IBM System p

System p Trends & Direction
THE POWER OF SIX

Executive Briefing Center
PSSC Montpellier – IBM Customer Center

POWER 6

AGENDA

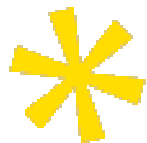Introduction – Announce

Performance Boost & Power savings

System p Virtualization enhancements
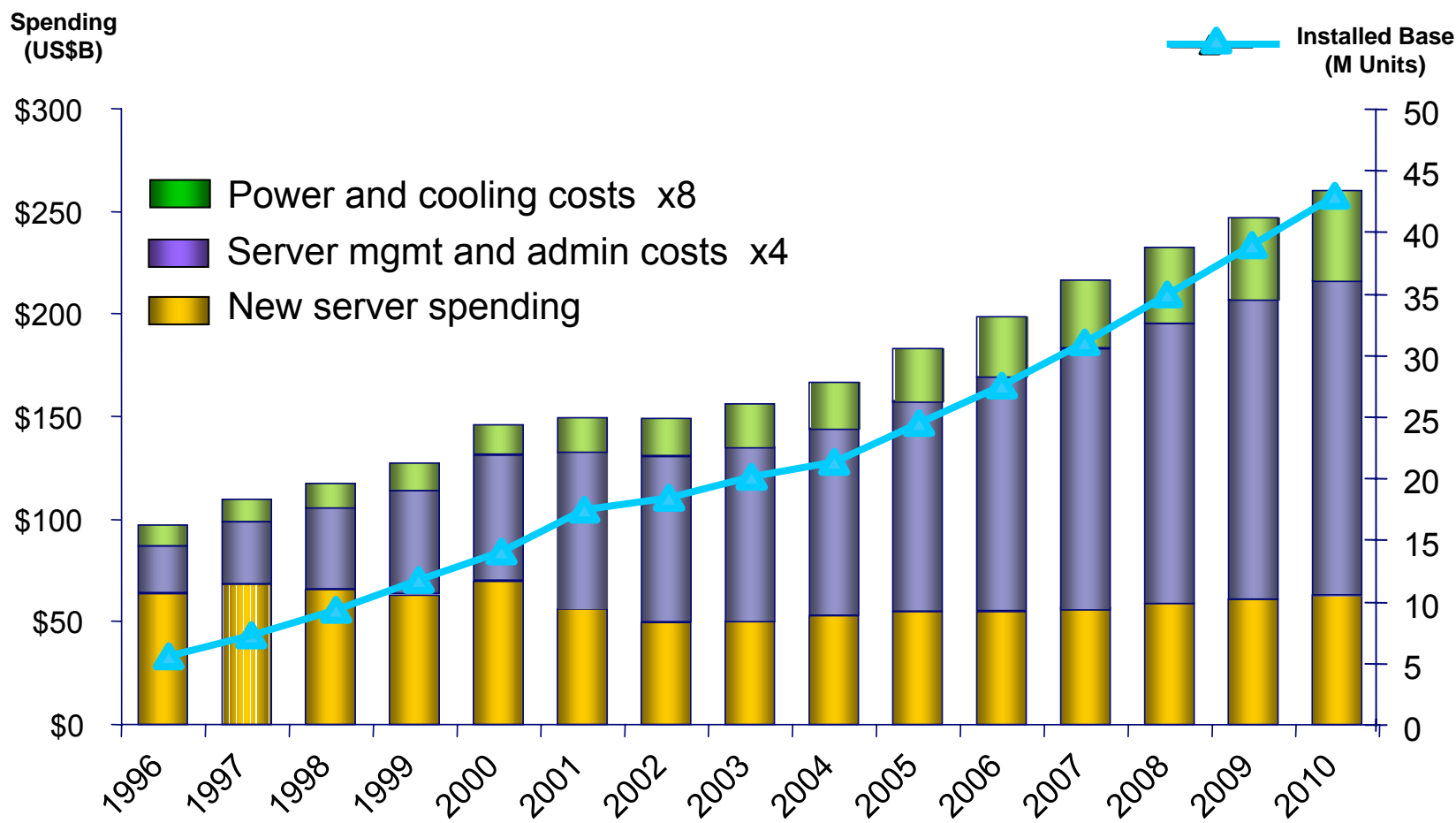
RAS & AIX 6 improvements

Today's challenge

Infrastructure complexity is raising costs and constraining growth

Power management is becoming key

Half of every dollar today is spent on energy for hardware
This is expected to increase by 54% over the next four years

Spending (US$B)

Installed Base (M Units)

- Power and cooling costs x8
- Server mgmt and admin costs x4
- New server spending

Source: IDC, Virtualization 2.0: The Next Phase in Customer Adoption, Doc #204904, Dec 2006

Get The Power Of Six. . .Take Back Control

© 2007 IBM Corporation

IBM

What do we announce today?
POWER6 & AIX6

POWER 6

AIX 6

New IBM System p570

- **Modular building blocks**
  - *--Start with four cores, grow to 16*
- **All 3 speeds are faster than competition**
  - *--3.5, 4.2 and 4.7 GHz POWER6*
- **More memory per core – than anyone**
  - *--Up to 768 GB max, 48GB/core!*
- **Full binary compatibility for investment protection**
  - *-- Existing Apps and AIX® 5L V5.2 & V5.3 run on POWER6*
- **Price-reduced POWER5+ 570s for customer flexibility**
  - *--IBM System p5 570 is now 20-25% more affordable*
  - *--Upgrades to POWER6 – buy now, upgrade when ready*

