Give more Power to SAP!

**- combine the power of SAP® business solutions
with IBM Power System™ and AIX™ strengths**

IBM SAP International Competence Center

ISICC

... combining our strengths

Milan Otajovic, SAP Global Alliance
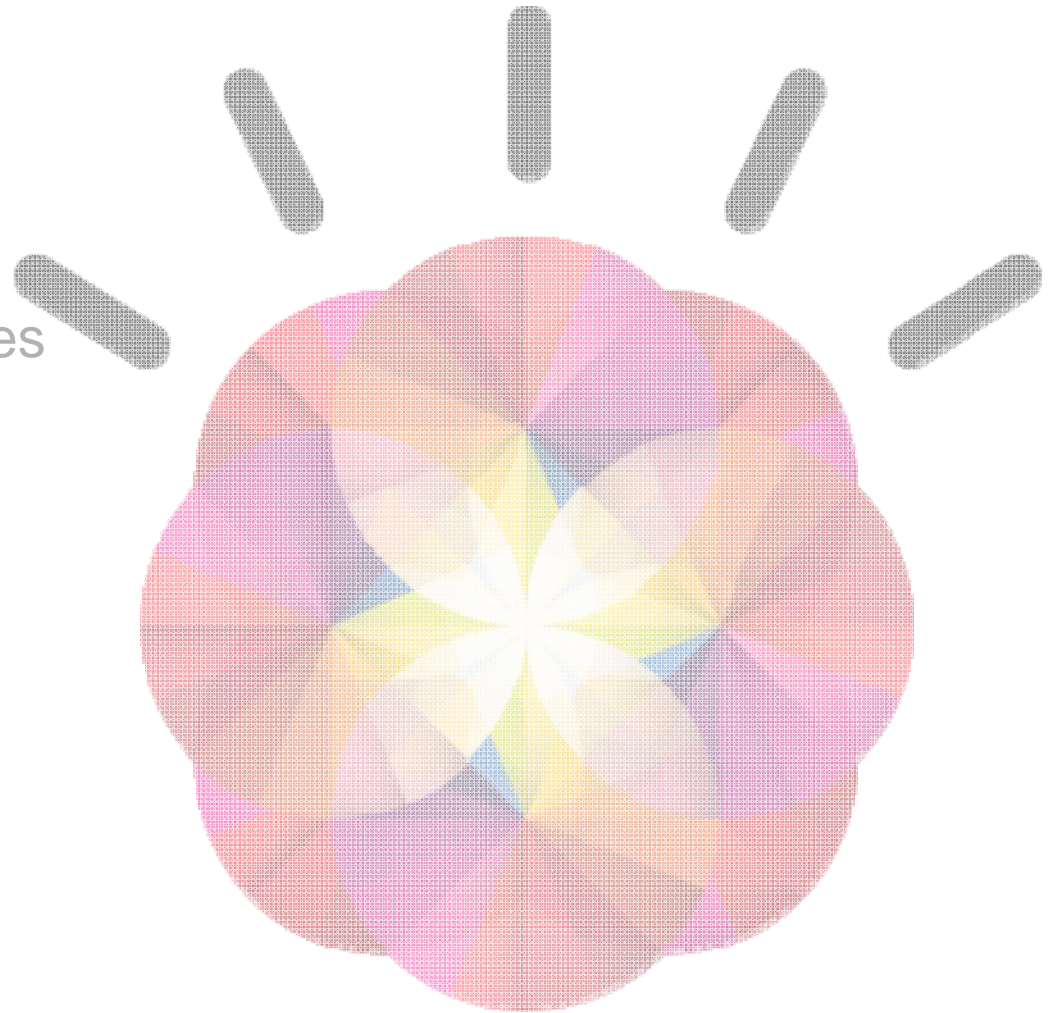motajovic@sk.ibm.com

IBM

Agenda

- IBM Power System™ News

- Remarks on POWER™ virtualization

- Benefits of POWER for SAP landscapes

- AIX for SAP Business Applications
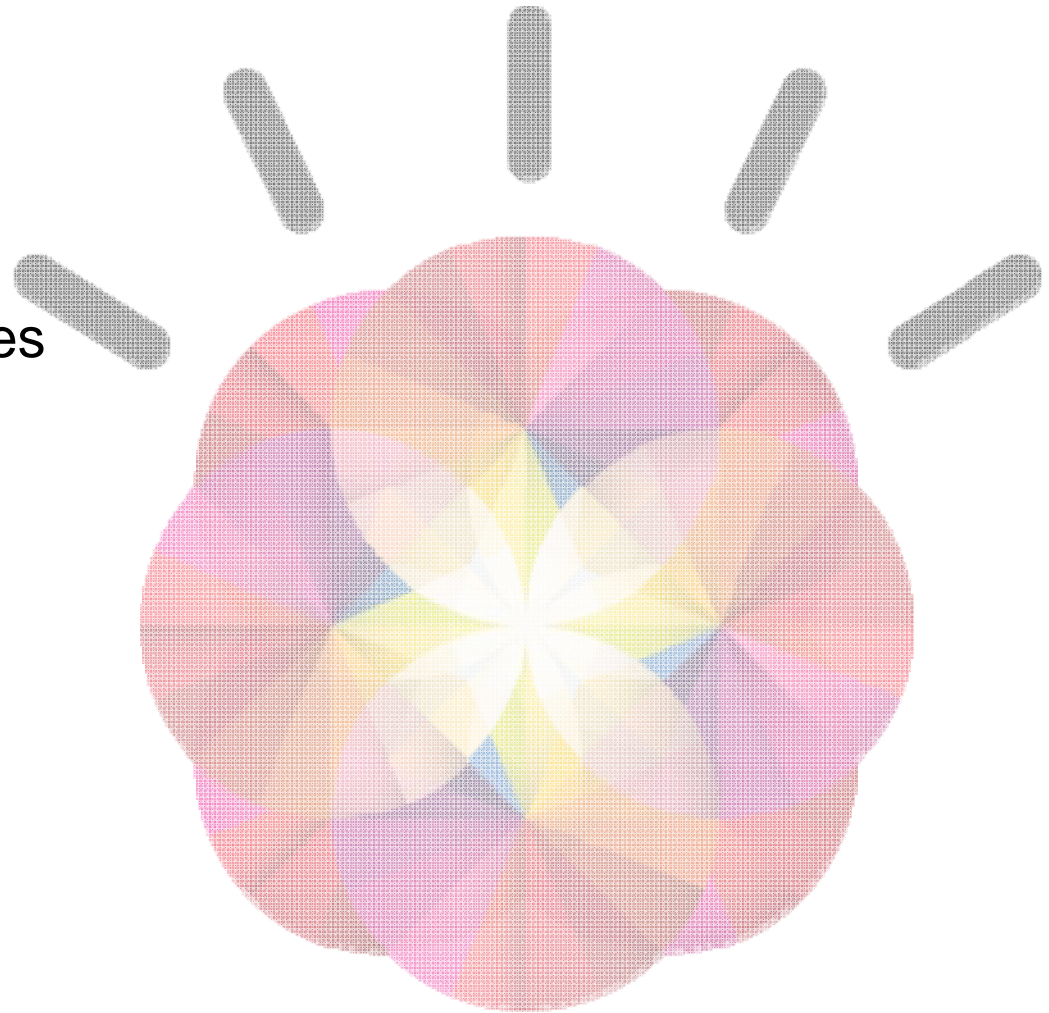
- System Management
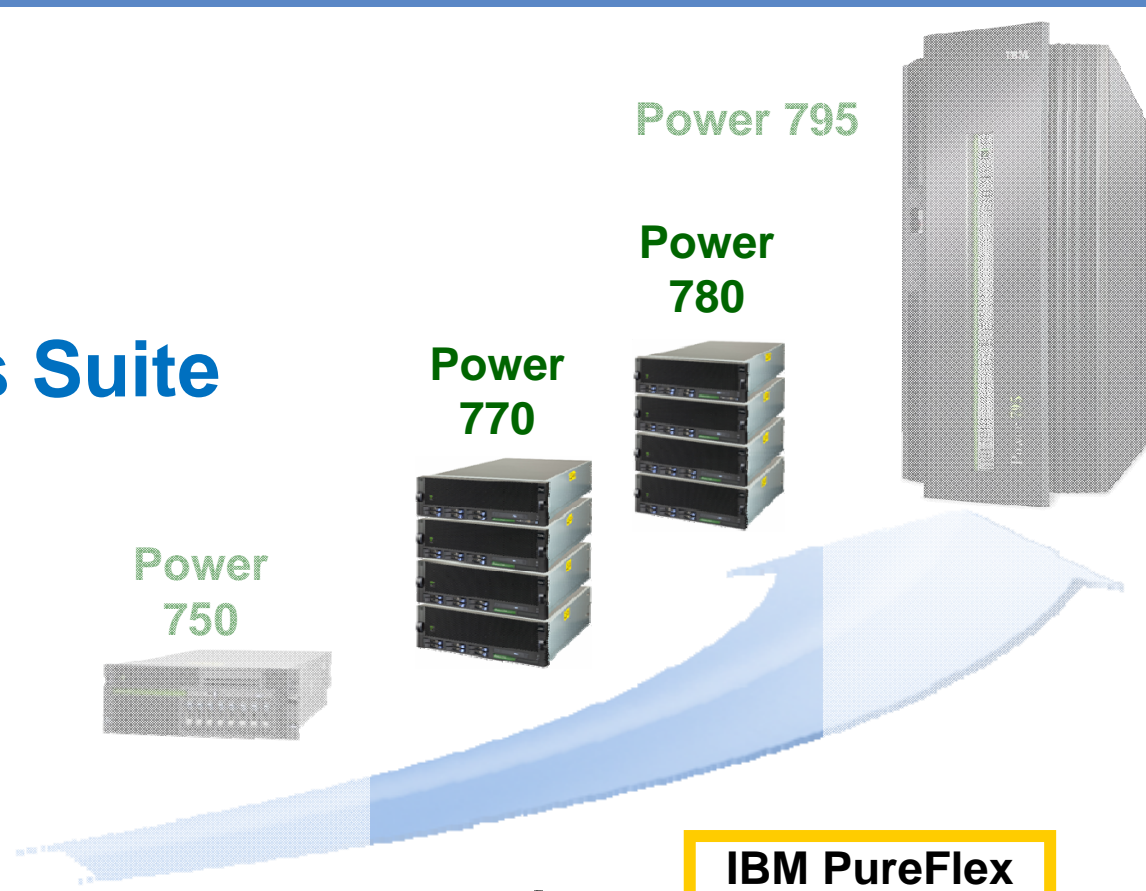
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- System Management

…New Members 2012

All ready to run

SAP **Business Suite**

Power 795

Power 780

Power 770

Power 750

Power 720/740

Power 710/730

IBM PureFlex System

p460

p260

p24L

PS Blades

PowerLinux 7R1 / 7R2

4

POWER7 Is Another Building Block in a Lasting Partnership

A successful cooperation and technology integration between SAP and IBM

- New AIX JVM (J9) improves SAP NetWeaver environment

- POWER Live Partition Mobility (LPM)
  - Move running SAP instances from one server to another

- AIX Workload partitions
  - A lean and fast approach of OS virtualization

- Integration of PowerVM™ / AIX virtualization metrics into SAP CCMS

- Integration of PowerVM and Systems Director with SAP Landscape Virtualization Manager for Cloud like operations

- **Optimized SAP NetWeaver Kernel (PBO, profile based optimization) for POWER platforms** (ships 3Q2012 w/ NW 7.31)
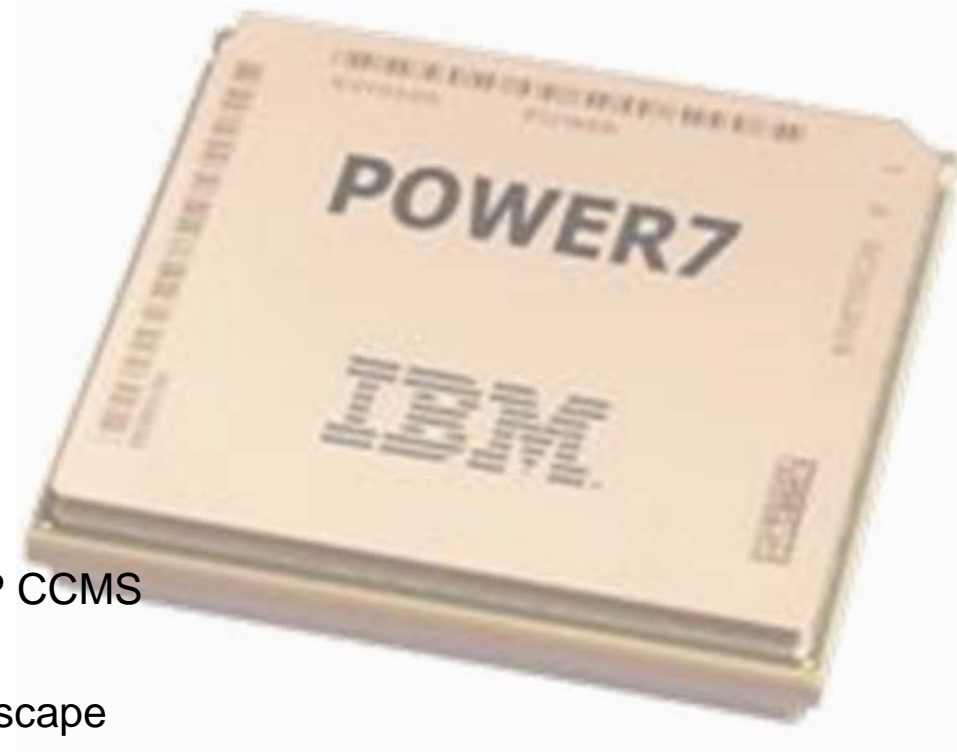
The New SAP NetWeaver 7.31_EXT PBO kernel

- Additional capacity and/or performance for existing SAP systems – for free!

  - Consistent improvements have been monitored in controlled environments.

  - Customers may experience different gains per their individual workload profile.

- Newer AIX and compiler options can increase efficiency of executables running on the POWER platform.

  - Tangible result of IBM SD benchmark leadership expertise

  - Supported for AIX Version 6.1 TL2 or higher, not restricted to POWER7(+)

  - NetWeaver 7.31_EXT can replace older NW 6.x and 7.x kernels

- Installation of PBO Kernel can be as easy as a simple SAP Kernel switch

- Improvements may result in tangible customer benefits:

  - Faster processing of ABAP based SAP transactions and batches

  - Have seen improvements on DB-Servers , too

  - Less system utilization driving an identical workload
    ➔ more capacity per server

POWER7 – designed for mission critical SAP applications

Operating System
Hot patch Kernel
Storage Keys

Hot Plug / Removal
Fans & Power Supplies

Hot Plug / Removal
PCI-X & PCIe Adapters
IO Drawers

Hot Plug / Removal
Disks

Hot Add
I/O racks

Memory
Chip Kill technology with
Bit-steering

Dual Clocks
770/780/795

Concurrent Add: 770/780
Eliminates Upgrade outages

Concurrent Service 770/780
Eliminates Repair Outages

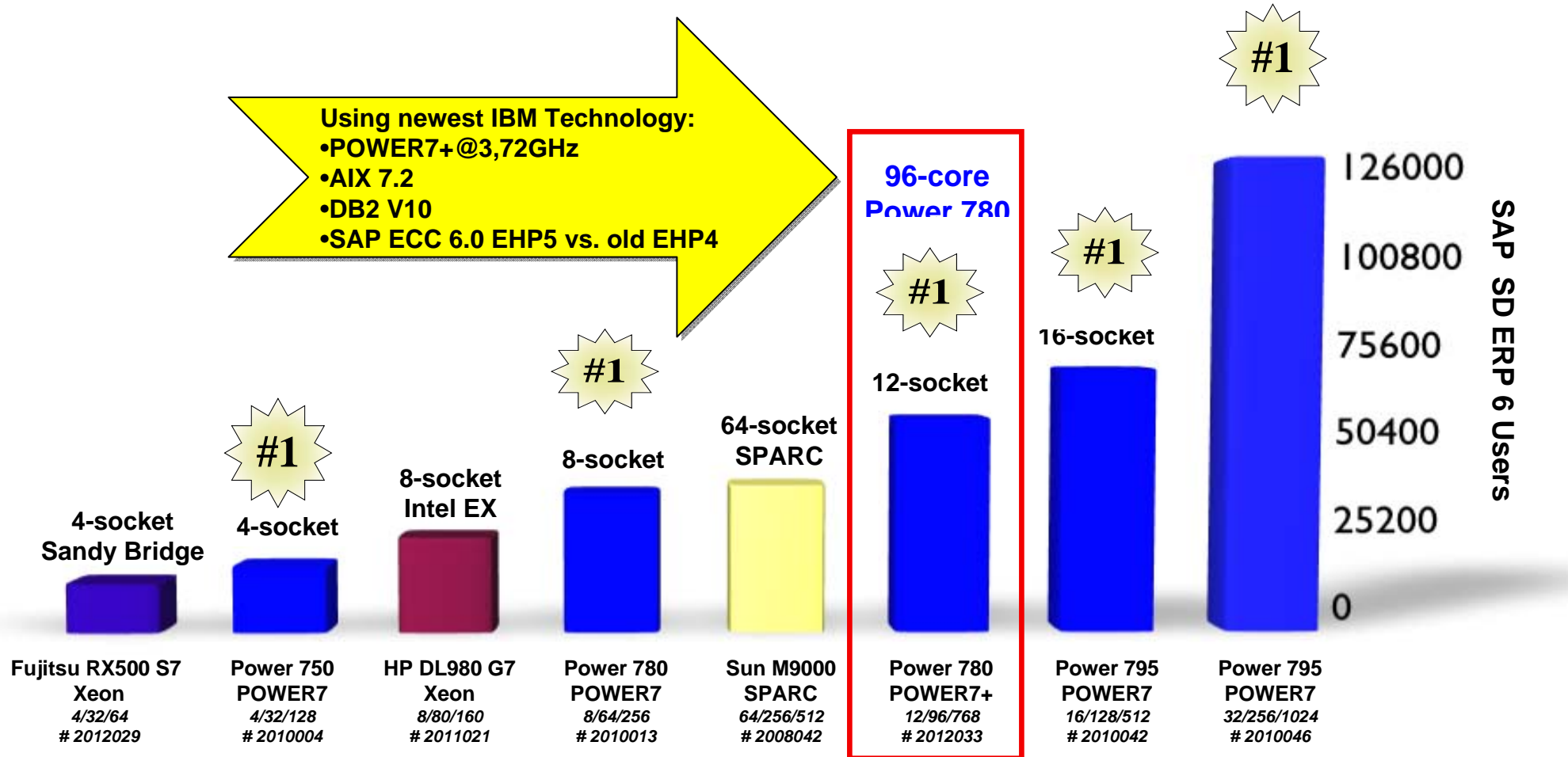**Passive backplane**
No active components

