IBM Executive Summary:
Business Value of IBM
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Hardware Systems
Industry Leading IBM Systems at all levels

**System z™**
- Absolute highest reliability and security
- Unmatched availability & scalability
- The Ultimate Consolidation Platform for Linux

**Power™**
- IBM Systems has more #1 benchmark results than all competitors combined
- Superior TCO for Unix Servers according to ITG

**System x™**
- New cost-efficiency standards for x86 servers
- Maximum performance per watt and dollar in the data center
- Only x86 vendor to grow market share in 2009 (IDC)

**System Storage™**
- First with drive-level encryption for midrange disk
- Improved performance via Solid-State technology
- Leader in storage virtualization

**Power i™**
- 35 years running JDE on i OS
- #1 benchmark Oracle E1
- 38% less cost than Windows/SQL
- Require less staff time to manage with superior uptime
Advantages moving from SPARC to Power

- 4, 6 or 8 cores per socket
- 3.0 to 4.14 GHz
- Up to 4 threads per core
- Integrated eDRAM L3 Cache
- Dynamic Energy Optimization
- Mixed Workloads

Where to find more information on Power Servers:
http://www.ibm.com/developerworks/wikis/display/LinuxP/Performance+FAQs#PerformanceFAQs-WheredoIfindreferenceinformationonthePOWER7systems
(Some) POWER7 Design Objectives

- **Maintain/Extend Leadership of POWER6 server attributes**
- **Dramatically improve cost/performance**
  - By increased performance through
    - Out of Order Execution
    - Enhanced SMT
    - Cache Hierarchy Improvements
    - SMP capability: Up to 32 sockets (256 cores)
- **Balance System Design**
  - Cache, Memory, and IO
- **Optimize Energy Efficiency with 8 cores on chip**
  - Policy enabled energy management
  - Processor Nap & Sleep Mode
  - Memory Power Down support
- **Built in Virtualization**
  - Memory Expansion
  - VM Control
Industry setting Technology

True Multicore/Multithreaded....

- Dual Core
- Chip Multi Processing
- Distributed Switch
- Shared L2
- Dynamic LPARs (32)

- Dual Core
- Enhanced Scaling
- SMT
- Distributed Switch +
- Core Parallelism +
- FP Performance +
- Memory bandwidth +
- Virtualization

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

- Multi Core
- On-Chip eDRAM
- Power Optimized Cores
- Mem Subsystem ++
- SMT++
- Reliability +
- VSM & VSX (Altivec)
- Protection Keys+

POWER4
180 nm

POWER5
130 nm

POWER6
65 nm

POWER7
45 nm

POWER8
Concept Phase

2001
2004
2007
2010
Cores: 8 (4/6 core options)

567mm² Technology:
- 45nm lithography, Cu, SOI, eDRAM

Transistors: 1.2 B
- Equivalent function of 2.7B
- eDRAM efficiency

Eight processor cores
- 12 execution units per core
- 4 Way SMT per core – up to 4 threads per core
- 32 Threads per chip
- L1: 32 KB I Cache / 32 KB D Cache
- L2: 256 KB per core
- L3: Shared 32MB on chip eDRAM

Dual DDR3 Memory Controllers
- 100 GB/s Memory bandwidth per chip

Scalability up to 32 Sockets
- 360 GB/s SMP bandwidth/chip
- 20,000 coherent operations in flight

Binary Compatibility with POWER6

Industry setting Technology
Taking Multicore/Multithreaded to new heights

POWER7 Processor Chip

Local SMP Links
L3 REGION
L3 Cache and Chip Interconnect
Remote SMP & I/O Links

MC0
MC1

F
A
S
T
L3 REGION
Industry setting Technology

Core Innovation....

POWER7 Core

64-bit PowerPC architecture v2.07

Execution Units
- 2 Fixed Point Units
- 2 Load Store Units
- 4 Double Precision Floating Point Units
- 1 Branch
- 1 Condition Register
- 1 Vector Unit
- 1 Decimal Floating Point Unit
- 6 Wide Dispatch
- Units include distributed Recovery Function

Out of Order Execution

Modes: POWER6, POWER6+ and POWER7

- POWER7 continues to support VMX / Extends SIMD support with VSX
  - 2 VSX units that can each handle 2 Double-Precision FP instructions
  - 8 FLOPS per cycle
  - VSX units can also handle 4 Single Precision instructions per cycle
  - VSX instruction set support for vector and scalar instructions
POWER7 TurboCore Mode

- TurboCore Chips: 4 available cores
- Aggregation of L3 Caches of unused cores.
- TurboCore chips have a 2X the L3 Cache per Chip available
  - 4 TurboCore Chips \( \text{L3} = 32 \text{ MB} \)
- Performance gain over POWER6.
  - Provides up to 1.5X per core to core
- Chips run at higher frequency:
  - Power reduction of unused cores.
- With “Reboot”, System can be reconfigured to 8 core mode.
  - ASM Menus
Memory Channel Bandwidth Evolution

**POWER5**
- Memory Performance: 2x DIMM
- DDR2 @ 553 MHz
- Effective Bandwidth: 1.1 GB/s

**POWER6**
- Memory Performance: 4x DIMM
- DDR2 @ 553 / 667 MHz
- Effective Bandwidth: 2.6 GB/sec

**POWER7**
- Memory Performance: 6x DIMM
- DDR3 @ 1066 MHz
- Effective Bandwidth: 6.4 GB/sec
Active Memory Expansion & Active Memory Sharing

- **Active Memory Expansion**
  - Effectively gives more memory capacity to the partition using compression / decompression of the contents in true memory
  - AIX partitions only, POWER7 only

- **Active Memory Sharing**
  - Moves memory from one partition to another
  - Best fit when one partition is not busy when another partition is busy
  - AIX, IBM i, and Linux partitions

**Considerations**
- Only AIX partitions using Active Memory Expansion
- Active Memory Expansion value is dependent upon compressibility of data and available CPU resource
Advantages moving to IBM Power Systems

Where to find more information on Power Servers:
http://www.ibm.com/developerworks/wikis/display/LinuxP/Performance+FAQs#PerformanceFAQs-WheredoIfindreferenceinformationonthePOWER7systems
Industry setting Technology
Power systems portfolio (August 2010)

Major Features:
- Modular systems with linear scalability
- PowerVM™ Virtualization
- Physical and Virtual Management
- Roadmap to Continuous Availability
- Binary Compatibility
- Energy / Thermal Management

Operating Systems
- AIX
- i for Business
- Linux

BladeCenter
PS700 / PS701 / PS702

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## Power 710, 720, 730 and 740 System Highlights

**Affordability with outstanding performance, energy efficiency and reliability and for Unix, IBM i and Linux applications**

### Power 710
- **2U - 1 Socket**
- 4, 6 or 8 cores
- Maximum memory: 64 GB
- PCIe: 4 low profile
- Virtual servers: 80
- Power: 100 – 240 VAC

**Dense, attractively priced 1-socket server that fits seamlessly in your existing infrastructure**

### Power 720
- **4U - 1 Socket**
- 4, 6 or 8 cores
- Maximum memory: 128 GB
- PCIe: 4 + 4 low profile (opt.)
- I/O drawer support: Yes
- Virtual servers: 80
- Power: 100 – 240 VAC

**Affordable, flexible rack or tower server for distributed applications or a complete, integrated business system with IBM i**

### Power 730
- **2U - 2 Socket**
- 8, 12 or 16 cores
- Maximum memory: 128 GB
- PCIe: 4 low profile
- Virtual servers: 160
- Power: 200 – 240 VAC