16 cores

12 cores

8 cores
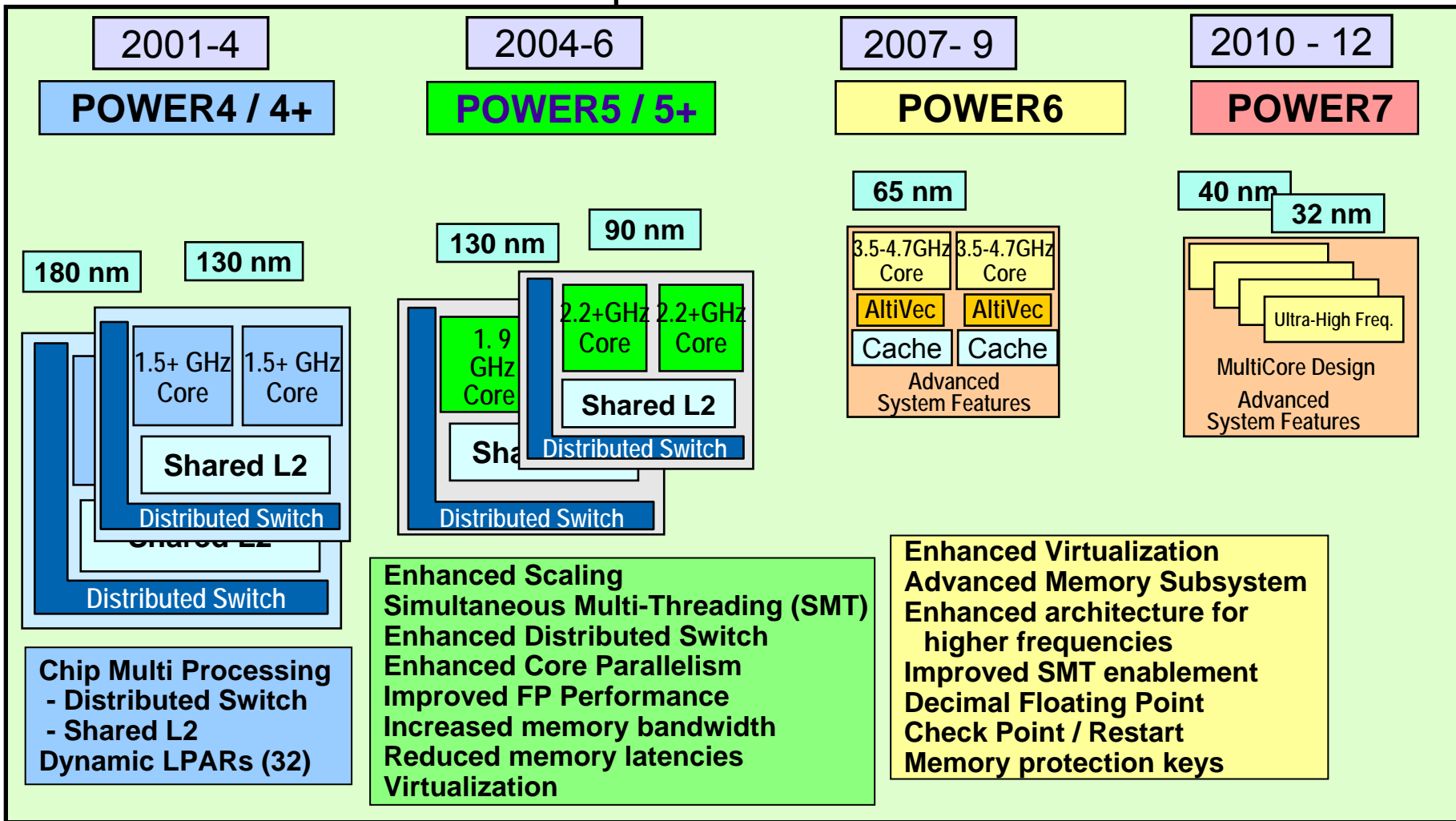
4 cores
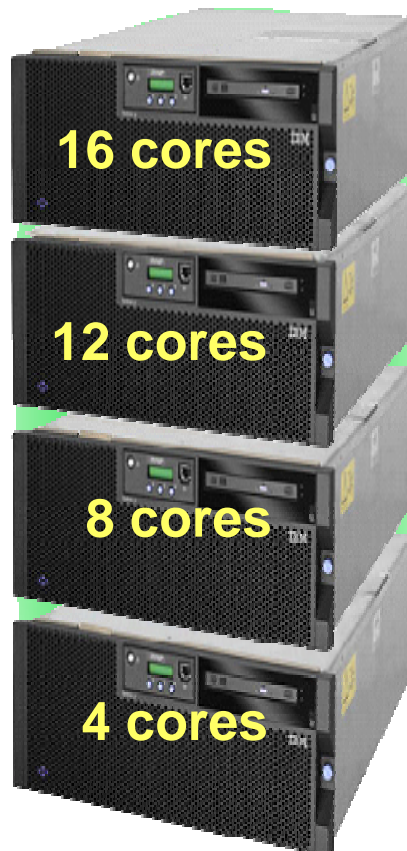
AIX 6.1

- **AIX planned enhancements will provide a tremendous step forward for our clients**
  - *Workload Partitions*
  - *Mobility*
  - *Security*
  - *Mainframe-inspired Continuous Availability*
  - *Manageability*

- *while providing **binary compatibility*** with previous releases*

- *AIX fully exploits the new capabilities of **POWER6***

- *Extreme **server consolidation**. Maximum **security computing** and **flexibility**.*