First Failure Data Capture
Help eliminates intermittent failures

Hypervisor
Mainframe technology

Mobility
Partition Mobility

Processors
Dynamic De-Allocation
Packaging
Instruction Retry
Alternate Processor Recovery

Power Systems Top Others in
SAP Sales & Distribution Benchmarks

Using newest IBM Technology:
- **POWER7+@3,72GHz**
- **AIX 7.2**
- **DB2 V10**
- **SAP ECC 6.0 EHP5 vs. old EHP4**

96-core Power 780

#1

#1

#1

#1

#1

#1

12-socket

16-socket

8-socket

64-socket SPARC

4-socket Sandy Bridge

4-socket

8-socket Intel EX

SAP SD ERP 6 Users

126000
100800
75600
50400
25200
0

Fujitsu RX500 S7 Xeon	Power 750 POWER7	HP DL980 G7 Xeon	Power 780 POWER7	Sun M9000 SPARC	Power 780 POWER7+	Power 795 POWER7	Power 795 POWER7
4/32/64	4/32/128	8/80/160	8/64/256	64/256/512	12/96/768	16/128/512	32/256/1024
# 2012029	# 2010004	# 2011021	# 2010013	# 2008042	# 2012033	# 2010042	# 2010046

(1) Configuration and results of the IBM Power 780 on the two-tier SAP SD standard application benchmark running SAP enhancement package 4 for the SAP ERP 6.0 application (Unicode): 12 processors / 96 cores / 768 threads, POWER7+, 3.72 GHz, 768 GB memory, 56,832 SAP SD benchmark users, running AIX® 7.1 and DB2® 9.7. Certification #: 2012033. Results valid as of 09/11/2012. ; Source: http://www.sap.com/solutions/benchmark/sd2tier.epx   Additional details on next page.

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Dynamic Platform Optimizer DPO

> Automatically aligns virtual machine resources to the optimal resource topology
> • Eliminates performance affects of dynamic resource changes or mobility
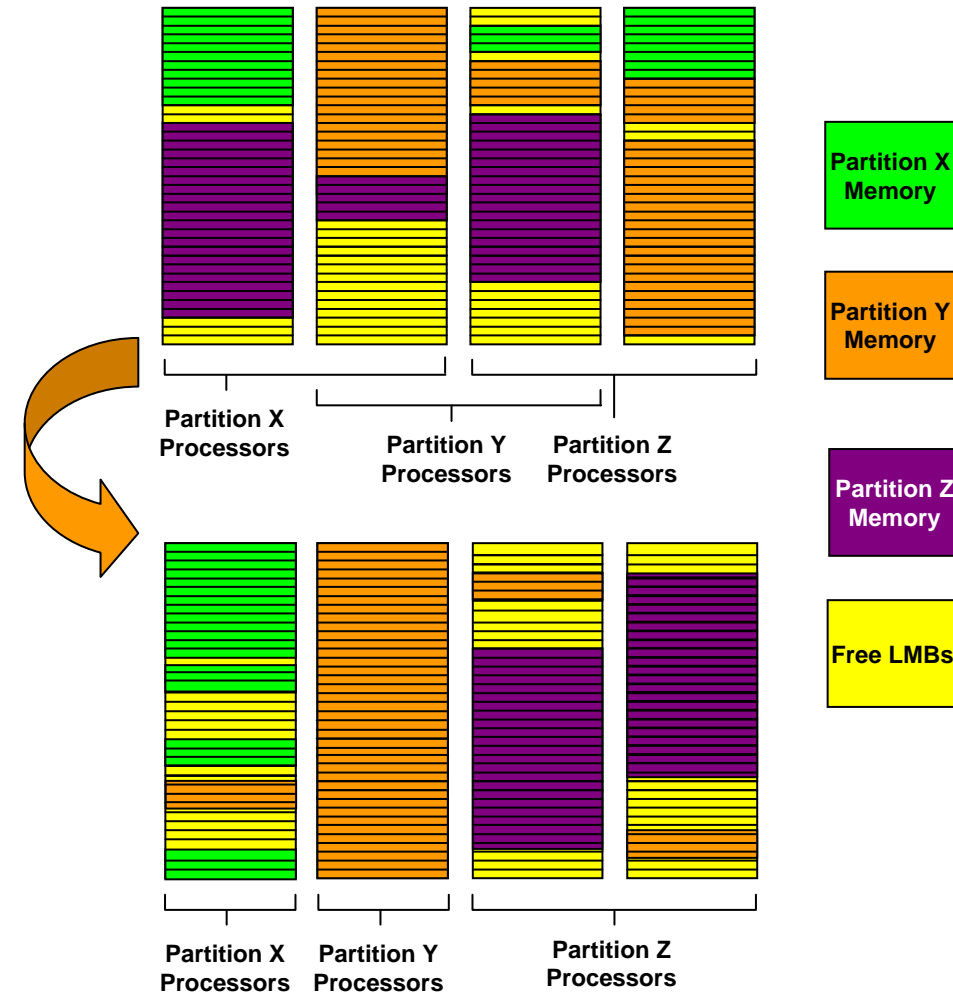
- **Key Features**
  - *Partition placement (memory, virtual CPUs) optimized dynamically to improve affinity*
  - *Available for Power 770,780, and 795 at no charge*
  - *Operating system agnostic*
  - *OS adjusts to new affinity properties after optimization operation. Full supported with*
    - *AIX: 6.1 TL8+, AIX 7.1 TL2+*
    - *IBM i: 7.1*

- **Client /SAP Application Benefits**
  - *Improved performance in a cloud environment*
  - *Consistent transaction dialogue times*

- **As of 10/2012 we have not yet tested DPO in an SAP application environment.**
  - *As a native POWER feature does not require formal SAP certification*
  - *We expect DPO to behave transparent and improve system behavior, in particular for large Power Systems and instances*
  - *During Re-Allocation of LPARs, SAP performance will be impacted, not apply during prime shift*

Partition X Processors | Partition Y Processors | Partition Z Processors

Partition X Processors | Partition Y Processors | Partition Z Processors

Partition X Memory
Partition Y Memory
Partition Z Memory
Free LMBs

TWO partners for mission critical SAP Business Applications
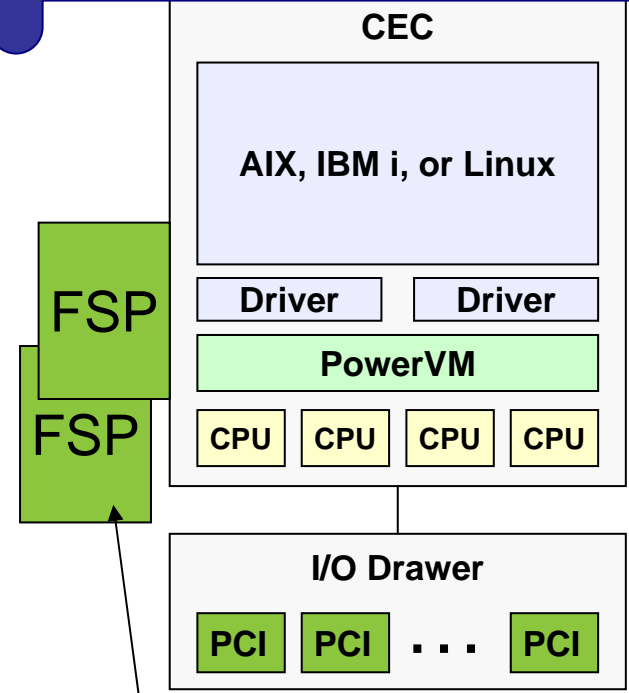
- IBM Owns Systems and much of the Stack:
  - I/O drawers / memory management unit
  - Processors
  - Other required chips
  - Hypervisor and VIOS
  - Device drivers
  - PCI adapters (validated)
  - Operating system
  - Middleware
  - Clustering software (PowerHA SystemMirror, System Pools)
  - Management Software (IBM Systems Director)
- Significantly improves availability
- Reduces problem determination complexity

Hardware RAS is more than just processor RAS

Caches, I/O Controllers, Power Subsystems, Memory, I/O sub-systems I/O Adapters, Firmware

CEC

AIX, IBM i, or Linux

| Driver | Driver |

PowerVM

| CPU | CPU | CPU | CPU |

FSP

FSP

I/O Drawer

| PCI | PCI | . . . | PCI |

Due to multiple OS Requirements Hardware Layer Is abstracted and Documented using Interfaces between PowerVM and OS And PowerVM And hardware service processors

Dedicated Service Processor does most CEC error determination/fault isolation OS and Hypervisor Independent

PowerVM is the Starting Point for SAP Cloud Computing

Cloud-Computing

IBM Cloud SCE Offerings
- Hosted services
- Technology / Components

SAP Automation and Service Management
SAP Landscape Virtualization Manager
SAP Post-Copy Automation
SAP Solution Manager

Server Virtualization (Hypervisors)
PowerVM
VMware

Storage Virtualization
XIV - today
SAN Volume Controller, Storwize V7000

Infrastructure Monitoring and Management
IBM Systems Director and Plug-Ins
VMControl, Storage Control
IBM FlashCopy Manager
SAP Filesystem Cloning

Dynamic IT landscape

The Power Ecosystem is Extended for Cloud Computing

Dynamic efficiency for cloud

Elastic Capacity (CoD) for Power System Pools	PowerVM Live Partition Mobility improvements	PowerVM Virtualization Performance Advisor	Dynamic Platform Optimizers	IBM Systems Director / Flex System Manager
Provides resource flexibility and usage based accounting of a public cloud for on-premise clouds	Offers faster response to changing business needs	Proactively provides performance optimization recommendations	Consistently monitors and optimizes allocation of High End Systems' workloads	Enables automated, workflow oriented infrastructure operations
Enables agility for adapting SAP infrastructure to project and LoB needs. Fits well to SAP's non CPU related licensing model.		Autonomous and interactive ways of establishing and maintaining optimal SAP application performance and system utilization		Integration with SAP Landscape Virtualization Management enable end-to-end Cloud operations.

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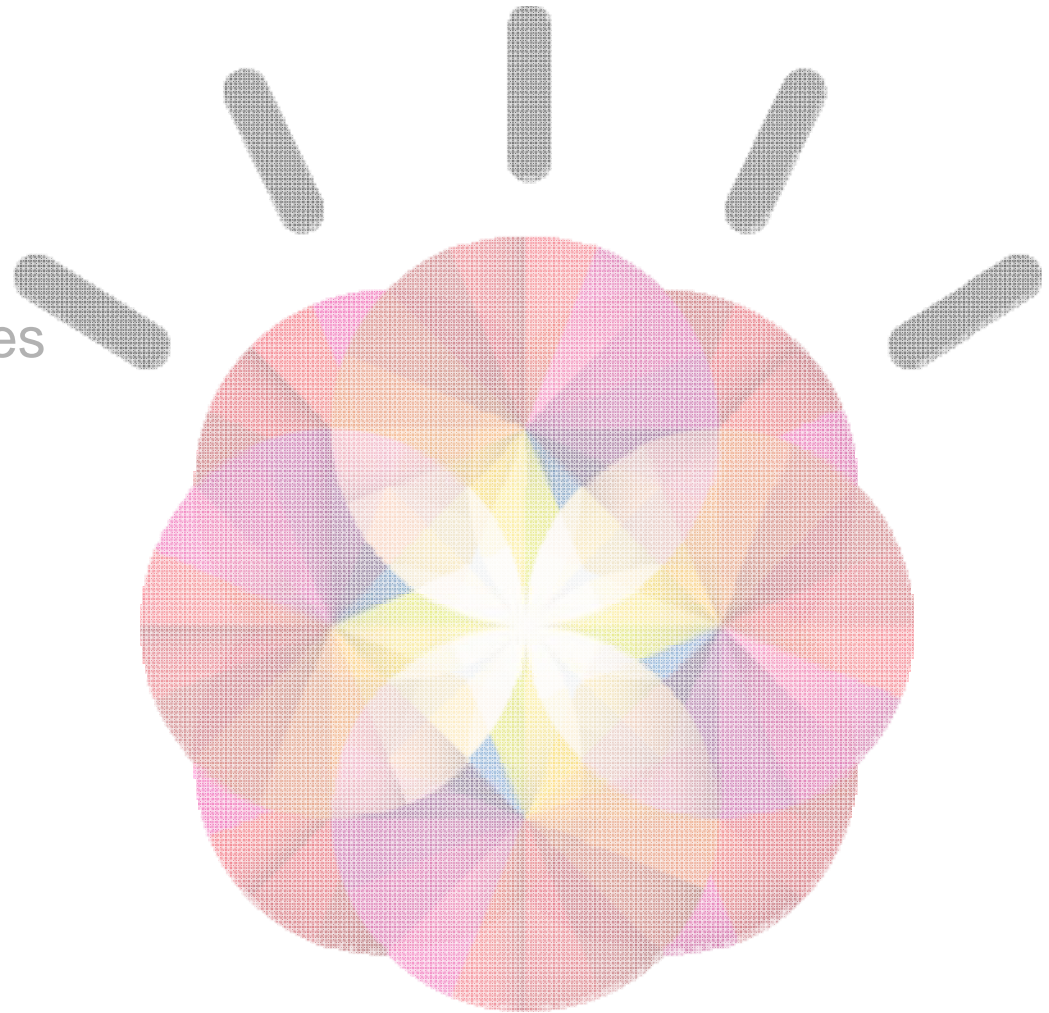
New SAP Environments are Growing in Size and Complexity

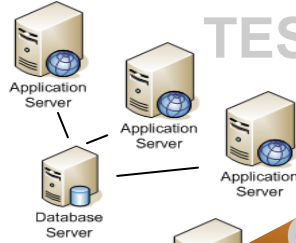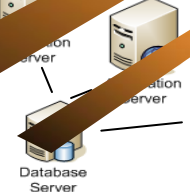Multiple Servers for each SAP System Landscape are required by SAP

DEV

TEST

QA

PROD

Application Server

Application Server

Application Server

Database Server

SAP System

1

2

3

...

Multiple system landscapes per SAP functional solution
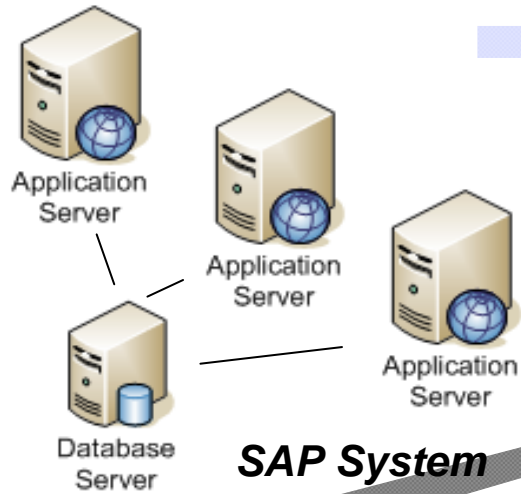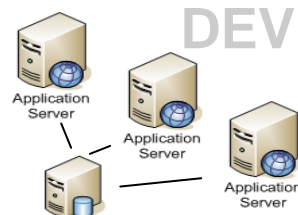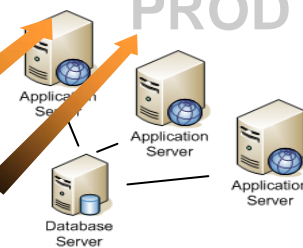
Multiple operational stages per System

2001	2003	2005	2006/7	2008+
1 landscape	**2** landscapes	**5** landscapes	**9** landscapes	**14** landscapes
59 batch jobs	**2** upgrades/yr	**4** parallel rollouts	**6** parallel rollouts	**9** parallel rollouts
400 users	**124** batch jobs	**3** upgrades/yr	**8** upgrades/yr	**8** upgrades/yr
	850 users	**198** batch jobs	**310** batch jobs	**412** batch jobs
		1400 users	**2800** users	**3100** users

PowerVM V2.2.2 Enhancements, 4Q2012

Technology

SAP Infrastructure Benefits

- **Support for 20 VMs per Core** → *Improved flexibility, by allowing more VMs to be executed on a single core.*

- **New VIOS Performance Advisor analyzes VIO Server performance and recommends optimal settings** → *Proactively optimize VIOS performance with recommendations provided by the performance advisor. Client benefits from performance experts best practices.*

- **Live Partition Mobility performance improvements doubles the concurrency and improves VM movement performance up to 3x** → *Accelerates VM movement which allows clients to move VMs faster to balance workload or to evacuate systems for Maintenance.*
Enables faster dynamic change for the business.