**High performance, energy efficient server ideal for running multiple application and infrastructure workloads in a virtualized environment**

### Power 740
- **4U - 2 Socket**
- 4, 6, 8, 12, or 16 cores
- Maximum memory: 256 GB
- PCIe: 4 + 4 low profile (opt.)
- I/O drawer support: Yes
- Virtual servers: 160
- Power: 200 – 240 VAC

**High-performance, flexible, configurable and reliable midsize database and consolidation server**
IBM BladeCenter Power Blades
PS700/701/702 Express

✓ IBM BladeCenter Chassis
✓ Single and double wide
✓ 4, 8 or 16 cores
✓ 64 Simultaneous threads
✓ 3.0 GHz
✓ Up to 256GB of Memory

New pricing: Only 70 PVU’s / Core

Comparison: Power 750 3.55GHz at 100 PVU’s/core
and Power 550 3.5GHz at 120 PVU’s/Core and rPerf performance
Power 750 Express

- 4 Socket 4U
- 6 or 8 cores per socket
- 32 core
- 128 Simultaneous threads
- 3.0 to 3.55 GHz
- Energy-Star Qualified

New pricing: Only 100 PVU’s / Core
40% more performance and 20% less PVU’s required per core
Net: 60% more performance per Software License

Comparison: Power 750 3.55GHz at 100 PVU’s/core and Power 550 3.5GHz at 120 PVU’s/ Core and rPerf performance
Power 770

- 12 or 16 core 4U Nodes
- Up to 4 Nodes per system
- 64 core
- 256 Simultaneous threads
- 3.1 and 3.5 GHz
- Capacity on Demand
- Enterprise RAS
Power 780

✓ New Modular High-End
✓ Up to 64 Cores
✓ TurboCore Feature
✓ 3.86 or 4.14 GHz
✓ Capacity on Demand
✓ Enterprise RAS
✓ 24x7 Warranty
✓ PowerCare
Introducing the IBM Power 795

Delivering extraordinary scalability, performance and availability for Data Centers with the most demanding Unix, Linux and i applications

- **Massive throughput, performance and scalability** in a new Power 795 system with up to 256 POWER7 processors
- **Large-scale consolidation of energy-wasting, under-utilized servers** onto an ultra-efficient Power 795 with unprecedented levels of utilization and resource sharing to support AIX, i and/or Linux applications
- **Improve infrastructure resilience** – Enterprise Power Systems & Software are engineered to deliver the highest levels of Power Architecture™ reliability, availability & serviceability
- **Enable rapid service delivery** – Industry-leading virtualization and Capacity on Demand for processors and memory help provide seamless, non-disruptive growth
- **Upgrades from Power 595** enable clients to leverage their investment in POWER6 systems to deploy POWER7 performance, scalability and efficiency within their enterprise

- New High-end
- 24 to 256 Cores
- TurboCore
- 3.7, 4.0 or 4.25 GHz
- Capacity on Demand
- Enterprise RAS
- 24x7 Warranty
- PowerCare
The highest scale commercial UNIX system

POWER7 continues to break through scalability barriers with more performance

SPECint_rate

256c

128c
64c
256c

HP Superdome  Power 595  Sun M9000  IBM Power 795

Serious scale.

See Power 795 Delivers Performance with Efficiency for more specific details
Built in Availability / Reliability

- **Operating System**
  - Hot patch Kernel
  - Storage Keys

- **Hot Plug / Removal**
  - Fans & Power Supplies
  - PCI-X & PCIe Adapters
  - IO Drawers

- **Hot Plug / Removal**
  - Disks

- **Hot Add**
  - I/O racks

- **Memory**
  - Chip Kill technology with Bit-steering

- **Processors**
  - Dynamic De-Allocation
  - Packaging
  - Instruction Retry
  - Alternate Processor Recovery

- **Dual Clocks**
  - 770/780

- **Concurrent Add:** 770/780
  - Eliminates Upgrade outages

- **Concurrent Service:** 770/780
  - Eliminates Repair Outages

- **Passive backplane**
  - No active components

- **First Failure Data Capture**
  - Help eliminates intermittent failures

- **Hypervisor**
  - Mainframe technology

- **Mobility**
  - Partition Mobility
  - WPAR Mobility

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Reliability

Built in capabilities in addition to the Power hardware features

Power/AIX Enterprise RAS

- Live Mobility
- System Trace
- Lightweight Memory Trace
- Component Trace
- MiniDump
- Parallel Dump
- Kernel exploitation of POWER6 Storage Protection Keys
- Functional Recovery Routines
- Dynamic tracing with probevue
- RAS Component Hierarchy
- Live Dump
- Firmware Assisted Dump
- Kernel no-execute enhancements
- Kernel Stack Overflow enhancements
- Run Time Error Checking
- POSIX Trace
- Netmalloc debug

Solaris Predictive Self Healing

- Automatic monitoring and diagnosis of CPU, Memory, and I/O subsystems
- Automatic offlineing of faulty resources while Solaris is running
- Administrator tools to view self-healing logs and results
- Standardized messaging for all self-healing diagnosis results
- Knowledge article web site linking to online diagnosis messages
- dtrace dynamic tracing

Source: http://www.sun.com/bigadmin/content/selfheal/selfheal_overview.pdf
Source: “Unix, Linux Uptime and Reliability Increase; Patch Management Woes Plague Windows” © 2008 Yankee Group Research, Inc. All rights reserved

According to a Yankee Group study* of 400 Windows, Linux and UNIX users, AIX was the most reliable server operating system:

Reported downtime per year*

<table>
<thead>
<tr>
<th></th>
<th>Hours of downtime</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIX</td>
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<tr>
<td>HP-UX</td>
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<tr>
<td>Solaris</td>
<td>2</td>
</tr>
</tbody>
</table>
Power Systems: Hardware & OS RAS Leadership

Exhibit 1: Corporate Enterprise Downtime (Hours per Year)

Source: ITIC July 2009

Ref: ITIC 2009 Global Server Hardware and Server OS Reliability Survey
Capacity on Demand: pay for the capacity you need – and save energy on unused active processors!

*Instant response to capacity needs... and only pay for each minute you use!*

<table>
<thead>
<tr>
<th>Offering</th>
<th>Processor</th>
<th>Memory</th>
<th>Pre-Pay</th>
<th>Post-Pay</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity Upgrade on Demand</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
<td>Non-disruptive upgrades. …tie un-used resources to start up if failures occur…</td>
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<tr>
<td>Trial Capacity on Demand</td>
<td>●</td>
<td>●</td>
<td></td>
<td></td>
<td>Test additional capability, Try new applications/workloads, Utilize for backup capacity</td>
</tr>
<tr>
<td>On/Off Capacity on Demand</td>
<td>●</td>
<td>●</td>
<td></td>
<td>○</td>
<td>Satisfy seasonal demand such as year-end processing (in processor day granularity)</td>
</tr>
<tr>
<td>Utility Capacity on Demand</td>
<td>●</td>
<td></td>
<td>●</td>
<td>○</td>
<td>Satisfy short, unpredictable workload spikes that require high service levels (in processor minute granularity)</td>
</tr>
</tbody>
</table>


- Supported
- Not available

IBM Power 770
Protecting your current Investment

IBM announces plans to enhance your investment in Power servers with upgrades to POWER7

Power 595: Simple processor book upgrade from POWER6 to POWER7

- Components replaced include:
  - Processor books, including memory
  - System Controllers (2)
- 12X I/O drawers & GX adapters will migrate
  - Refresh RIO-based I/O drawers & GX adapters with 12X technology now to optimize performance and prepare for the POWER7 transition

Smooth upgrades will also be available for Power 570 systems, enabling clients to quickly transition to POWER7 technology while leveraging their current investment.
Shared I/O Resources
Getting More out of few resources

Physical Devices shared with multiple LPARs

- Boot disks (Internal or SAN)
- Ethernet/NICs (Either IVE or SEA via VIOS)
- SAN adapters/HBAs (Either NPIV or shared via VIOS)
- SAN LUNs for data
- Optical device (CD, DVD)
- Tape drive
- Virtual Ethernet – a high speed private network within the server
POWER Servers — Enhanced energy efficiency

- **POWER Chip Level Functions**
  - **Power Reduction**: Monitor & reduce power to idle logic within cores
  - **NAP Mode**: Reducing power to inactive cores when threads not executing; savings of 11% over idle loops (COD benefit).
  - **Thermal Tuning**: Sensors monitor & reduce power to overactive circuits
  - **Memory Powerdown**: On-chip memory controller enables a decrease in DRAM idle power by deactivating the clock-enable control signal.

