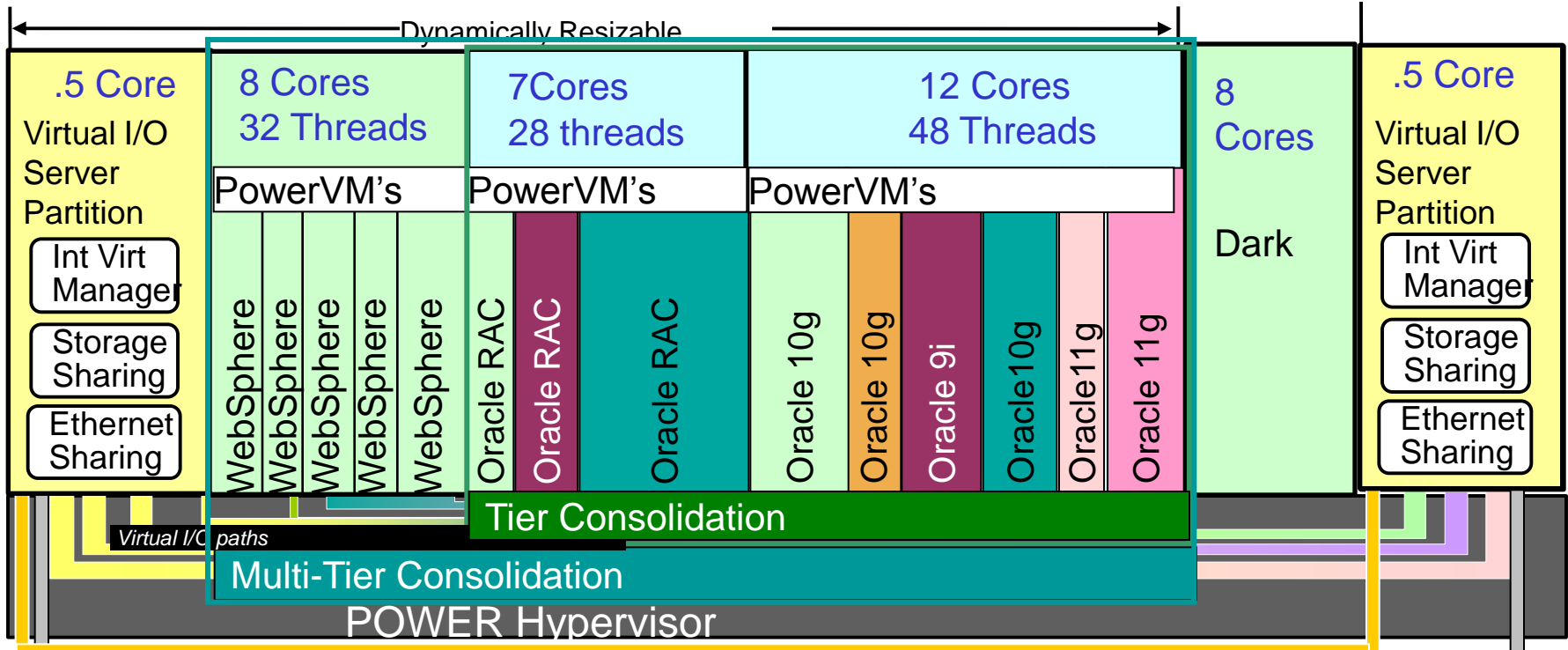- **AIX, i/OS, RedHat, SuSe, but no Windows support**

VMware

- PC virtualization since 1999, server virtualization since 2001
- Proven 20 to 1 compression ration of real to virtual servers (of the right type)
- Standard for x86 virtualization - Infrastructure and small applications
- **Pure software virtualization with 15% to 30% overhead in production workloads**
- **Scalability: v4 ➜ 1 to 8 threads (.4 chips / 4 cores)**
                      v5 ➜ 1 to 32 threads (1.6 chips /16 cores)
- **No partitioning technology**
- **I/O is handled within virtual machines**
- **No Oracle technical support or sub-capacity pricing support**
- **Expensive and now priced on virtual resources**