- **New VMcontrol support for advanced PowerVM functions**
  Linked Clones
  IBM i system pool support → *Linked Clones accelerate VM deployment by sharing common components saving storage and time to deploy IBM i system pool support optimizes resource utilization and management efficiency*

- **Shared Storage Pool Enhancements** → *Improved scaling, reliability, availability and serviceability provides better service to clients.*
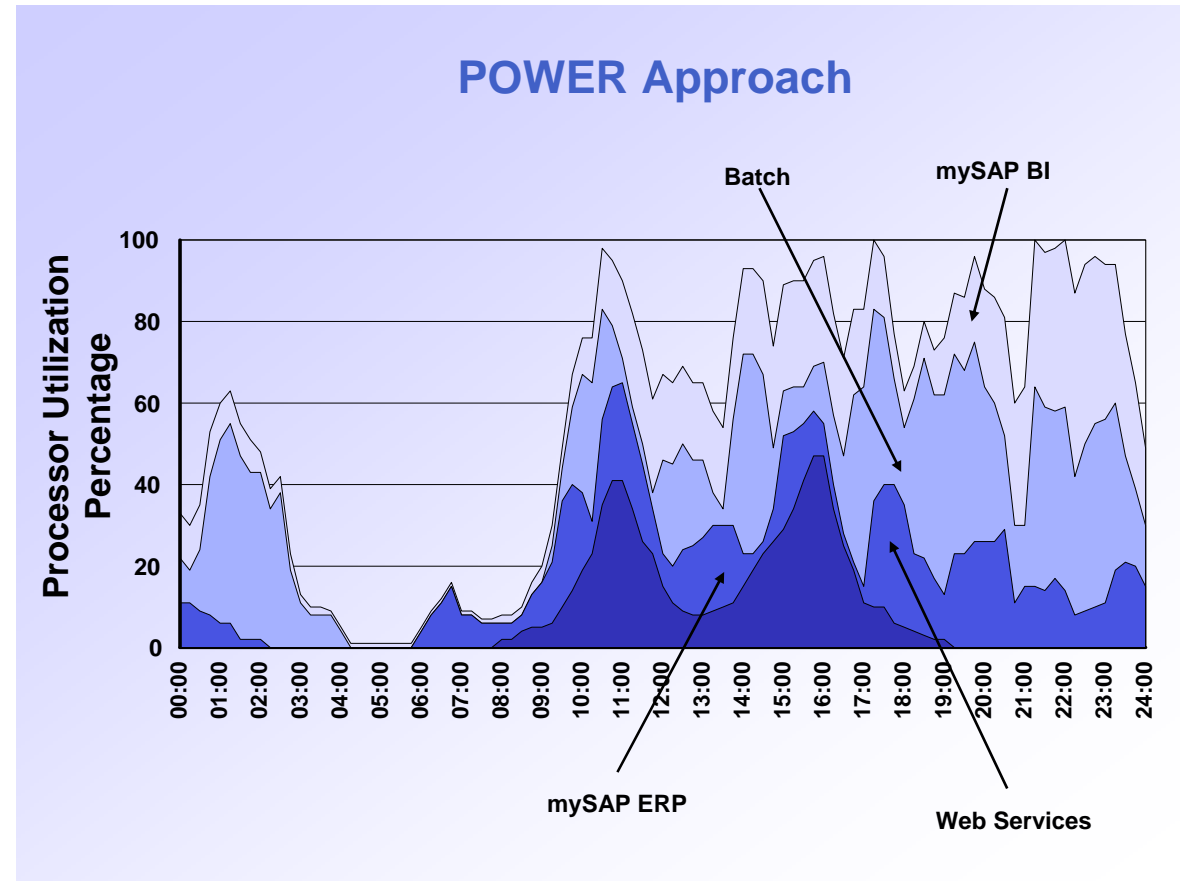
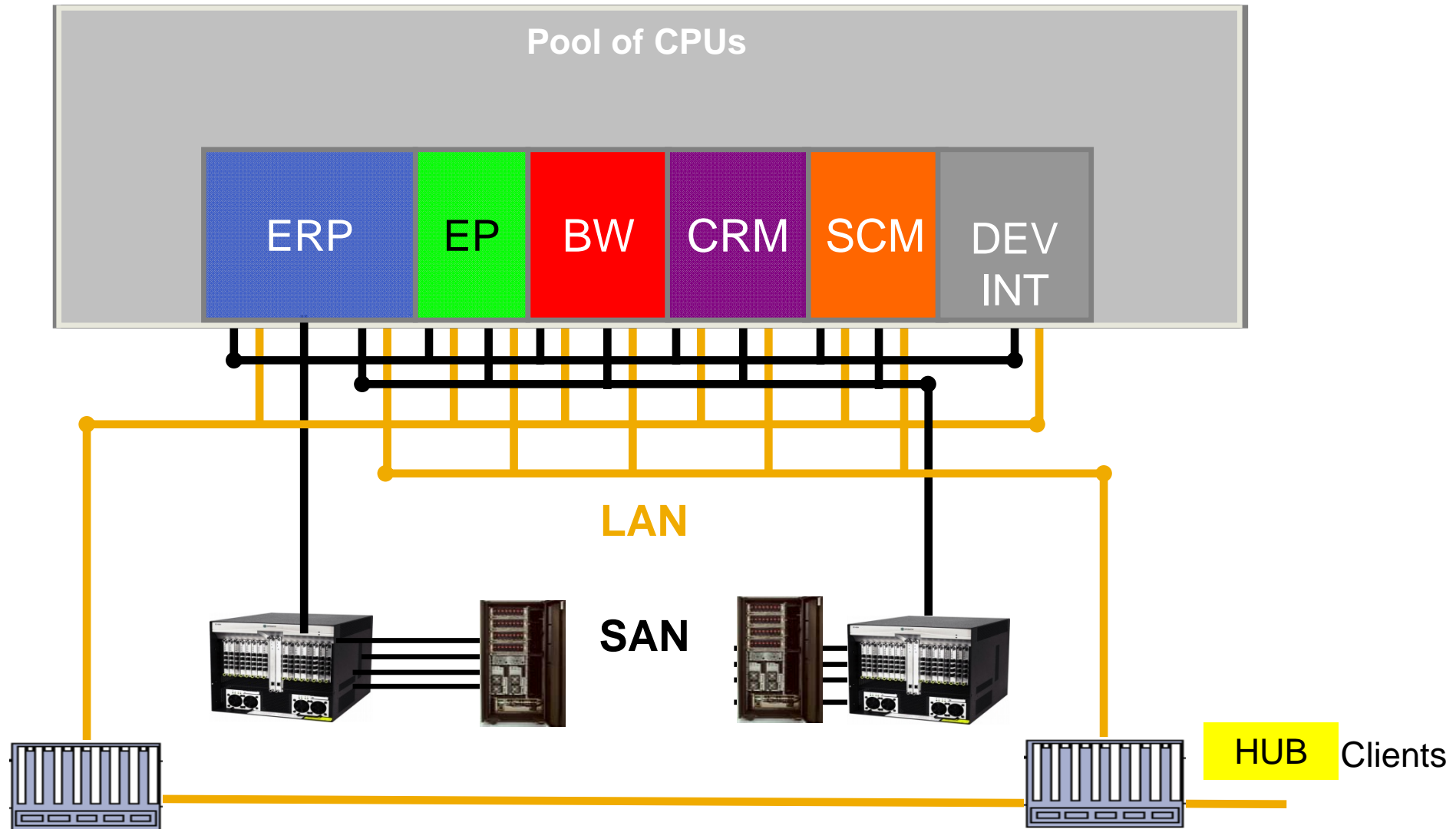# Combine functional Integration and Consolidation
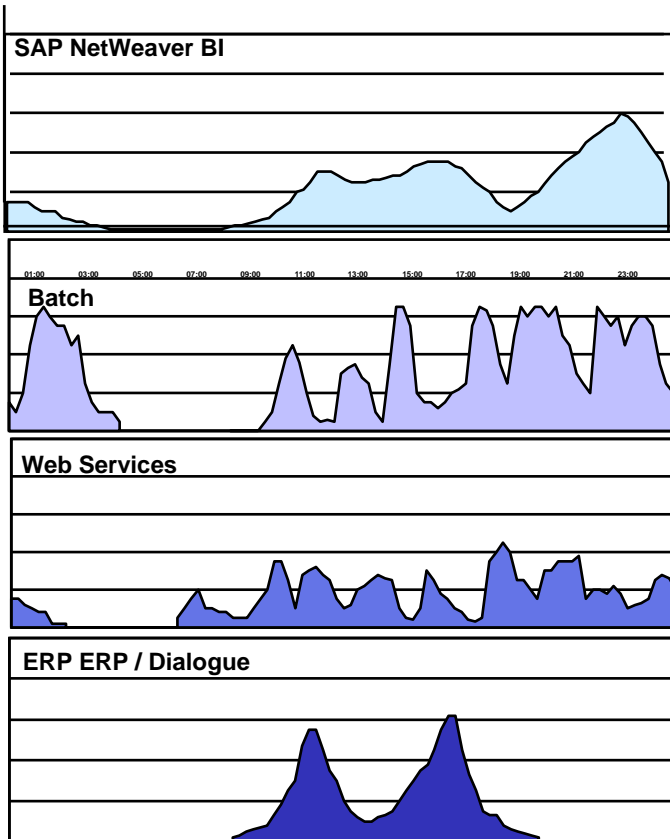
- **Many SAP applications are integrated from a business and date perspective but not from a workloads point of view**
- **They are managed as separate servers/LPARs**
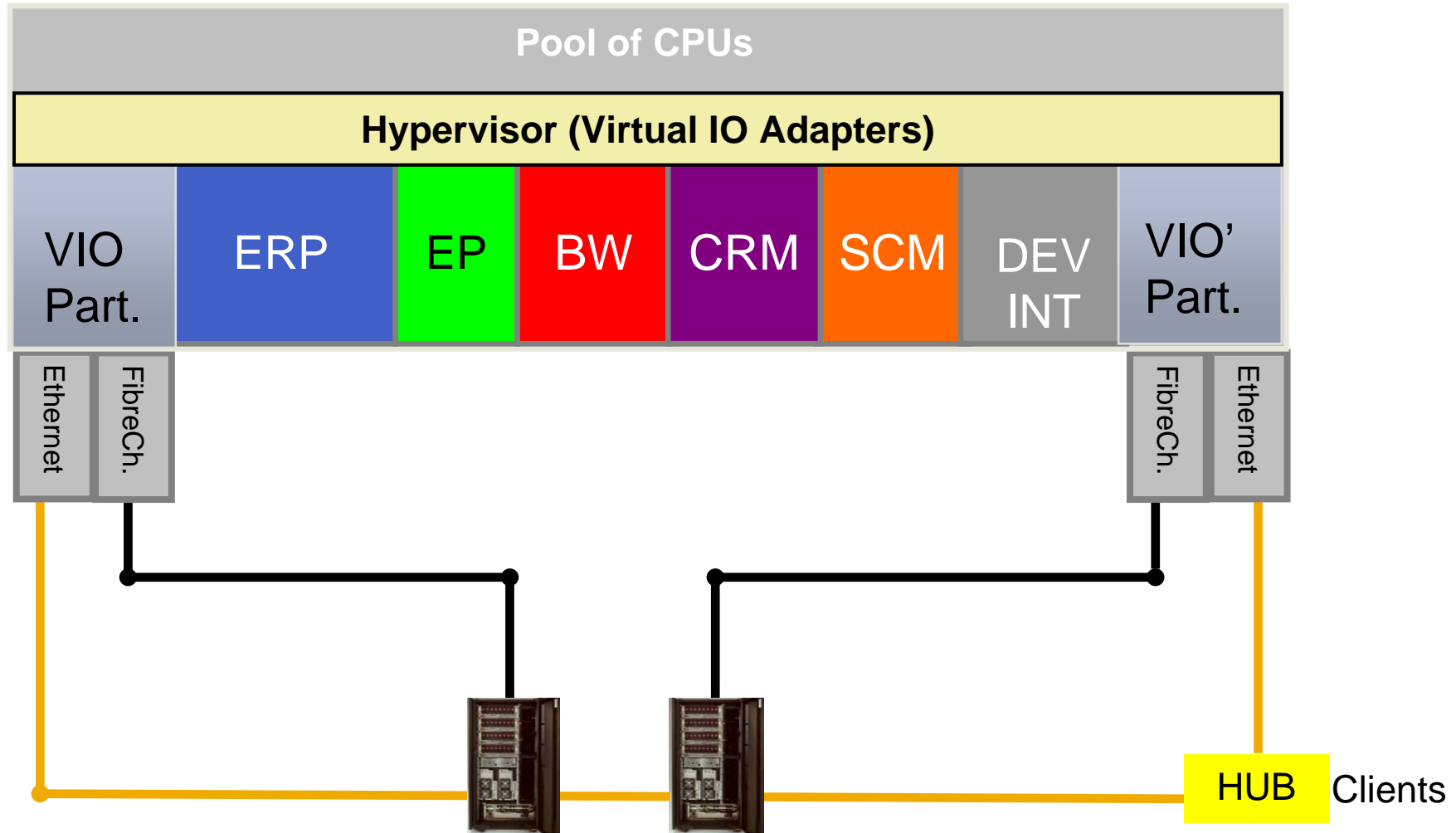- **Results in low degree of synergy**

- **POWER processor-based systems and manageability features will allow for workload 'combination' while still keeping applications distinct**
  - **Improved system efficiency**
  - **Less TCO**
  - **Less energy**

SAP consolidation without PowerVM Virtual IO

Pool of CPUs

ERP · EP · BW · CRM · SCM · DEV INT

LAN

SAN

HUB Clients

SAP consolidation with PowerVM Virtual IO

Pool of CPUs							
Hypervisor (Virtual IO Adapters)							
VIO Part.	ERP	EP	BW	CRM	SCM	DEV INT	VIO' Part.

Ethernet | FibreCh.

FibreCh. | Ethernet

HUB Clients

The LPARS get access to the data via the Virtual I/O partitions

Active Memory™ Expansion

- Innovative POWER7 technology
  - For AIX 6.1 or later
  - For POWER7 servers

- Uses compression/decompression to effectively expand the true physical memory available for client workloads

- Advanced Memory Expansion is ordered as hardware feature code (FC). The price is related to the server class.)

- AME has been tested with SAP ERP workload, and delivered excellent expansion factors (as of March 2010).
  - SAP customers can use AME today for non-PROD SAP instances
  - Work is going on to extend support to SAP PROD
    - SAP monitoring (CCMS) integration of AME specific metrics
    - Middleware testing
    - Information and education of support organizations

uncompressed mem.

compressed memory

AIX

LPARs' memory

Power Hypervisor

Power7 System

Hardware Management Console

New LPAR Attributes
- Active Memory Expansion On/Off
- Memory Expansion Factor
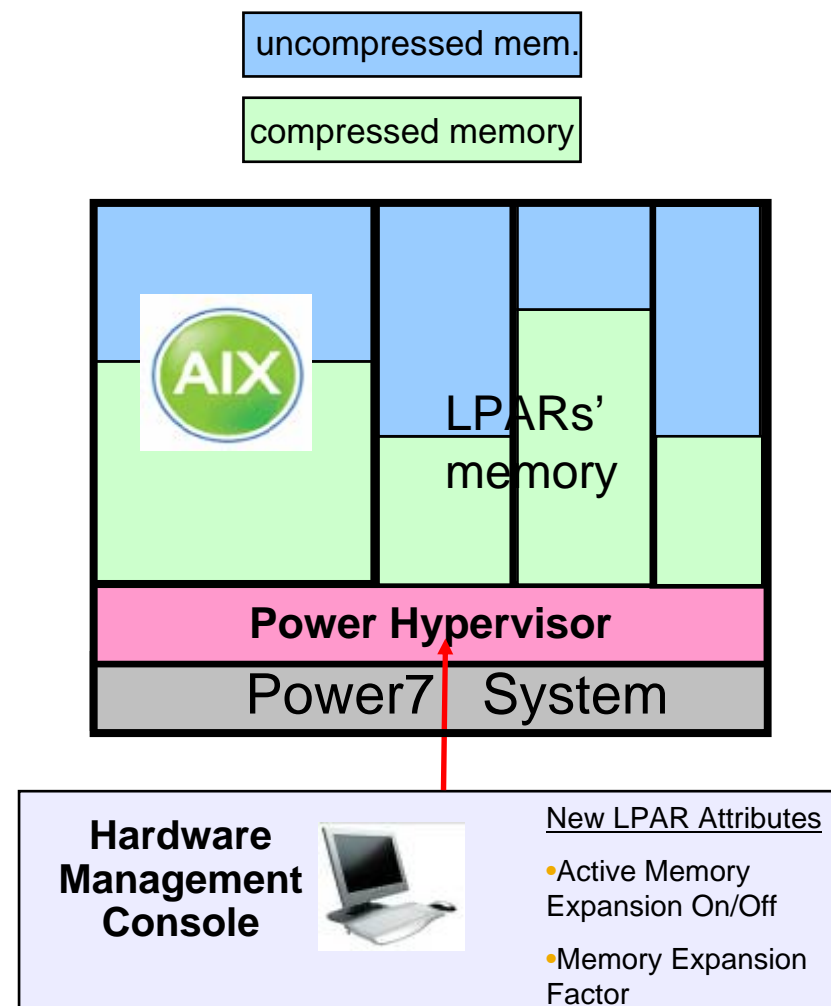
Active Memory Expansion Value