AGENDA

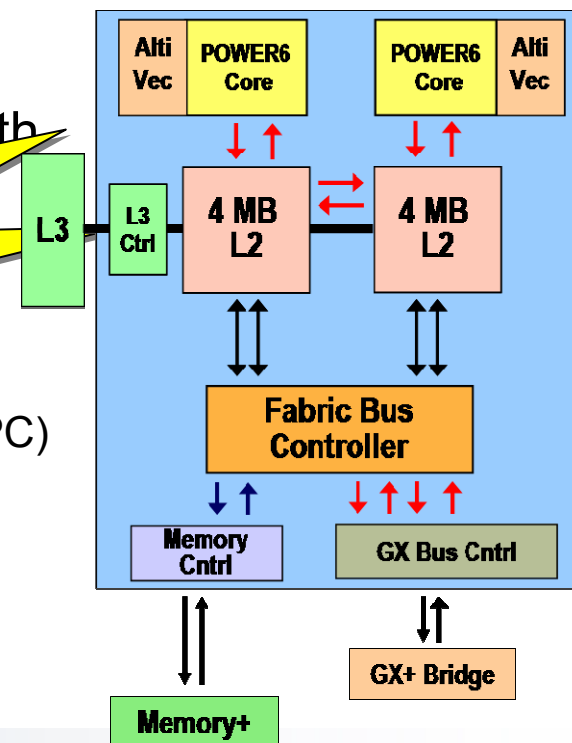## Performance Boost & Power savings

POWER Processor Roadmap

2001-4	2004-6	2007- 9	2010 - 12
POWER4 / 4+	**POWER5 / 5+**	**POWER6**	**POWER7**

65 nm

40 nm

32 nm

3.5-4.7GHz Core	3.5-4.7GHz Core
AltiVec	AltiVec
Cache	Cache

Advanced System Features

90 nm

Ultra-High Freq.

MultiCore Design
Advanced System Features

130 nm

130 nm

180 nm

1.5+ GHz Core	1.5+ GHz Core

Shared L2

Distributed Switch

Shared L2

Distributed Switch

2.2+GHz Core	2.2+GHz Core

Shared L2

Distributed Switch

1. 9 GHz Core

Sha...

Distributed Switch

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

Enhanced Scaling
Simultaneous Multi-Threading (SMT)
Enhanced Distributed Switch
Enhanced Core Parallelism
Improved FP Performance
Increased memory bandwidth
Reduced memory latencies
Virtualization

Enhanced Virtualization
Advanced Memory Subsystem
Enhanced architecture for
   higher frequencies
Improved SMT enablement
Decimal Floating Point
Check Point / Restart
Memory protection keys

BINARY COMPATIBILITY

POWER6 – Balanced Performance clients can count on

- Ultra-high frequency dual core – up to 4.7GHz
  - 7-way superscalar, 2-way Enhanced SMT core
- Balanced design with highest system bandwidth
  - 2X Memory Bandwidth (> 1...
  - 3X SMP and I/O ...
- Integrated Acc...
  - Deci... ...pplications
  - ... ...3D modeling (HPC)
- Full er... ...g ...ecovery
- Dynamic power saving
- **Consistent, predictable delivery**
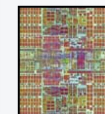
+50% perf/core Same power envelope

| L3 | L3 Ctrl | 4 MB L2 | 4 MB L2 |

Alti Vec | POWER6 Core | POWER6 Core | Alti Vec

Fabric Bus Controller

Memory Cntrl | GX Bus Cntrl

Memory+

GX+ Bridge
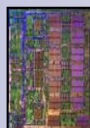
2001	2003	2004	2006	2007
POWER4™	**POWER4+™**	**POWER5™**	**POWER5+**	**POWER6™**

The IBM POWER6 *"Grand Slam"* for major workloads

3X Transaction
TPC-C**
Systems with 16 or more cores

2X Java
SPECjbb2005*
Systems with 16 or more cores

2.3X Throughput
SPECint_rate2006*
Systems with 8 or more cores

2.3X HPC
SPECfp_rate2006*
Systems with 8 or more cores

* Source: http://www.spec.org/   IBM p570 POWER6 results to be submitted on 5/21/07: All other results as of 04/27/07;
** Source: www.tpc.org/ IBM p570 POWER6 result to be submitted on5/21/07; All other results as of 04/27/07
See next page for full detail   © 2007 IBM Corporation

EFFICIENCY OF SIX: for energy management
Innovation in "green" system design for data centers

- More Work per Watt reduces power at the system level

- Virtualization enables consolidation of under-utilized servers

- POWER6 with EnergyScale™ technology enables dynamic power saving and management
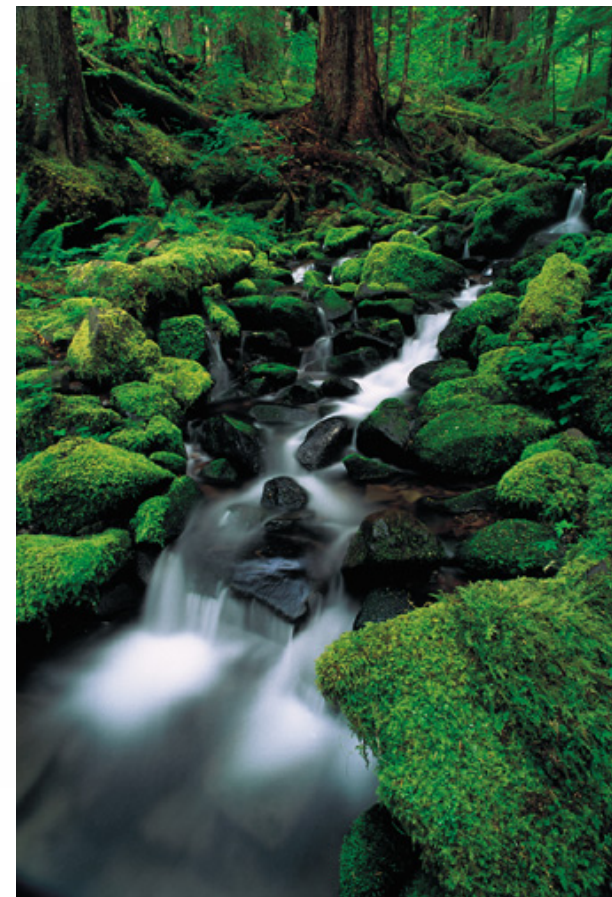
AGENDA