Power Systems Virtualization − traditional selling points

- **Integrated virtualization:** PowerVM is integrated firmware, not add-on software

- **Performance without penalty:** all benchmarks published in a virtualized environment

- **Dynamic resource sharing:** drive systems to very high utilization for maximum ROI; optimize memory usage via Active Memory Sharing, Active Memory Expansion, Memory De-duplication (coming soon)

- **Dynamic LPAR resources:** add & remove VM resources while VM is active

- **Dynamic HW resources:** CUOD, HW sparing, dynamic HW resource enablement

- **Scalability:** far more VMs per server, much larger VM sizes, scales linearly

- **Superior platform RAS:** Alternate CPU recovery, multiple VIOS with multipathing, instruction level retry, memory mirroring, OS/FW resilience, hardware sparing, hardware enforced I/O access control

- **Superior security:** firmware approach limits attack surface (virus free; hack resistant)

- **OS virtualization:** System and Application WPARs

- **Compatibility across generations:** avoid or defer impact to software assets

- **Live partition mobility:** non-disruptive, for VMs of any size up to entire system, many concurrently, across HW generations (P6, P7), WPAR mobility across AIX generations

Power Systems Virtualization
– Proven and Pervasive

Dynamically Resizable

.5 Core	8 Cores 32 Threads	7Cores 28 threads	12 Cores 48 Threads	8 Cores	.5 Core

.5 Core

Virtual I/O Server Partition

- Int Virt Manager
- Storage Sharing
- Ethernet Sharing