- **System POWER Hardware Functions**
  - **EnergyScale I/O**: Powering off hot-pluggable PCI slots not being used; savings of 14 watts/slot.
  - **Variable Fan Speed (10,500 – 5500 RPM)**: Reduces power to fans (1/3 of total server power) by up to 45% based on ambient temperature**
  - **Enhanced System Design & Implementation**: Improved server Performance / WATT each generation
TPMD: Thermal Power Management Device

- TPMD card is part of the base hardware configuration (all P7 models)
- Resides on the processor planar
- TPMD function is comprised of a risc processor and data acquisition
- TPMD monitors power usage and temperatures in real time
- Responsible for thermal protection of the processor books
- Can adjust the processor power and performance in real time.
- If the temperature exceeds an upper (functional) threshold, TMPD actively reduces power consumption by reducing processor voltage and frequency or throttling memory as needed.
- If the temperature is lower than upper (functional) threshold, TMPD will allows POWER7 cores to over clock if workloads demands are present.
POWER7 “Over Clock” Uplift

Nominal Over Clock
IBM Systems Energy Estimator

The IBM® Systems Energy Estimator (also referred to as Energy Estimator or Estimator) is a new web-based tool for estimating power requirements for IBM Power Systems. You can use this tool to estimate typical power requirements (watts) for a specific system configuration under normal operating conditions. The Energy Estimator can be run in stand-alone mode and is also integrated with the IBM Systems Workload Estimator. The Energy Estimator will be regularly updated to support new hardware and software functions.

The estimated power requirement is described as "typical" and does not necessarily represent the worst-case power condition that can be measured at 100 percent processor utilization or under abnormal operating conditions such as excessive inlet temperature or hardware failure. At this time, the estimated power requirement does not take into account energy saving techniques which may be employed by the IBM Systems Director Active Energy Manager and IBM EnergyScale technology for POWER6 processor-based systems.

Energy Estimator features

Functions provided as part of Energy Estimator v2009.3 (August 2009)

- Utilization-based energy estimates
  For energy estimates initiated from the Workload Estimator Selected system screen, the estimated energy value will reflect an adjustment based on the projected CPU utilization. This support is initially provided for a subset of the system models with support for additional models planned for the future. For supported models, the Energy estimate screen will show an estimated energy value near maximum utilization and at the projected CPU utilization.

Welcome page

Launch the Energy Estimator

www.ibm.com/systems/support/tools/estimator/energy
Studies show AEM can enable a system to save up to 30% of normal CPU power usage thereby improving energy efficiency and reducing costs.

Energy Management: IBM Systems Director Active Energy Manager (AEM)

- Monitor, measure and control energy usage and reduce costs
- Better utilization of existing resources with capping for individual systems or groups of systems
- Cornerstone of IBM energy management framework

Industry Leadership

- Comprehensive energy management across IBM Systems (Mainframe, Modular, Power and Storage) as well as non-IBM Systems that addresses client pain points for energy
- Next generation of IBM PowerExecutive that extends the scope and capabilities of energy management across systems and facility providers
Power is Integrated Value

**Information Management**
- IBM Smart Analytics System
- SAP on IBM DB2 and Power Systems
- IBM DB2 pureScale

**Lotus software**
- IBM Lotus Domino Consolidation on Power

**Rational software**
- IBM Rational Developer for Power

**Tivoli software**
- IBM Systems Director Editions

**WebSphere software**
- IBM WebSphere Application Server Parallelization

**AIX for Business**
Advantages moving from Solaris to AIX

The next step in the evolution of UNIX®
Why AIX is the Premier UNIX® Platform Today

- Outstanding Performance
- Improved Efficiency through Virtualization
- Innovation through integrated Development
- Strong, stable, non-disruptive roadmap
AIX Evolution – Over Twenty years of Progress


AIX V2 & V3
Establishment in the market:
- RISC Support
- UNIX credibility
- Open Sys. Stds.
- Dynamic Kernel
- JFS and LVM
- SMIT

AIX V3.2.5
Maturity:
- Stability
- Quality

AIX V4.1/4.2
SMP Scalability:
- POWERPC spt.
- 4-8 way SMP
- Kernel Threads
- Client/Server pkg
- NFS V3
- CDE
- UNIX95 branded
- NIM
- > 2GB filesystems
- HACMP Clustering
- POSIX 1003.1, 1003.2, XPG4
- Runtime Linking
- Java 1.1.2

AIX V4.3
Higher levels of scalability:
- 24-way SMP
- 64-bit HW support
- 96 GB memory
- UNIX98 branded
- TCP/IP V6
- IPsec
- LDAP Dir. Server.
- Workload Mgr
- Java JDT/JIT
- Direct I/O
- Alt. Disk Install
- Exp/Bonus CDs

AIX V5.1/5.2
Flexible Resource Management:
- POWER4+ spt.
- 64-bit SMP
- Dynamic LPAR
- Dynamic CUoD
- New 64bit kernel
- 512GB mem
- JFS2
- 16 TB filesystems
- UNIX03 branded
- Concurrent I/O
- MultiPath I/O
- Flex LDAP Client
- XSSO PAM spt

AIX 5L V5.3
Advanced Virtualization:
- POWER5 support
- 64-way SMP
- SMIT
- MicroPartitions™
- Virt I/O Server
- Partition Load Mgr
- NFS Version 4
- Adv. Accounting
- Scaleable VG
- JFS2 Shrink
- SUMA
- SW RAS features
- POSIX Realtime

AIX 6
Enterprise RAS:
- POWER6 support
- Workload Partitions
- Application Mobility
- Continuous Avail.
- Storage Keys
- Dynamic tracing
- Software FFDC
- Recovery Rtns
- Concurrent MX
- Trusted AIX
- RBAC
- Encrypting JFS2
- AIX Security Expert
- Director Console

AIX 7
Future of UNIX:
- 256 core/1024 thread scalability
- POWER7 Exploitation
- Domain based RBAC
- AIX Profile Manager
- WPAR enhancements
- AIX 5.2 in a WPAR
- PowerVM virtualized storage
- LVM SSD support
- Terabyte segment

Open Systems Workstations
Uni-processor

Distributed Client-Server Computing
4-8 way SMP

Network Centric Computing
24-way SMP

e-Business Computing
32-way SMP

On Demand Business
64/256-way SMT

New Enterprise Data Center

Smarter Planet
1024-way SMT
AIX Editions

AIX 6 is available in three different editions:

- **AIX Standard Edition**
  - Suitable for most UNIX workloads
  - Vertical scalability up to 64 cores

- **AIX Enterprise Edition**
  - AIX plus enterprise management
  - Includes AIX Standard Edition plus Systems Director Enterprise Edition and the Workload Partitions Manager for AIX
  - Vertical scalability up to 64 cores

- **AIX Express Edition**
  - Lower priced edition targeted at low end servers and consolidation of smaller workloads on larger servers
  - Includes most of the functionality of AIX Standard Edition
  - Vertical scalability is limited to 4 cores and 8GB of memory per core in a single partition
  - Clients can use multiple AIX Express Edition partitions in a single larger server

Clients can mix multiple AIX editions in the same server  

Note: AIX V5.3 is only available in a Standard Edition
AIX Binary Compatibility Guarantee

AIX 6 Binary Compatibility

Dear System p and System i clients:

We listened and we have delivered for you, and in fact we hope you have been ecstatic with the recent announcements on the AIX® 6 and POWER6™ products. Not only can the new POWER6 servers run AIX V5.2, V5.3 and AIX V6.1—with binary compatibility for applications currently running on AIX V5.1, V5.2 and V5.3—but AIX 6 will even run on older hardware, based on POWER5™, and POWER4™ processors. This broad support for multiple levels of the AIX operating system on multiple generations of POWER systems is the strongest that we have ever had.

But some clients have said that they want to hear it from me. We've said we will offer binary compatibility and we mean it. We are offering a guarantee that your applications, whether written in house or supplied by an application provider, will run on AIX 6 if they currently run on AIX V5.1, V5.2 or V5.3—without recompilations or modification. Even well-behaved 32-bit applications from AIX V4.1, V4.2, and V4.3 will run without recompilation.

Take us up on that challenge. We assume (and require) that these applications comply with reasonable programming standards (see ibm.com/systems/p/os/aix/compatibility/conditions), but if they do and the applications will not run on AIX 6, contact us. We will investigate and assign our developers to work on the binary compatibility problem. I don't anticipate anyone will call but I wanted to assure you that we are committed to the binary compatibility of AIX 6.

The qualities of the AIX operating system—virtualization, security, performance, and quality—have won many new clients to AIX. AIX 6 will be the next step forward in the evolution of UNIX, while allowing existing AIX V5.1, V5.2 and V5.3 applications to continue to run. AIX is and will remain the strategic UNIX operating system for IBM.

Thank you for your continued confidence in IBM System p and System i servers and in the AIX operating system. Keeping your applications up and running is one of our primary goals. I want you to rest assured that we are taking great care to ensure that when you upgrade to AIX 6, your AIX V5.1 V5.2 and V5.3 applications will not only run unmodified, but you will also be able to take advantage of the new innovations in AIX 6.

Sincerely,

Ross A. Mauri
General Manager
IBM System p

*Complete details on AIX binary compatibility can be found at http://www.ibm.com/servers/aix/os/compatibility/
Some differentiating operating system features

<table>
<thead>
<tr>
<th>AIX</th>
<th>Solaris</th>
</tr>
</thead>
<tbody>
<tr>
<td>WPAR</td>
<td>Containers</td>
</tr>
<tr>
<td>LPAR</td>
<td>LDOM</td>
</tr>
<tr>
<td>Partition Mobility</td>
<td></td>
</tr>
<tr>
<td>Application Mobility</td>
<td></td>
</tr>
<tr>
<td>AIX Security Expert</td>
<td>Solaris Security Toolkit</td>
</tr>
<tr>
<td>Enterprise RAS</td>
<td>Predictive Self Healing</td>
</tr>
<tr>
<td>Probevue</td>
<td>dtrace</td>
</tr>
<tr>
<td>RBAC</td>
<td>Process Right Mgmt</td>
</tr>
<tr>
<td>Encrypting FS</td>
<td>Encrypting ZFS (someday?)</td>
</tr>
<tr>
<td>JFS2 / GPFS</td>
<td>ZFS</td>
</tr>
<tr>
<td>Trusted Execution</td>
<td>bart &amp; Fingerprint DB</td>
</tr>
</tbody>
</table>
Flexible PowerVM & AIX Options

- Dedicated LPARs
- Micro-Partitions
- WPARs
- Workload Manager

- Application Mobility
- Partition Mobility

Resource Flexibility

- LPAR / Micropartitions
  - AIX V5.3 on POWER5 or later

- Workload Partitions
  - AIX 6 on POWER4 or later

- Live Application Mobility

Workload Isolation

- Live Partition Mobility

AIX Workload Manager
  - AIXV4.3.36 on POWER3 or later
AIX V6.1 PowerVM Workload Partitions (WPAR)

**What is it?**
- Virtualized AIX operating system environments within a single AIX image
- Each WPAR shares the single AIX operating system
- Applications and users inside a WPAR cannot affect resources outside the WPAR
- Each WPAR can have a regulated share of processor, memory and other resources
- Two types of WPAR
  - System WPARs have separate security and appear like a completely separate OS
  - Application WPARs are manageability wrappers around a single application

**How it can help?**
- Can make it easier to consolidate workloads from underutilized servers
- Can reduce cost and complexity by reducing the number of AIX OS instances to manage
- Can provide increased flexibility by allowing administrators to quickly create, clone or delete Workload Partitions
- Can improve administrative efficiency by providing for delegated root users for each WPAR
- Provides new ways to manage your IT infrastructure
- Allows consolidation on a scale not previously practical
WPAR Shared Applications Enables Administrative Efficiency

Application installed in Global instance and used by multiple WPARs

Global filesystems

/  
/etc  
/usr  application code  
/opt  application code (or here)  
/var  
/tmp  
/appserver application code (or here)

System WPAR filesystems

/  r/w - unique per WPAR  
/etc  r/w - unique per WPAR  
/usr  r/o from global (typically)  
/opt  r/o from global (typically)  
/var  r/w - unique per WPAR  
/tmp  r/w - unique per WPAR  
/appserver  r/o from global  
/config  r/w uniq per WPAR (example)
## WPARs versus Containers

<table>
<thead>
<tr>
<th>Capability</th>
<th>IBM AIX WPAR</th>
<th>SUN Solaris Containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live relocation of a WPAR / container</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>System WPAR / container</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>Application WPAR / container</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Time to create WPAR / container</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>Single system management of WPAR / container</td>
<td>+</td>
<td>=</td>
</tr>
<tr>
<td>Multi-system management of WPAR / container</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Policy based relocation of WPAR / container</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>System commands are WPAR / container ready</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Resource isolation – memory and processor</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>Resource isolation – thread, process, paging</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Processor regulation based on Fair Share</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>Processor regulation based on Percentage</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

AIX Workload Partitions Can Be Used in LPARs

- Dedicated Processor LPAR
  - Finance
  - Planning
  - Business Intelligence

- LPAR
  - Americas
  - Asia

- VIO Server
  - WPAR #1
    - MFG
  - WPAR #2
    - Planning

- Micropartition Processor Pool

- LPAR EMEA
  - WPAR #1
    - eMail
  - WPAR #2
    - Test
  - WPAR #3
    - Billing

POWER Hypervisor
### Mobility on Power Systems

#### PowerVM Live Partition Mobility

- Move an entire Logical Partition from one system to another while it is running with almost no impact to end users
- Moves the entire LPAR including the operating system
- Requires systems based on the Power6 processor, PowerVM Enterprise, and all I/O must be through the Virtual I/O Server
- Works with partitions running AIX V5.3, AIX 6 and Linux