- **Enable more LPAR's per server**
  - Active memory expansion reduces the physical memory requirements of existing LPAR's
  - Existing LPAR's physical memory sizes can be reduced
  - Free memory capacity can be used to create more LPAR's
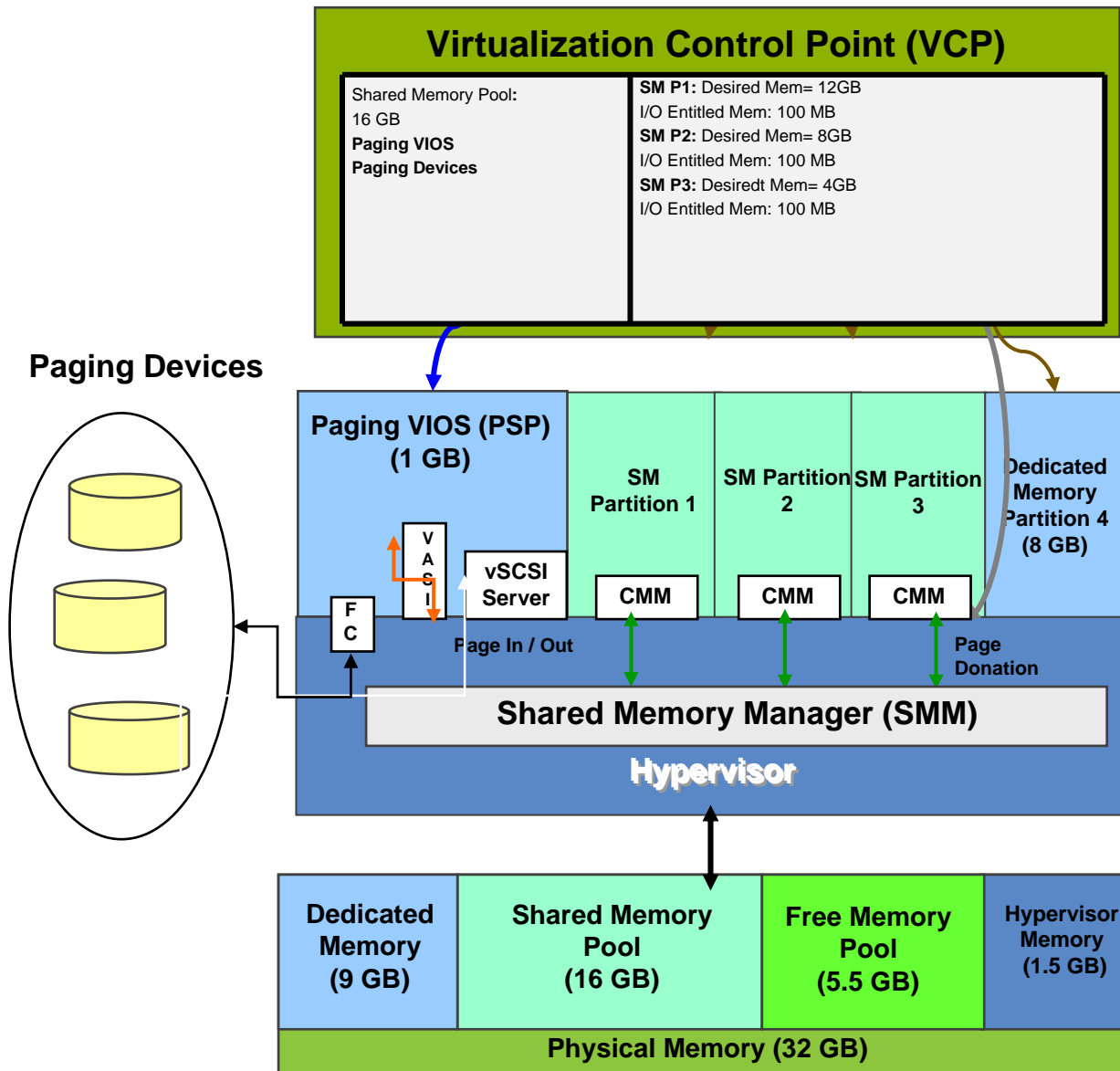 - ➜ **Supports SAP consolidation scenarios**
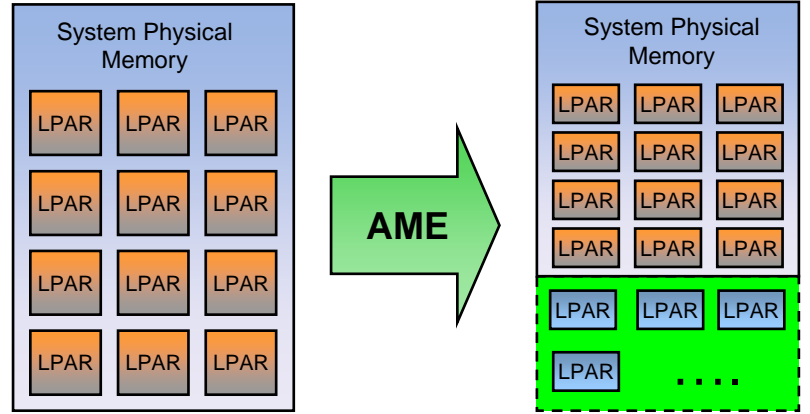
- **Increase a LPAR's effective memory capacity**
  - Active memory expansion can increase the effective memory capacity of a LPAR
  - Enabling active memory expansion for a LPAR and keeping the LPAR's physical memory size unchanged increases the memory available to a workload
  - ➜ **Supports natural growth and new SAP technologies**

Active Memory Sharing (AMS)

Virtualization Control Point (VCP)

Shared Memory Pool:
16 GB
Paging VIOS
Paging Devices

SM P1: Desired Mem= 12GB
I/O Entitled Mem: 100 MB
SM P2: Desired Mem= 8GB
I/O Entitled Mem: 100 MB
SM P3: Desiredt Mem= 4GB
I/O Entitled Mem: 100 MB

Paging Devices

Paging VIOS (PSP) (1 GB)

VASI

vSCSI Server

FC

SM Partition 1

SM Partition 2

SM Partition 3

Dedicated Memory Partition 4 (8 GB)

CMM   CMM   CMM

Page In / Out   Page Donation

Shared Memory Manager (SMM)

Hypervisor

Dedicated Memory (9 GB)

Shared Memory Pool (16 GB)

Free Memory Pool (5.5 GB)

Hypervisor Memory (1.5 GB)

Physical Memory (32 GB)

- **POWER6™ feature**
  - Administration comparable to SPLPARs
  - No instantaneous memory allocation as with cpu cycles!
  - "Ballooning" policies for memory loaning
- **Not formally supported by SAP for production use.**
  - Not yet thoroughly tested with SAP applications.
    - PoCs with small SAP instances work fine
    - Scalability for large memory sizes ?
  - Formal DB vendor support statements pending (DB2, Oracle, MaxDB)
  - Pilot program (non-production environments) started in 11/09, acquiring additional pilot customers.
- **Technical Paper on PW:**
  http://www.ibm.com/partnerworld/wps/servlet/Content Handler/POW03017USEN

Active Memory Expansion & Active Memory Sharing

Active Memory **Expansion**

- **Effectively gives more memory capacity to the partition**
  ➔ *"memory expansion"*
  – Efficiency depends on compressibility of in-memory content

- AIX partitions only

- **Easy initialization via HMC**

- Instantaneous effect when activated

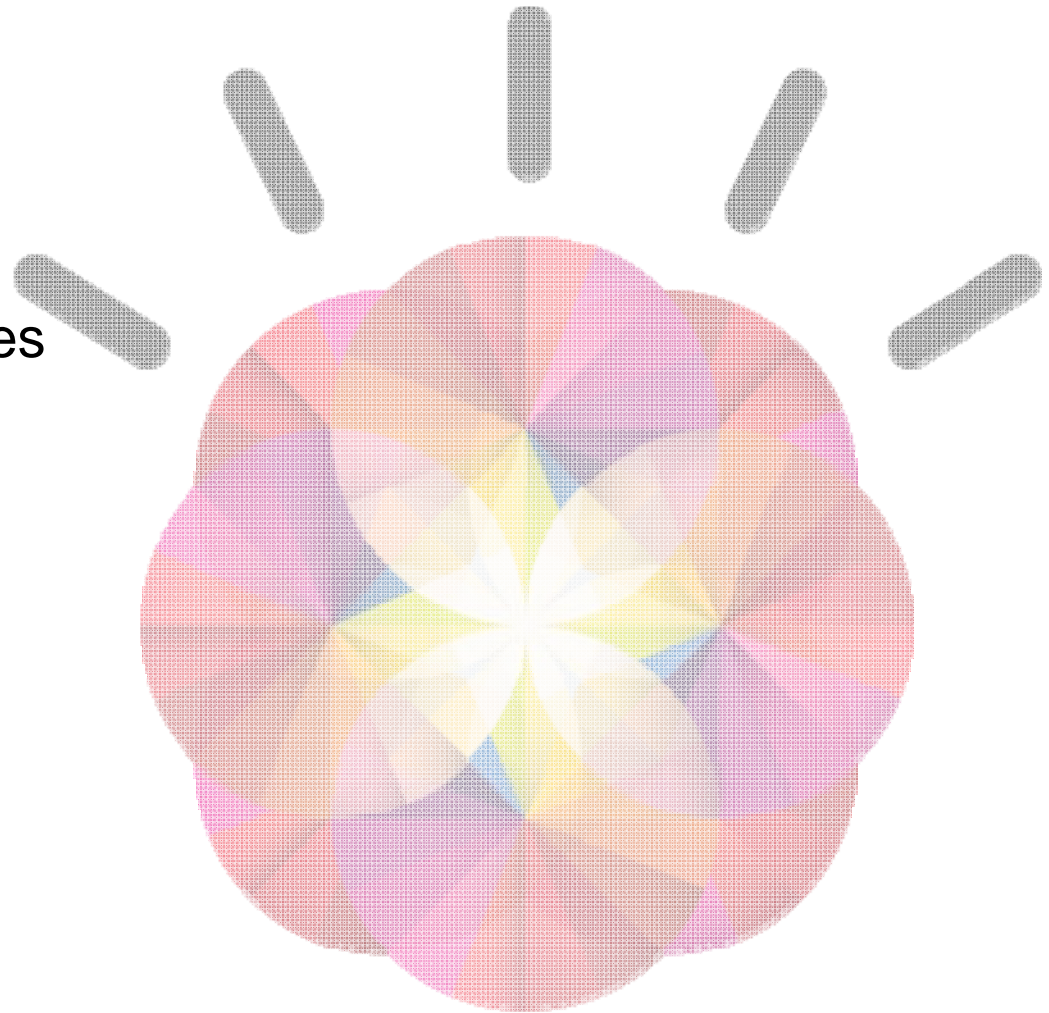- **Potential of HW assistance**
- Permanently requires few CPU cycles
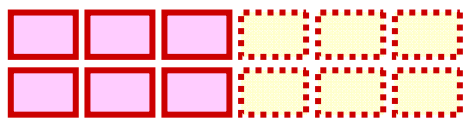
Active Memory **Sharing**

- Moves memory from one partition to another ➔ *"memory pooling"*
  – Latency of memory availability
  – Best fit when one partition is not busy while another partition is busy

- AIX, IBM i, and Linux partitions

- Comparably complex to setup

- Latency until pooled memory available to application
- N/A
- No CPU cycles required after memory allocation done
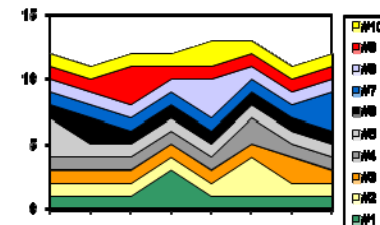
Agenda

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Power Systems' Strategy ➔ Reduce unplanned outages

Core 0   Soft Error   Hard Error   **Core 1**

RU Instruction State Checkpoint
GP1=0x14343433
CT=-0x12344324
. . .

On Fault

No Error

DRAM DRAM DRAM DRAM   DRAM DRAM DRAM DRAM

Memory Controller
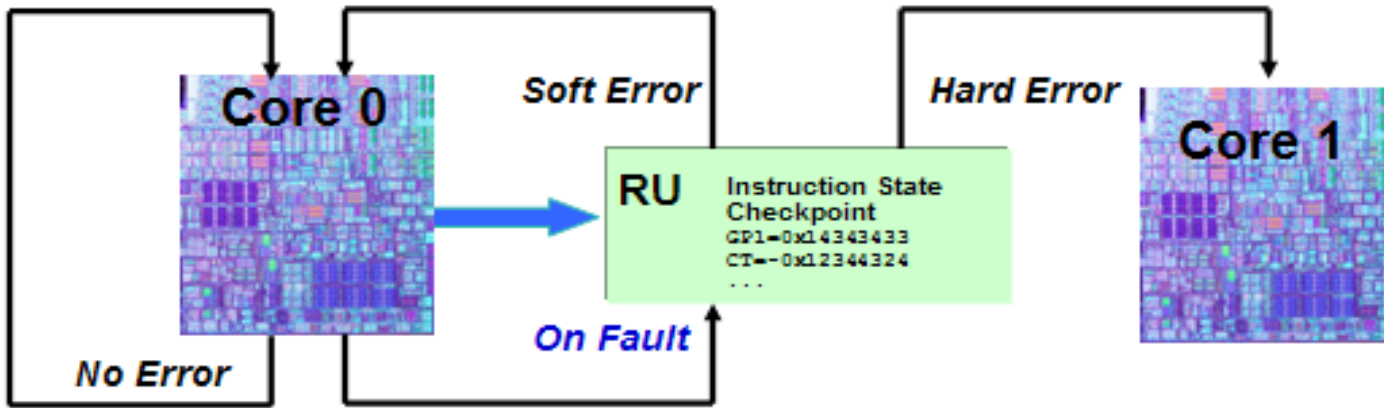
1. CPU

- Processor Instruction retry
  ➔ Alternate Processor Recovery

2. Memory

- Dynamic I/O bit line repair

- Redirect physical connection to DIMMs

3. Server Nodes

- Hot node add

- Concurrent repair
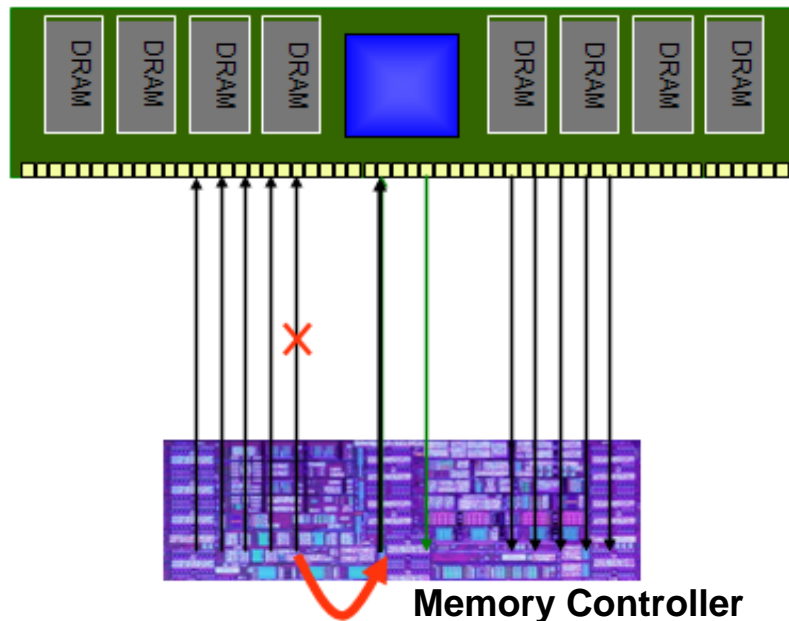
Faster Memory Bandwidth ideally fits growing demand by SAP applications

POWER5
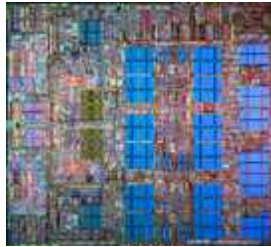
POWER6

POWER7

Memory Performance:
2x DIMM

Memory Performance:
4x DIMM

Memory Performance:
6x DIMM

DDR2 @ 553 MHz
Effective Bandwidth:
1.1 GB/s

DDR2 @ 553 / 667 MHz
Effective Bandwidth:
2.6 GB/sec
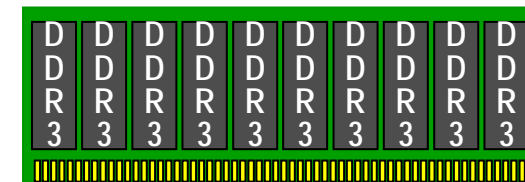
DDR3 @ 1066 MHz
Effective Bandwidth:
6.4 GB/sec

POWER7 Multi-threading Options

- **Certain SAP workload characteristics benefit from different SMT modes**
  - **Always differentiate "system capacity" = SAPS and "performance" of a single thread = response time**

- **SMT1:** Largest unit of execution work
- **SMT2:** Smaller unit of work, but provides greater amount of execution work per cycle
- **SMT4:** Smallest unit of work, but provides the maximum amount of execution work per cycle