System p Virtualization enhancements

IBM's 40-year History of Leadership in Virtualization

1967	1973	1987	1997	2001	2004	2007
IBM develops **hypervisor** that would become VM on the mainframe	IBM announces first machines to do **physical partitioning**	IBM announces **LPAR on the mainframe**	**POWER LPAR design** begins	IBM introduces **LPAR in POWER4™ with AIX**	**Advanced POWER Virtualization** ships	IBM announces POWER6, **the first UNIX® servers with Live Partition Mobility**

"In our opinion, they [System p servers] bring mainframe-quality virtualization capabilities to the world of AIX."

- Ulrich Klenke, CIO, rku.it

January 2006

Advanced POWER Virtualization on IBM System p servers

AIX

Linux® on POWER

client quote source: rku.it case study published at http://www.ibm.com/software/success/cssdb.nsf/CS/JSTS-6KXPPG?OpenDocument&Site=eserverpseries

The Solution: System p Virtualization

LinuxWorld 2006 awards the **Product Excellence** awards to **IBM** with its **Advanced POWER Virtualization**.

Plala Networks Reduced Power Consumption by 80%

Metlife IT Administration Costs Cut by 30%
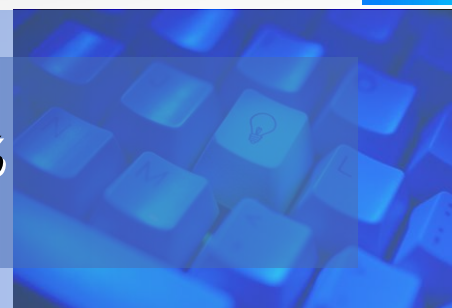
UPMC From 167 Servers to Five

Decreased 3-year TCO by $18M

Sources: Plala Networks case study published on May 9, 2007 at http://www.ibm.com/software/success/cssdb.nsf/CS/CMPN-732N6Q?OpenDocument&Site=eserverpseries&cty=en_us,

Metlife case study published on Feb 12, 2007 at http://www.ibm.com/software/success/cssdb.nsf/CS/JFTD-6YCRL6?OpenDocument&Site=eserverpseries&cty=en_us,

IBM Press release on UPMC success published at http://www.ibm.com/industries/healthcare/doc/content/news/pressrelease/2389264105.html

Get The Power Of Six. . .Take Back Control

System p Virtualization

Advancing the Most Complete Virtualization Offering for UNIX and Linux

Optimize your IT Infrastructure and Respond to Rapidly Changing Business Needs

- *By balancing workloads across multiple servers*

Eliminate Planned Downtime

- *By moving workloads from one server to another without application disruption*

Improve Power Efficiency

- *By consolidating workloads as business demands change and powering down/off underutilized servers*

Securely Share Systems Resources

- *Through industry-standard certified security capabilities*

New Capabilities

- Live Partition Mobility
- Virtual Shared Pool<u>s</u>
- WPAR & Live Application Mobility
- Shared Dedicated Capacity
- Integrated Virtual Ethernet

* All statements regarding IBM future directions and intent are subject to change or withdrawal without notice and represent goals and objectives only. Any reliance on these Statements of General Direction is at the relying party's sole risk and will not create liability or obligation for IBM.

Live Partition Mobility on IBM System p*

Move <u>running</u> UNIX and Linux operating system workloads from one POWER6 processor server to another!