8 Cores / 32 Threads

PowerVM's

- WebSphere
- WebSphere
- WebSphere
- WebSphere
- WebSphere

7Cores / 28 threads

PowerVM's

- Oracle RAC
- Oracle RAC
- Oracle RAC

12 Cores / 48 Threads

PowerVM's

- Oracle 10g
- Oracle 10g
- Oracle 9i
- Oracle10g
- Oracle11g
- Oracle 11g

8 Cores

Dark

.5 Core

Virtual I/O Server Partition

- Int Virt Manager
- Storage Sharing
- Ethernet Sharing

Tier Consolidation

Virtual I/O paths
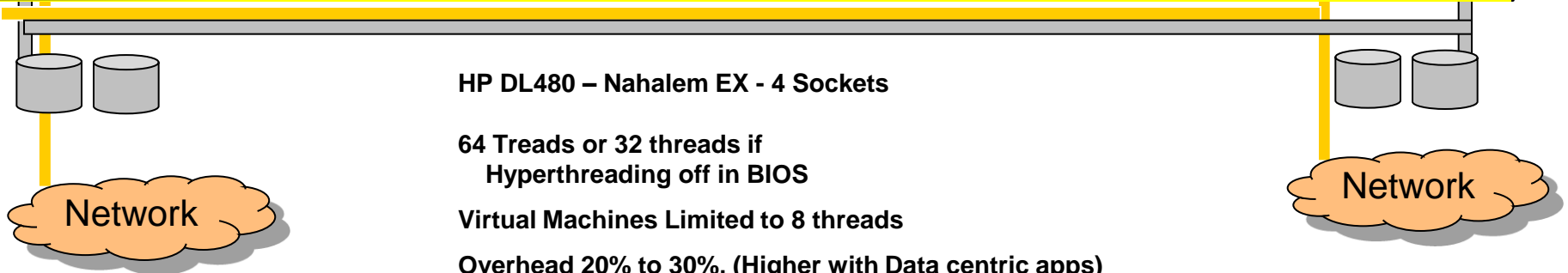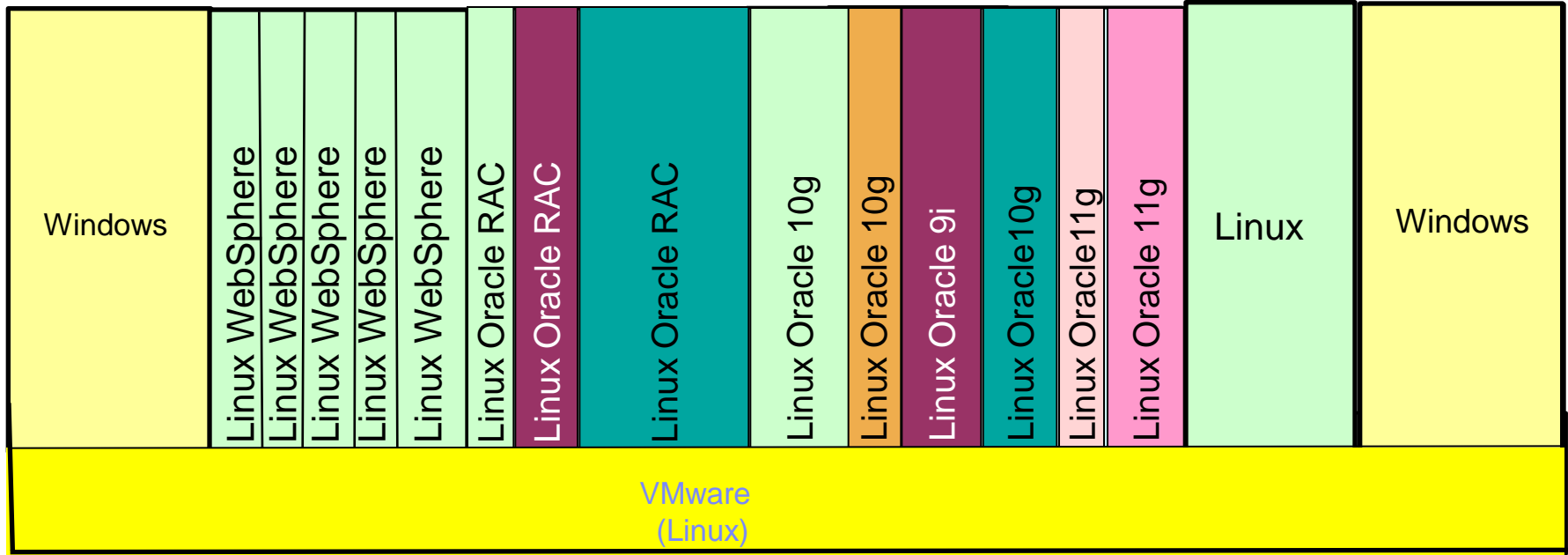
Multi-Tier Consolidation

POWER Hypervisor

Network

Network

Oracle Pricing on Power7 32 core system

Oracle EE: 19 cores

Oracle RAC: 7 cores

WebSphere: 800 PVUs

Do not pay middleware prices for VIO server cores

Virtual Network to WebSphere works at memory speeds

EMC VMware vSphere V4 – Limitations and overhead

Each Virtual Machine 1-8 Threads

| Windows | Linux WebSphere | Linux WebSphere | Linux WebSphere | Linux WebSphere | Linux WebSphere | Linux Oracle RAC | Linux Oracle RAC | Linux Oracle RAC | Linux Oracle 10g | Linux Oracle 10g | Linux Oracle 9i | Linux Oracle10g | Linux Oracle11g | Linux Oracle 11g | Linux | Windows |

VMware (Linux)

Network

Network

HP DL480 – Nahalem EX - 4 Sockets

64 Treads or 32 threads if Hyperthreading off in BIOS

Virtual Machines Limited to 8 threads

Overhead 20% to 30%, (Higher with Data centric apps)

Entire system Software Licensing overlap

Limited Oracle Support

I/O constraints

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Why is Virtualization and Scalability important?