- Can dynamical shift between modes as required: SMT1 / SMT2 / SMT4
- Mixed SMT modes supported within same LPAR
  - Requires use of "Resource Groups"
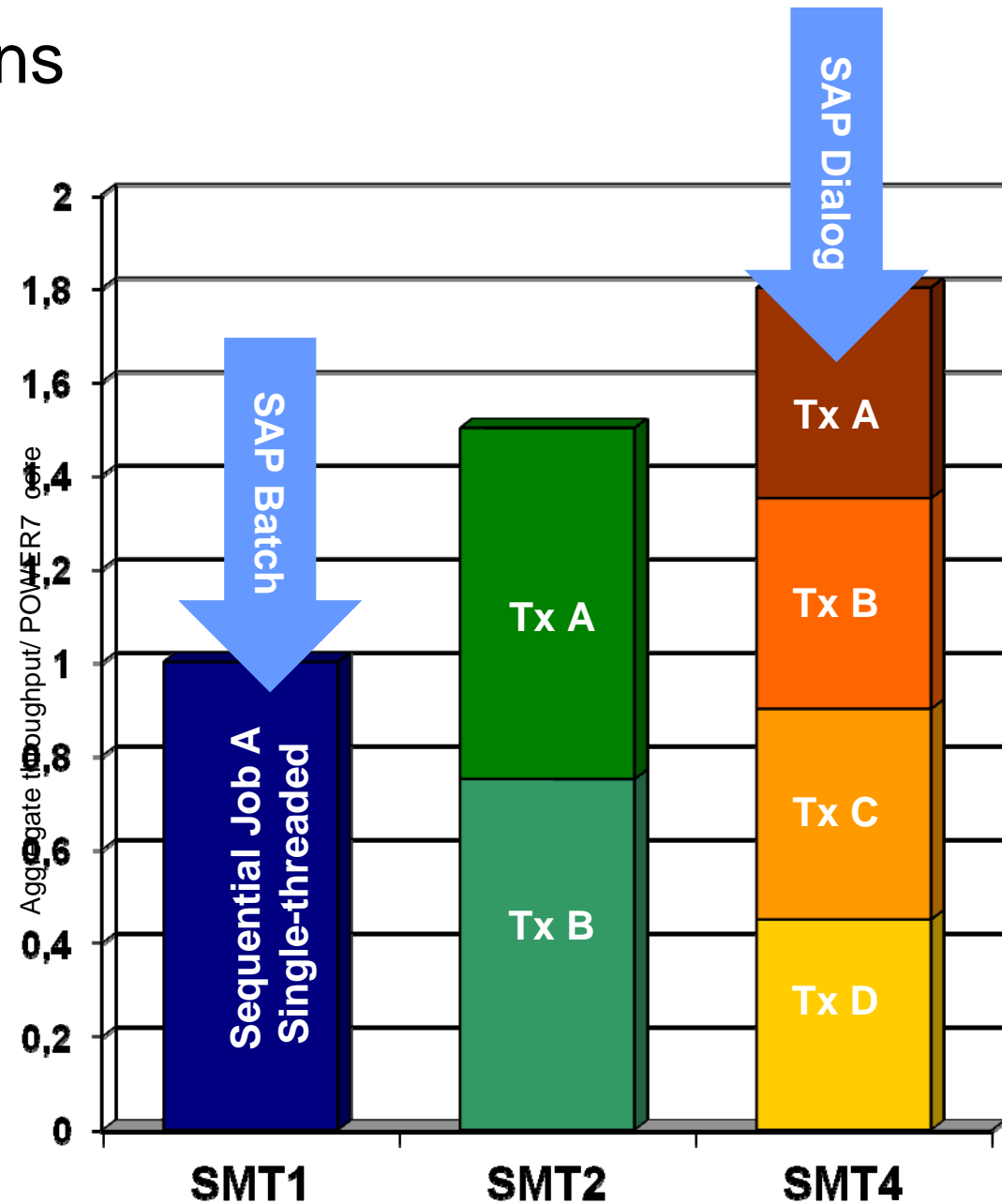
IBM SAP Customer experiences

SAP Systems in a Customer Datacenter on a virtualized IBM POWER5 Environment

- Large European Bank
- 62 SAP "systems" + HA
- Classic sizing = 189 CPUs
- Virtualized = 48 CPUs

- Consolidated to 4 p570 systems using Shared Processor LPARs and MicroPartitioning

- One system ran 21 LPARS, peak usage, 11.5 physical CPUs
- Another ran 18 LPARS, peak usage 11.7 physical CPUS

shared instances ~ 60% avg. util
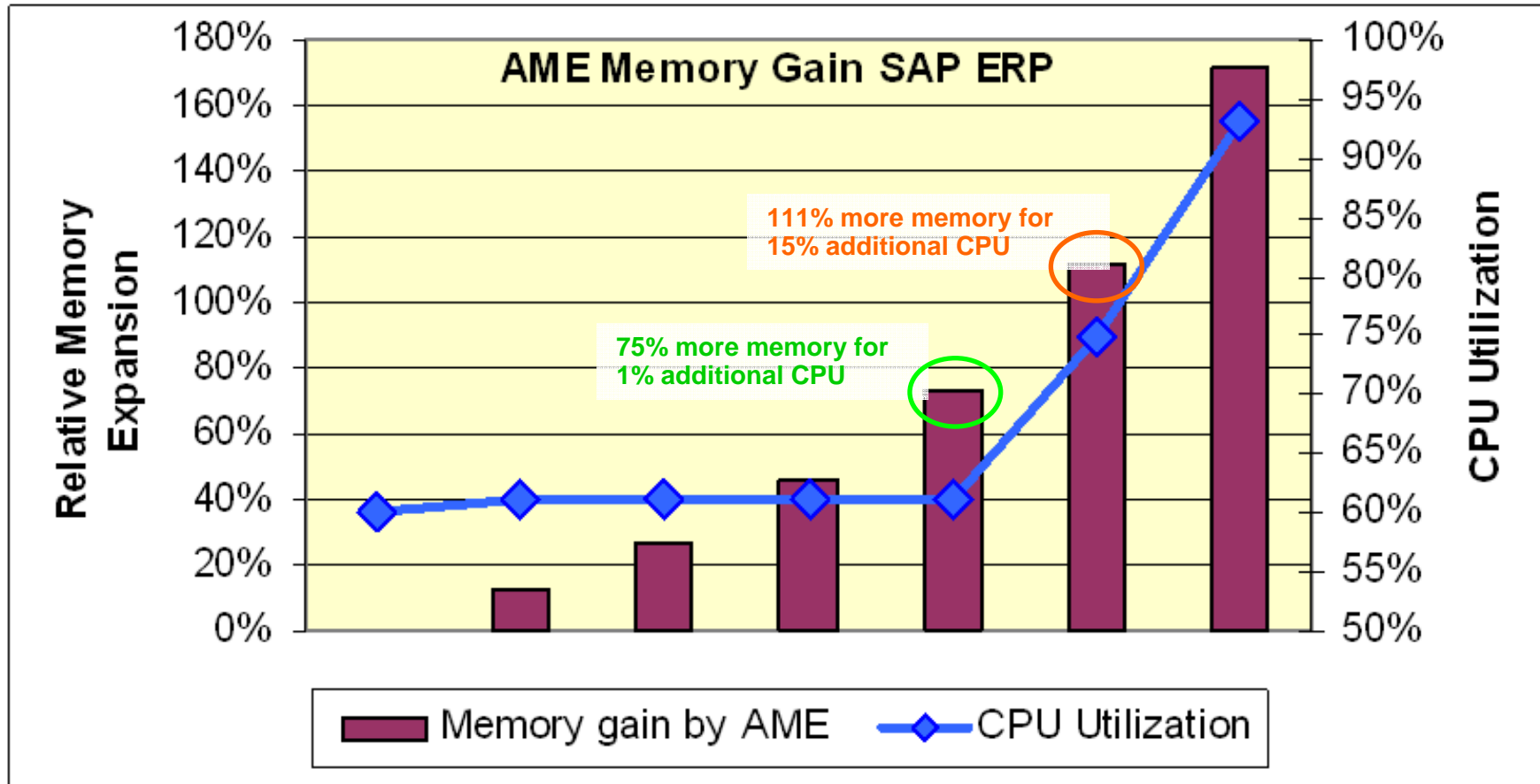
Isolated instance < 20% avg. util
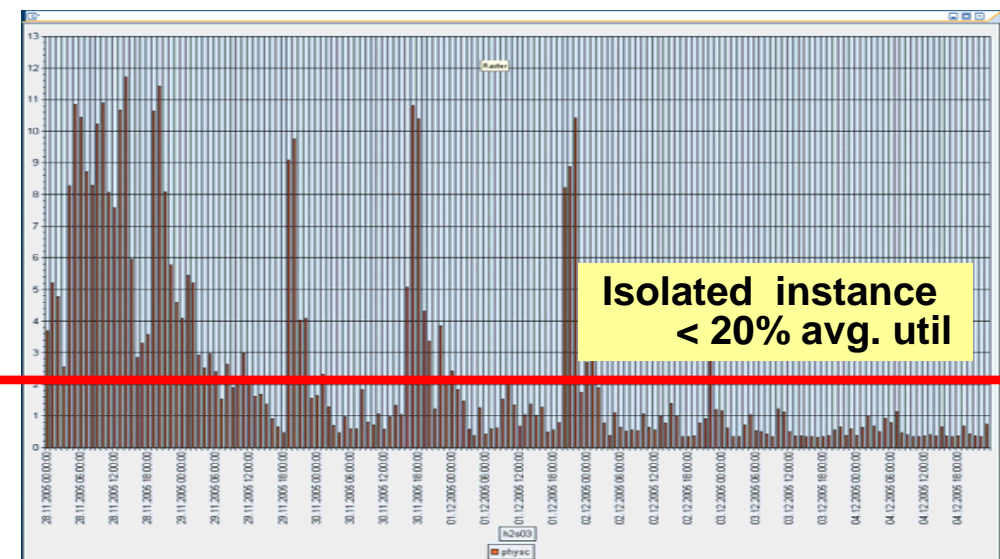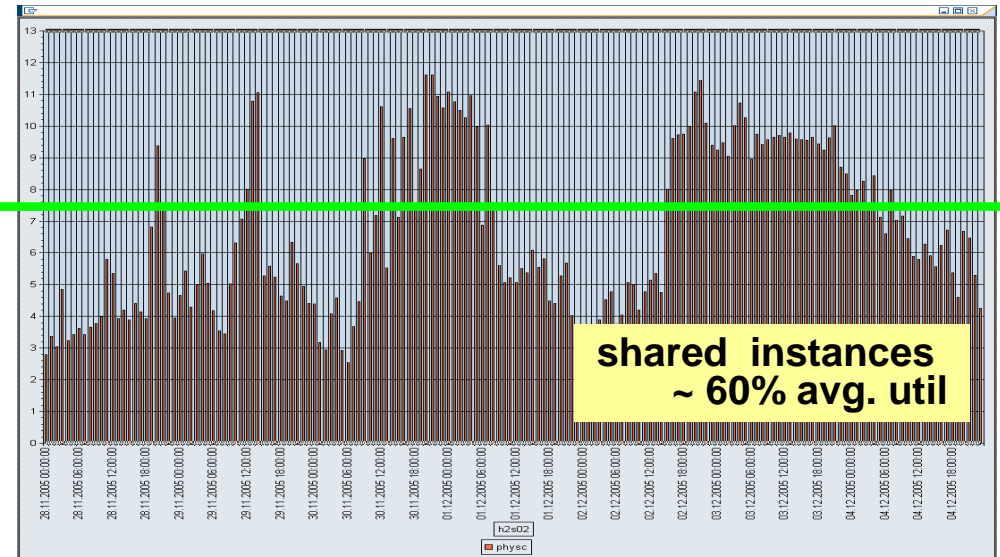
Factors pro CPU Virtualization

- Multiple SAP or other application instances can be consolidated to a Power based system

- Their workload peaks are statistically well distributed

    –At least Micro-Spikes and/or long term distribution

- You can use less time critical application instances for cpu pool buffering

    –E.g., non Production systems like DEV, EDU, TEST etc.

- Automated priority based capacity adjustment during out-of order situations

    –HA take overs

    –Unplanned load peaks

- Customer has a high demand for immediately deployed (temporary) systems

    –E.g., test, demo, migration environments
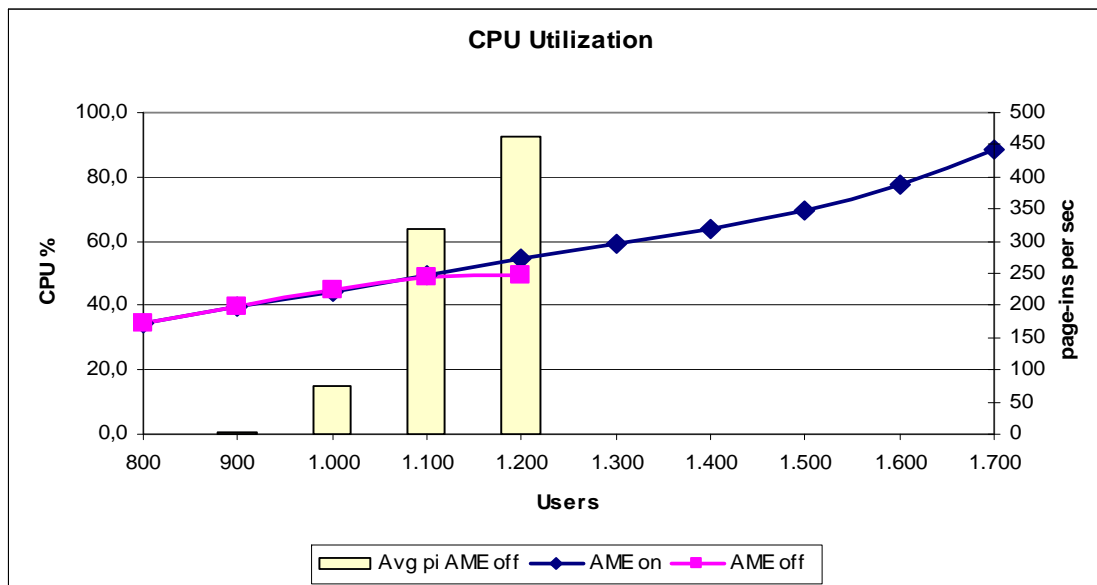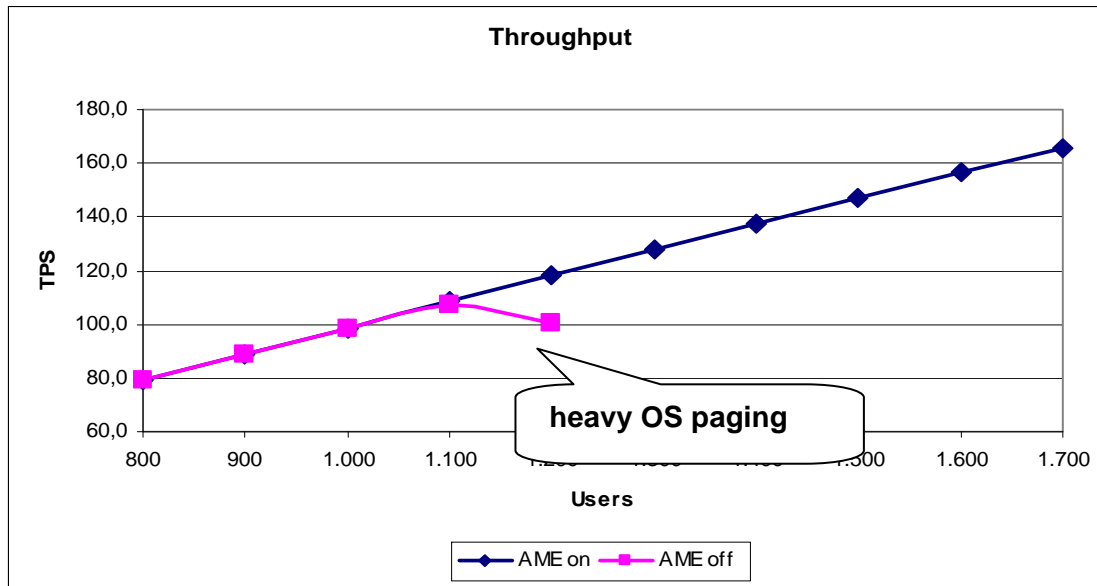
Sample SAP ERP Workload behaves well

Single Partition in use by DB and AppServer

AME Memory Gain SAP ERP

111% more memory for 15% additional CPU

75% more memory for 1% additional CPU

Legend: Memory gain by AME — CPU Utilization

- Test configurations held total memory constant at 14.25 GB, varying mix of real and gained memory by AME.
- Number of cores was kept constant at 4 cores.
- SAP application throughput was kept constant ➔ increase in cpu load caused by AME
- Individual load results will vary depending on expansion factor of the SAP applications and data and available CPU resource

Active Memory Expansion benefits for SAP instances

Throughput

Chart: Throughput (TPS vs Users, 800–1.700). Annotation: "heavy OS paging". Legend: AME on, AME off

CPU Utilization

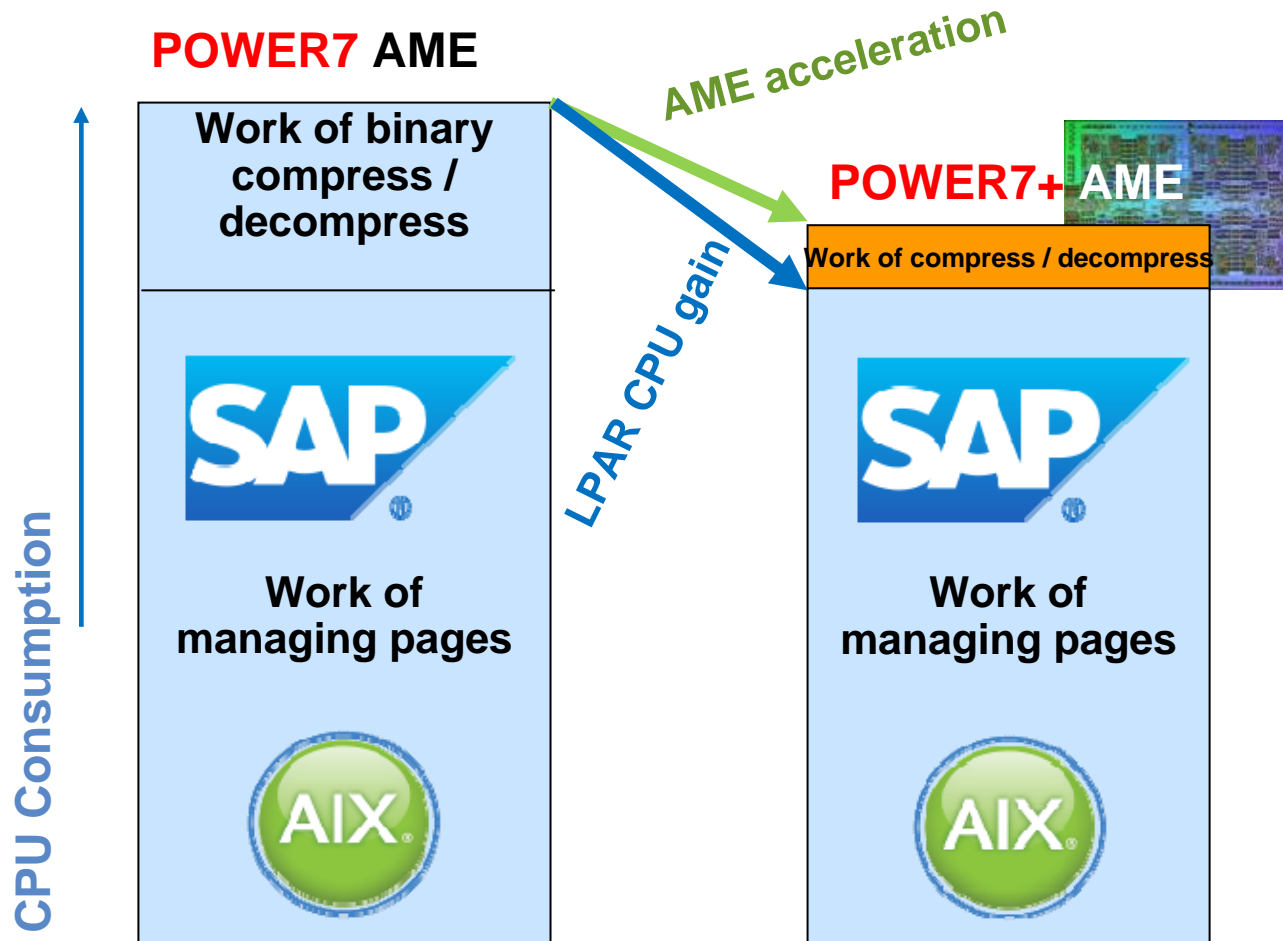*Chart: CPU Utilization (CPU % and page-ins per sec vs Users, 800–1.700). Legend: Avg pi AME off, AME on, AME off*