Virtualized SAN and Network Infrastructure

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

Continuous Application Availability

With Live Partition Mobility and Live Application Mobility, planned outages for hardware and firmware maintenance and upgrades can be a thing of the past
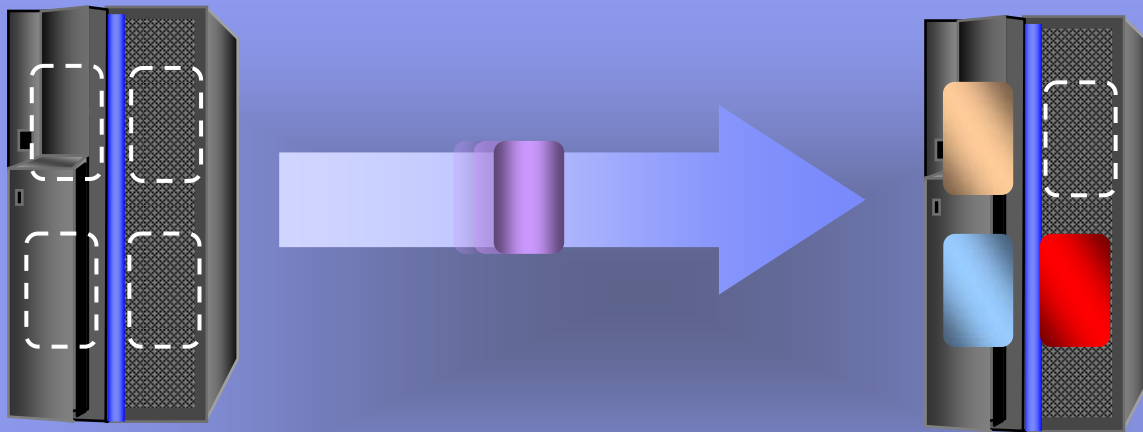
Relocate all partitions from one server to another when performing maintenance. Move the partitions back when maintenance is complete
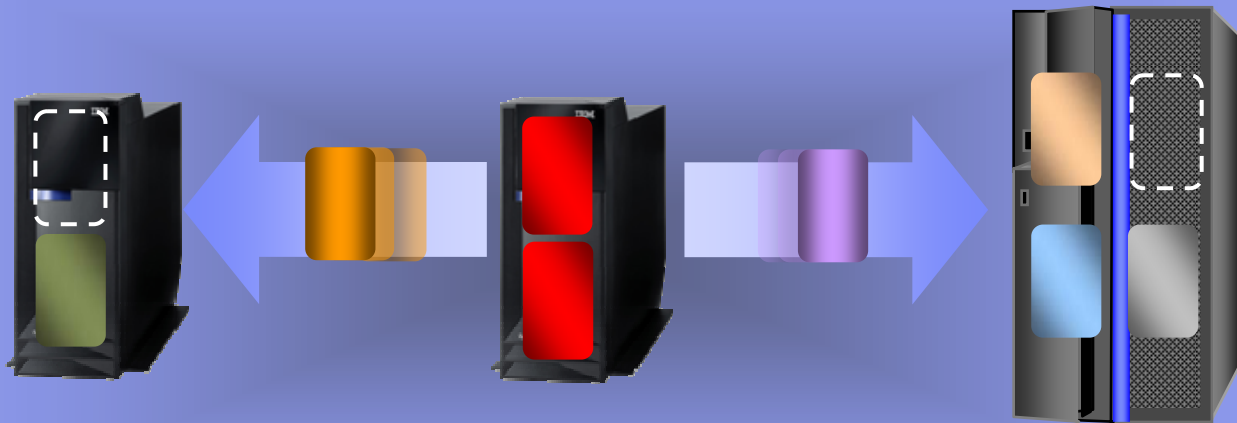
* All statements regarding IBM future directions and intent are subject to change or withdrawal without notice and represent goals and objectives only. Any reliance on these Statements of General Direction is at the relying party's sole risk and will not create liability or obligation for IBM.

IBM Systems

Energy Savings

During non-peak hours, consolidate workloads and power off excess servers
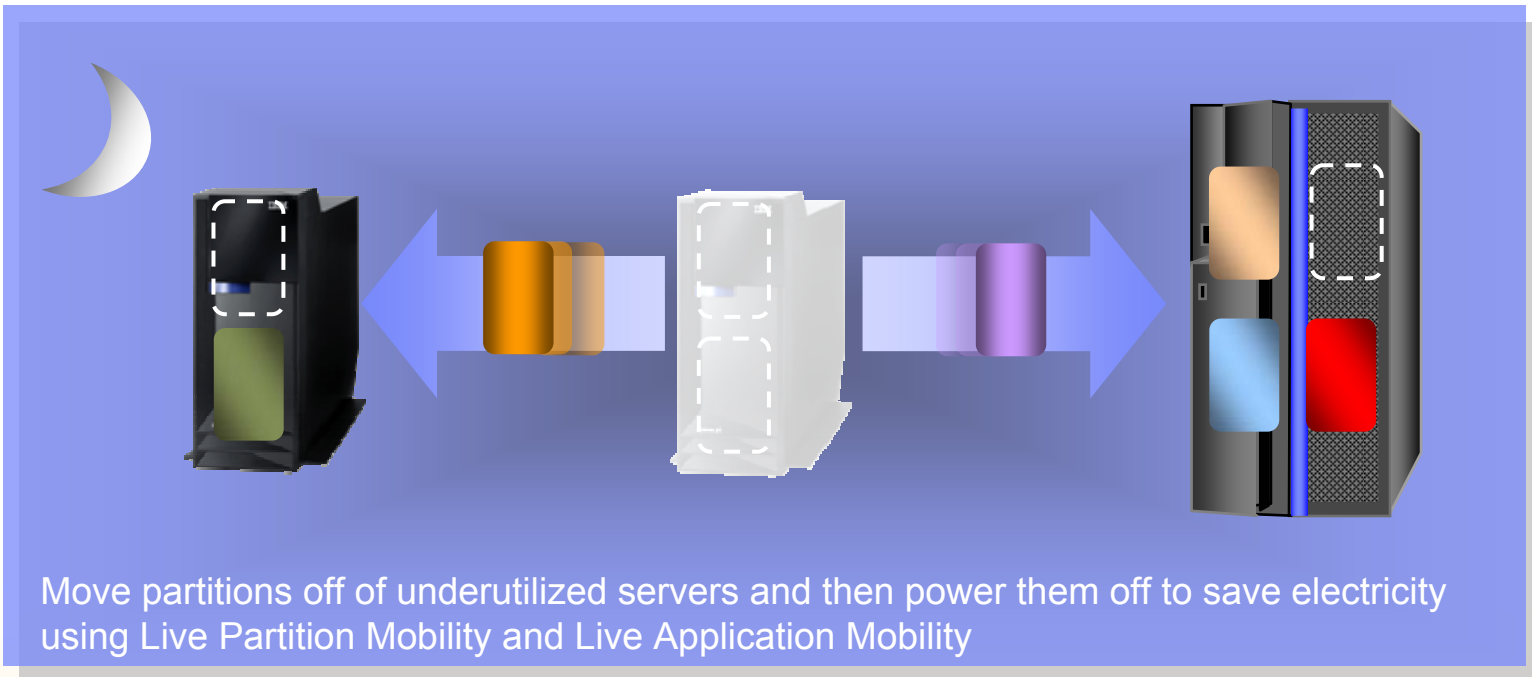
Move partitions off of underutilized servers and then power them off to save electricity using Live Partition Mobility and Live Application Mobility