The #1 reason IT managers deploy virtualization solutions is **workload consolidation**

Put simply, the more workloads that can be encapsulated within VMs and combined onto a single server, the higher the consolidation ratio, software license reduction and greater the **cost reduction**

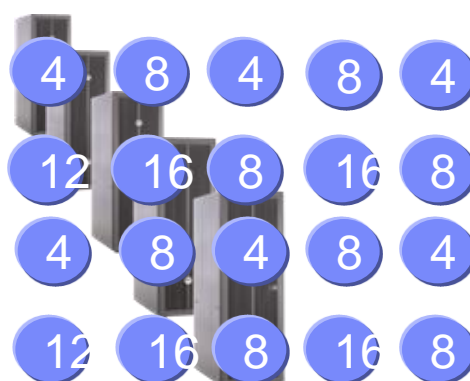The integrated combination of POWER architecture and PowerVM makes possible far higher consolidation ratios than scale-out scenarios
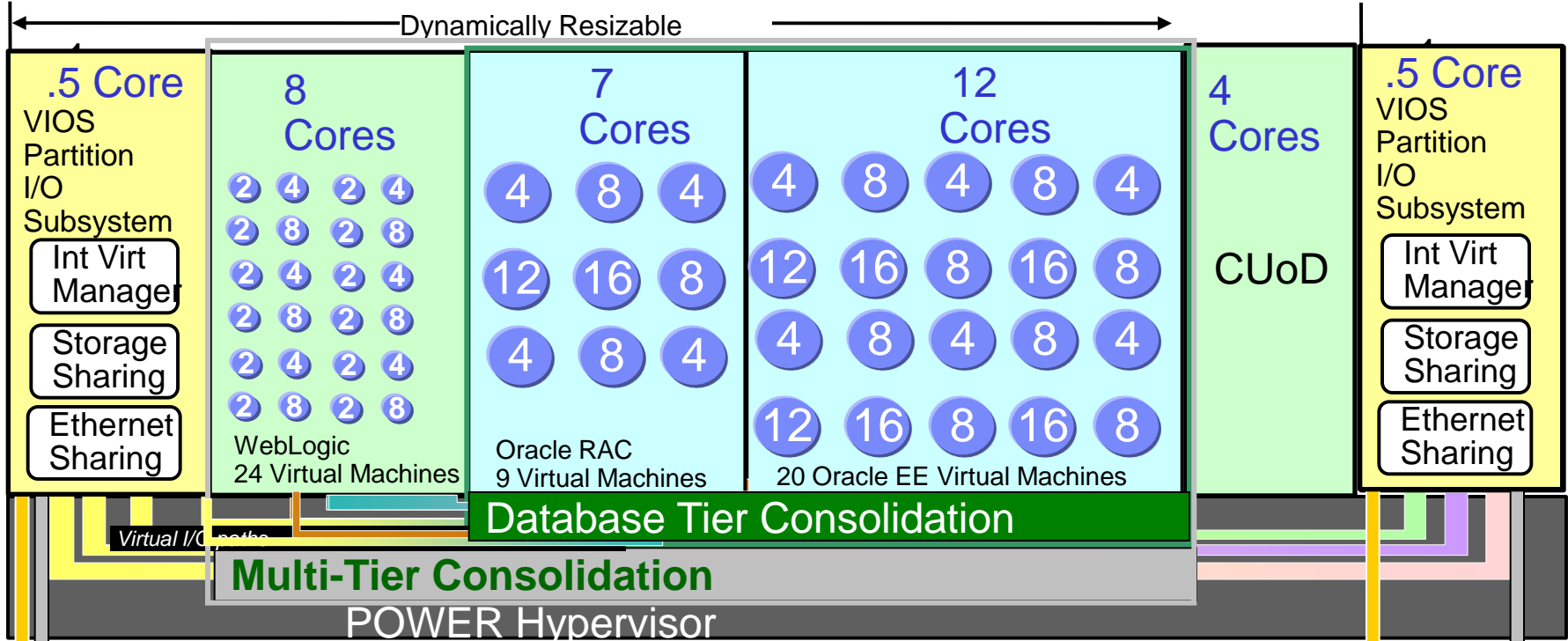
24 WebSphere Servers