- In cases, when server resp. LPAR throughput is limited by insufficient memory allocation, AME can help to fully utilize the available CPU power.
  - OS paging is avoided or shifted to a higher utilization rate
  - ➔ new SAP technologies, natural growth

- LPARs can be deployed with fewer real memory
  - Allows for more LPARs per server and thus even more compact consolidation scenarios
  - ➔ SAP system consolidation

- Depending on SAP memory requirements, customers may be able to stay with smaller or less DIMMS per box:
  - Less TCA
  - Headroom for future growth

Potential real memory savings by AME for SAP customers
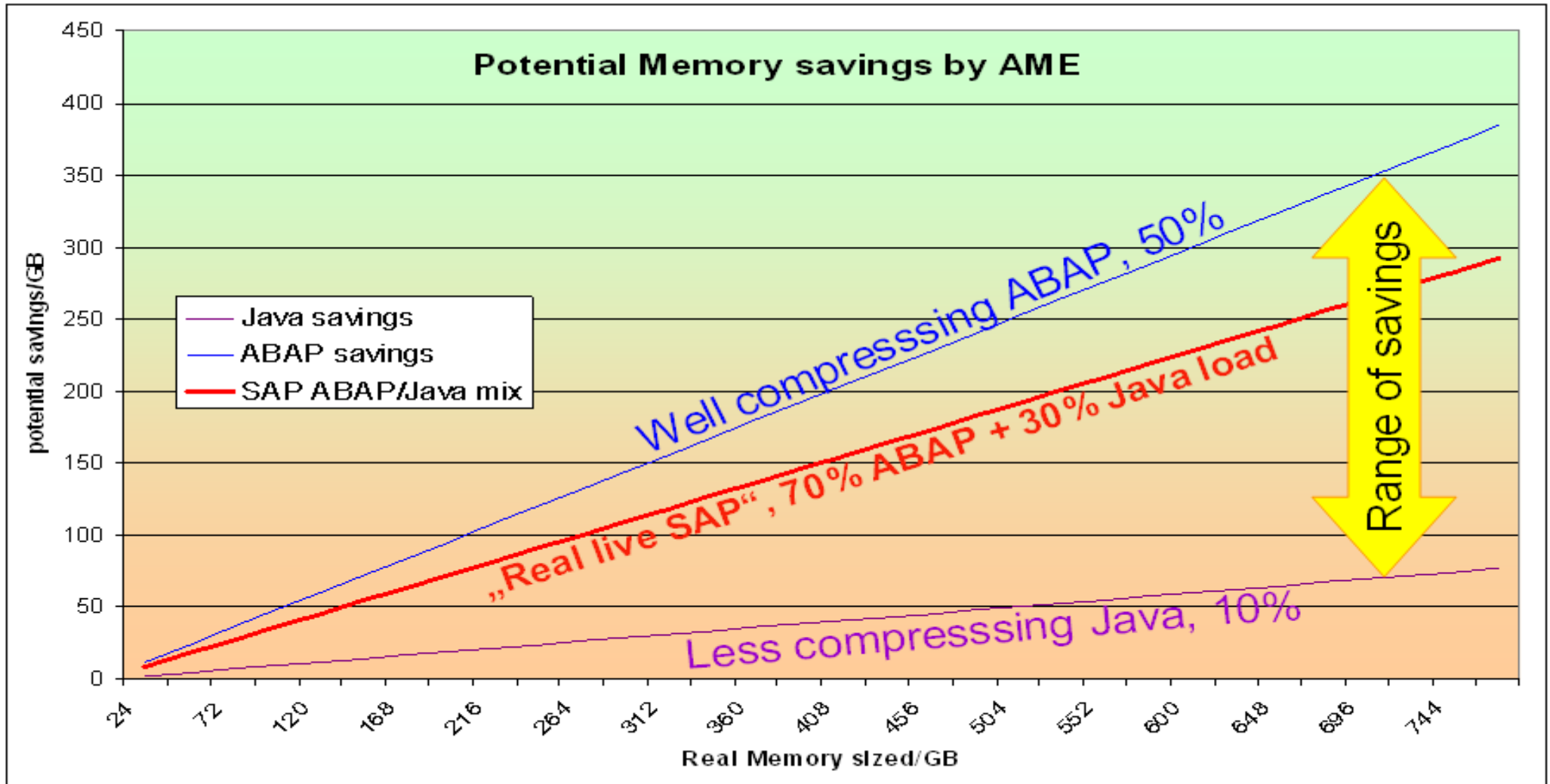
- Real live memory gains by SAP implementations depend on the workload mix
- Internal and customer tests show an potential expansion factor of factor 2x for ABAP based workloads, about 1,6 for DB-loads.
- See presentation at TechDocs for details: http://w3.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS3879

AME on POWER7+ offloads compression from SAP Application LPARs

POWER7 AME

CPU Consumption

Work of binary compress / decompress
SAP
Work of managing pages
AIX

AME acceleration

LPAR CPU gain

POWER7+ AME

Work of compress / decompress
SAP
Work of managing pages
AIX

- Less CPU for the same amount of memory expansion
  - Can then run more partitions or work per partition
  - If fewer cores needed, may result in lower software licensing

- OR more memory expansion for the same amount of processor
  - Better able to relieve memory shortages and improve performance
 - May be able to do more work

Agenda

- IBM Power System™ News

- Principles of POWER™ virtualization

- Benefits of POWER for SAP landscapes

- **AIX for SAP Business Applications**

- Systems Management
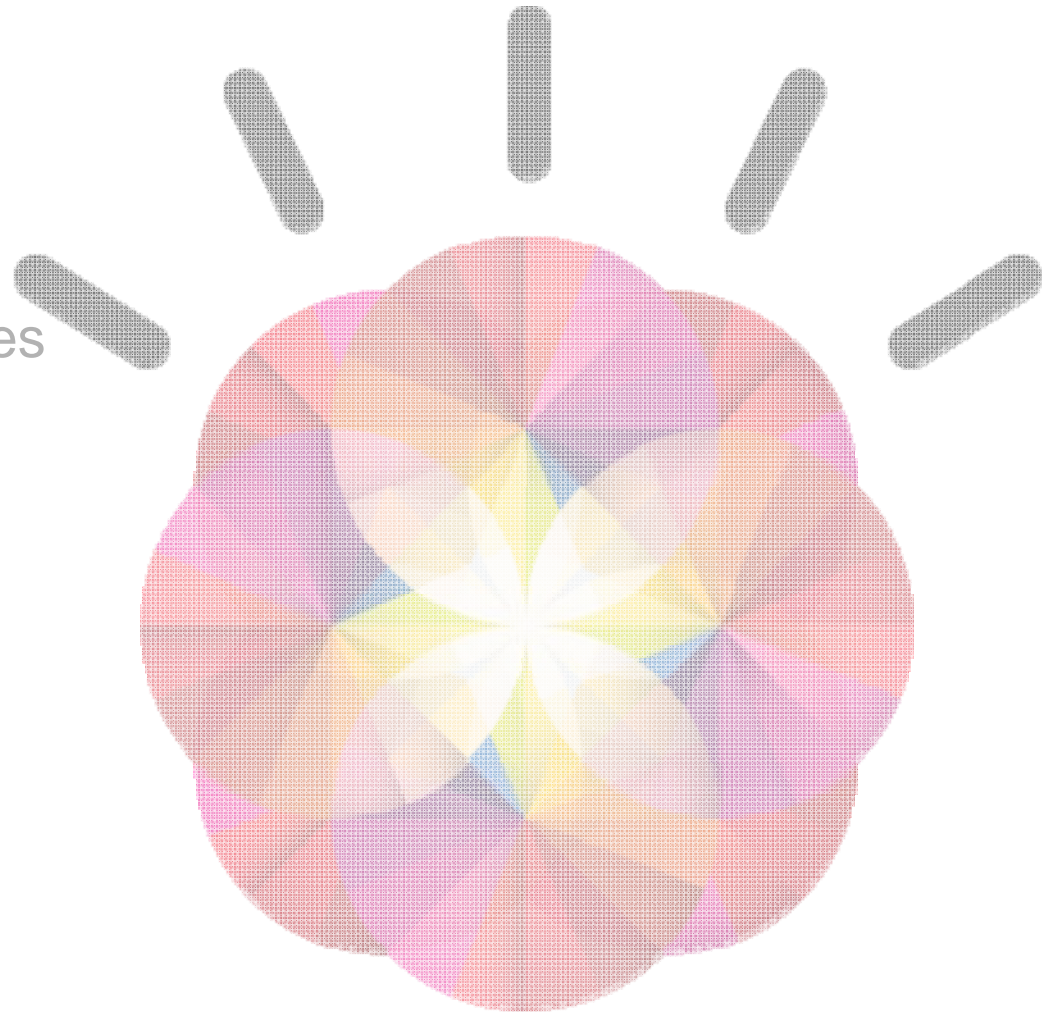
Required SW-Levels for POWER7 Systems – all SAP certified

- AIX 5.3 with the 5300-11 Technology Level and SP2, or later
- AIX 6.1 with the 6100-04 Technology Level and SP3, or later
- IBM i 6.1 with 6.1.1 machine code, or later. IBM i 7.1 plan mid 2010
- SUSE Linux Enterprise Server 10 with SP3 for POWER
- SUSE Linux Enterprise Server 11 for POWER, or later
- RHEL SoD
- VIOS 2.1.2.12 with Fix Pack 22.1 and Service Pack 2, or later

Live Partition Mobility

POWER6 POWER6+

POWER7   LPAR needs to run in **POWER6 / POWER6+ Compatibility Mode**
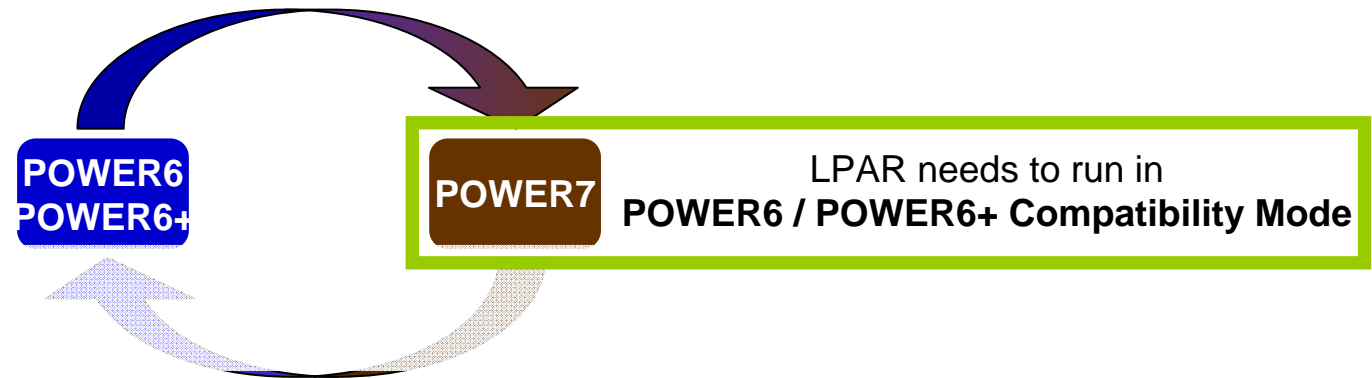
- Migrate partitions between POWER6 and POWER7 Servers
  - **Multiple SAP customers have successfully applied this method**
- Leverage POWER6 / POWER6+ Compatibility Mode
  - Forward and Backward
 - Does not allow to run SAP on POWER7 in SMT4 mode

AIX - most reliable OS for mission critical SAP Apps

Operating System	Percentage of Critical and High	Percentage of all OS Vulnerabilities
Microsoft	73%	27%
Apple	9%	29%
Linux	16%	31%
HP-UX	2%	1%
Sun Solaris	0%	4%
BSD	0%	4%
IBM AIX	0%	2%
Others	2%	4%

Table 9: Operating systems with the most critical and high vulnerability disclosures, 2010 H1.

Vulnerability Disclosures Affecting Operating Systems
2005-2010 H1

Linux — Apple — Microsoft — Sun Solaris — BSD
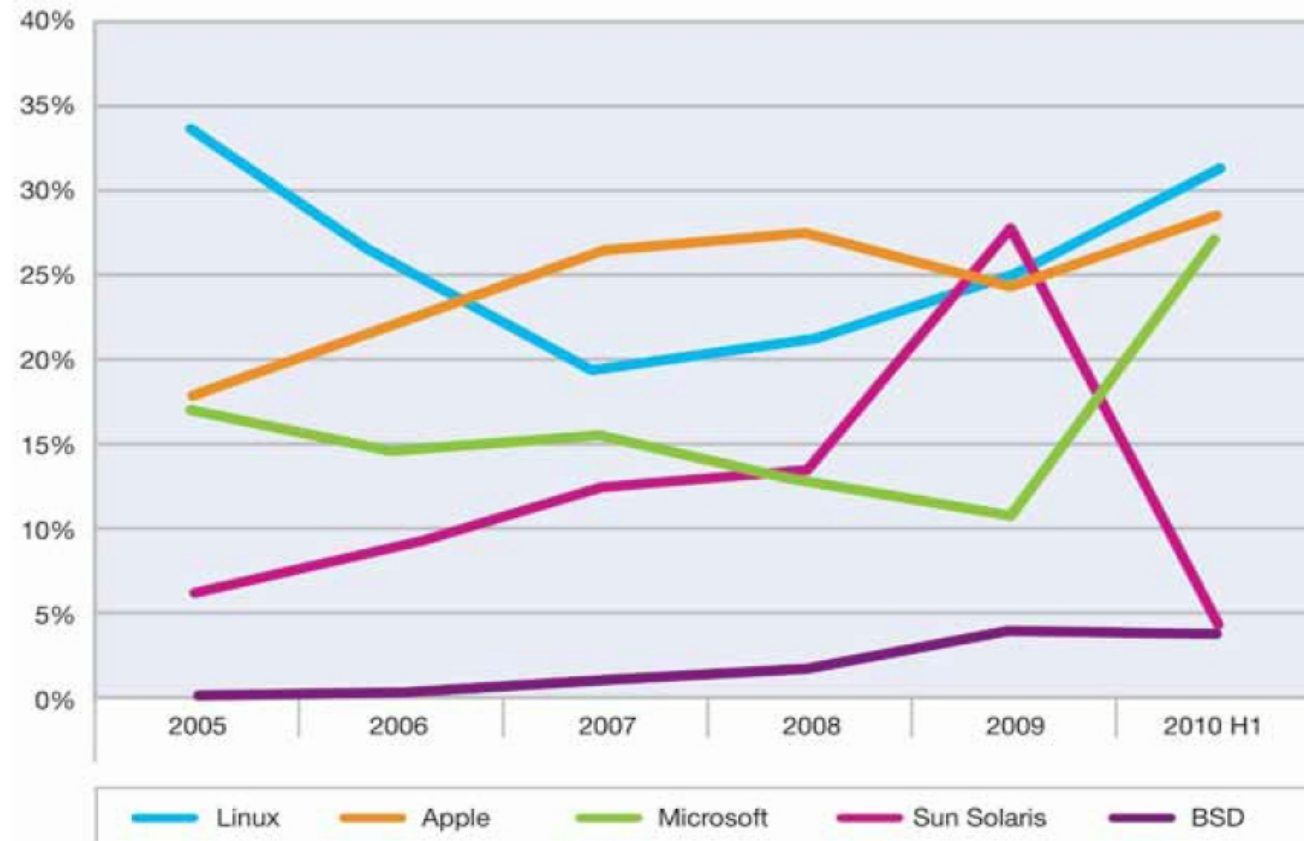
AIX Dropped off the list due to low vulnerabilities!