IBM Systems
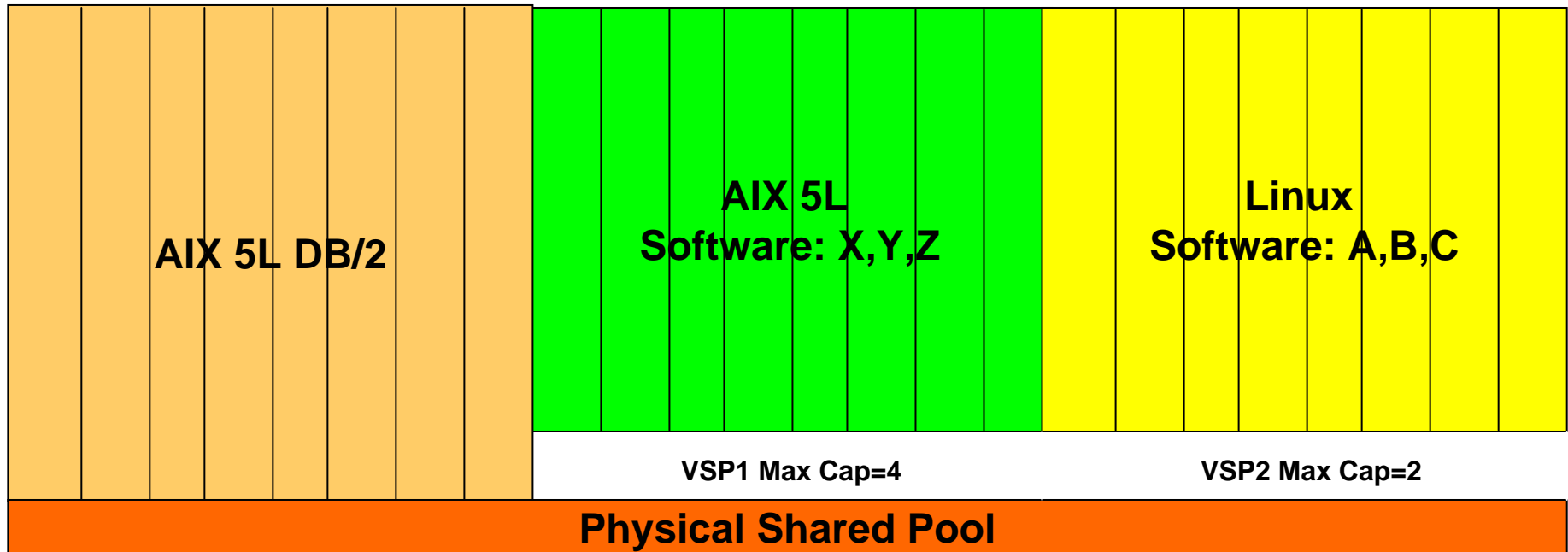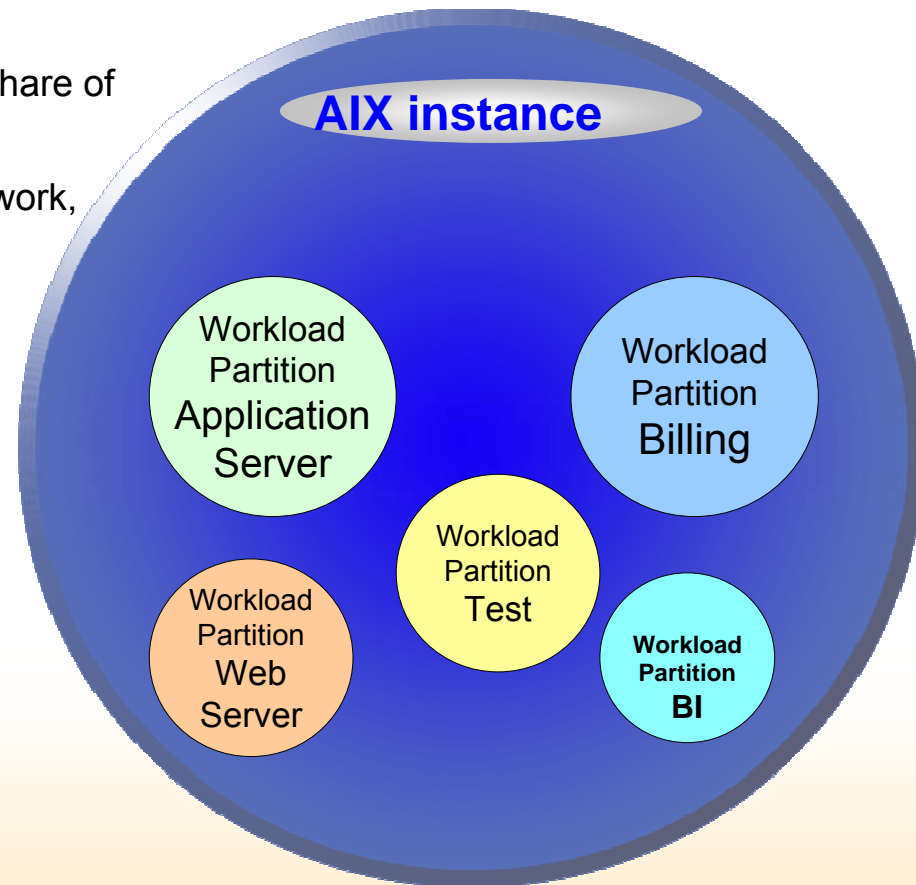
Workload Balancing with Live Partition Mobility*

As computing needs spike, redistribute workloads onto multiple physical servers without service interruption