#### Live Application Mobility

- Move a Workload Partition from one AIX system to another AIX system while running with almost no impact to end users
- Moves only the WPAR, the AIX operating system is not moved
- Requires AIX 6, PowerVM Workload Partitions Manager
- Works on systems based on Power4, Power5, and Power6 processors

### Benefits

- Improved application availability
- Energy saving
- Better workload management
PowerVM Live Partition Mobility with POWER6 & POWER7

Allows migration of a running LPAR to another physical server

- Reduce impact of planned outages
- Relocate workloads to enable growth
- Provision new technology with no disruption to service
## Lower TCO using Power servers and PowerVM*

<table>
<thead>
<tr>
<th>Expense</th>
<th>Potential Savings</th>
<th>Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance</td>
<td>69% - 76%</td>
<td>Fewer, newer servers can reduce maintenance contract costs.</td>
</tr>
<tr>
<td>Software</td>
<td>65% - 69%</td>
<td>Fewer software copies and fewer CPUs can result in lower license, update subscription and support costs.</td>
</tr>
<tr>
<td>Personnel</td>
<td>31% - 45%</td>
<td>Fewer physical servers, reduced platform diversity and use of automated management tools can reduce personnel costs for system administration and related functions.</td>
</tr>
<tr>
<td>Facilities</td>
<td>52% - 61%</td>
<td>Fewer physical servers and use of smaller-footprint, more energy-efficient models can result in lower overhead for data center occupancy, power and cooling.</td>
</tr>
</tbody>
</table>

*Business Case for IBM System p5 Virtualization,* Economic Benefits of IT Simplification. International Technology Group, 02/10/2006. Study methodology: Companies in financial services, manufacturing and retail with $15 Billion+ revenues and total 200,000+ employees focusing on UNIX® large enterprise environments with multiple, broad-ranging applications. Study compared the cost of the company's workload running on multiple vendor servers and employing minimal virtualization to the cost of the company's workload running on the p5-510, 550, 570, 590 and 595 – 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 62% in TCO savings by virtualizing and consolidating on the System p servers. For further information, see the white paper at: [http://www-03.ibm.com/systems/p/library/consult/itg_p5virtualization.pdf](http://www-03.ibm.com/systems/p/library/consult/itg_p5virtualization.pdf) 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.
AIX Security

The most secure, virtualized UNIX and Linux environment available

- Role-based Access Control
  AIX V6.1: allows delegation of privileged administration tasks to non-privileged users
- AIX Security Expert
  A centralized security management tool that can control over 300 security settings from a single console
- Encrypting Filesystem
  Automatically encrypt data in a JFS2 filesystem. Protect data from access by privileged users. Backups can be in encrypted or clear formats
- Trusted Execution
  Validated system environment

Manage Growth, Complexity & Risk

Reduce the cost and complexity of security administration

- By allowing secure delegation of administrative tasks to non-privileged users

Enable a more secure IT infrastructure

- By making it easier to manage and through additional security capabilities
- By reducing unauthorized access to data, even by privileged users
## AIX Security Expert compared to Solaris & HP-UX

<table>
<thead>
<tr>
<th>Feature</th>
<th>AIX Security Expert</th>
<th>Sun Solaris Security Toolkit</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Security Hardening</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Fully Supported Product</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Installs with Base Operating System</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Policy Based</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Command Line</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Graphical User Interface</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Selectable Security Profile</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Port Scan Protection</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Selectable Security Level Guide</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Provisioning Base on Service Requirement</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Never requires a reboot for configuration change</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Undo Feature</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Security Check</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Reset OS Default Settings</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>

We Match Solaris EAL4+ Certification

Power servers with PowerVM are certified for Common Criteria EAL4+

[Image of Common Criteria Certificate]

http://www.niap-ccevs.org/cc-scheme/st/index.cfm/vid/10299
AIX V6.1 Non-intrusive Reliability Features

What is it?

- A number of new reliability, availability and serviceability features that are designed to improve system and application reliability
- New features include:
  - Live Dump
  - Firmware Assisted Dump
  - Enhanced First Failure Data Capture (FFDC) for AIX
- Enhanced features:
  - Lightweight malloc debug
  - Lightweight memory trace
  - Consistency checkers
  - Component trace

How it can help?

- Designed to increase availability by reducing problem determination time and effort
- Can reduce the impact of problems by minimizing the intrusiveness of problem determination compared to traditional methods
- These new service features provide an infrastructure that can fundamentally change the OS problem determination process for the better
AIX V6.1 probevue Dynamic Tracing

What is it?

- A new capability to dynamically extract information about a program as it is running
- Trace points can be added or removed dynamically without recompiling or restarting the application
- Includes a new language, vue, to define the desired action when a probe point is reached
- Support for C, C++ and Java language programs

How it can help?

- Enables the possibility to dramatically reduce the amount of time and effort to debug and tune applications
- Can reduce the performance impact to the system compared to using traditional tracing methods
- Dynamic tracing offers an entirely different way for developers and system administrators to troubleshoot application problems
AIX V6.1 POWER6 Automatic Variable Page Size

**What is it?**

- AIX V6.1 exploitation of a POWER6 feature that supports variable page size
- AIX will automatically select optimal page size to provide better performance
- Kernel will choose between 4K and 64K pages, including a mix within a memory region
- Supports process data, heap, stack, shared memory, anonymous mmap() memory
- Enabled by default with administrative controls to turn off or change aggressiveness to “upsize”

**How it can help?**

- Can improve overall system performance which could improve the amount of work done per Watt of energy
- Automated page size tuning can reduce the amount of effort and cost associated with managing a key aspect of performance tuning
- Since this feature is turned “on” by default, it improves your ability to get the most out of your systems based on POWER6 processors
- This “self tuning” aspect of AIX V6.1 can improve performance while reducing administrative workload
AIX V6.1 Concurrent Kernel Maintenance

What is it?

- A new capability to install some kernel fixes without having to reboot
- Concurrent kernel maintenance can be applied without substantially impacting application or AIX operations
- Concurrent maintenance can be backed off without an outage
- Theoretically could be used for about 80% of the single module kernel updates
- Concurrent maintenance will initially be packaged as Interim Fixes
- Traditional install and reboot still required for upgrades and some kernel maintenance

How it can help?

- Can provide for higher application and AIX availability by reducing the number of planned outages to reboot for kernel fixes
- Enables greater security by reducing the impact of installing some security fixes
- This new capability can change the way administrators handle critical fixes such as security patches
IBM Power Systems Advantage

Our value proposition for clients invested in UNIX

- Performance + Modular growth and scalability + Increased Utilization
- Application Availability + Energy efficiency + Security

Moving from Solaris to AIX was a non-event.

Some of the 500+ clients who have migrated to Power Systems from Sun
- Alabama Gas Corporation
- Brakes India Limited
- DRK Kliniken Berlin
- National Bank of Canada
- National Library of China
- Seagate Technology LLC
- Volkswagen AG

- Shouldn’t you join the list of clients enjoying this value?
Advantages moving from Solaris to Linux
IBM Provides Complete Linux Solutions for the Correct Platform

- Implementation Support services
- Enterprise-ready Common across platforms
- Manage complex environments
- Manage complex environments
- Tier 1 Linux support for all IBM Systems
- Match workload needs to platform capabilities
- OS management skills common across platforms
- Increase flexibility
- Petabyte-scale storage solutions

Security
- Policy-based security
- Common criteria certification
- Very rapid time to fix if vulnerabilities are discovered

Supported platforms
- Wristwatches to mainframes
- Brodest range of supported virtualization environments
- Can optimize by workload

Scalability
- Ongoing innovation in both scale out and scale up
- Platform support provides flexibility in consolidation

Skills
- Linux skills widespread
- OS management skills applicable across platforms

IBM Global Services

Information Management
WebSphere®
Tivoli®
Lotus®
Rational®

IBM Systems Software

IBM System x
IBM Power Systems
IBM System z

IBM Systems Storage

Linux provides common benefits across all IBM platforms
IBM Collaborates with Linux Community

- has been an active participant since 1999
- is one of the leading commercial contributors to Linux
- has over 600 full-time developers working with Linux and open source

**Linux Kernel & Subsystem Development**
- Kernel Base Architecture Support
- GNU
- Security
- Systems Management
- RAS
- Virtualization
- Special Projects
- Filesystems, and more...