X-Force report – Mid-year 2010 http://www-935.ibm.com/services/us/iss/xforce/trendreports/

AIX Workload Partitions

- **SAP supports WPARs for production systems.**
  - Shared system WPARs
  - No resource control
  - DLPARs (Monitoring)

- **SAP-Note 1105456** describes supported WPAR environments, prerequisites and restrictions
  - System WPARs only

- **WPAR Application Mobility not supported**

- **Benefits for SAP customers**
  - Less administration efforts for AIX maintenance in LPARs
  - Fast to deploy
  - Single memory space = real-time memory virtualization, no DLPAR operations

- **Customer testimonial April 2012**
  - *"Savings up 2,8GB per SAP system, in sum 60GB for landscape"*
  - *"Down from 21 to only 2 OS environments to be maintained"*
  - *"Still own environments from SAP application side"!*

AIX Image

single memory space

Workload Partition A

Workload Partition B

Workload Partition C

Workload Partition D

Workload Partition E
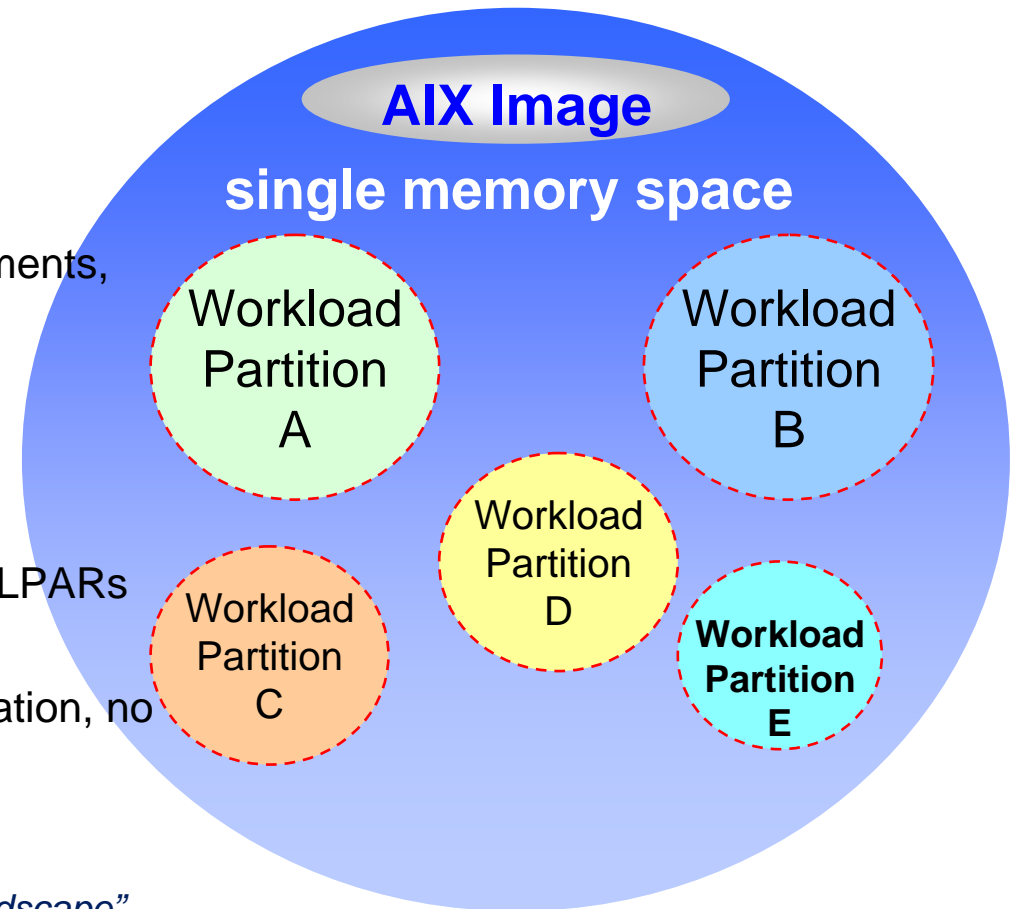
SAP Solution Package for IBM PowerHA SystemMirror 6.1

- **Motivation**
  - Standardized toolset around the globe
  - Support for replicated enqueue scenarios
  - Align implementation to SAP recommendations
  - Provide SAP specific Best Practices and recommendations

- **Supported SAP scenarios**
  - ABAP, JAVA and Double Stack w/o ERS and App (optional)
    - Tested for NW7.0, 7.20, ECC6.0, EP6, PI7.1
  - 2-tier and 3-tier installations
  - Multi-node clusters
  - DB2 and Oracle DBs
  - HA + DR (PowerHA/XD and SystemMirror Enterprise)

- **Solution**
  - Set of documentation covering Storage, VIOS, AIX and PowerHA for SAP HA installation & configuration
  - PowerHA configuration
  - PowerHA start, stop and monitor scripts
- **Limitation**
  - manual setup (not automated) of PowerHA accordingly to Documentation

Public PowerHA Best Practices WIKI

- Link at ISICC-WIKI http://www.ibm.com/developerworks/wikis/display/WikiPtype/SAP+and+PowerHA
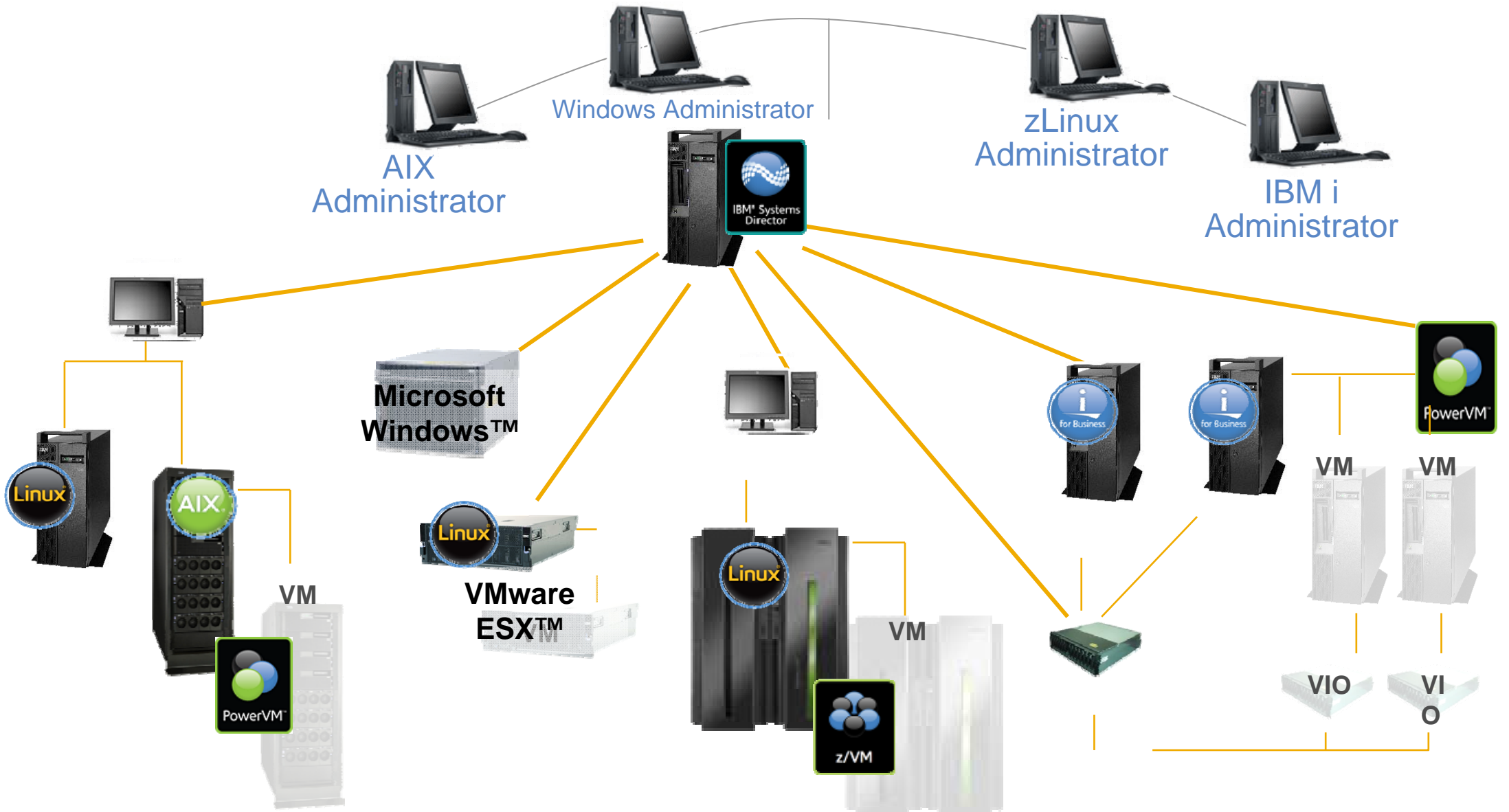- Co-Authors and contributors welcome
  - could be established as central SAP with PowerHA repository

Agenda

- IBM Power System™ News

- Remarks on POWER™ virtualization

- Benefits of POWER for SAP landscapes

- AIX for SAP Business Applications

- **Systems Management**
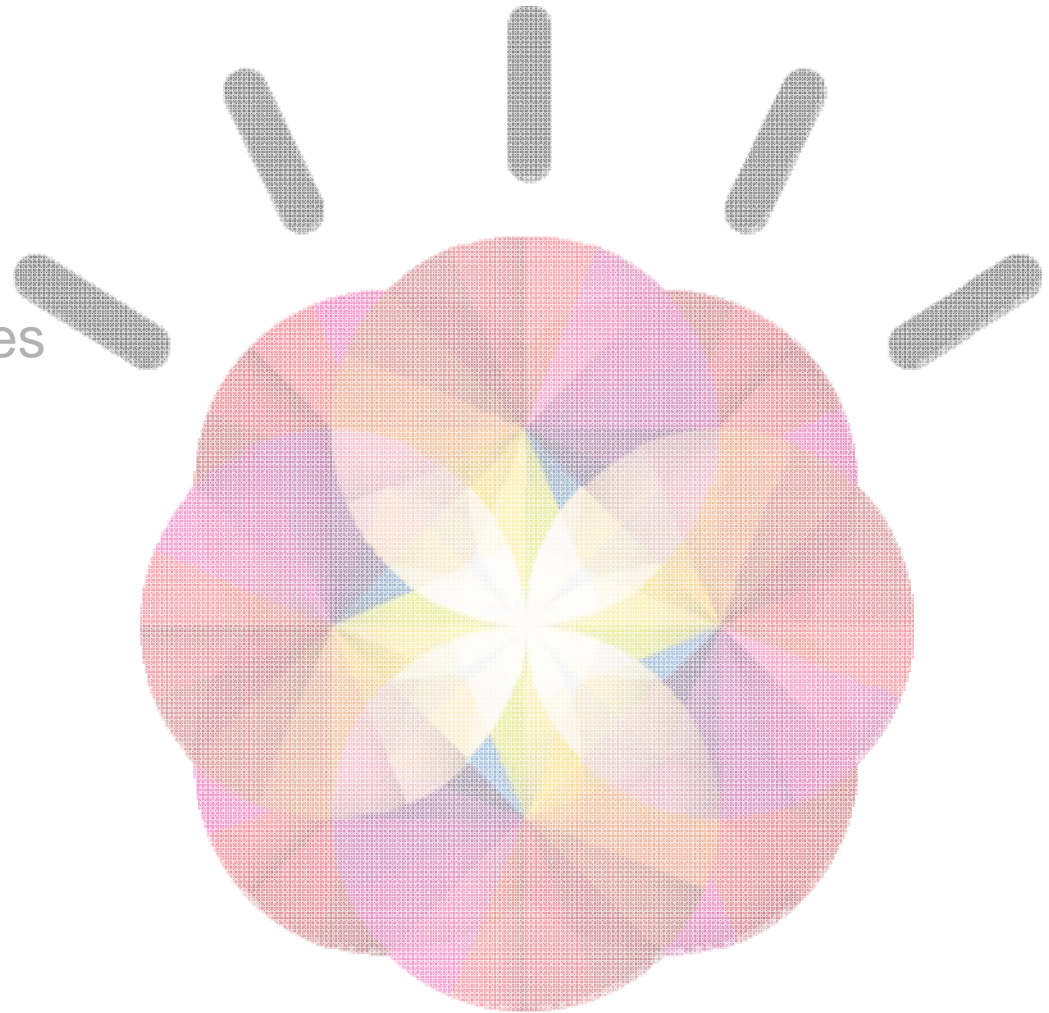
IBM Systems Director provides a cross-platform management tool

Windows Administrator

AIX Administrator

zLinux Administrator

IBM i Administrator

IBM® Systems Director

Microsoft Windows™

VMware ESX™

Linux

AIX

VM

PowerVM

Linux

Linux

VM

z/VM

for Business

for Business

VM

VM

PowerVM

VIO

VIO

PowerVM and AIX SAP Monitoring Transaction (ST06, OS07)

Hierarchy of virtualization layers now clearly visible

Physical server
↳ **LPAR**
↳ **WPAR**
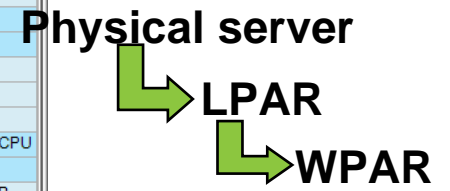
PowerVM behavior shown in SAP NetWeaver Administrator Console

- Consumed „entitlement" of an LPAR over time

  → history data
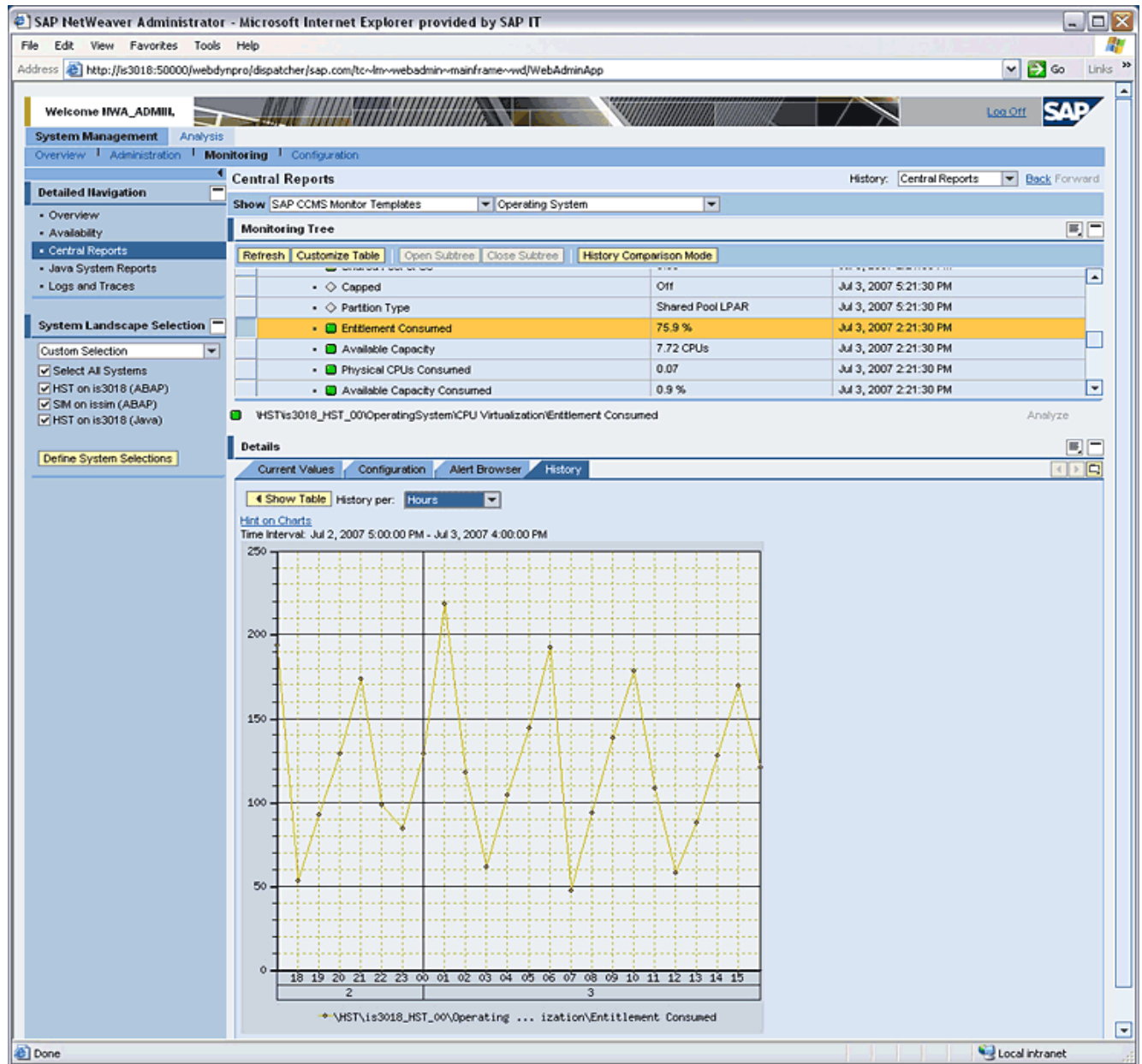
SAP NetWeaver Administrator Console showing the percentage of consumed entitlement over time

POWER Specific Memory Metrics in CCMS

Operating System Monitor   Edit   Goto   Environment   System   Help

YI3 is3046 AIX is3046 1 6 00F609624C00

Snapshot Memory Fri Oct 29 11:29:52 2010 Interval 10 sec.