9 Oracle RAC Servers

20 Oracle EE Servers

PowerVM

(x) #cores in each physical server

Power Systems Virtualization
– Proven, Pervasive and Providing Software Efficiency

Dynamically Resizable

.5 Core
VIOS
Partition
I/O
Subsystem

Int Virt Manager

Storage Sharing

Ethernet Sharing

8 Cores

2 4 2 4
2 8 2 8
2 4 2 4
2 8 2 8
2 4 2 4
2 8 2 8

WebLogic
24 Virtual Machines

7 Cores

4 8 4
12 16 8
4 8 4

Oracle RAC
9 Virtual Machines

12 Cores

4 8 4 8 4
12 16 8 16 8
4 8 4 8 4
12 16 8 16 8

20 Oracle EE Virtual Machines

4 Cores

CUoD

.5 Core
VIOS
Partition
I/O
Subsystem

Int Virt Manager

Storage Sharing

Ethernet Sharing

Virtual I/O paths

Database Tier Consolidation

Multi-Tier Consolidation

POWER Hypervisor

Oracle Consolidation: (X) #cores in prior physical server

68 Oracle RAC cores consolidated into 7 core Partition

176 Oracle EE cores consolidated into 19 core partition

Oracle RAC licenses put on the shelf

Oracle EE licenses put on the shelf

WebSphere: 96 cores consolidated into 8 cores

Network

Network

Software Serviceability with Virtualization

Integrated virtualization (PowerVM):

- – All Power Systems have provided an integrated hypervisor since 2004
- – Every customer uses this built-in virtualization and it cannot be removed
- – Software vendors fully support this virtualized environment

Virtualization add-on products (VMware / KVM / Oracle VM):

- – Most software vendors require removal of virtualization to debug problems
- – Customers are forced to reproduce problem on a "bare metal" system
- – Many problems cannot be reproduced in a lower transaction, unvirtualized, lower-utilization environment
- – Oracle does not support VMware
- – IBM itself requires removal of VMware if the problem cannot be quickly diagnosed

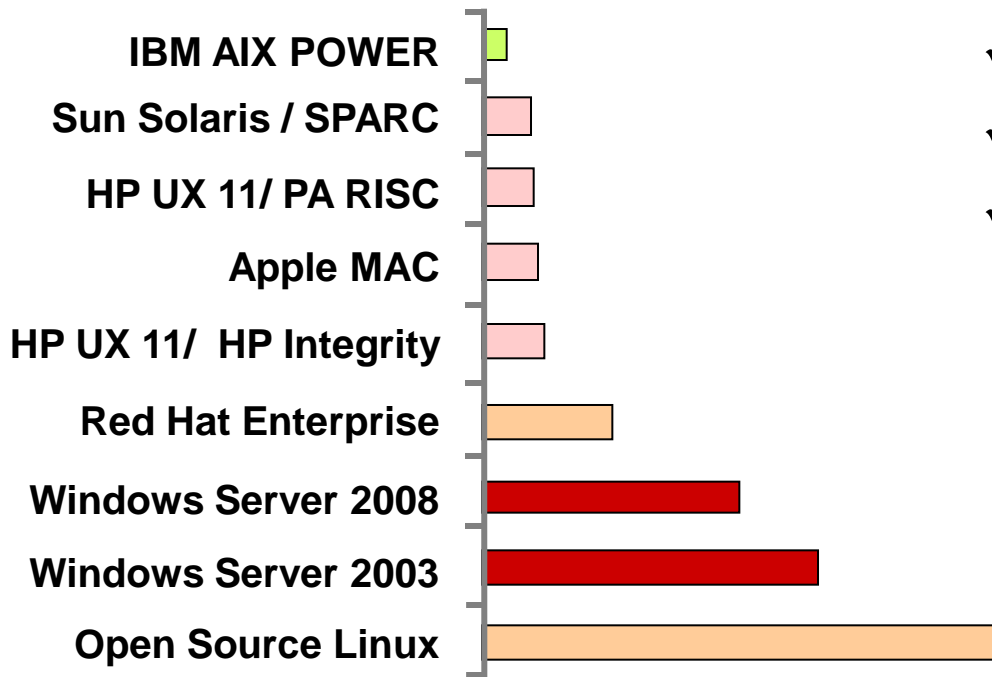# Power Hyperviser
for secure computing.