**Expanding the Open Source Ecosystem**
- Apache & Apache Projects
- Eclipse
- Mozilla Firefox
- OpenOffice.org
- PHP
- Samba, and more...

**Foster and Protect the Ecosystem**
- Software Freedom Law Center
- Free Software Foundation (FSF)
- Open Invention Network, and more...

**Promoting Open Standards & Community Collaboration**
- The Linux Foundation
- Linux Standards Base
- Common Criteria certification
- Open Software Initiative, and more...

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<table>
<thead>
<tr>
<th>Company Name</th>
<th>Number of Changes</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>26,644</td>
<td>18.2%</td>
</tr>
<tr>
<td>Red Hat</td>
<td>17,981</td>
<td>12.3%</td>
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<tr>
<td>Unknown</td>
<td>11,164</td>
<td>7.6%</td>
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<tr>
<td>IBM</td>
<td>11,151</td>
<td>7.6%</td>
</tr>
<tr>
<td>Novell</td>
<td>11,046</td>
<td>7.6%</td>
</tr>
<tr>
<td>Intel</td>
<td>7,782</td>
<td>5.3%</td>
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<tr>
<td>Consultant</td>
<td>3,657</td>
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<tr>
<td>Oracle</td>
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<tr>
<td>Linux Foundation</td>
<td>2,345</td>
<td>1.6%</td>
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<td>SGI</td>
<td>2,317</td>
<td>1.6%</td>
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<td>Parallels</td>
<td>1,939</td>
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<tr>
<td>Renesas Technology</td>
<td>1,925</td>
<td>1.3%</td>
</tr>
<tr>
<td>Academia</td>
<td>1,712</td>
<td>1.2%</td>
</tr>
<tr>
<td>Fujitsu</td>
<td>1,592</td>
<td>1.1%</td>
</tr>
<tr>
<td>MontaVista</td>
<td>1,564</td>
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<tr>
<td>MIPS Technologies</td>
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<td>1.1%</td>
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<tr>
<td>Analog Devices</td>
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<td>1.0%</td>
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<tr>
<td>HP</td>
<td>1,415</td>
<td>1.0%</td>
</tr>
<tr>
<td>Freescale</td>
<td>1,375</td>
<td>0.9%</td>
</tr>
<tr>
<td>Google</td>
<td>1,261</td>
<td>0.9%</td>
</tr>
</tbody>
</table>

Run x86 Linux applications on Power alongside your AIX, i and Linux on Power applications

Simplifies migration of Linux x86 applications enabling customers to realize the energy and administration savings of consolidation

- Run most existing 32-bit x86 Linux applications with no application changes
- Included with the purchase of PowerVM Editions

Install and Run
- No Porting
- No Recompile
- No changes
What Linux distributions will be supported with POWER7

- SUSE Linux Enterprise Server 11 SP1
- SUSE Linux Enterprise Server 10 SP3
- Red Hat Enterprise Linux 5.5
- SOD: Roadmap to RHEL 6 (outlook 2H2010)

Weblecture: Linux Updates for POWER7
Simplify Linux installation on Power Systems

Preinstall Linux on Power blades through Power 780

Save time and leverage IBM expertise by allowing IBM to install Linux for you in the factory prior to shipping the server

- Provides support for POWER6 and POWER7 running SLES 10 and 11
  - adds support for SUSE Linux Enterprise Server 11 SP 1

IBM Installation Toolkit for Linux v4.1

Provides a set of tools that significantly simplifies the installation of Linux on IBM Power Systems

- Provides support for POWER6 running SLES 10 SP2 & SP3, SLES 11, RHEL 4.7 & 4.8, and RHEL 5.4 & 5.5; and POWER7 running SLES 10 SP3, SLES 11, and RHEL 5.5
  - adds support for POWER6 and POWER7 running SLES 11 SP1
  - adds new features such as signed RPMs, https support, bootable USB creation, ipr_utils in rescue mode, and OpenMPI 1.4.2

Free download, Free support…

Linux for Power Differentiates with RAS, Virtualization, and Performance

Reliability, Availability, Serviceability (RAS)
- Enterprise Hardware
  - Redundant fans, blowers, power supplies, regulators, service processors, system clocks
  - Hot swap fans, blowers, regulators, disk, I/O adapters
  - Dynamic processor sparing
  - Memory sparing
  - Chipkill memory with dynamic bit steering
  - Dynamic system clock failover
- Concurrent firmware update
- PCI bus Enhanced Error Handling (EEH)
- Service Focal Point software
- NVRAM-based error logging

Virtualization
- Dedicated and shared cpus and I/O
- Micro-partitioning
- Dynamic LPAR cpu, memory, I/O
- Virtual I/O Server for storage
  - Virtual SCSI
  - Virtual CD
  - Virtual Tape
- Virtual LAN
- N-port ID Virtualization (NPIV)
- Active memory sharing (memory overcommit)
- Live Partition Mobility
- Linux x86 optimizing translator (Lx86)
- VMControl support for image mgmt

Performance
- POWER7 Processor
  - 8 cores per chip
  - 4-way SMT
  - VSX with 128-bit double precision floating point
  - Embedded L3 cache
- Turbocore Modes
- Capacity on Demand
  - Try-and-buy
  - Processors and memory
  - Dynamic activation
- Solid state disk
- Flexible large pages for applications
- Outstanding Linux benchmarks
- Advanced Toolchain from IBM
Heterogeneous Partition Mobility

- **Live Partition Mobility Between Processor Families**
  - **POWER7 Servers Capable of running in POWER6 and POWER6+ Compatible Modes**
    - Supports P6/P6+ Functionally Equivalent Execution Mode for OS and Applications
    - Provides Compatible environment for LPARs Live Migrated between P6 and P7 systems
    - POWER7 and POWER6 partitions can run concurrently on the same P7 platform
    - POWER6 partitions take advantage of P7 micro-architecture enhancements (OOO execution)
    - POWER6 mode enforced by the platform
- **Ease in Deploying New POWER7 Servers**
- **Flexibility to Load Balance across POWER6 and POWER7 Servers**
- **Flexibility to Utilize POWER6 Servers for POWER7 Maintenance Windows**

Recommendation: Apply latest firmware and Linux OS fix-packs before migrating.
Learn More about Linux for Power

Power Systems Linux Portal

http://www.ibm.com/power/linux

Linux Technical Wiki

http://www.ibm.com/developerworks/wikis/display/LinuxP/Home

Linux Customer Testimonials

Download to your computer or order a hardcopy

http://www.ibm.com/systems/power/software/linux/casestudy/
White Paper: Migrating Linux/x86 Applications to Power

Best Practices for Migrating Linux/x86 Applications to IBM Power Systems

by Pat Fleming (IBM LBS)