As one server gets overtaxed from a spike in demand, relocate partitions to other servers

IBM Systems

Virtual Shared Pools

AIX 5L DB/2	AIX 5L Software: X,Y,Z	Linux Software: A,B,C
	VSP1 Max Cap=4	VSP2 Max Cap=2

Physical Shared Pool

► **Cap total capacity used by a group of partitions**

► **Only license the relevant software based on VSP Max**

► **Still allow other partitions to consume capacity not used by the partitions in the VSP**

IBM Systems

AIX 6 Workload Partitions – WPAR

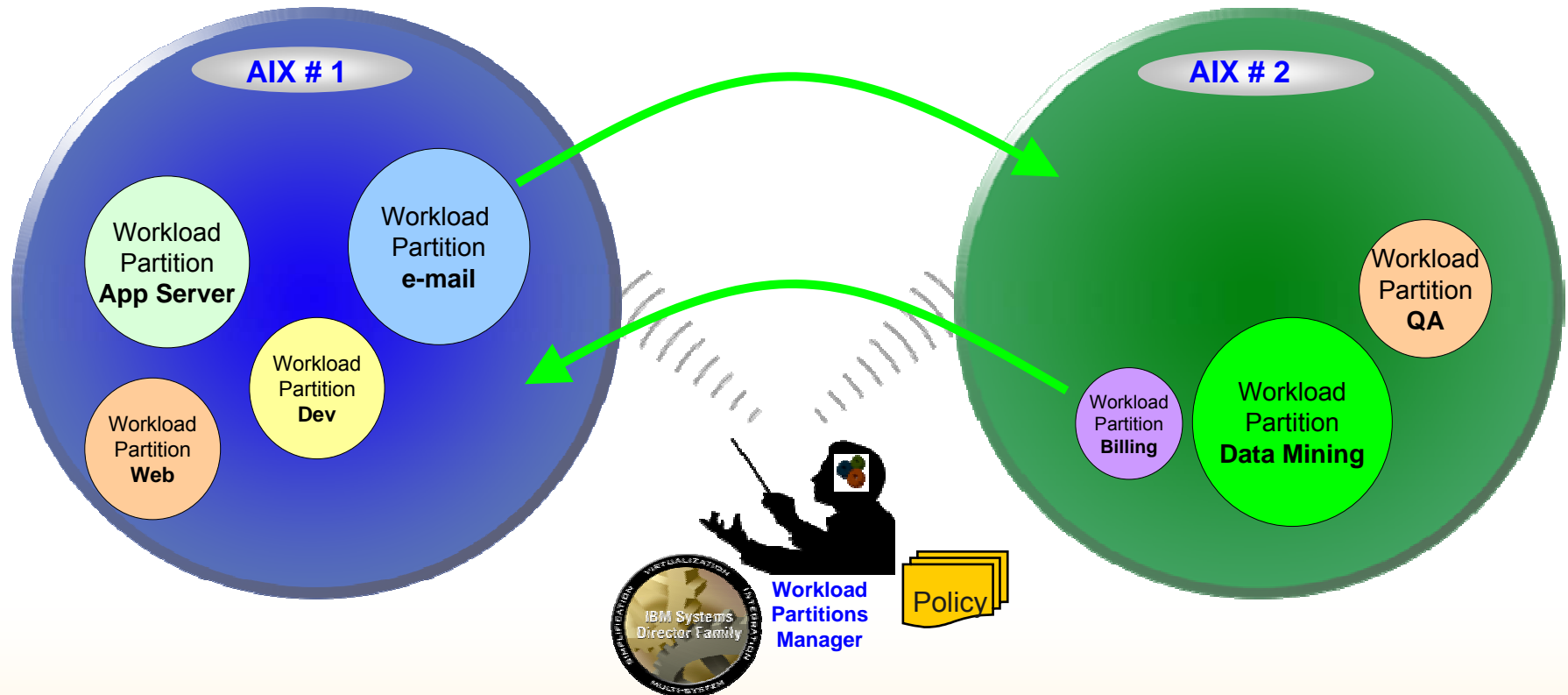*Improved administrative efficiency by reducing the number of AIX images to maintain*

- **Software partitioned system capacity**
  - Each Workload Partition obtains a regulated share of system resources
  - Each Workload Partition can have unique network, filesystems and security

- **Two types of Workload Partitions**
  - System Partitions
  - Application Partitions

- **Separate administrative control**
  - Each Workload Partition is a separate administrative and security domain