- The PowerVM hypervisor is secure by design. IBM is the only vendor who designs the virtualized environment from bare metal through the hypervisor.

- Power Hypervisor is part of our digitally signed firmware with strong cryptography which makes it impossible to remotely install a modified fileset into the EPROMs (Erasable Programmable Ready Only Memory) of IBM Power Systems.

- Power virtualization including the hypervisor and the Virtual I/O server has been certified for EAL4+ Common Criteria.

Risk Management Factors	VMware ESX 4.0 *(in VMware vSphere 4)*	Power Hypervisor
Implementation of virtualization technology	Third-party software add-on	Integrated into system firmware
Isolation of I/O drivers from hypervisor	No	Yes (using VIOS)
Common Vulnerability Exposures (CVE) reported in US Government NIST Database against hypervisor	+200	Zero, nada, nilch

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AIX on POWER is the most reliable OS among UNIX, Linux and Windows

Corporate Enterprise Downtime
(Hours per Year)

- IBM AIX POWER
- Sun Solaris / SPARC
- HP UX 11/ PA RISC
- Apple MAC
- HP UX 11/ HP Integrity
- Red Hat Enterprise
- Windows Server 2008
- Windows Server 2003
- Open Source Linux

IBM leadership

- ✓ **99.997% uptime***
- ✓ **2.3X better than next UNIX**
- ✓ **>10X better than x86-based platforms**

POWER7™
BUILT ON
AIX
Power

*Source: **ITIC 2009 Global Server Hardware & Server OS Reliability Survey Results**,
July 7, 2009. Fully paper is available at ibm.com/aix

What Migration Risks Concern Customers?

Have no fear:
It's only migration

Competitive Platforms

IBM Platforms

Risk	Key Questions
Technical	**Can it be done?** • Are required ISV products available on the target platform? • What differences need to be addressed such as application APIs, threading and data formats? • Are there tools available to help minimize the complexity and risk?
Cost	**Can it be done within the budget?** • How will the migration cost be funded? • Does the business case have a positive ROI?
Schedule	**Can it be done on time?** • How much downtime will be required for transition? • When can the business support this change?
Skills and Culture	**Are the required resources available?** • How will the existing systems administration and application development team skills be transitioned? • How will retraining be performed?
Operational	**How well will it work?** • How will the migrated workload be tested? • Will the performance and reliability meet business requirements? • Will it work the same way on the target platform or will changes in customer, supplier or user interfaces be required?

IBM Migration Factory Objectives

- To help minimize the cost of transition/ migration services so they do not become the main objection to moving to IBM
  - Provide and leverage many person-years of application migration knowledge & experience
  - Focus on the use of tools, metrics and automation to reduce the cost of migrating from one platform to another
  - **Mitigate and reduce the risk in moving applications from one platform to another**
  - **Reduce the cost of moving applications from one platform to another**
  - Support success through process, expertise and project management

Power Systems   >40% World wide
UNIX Market Share: >50% U.S. Market share

- Power provides cost reduction, cost avoidance and high Business Value

- Total Cost of Ownership and Business Value far outweigh Acquisition costs

- Power excels at data centric workloads

- **Utilization rates** are a price/performance **advantage multiplier**

- Power customers have consolidated hundreds
  of servers to single digits of servers

- Power7 Consolidating hundreds of Systems
- Private Cloud technology for mission critical

"The Heist" - Who stole

all the Servers?