July 2010

Source: http://www.ibm.com/common/ssi/cgi-bin/ssialias?infotype=SA&subtype=WH&appname=STGE_PO_PO_USEN&htmlfid=POW03053USEN&attachment=POW03053USEN.PDF
Workload Virtualization
Workloads drive the Data Center sprawl of today
A source of complexity and cost, and a Savings Opportunity

Distributed-systems can proliferate IT costs:
- Cost and complexity (e.g., more physical servers, real network gear)
- Excessive energy usage and heating problems
- Inadequate power and cooling infrastructure
- Data silos and data synchronization
- Linear staffing costs
- Linear per processor software costs
- Frequent outages

LESS IS MORE – Focus on highly efficient use of FEWER servers

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## Real Innovative Virtualization

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>IBM invents Hypervisor that would become VM on the mainframe</td>
</tr>
<tr>
<td>1974</td>
<td>IBM introduces first machines with Physical Partitioning</td>
</tr>
<tr>
<td>1988</td>
<td>IBM delivers LPARs on the mainframe</td>
</tr>
<tr>
<td>2001</td>
<td>LPARs on POWER4</td>
</tr>
<tr>
<td>2004</td>
<td>POWER Hypervisor on POWER5</td>
</tr>
<tr>
<td>2007</td>
<td>Partition Mobility on POWER6</td>
</tr>
<tr>
<td>2009</td>
<td>PowerVM Active Memory Sharing</td>
</tr>
</tbody>
</table>

**PowerVM builds on 40+ years of IBM innovation:**

- Extreme scalability & robustness
- Fine-grained dynamic sharing of processors, memory and I/O
- Virtual or direct resources
- Integrated firmware hypervisor
- Virtual I/O Server
- Hardware enforced isolation
- Integrates LPARs and WPARs
- Lx86 cross-platform virtualization
- Capacity on Demand
- Live Partition Mobility
POWER, and PowerVM

Built In, Always On, Made for each other

- POWER systems are designed with scalable memory, memory bandwidth, and I/O bandwidth to handle high utilization rates

- POWER and PowerVM enable sharing of:
  - POWER processors (Shared processors, Micro-Partitioning™)
  - POWER memory (Active Memory Sharing™)
  - POWER I/O (Virtual I/O Sharing)

PowerVM dynamically manages and adjusts system resources

- PowerVM manages priorities with Partition Availability Priority

- PowerVM allocates resources down to 1/100th of a processor

- POWER and PowerVM support virtual servers up to 64 cores
Why Virtualize Workloads With PowerVM?

- Creating a virtualized workload with PowerVM is simple:
  - Create a new PowerVM logical partition (LPAR) or virtual machine (VM)
  - Install the operating system (AIX, IBM i or Linux) in the VM
  - Install the workload application(s) in the VM
  - Configure the operating system and applications as required

- At this point, the completed virtualized workload can be stored, copied, archived or modified just like any other file

- The benefits of virtualizing workloads with PowerVM in this way include:
  - **Rapid provisioning** – deploying the ready-to-run workload is a quick and easy process
  - **Scalability** – deploying multiple copies of the same workload type is simplified
  - **Recoverability** – bringing a workload back online after an outage is fast and reliable
  - **Consolidation** – many diverse workloads can be hosted on the same server

- All of these benefits save system administrator time and resources
  - In addition, workload consolidation offers significant IT infrastructure cost reductions
PowerVM Editions: Tailored to Client Virtualization Needs

- **PowerVM Express Edition**
  - Evaluations, pilots, PoCs
  - Single-server projects

- **PowerVM Standard Edition**
  - Production deployments
  - Server consolidation

- **PowerVM Enterprise Edition**
  - Multi-server deployments
  - Cloud infrastructure

<table>
<thead>
<tr>
<th>PowerVM Editions</th>
<th>Express</th>
<th>Standard</th>
<th>Enterprise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum VMs</td>
<td>2 per server + VIOS</td>
<td>10 per core (up to 1000)</td>
<td>10 per core (up to 1000)</td>
</tr>
<tr>
<td>Virtualization Management</td>
<td>VMControl IVM</td>
<td>VMControl IVM, HMC</td>
<td>VMControl IVM, HMC</td>
</tr>
<tr>
<td>Virtual I/O Server</td>
<td>✔</td>
<td>✔ ✔</td>
<td>✔ ✔</td>
</tr>
<tr>
<td>PowerVM Lx86</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Shared Processor Pools</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Live Partition Mobility</td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Active Memory Sharing</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PowerVM Editions** offer a unified virtualization solution for any Power workloads.
Power Systems Virtualization for Oracle – Tier Consolidation & Virtualization –

Dynamically Resizable

- 1 Core
  - Virtual I/O Server Partition
  - Int Virt Manager
  - Storage Sharing
  - Ethernet Sharing
- 16 Cores
  - PowerVM’s
- 8 Cores
  - Oracle 10g (Linux)
- 6 Cores
  - Oracle 10g
  - Oracle 11g
- 24 Cores
  - PowerVM’s
  - Oracle 10g
  - Oracle 11g
  - Oracle 9i
- 8 Cores
  - CUoD
  - Int Virt Manager
  - Storage Sharing
  - Ethernet Sharing

Tier Consolidation

Virtual LAN

POWER Hypervisor

ISV Pricing on Power 64 core system
- Oracle EE: 38 cores
- WebSphere: 1920 PVUs
- Do not pay for VIO server or CUoD cores

Virtual Network WebSphere to Oracle works at memory speeds
## PowerVM Leads Oracle /Sun Virtualization

<table>
<thead>
<tr>
<th>Virtualization capability</th>
<th>Sun Logical Domains 1.1</th>
<th>PowerVM Editions</th>
<th>PowerVM Business Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support across entire product line</td>
<td>Sun UltraSPARC T1/T2 servers only</td>
<td>All Power Systems servers</td>
<td>Standardize on one virtualization solution across an entire line of servers</td>
</tr>
<tr>
<td>Maximum Partitions</td>
<td>32(T1) 128(T2+)</td>
<td>1000</td>
<td>Consolidate more server workloads</td>
</tr>
<tr>
<td>Dynamic logical partitioning</td>
<td>Add/remove CPU</td>
<td>Yes</td>
<td>Adapt to changes without downtime</td>
</tr>
<tr>
<td></td>
<td>Add-only virtual I/O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support for live partition mobility</td>
<td>‘Warm’ migration with many constraints</td>
<td>Yes</td>
<td>Decrease downtime in your enterprise</td>
</tr>
<tr>
<td>Support for dedicated I/O</td>
<td>No</td>
<td>Yes</td>
<td>Superior performance for I/O intensive workloads</td>
</tr>
<tr>
<td>Cross-platform virtualization</td>
<td>No</td>
<td>Yes (Lx86)</td>
<td>PowerVM can consolidate workloads from four different platforms</td>
</tr>
</tbody>
</table>
Why Larger Virtualized Servers
*From 1 to 64 Sockets...*

**Higher Utilization**
- CPU & memory
- I/O ports & adapters
- Large or small workloads

**Efficient Data Center**
- Power and generator
- Cooling
- Floor space

**Increased Productivity**
- Order, track, retire
- Install, cable, fix
- Patch fewer hypervisors

**Greater RAS**
- More RAS features
- Fewer parts
- Capacity on Demand
PowerVM on POWER7 delivers virtualization without limits with higher performance than VMware for the same virtual workloads

65%

PowerVM outperforms VMware by up to 65% on Power 750, running the same Linux workloads and virtualized resources*

PowerVM runs workloads more efficiently than VMware, with far superior resource utilization, price/performance, resilience and availability

* "A Comparison of PowerVM and VMware Virtualization Performance", April 2010
http://www.ibm.com/systems/power/software/virtualization/whitepapers/compare_perf.html
PowerVM on POWER7 delivers linear scalability with more efficient resource utilization than VMware

32x

PowerVM on Power 750 outscales VMware with linear scaling that maximizes resource utilization with 4x more virtual CPUs*

Yet the Power750 is a Small tier Power Systems server...