- **Shared system resources**
  - Operating system, I/O, processor, memory

AIX instance

Workload Partition Application Server

Workload Partition Billing

Workload Partition Test

Workload Partition Web Server

Workload Partition BI

IBM Systems

AIX 6 Live Application Mobility

Move a running Workload Partition from one server to another for outage avoidance and multi-system workload balancing
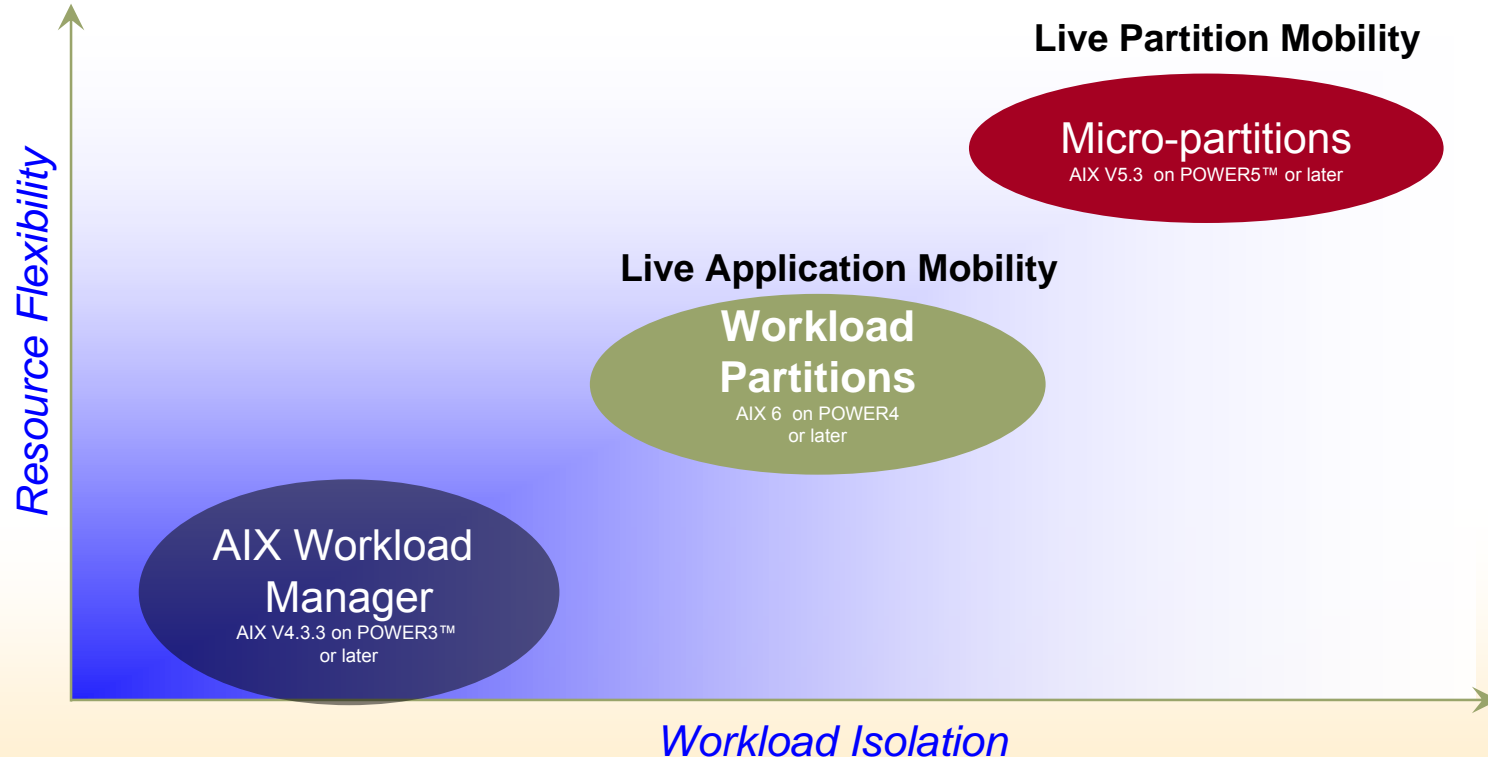

AIX # 1

Workload Partition **App Server**

Workload Partition **e-mail**

Workload Partition **Dev**

Workload Partition **Web**

AIX # 2

Workload Partition **QA**

Workload Partition **Billing**

Workload Partition **Data Mining**

Workload Partitions Manager

Policy

Works on any hardware supported by AIX 6 including POWER5

IBM Systems

IBM System p Announces Two Methods of Mobility

Live Partition Mobility – move a running POWER6 partition …
Live Application Mobility – move a running AIX 6 application …
… From one server to another

Live Partition Mobility

Micro-partitions
AIX V5.3 on POWER5™ or later

Live Application Mobility

Workload Partitions
AIX 6 on POWER4 or later

AIX Workload Manager
AIX V4.3.3 on POWER3™ or later

Resource Flexibility

Workload Isolation

* All statements regarding IBM future directions and intent are subject to change or withdrawal without notice and represent goals and objectives only. Any reliance on these Statements of General Direction is at the relying party's sole risk and will not create liability or obligation for IBM.

IBM Systems

AGENDA

RAS & AIX 6 improvements

Availability of POWER6™
Technologies designed to enable continuous availability

AIX 6

- **In today's on demand IT environment downtime is costly**
  - Financial impact
  - Client loyalty impact
  - Market competitiveness impact

- **Help clients eliminate planned and reduce unplanned downtime**
  - Protect each application through isolation and preventative reliability
  - Enable partition and application mobility to eliminate disruptions

System **R**eliability Enhancements
- Processor Instruction Retry
- Storage Keys*

Improving Application **A**vailability
- Live Partition Mobility*
- Live Application Mobility*

Improving **S**erviceability
- AIX Concurrent Maintenance
- System Concurrent Maintenance
  - Hot-node add, cold-node repair*

Summary……………………………………Questions?

Performance Boost & Power savings
Twice the frequency for same power envelope

System p Virtualization enhancements
Live Partition mobility
Live Application mobility

RAS & AIX 6 improvements
One step further to mainframe-world

POWER6 and AIX 6 new function – recap

Feature	Licensed Via		Supported OS			Supported Hardware		
	APV	AIX v6.1	AIX v5.3	AIX v6.1	Linux	POWER4	POWER5	POWER6
Dedicated processor sharing	✓		✓	✓	✓			✓
Hardware Decimal FP			✓	✓	✓			✓
Integrated Virtual Ethernet			✓	✓	✓			✓
Storage keys - application			✓	✓				✓
Storage keys – kernel				✓				✓
Live Partition Mobility	✓		✓	✓	✓			✓
Multiple virtual shared pools	✓		✓	✓	✓			✓
WPARs		✓		✓		✓	✓	✓
Live Application Mobility		✓		✓		✓	✓	✓