Monitoring Category	Description	Value	Unit
Info	Operating system	AIX is3046 1 6 00F60962	
	Timestamp	Fri Oct 29 11:29:52 2010	
Memory	Physical memory	8.388.608	KB
	Configured swap size	2.621.440	KB
	Free swap size	2.343.020	KB
	Maximum swap size	2.621.440	KB
	Actual swap size	2.621.440	KB
	Free	89	%
	Pages In	1	Pg/S
	Pages Out	0	Pg/S
	Page In	4	KB/s
	Page Out	0	KB/s
	Page In of RAM	0	%/h
	Page Out of RAM	0	%/h
	Filesystem Cache	47	MB
	Useable 4KB Pages	892.780	KB
	In Use 4KB Pages	843.796	KB
Memory Virtualization Virtual System	Memory Mode	Dedicated Expanded	
	AME Target Factor	2,00	
	AME Actual Factor	2,00	
	AME Expanded Memory	8.192	MB
	AME True Memory	4.096	MB
	AME Deficit Memory	0	MB

AME specific section

- The memory monitoring capabilities are introduced with saposcol version 12.46.
    - See SAP-Note #710975 for more details and updated SAP-Note #1464605 titled "POWER7 Active Memory Expansion".

IBM SmartCloud Entry for Power

Entry cloud solution that focusses on virtual machine and OS provisioning and operations.

Independent from SAP stack, but can complement SAP Cloud solutions.

✓ Fast time to value with a solution that is simple deploy, easy to use and works with existing infrastructure

✓ Accelerate infrastructure delivery and speed service deployment to quickly respond to changing business needs

✓ Increase IT efficiency with standardization and lower operations cost

✓ Scale as needed to improve quality and meet demand with continuous availability

✓ Enable self service with a simple interface that provides oversight

IBM entry cloud configuration for SAP solutions on Power

The entry cloud solution for SAP landscapes.

Lifts IBM Power Systems Cloud capabilities to SAP software layer by integrating with SAP NetWeaver Landscape Virtualization Management.

- ✓ **Huge time savings** for base virtualization and cloud administration tasks in a SAP environment, by maintaining transparency between all SAP and IBM layers

- ✓ Offered integration and simplified deployment allows customers to **respond to business needs much faster**

- ✓ **Easy implementation of base use case scenarios**, such as SAP instance provisioning, SAP rename, and SAP post-processing

- ✓ **Improved responsiveness** with automation for key operations like SAP System Copy, SAP System Cloning

- ✓ **Better insight** with capacity management and monitoring of all SAP and IBM layers

- ✓ **Enables self service** with a simple interface that provides oversight

- ✓ The solution is **upgradeable and expandable to advanced cloud offerings**

PowerVM and Systems Director Integrate with SAP Cloud Technology

IT ADMIN   SAP BASIS

Integrated Application and Infrastructure Management

SAP Solution Manager

IBM Systems Director / FSM

**Topology view
Virtualization metrics
Live partition mobility
OS provisioning**
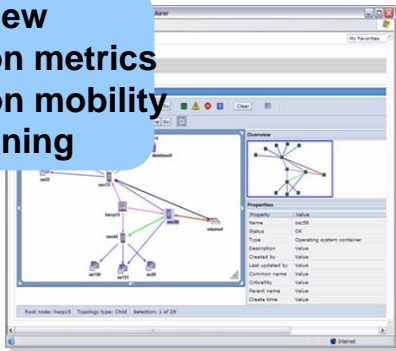
**SAP Landscape
Virtualization Management**
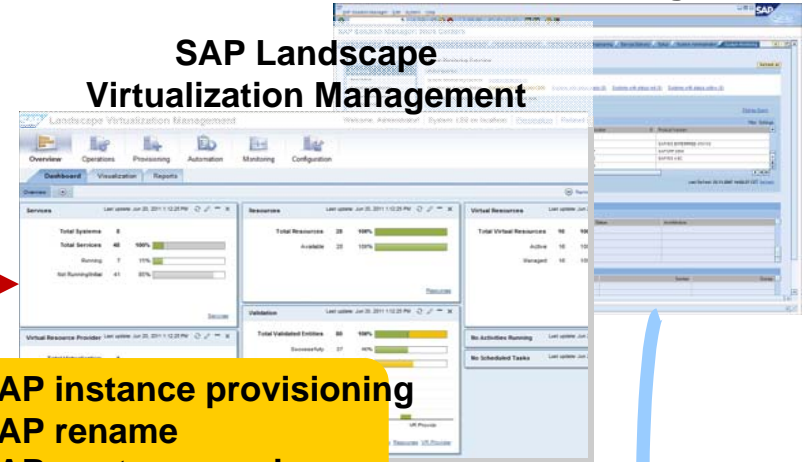
**SAP instance provisioning
SAP rename
SAP post-processing**
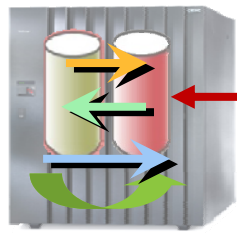
**IBM Tivoli Storage
FlashCopy Manager**

Database / storage cloning

Virtualized Environments

SAP   SAP   SAP   SAP
AIX   i for Business   Linux

IBM TotalStorage
SAN Volume Controller   Virtualization   PowerVM   z/VM   vmware

Hardware
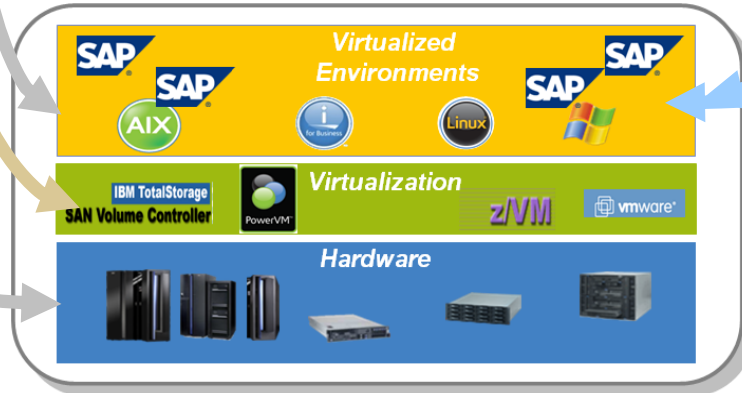
Find a comprehensive presentation on this topic on TechDocs:
*"Introduction to an Integral IBM / SAP Cloud Solution for SAP
Landscape
Management"*
http://w3.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS4803

POWER7 Technology Value for SAP Applications…

- **Technology**
  - Roadmap
  - Processor Leadership
  - Green Technology built in
  - Common architecture from Blades to High-end

- **Performance**
  - Power Systems scalability
  - Performance leadership in a variety of workloads
  - Best per core / per system performance
  - Memory and IO bandwidth

- **Virtualization**
  - Consolidate to higher levels
  - Virtualize Processors, Memory, and I/O
  - Dynamic movement of Partitions and Applications
  - Reduce infrastructure costs

- **RAS**
  - Power Systems mainframe inspired RAS features
  - Hot Add support / Hot Maintenance
  - Alternate Processor Recovery
  - Operating Systems Availability Leadership

POWER4
180 nm

POWER5
130 nm

POWER6
65 nm

POWER7
45 nm

POWER8
22 nm

AIX | i for Business | Linux

PowerVM

AIX | i for Business | Linux | Virt I/O Server Shared I/O

Hypervisor

Single SMP Hardware System

Exhibit 1: Corporate Enterprise Downtime (Hours per Year)
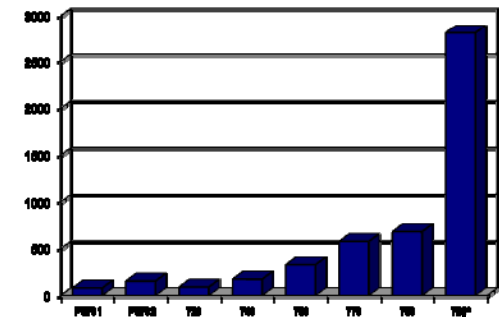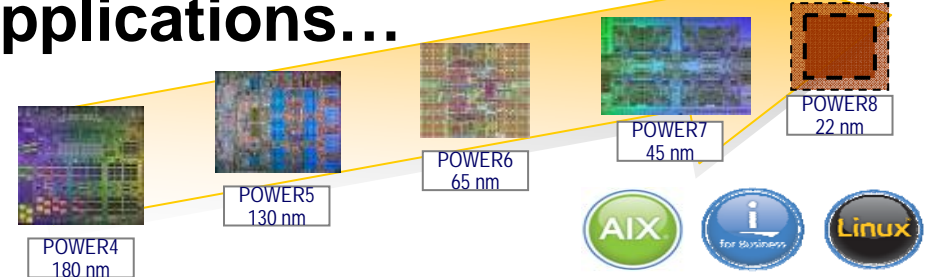
Integration: The Power Systems advantage

- **x86 Competitors' approach:**
  - Start with generic motherboard
  - Insert third-party CPU
  - Install third-party hypervisor

- **IBM Power Systems approach:**
  - Start with leadership CPU
  - Design industrial-strength server
  - Integrate world-class virtualization

Conclusion – Why Power Systems for SAP?

- TCO

- Risk

- Unplanned outage avoidance

- Planned outage avoidance

- Operations simplification

■ SAP landscapes often have large # of instances both prod & non-prod

■ SAP migrations are disruptive, expensive

■ Business critical nature of SAP, even BI and SCM mean that outages can result in huge business cost

■ Multiple shifts, batch workloads and/or global single instance mean that systems operate 24/7/365

■ Personnel and facilities often cost 3 to 4 times the cost of the server hardware, skilled employees increasingly hard to find

■ Leadership performance per core, virtualization + reduced middleware costs when priced per core

■ Minimized due to solid product roadmaps, leadership and growing marketshare

■ Mainframe inherited HW features protect against memory, cpu, I/O failures, z/OS inherited SW features protect against misbehaving applications and device drivers

■ Dynamic firmware and OS kernel updates, Live Partition Mobility

■ Virtualization reduces number of I/O cards, cabling, numbers of systems, allows for aggregate monitoring, capacity planning, rapid response to changing business demands

Helpful „SAP on IBM POWER" documents

- IBM internal competitive + reference materials available as a Cattail Collection:
  - http://cattail.boulder.ibm.com/cattail/#view=collections/C64753E05C0C3DDA93486644093F23B6

- Comfortable Video-Demos available at TechDocs (includes PW & www):
  - *POWER6 Live Partition Mobility Demo with SAP*
  - http://w3.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS2921
  - **Integration of IBM** *PowerVM and SAP Adaptive Computing Controller + CCMS*
  - http://w3.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS4232

- Whitepapers available
  - *Live Migration of Power Partitions running SAP Applications (SAP SDN)*
  - https://www.sdn.sap.com/irj/scn/go/portal/prtroot/docs/webcontent/uuid/b0b6911f-bf10-2c10-14ba-bc789953ff25
  - *SAP Adaptive Computing Controller for IBM Power Systems and IBM System z*
  - http://w3.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP101745

- Redbook completely reworked in October 2011
  - *SAP Applications on PowerVM*
  - http://www.redbooks.ibm.com/redbooks/pdfs/sg247564.pdf

- ISICC Wiki Page covering SAP landscapes on IBM PowerVM
  - http://w3.tap.ibm.com/w3ki2/display/isicc/PowerVM+and+AIX+Virtualization
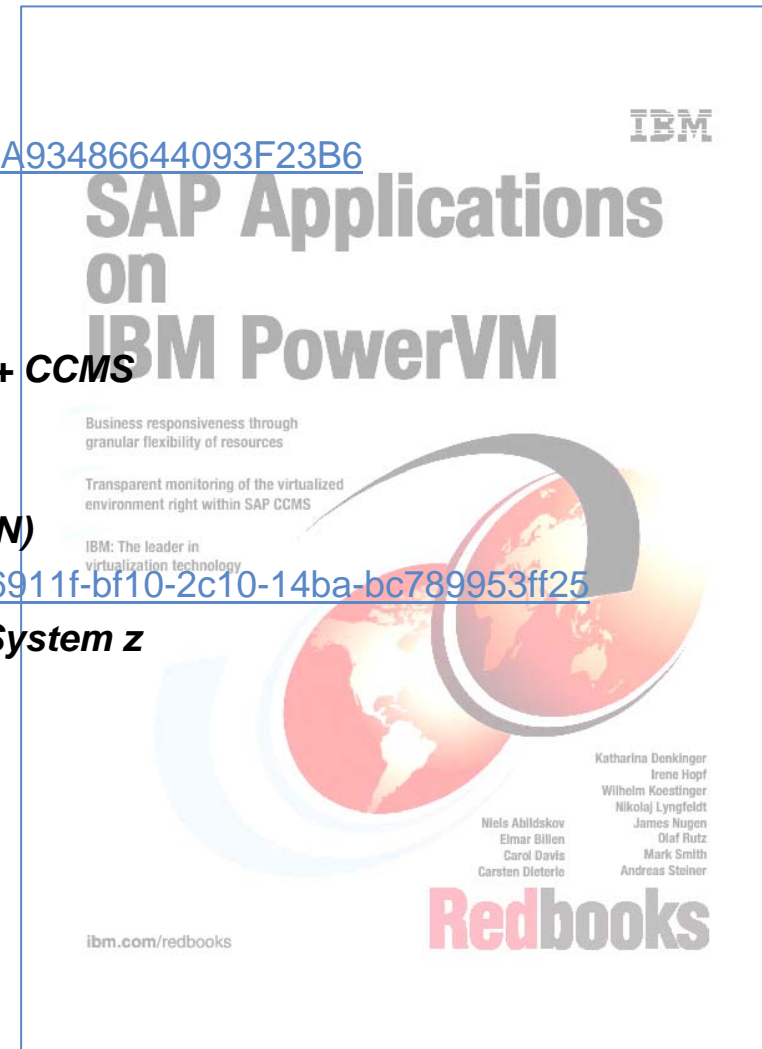
SAP Provided Information

- Almost all technical SAP materials are maintend on the SAP Service Market Place. It requires a one time registration (S-User) in order to get access to the provided links and repositories at SAP.

- Product Availability Matrix (PAM)
    - http://service.sap.com/pam
    - Lists all supported OS/DB/SAP stacks
- Another technical Source is SAP Developer Network (SDN):
    - http://www.sdn.sap.com/irj/sdn
- AIX Landing Page in SDN
    - http://www.sdn.sap.com/irj/sdn/aix
- Public SAP Benchmark Entry Page
    - http://www.sap.com/solutions/benchmark/index.epx
    - 2 tier is most common one and base for SAPS comparisons

Mail contact: motajovic@sk.ibm.com,
isicc@de.ibm.com

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Notes on benchmarks and values

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

All performance measurements were made with AIX or AIX 5L operating systems unless otherwise indicated to have used Linux. For new and upgraded systems, AIX Version 4.3, AIX 5L or AIX 6 were used. All other systems used previous versions of AIX. The SPEC CPU2006, SPEC2000, LINPACK, and Technical Computing benchmarks were compiled using IBM's high performance C, C++, and FORTRAN compilers for AIX 5L and Linux. For new and upgraded systems, the latest versions of these compilers were used: XL C Enterprise Edition V7.0 for AIX, XL C/C++ Enterprise Edition V7.0 for AIX, XL FORTRAN Enterprise Edition V9.1 for AIX, XL C/C++ Advanced Edition V7.0 for Linux, and XL FORTRAN Advanced Edition V9.1 for Linux. The SPEC CPU95 (retired in 2000) tests used preprocessors, KAP 3.2 for FORTRAN and KAP/C 1.4.2 from Kuck & Associates and VAST-2 v4.01X8 from Pacific-Sierra Research. The preprocessors were purchased separately from these vendors. Other software packages like IBM ESSL for AIX, MASS for AIX and Kazushige Goto's BLAS Library for Linux were also used in some benchmarks.

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

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

Current: 3Q 2010

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

SPEC	http://www.spec.org
LINPACK	http://www.netlib.org/benchmark/performance.pdf
Pro/E	http://www.proe.com
GPC	http://www.spec.org/gpc
STREAM	http://www.cs.virginia.edu/stream/
Fluent	http://www.fluent.com/software/fluent/index.htm
TOP500 Supercomputers	http://www.top500.org/
AMBER	http://amber.scripps.edu/
FLUENT	http://www.fluent.com/software/fluent/fl5bench/index.htm
GAMESS	http://www.msg.chem.iastate.edu/gamess
GAUSSIAN	http://www.gaussian.com
ANSYS	http://www.ansys.com/services/hardware-support-db.htm
	Click on the "Benchmarks" icon on the left hand side frame to expand. Click on "Benchmark Results in a Table" icon for benchmark results.
ABAQUS	http://www.simulia.com/support/v68/v68_performance.php
ECLIPSE	http://www.sis.slb.com/content/software/simulation/index.asp?seg=geoquest&
MM5	http://www.mmm.ucar.edu/mm5/
MSC.NASTRAN	http://www.mscsoftware.com/support/prod%5Fsupport/nastran/performance/v04_sngl.cfm
STAR-CD	www.cd-adapco.com/products/STAR-CD/performance/320/index/html
NAMD	http://www.ks.uiuc.edu/Research/namd
HMMER	**http://hmmer.janelia.org/**
	http://powerdev.osuosl.org/project/hmmerAltivecGen2mod

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Notes on performance estimates

- rPerf for AIX

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

- rPerf estimates are calculated based on systems with the latest levels of AIX and other pertinent software at the time of system announcement. Actual performance will vary based on application and configuration specifics. The IBM eServer pSeries 640 is the baseline reference system and has a value of 1.0. Although rPerf may be used to approximate relative IBM UNIX commercial processing performance, actual system performance may vary and is dependent upon many factors including system hardware configuration and software design and configuration. Note that the rPerf methodology used for the POWER6 systems is identical to that used for the POWER5 systems. Variations in incremental system performance may be observed in commercial workloads due to changes in the underlying system architecture.

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

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- CPW for IBM i

- Commercial Processing Workload (CPW) is a relative measure of performance of processors running the IBM i operating system. Performance in customer environments may vary. The value is based on maximum configurations. More performance information is available in the Performance Capabilities Reference at: www.ibm.com/systems/i/solutions/perfmgmt/resource.html

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