Large tier POWER7 models such as the Power 795 can offer 32x more virtual CPUs than VMware

* “A Comparison of PowerVM and VMware Virtualization Performance”, April 2010
http://www.ibm.com/systems/power/software/virtualization/whitepapers/compare_perf.html

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PowerVM delivers firmware-based security

• Unlike x86-based products such as VMware, the PowerVM hypervisor is secure by design. IBM is the only vendor that has designed the virtualized environment from ‘bare metal’ through the hypervisor.

• PowerVM hypervisor is part of the digitally-signed firmware with strong cryptography which makes it impossible to remotely install a modified fileset into the EPROMs of Power Systems.

• There are zero vulnerabilities reported against PowerVM by US CERT or by MITRE Corporation

• PowerVM is certified at a CC Evaluated Assurance Level 4+

Remember, zero is a number too … a very good number in the Security domain.
• Clients seeking entry-level Power Systems virtualization on fewer cores than are built into a POWER7 chip

• PowerVM can be licensed for less than four cores
  – For example, a client can license PowerVM on a single-socket server (with a four-core POWER7 chip) for just one, two or three cores
  – Does not force you to pay for more than they need

• Note: PowerVM must still be licensed for all active cores on a system

• Business benefits
  – Creates more affordable entry point for new PowerVM prospects
  – Encourages broader deployment of virtualization on Power Systems
  – Expands PowerVM installed base for future upgrades
Learn More About PowerVM

PowerVM portal on the IBM Web site

http://www.ibm.com/systems/power/software/virtualization

(… or Google ‘PowerVM’ and click I’m Feeling Lucky)
New PowerVM sales and marketing resources

- New IBM Redbook:
  - *Exploiting IBM PowerVM Virtualization Features with IBM Cognos 8 Business Intelligence*

- Updated white paper:
  - *A Comparison of PowerVM and VMware Virtualization Performance*

- New white paper:
  - *Best Practices in Migrating Linux/x86 Workloads to Power Systems with PowerVM*

- PowerVM Flash Videos:
  - *Live Partition Mobility*
  - *Active Memory Sharing*
  - *PowerVM Lx86*
PowerVM Flash videos

- To be posted in PowerVM portal on IBM Web site
- Also available for use as standalone executables
Systems Management
Virtualization delivers flexibility but can increase complexity

- IDC projects that use of server virtualization will result in a significant increase in the number of servers (physical + virtual) to be managed

- HOWEVER some of our clients tell us that their costs are not escalating. **Budget and resource limitations** mean that they …
  - Cannot implement some workloads
  - Cannot effectively manage the workloads they implement

![Bar chart showing spending (US$b) from 1997 to 2009, with categories: Power and cooling costs, Server mgmt and admin costs, New server spending.](chart)

Source: IDC, 2008
IBM delivers an integrated solution to help simplify IT operations – IBM® Systems Director 6.1

*IBM® Systems Director – at the core of an IT management strategy – can reduce the costs of IT service delivery, improve business resiliency and security, and help meet energy usage requirements*

- Reducing complexity with integrated platform and enterprise service management
- Deploying and managing virtual servers to control data center space
- Managing energy usage helps meet “green” initiatives and cost objectives
IBM® Systems Director provides the foundation for managing IBM servers

- Simplify IT administration with a single console
- Monitor key metrics and set threshold alerts
- Add new capabilities with plug-ins and upward integration
The intuitive user interface helps reduce the IT skill levels required.

- Click server resource status for more information on problem areas.
- Common views and tasks are readily accessible.
- View resources by type and click for more details.
Topology views give a quick view of status and easier drill-down

- **Resource Topology Map**
  - Relationships
  - Dependencies
  - Physical & Virtual
- **Contextual Task Launch**
  - Launch point
  - Contextual tasks
  - Create virtual server
  - Relocate virtual server
  - Server, OS Management
- **Resource Health Status**
- **Resource Drill Down**
  - Detailed Properties
  - Event logs
  - Finger-tip troubleshooting
What Is IBM Systems Director VMControl?

• A plugin for Systems Director

• A cross-platform suite of products that assists you in rapidly deploying virtual appliances to create virtual servers, which are configured with the operating system and software applications

• Designed to simplify the management of workloads in your IT environment

• Advanced features enables you to group resources into system pools
  – Centrally manage and control different workloads
  – Consolidate workloads into distinct and manageable groups
Solution: VMControl Unifies Virtualization Management

- Introducing **IBM Systems Director VMControl**

- Enables consistent multi-platform virtualization management for IBM Systems
  - Manages Power Systems, System z®, System x®, storage and network resources
  - Integrates management of virtual servers, appliances, storage, networks and clouds

- Provides seamless integration with Tivoli enterprise service management solutions
VMControl Express Edition
Management of virtualized resources

- Multi-platform management
  - View virtual and physical assets
  - Virtualized life-cycle management
  - Topology maps

- Edit virtual resources
  - Edit physical hosts
  - Edit virtual machines
  - Use GUI or command line

- Relocate virtual machines
  - Execute live relocation
  - Plan for relocation
VMControl Standard Edition
A complete management solution for libraries of virtual appliances

- Discovery and manage heterogeneous image repositories
- Import, capture and catalog new virtual images from existing systems
- Simplified virtual image deployment and customization
- Dynamically provision virtual server, storage and network resource
- Leverages OVF open standard packaging for interoperability
VMControl Enterprise Edition
Introduces concept of system pools for higher-level management

- Combines multiple virtual resources into one manageable entity
- Automates virtual image mobility for optimal utilization and resilience
- Optimizes virtual assets for performance, availability and energy use
- Integrates server, storage and network virtualization

IT Resources   Virtual Images   System Pools

Mobility
Optimized for
- Availability
- Performance
- Energy
VMControl Enterprise Edition
Lifecycle management for system pools

- Relocate virtual workloads within the system pool
  - Determine best host placement within the pool
  - Supports single virtual images and host evacuation

- Move virtual workloads away from a failing host
  - Automate relocation of virtual workloads in response to predicted host system failures without disruption

- Restart virtual workloads when a host fails
  - Automate remote restart of virtual workloads in response to host failures with minimal disruption

- Resilience policy associated with the workload
  - Enables host system monitoring for failures and predictive failures and automates recovery action

- Automation policy associated with workloads
  - **Advise** – VMControl recommends actions and requires confirmation
  - **Automate** – VMControl automates actions
## VMControl Editions and PowerVM

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Virtualization Capabilities</strong></td>
<td><strong>Virtualize resources</strong></td>
<td><strong>Manage virtual images</strong></td>
<td><strong>Optimize system pools</strong></td>
</tr>
<tr>
<td><strong>PowerVM</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create/manage virtual machines (x86, PowerVM and z/VM)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Virtual machine relocation</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Capture/import, create/remove standardized virtual images</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Deploy standard virtual images</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Maintain virtual images in a centralized library</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Create/remove system pools and manage resources in system pools</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Add/remove physical servers within system pools</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
Put it all together, and **IBM today** is ready to **help you move off of your old legacy Sun environment, into solutions for Tomorrow**
Thank You

Thomas Broussard
Executive IT Architect
tbrouss@us.ibm.com
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