



HP-UX 11i and
HP Integrity servers: Delivering
mission-critical virtualization to
enable an Adaptive Infrastructure



Agenda

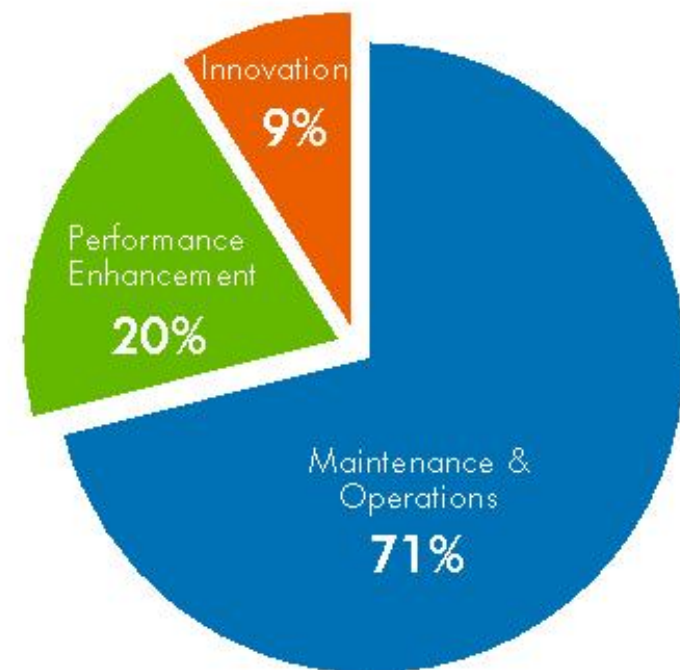
- Customer pain points addressed by HP's Adaptive Infrastructure
- HP-UX 11i and Integrity: the best enterprise UNIX offering in the industry
- Today's news:
Delivering mission-critical virtualization to enable an Adaptive Infrastructure
 - New **HP-UX 11i v3** delivers flexible capacity and mainframe-class availability for the most demanding workloads
 - **Enhancements to HP-UX 11i and VSE** make mission-critical virtualization easier to deploy, secure and manage
 - **New Integrity blade and entry-class server** with lower price points enable more customers to benefit from virtualization
 - **Integrity servers** balanced performance
 - HP 9000 cell-based server **support for sx2000 chipset** simplifies transition to Integrity
- Storage Overview



Customer pain points

- IT environment is too expensive to manage and maintain
- Too many applications, too much customization and too many underutilized servers
- Struggle to meet service level agreements and fast response times for critical workloads
- Can't implement new projects fast enough
- Need to reduce headcount every year, but the work never seems to go away
- Compliance demands are evolving and not sure how to react
- Infrastructure is at risk to security breaches and viruses

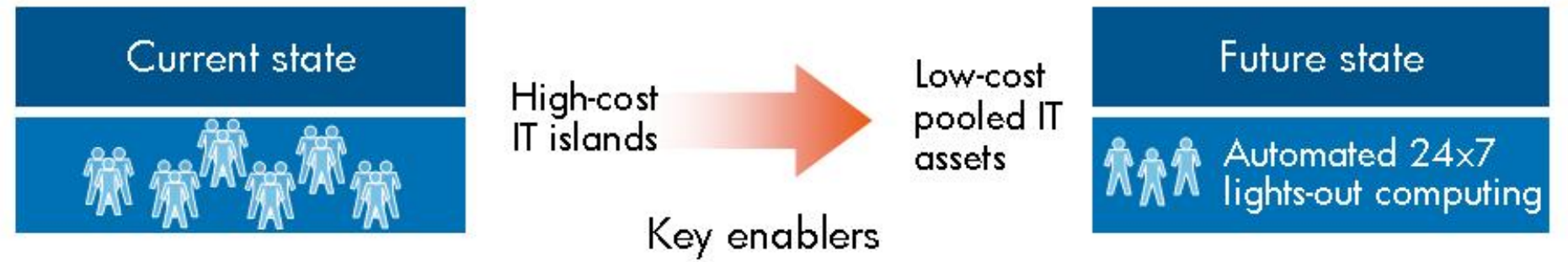
IT budgets have little left for innovation



Only 9% or less of budget is left for innovation

Adaptive Infrastructure and Integrity Systems

Delivering on the 24x7 lights-out trend



IT Systems & Services	Power & Cooling	Management	Security	Virtualization	Automation
<ul style="list-style-type: none"> Scalability based on standards IT services and solutions 	<ul style="list-style-type: none"> Energy-efficient computing 	<ul style="list-style-type: none"> Unified Infrastructure Management 	<ul style="list-style-type: none"> Proactive best practices and built-in protection 	<ul style="list-style-type: none"> Pooling and sharing of IT resources to optimize utilization 	<ul style="list-style-type: none"> Dynamic IT re-deployment to meet changing business demand



HP Integrity Systems, Integrity Software and HP-UX 11i

Integrity servers and HP-UX 11i: best enterprise UNIX offering in the industry

Integrity momentum

- Over 10,700 applications certified for Integrity
- ~ 60% of Fortune 100 rely on HP Integrity
- More HP Integrity servers ship than HP 9000 servers (units and revenue)

Commercial UNIX pioneer turns "20"

- HP-UX installed base of over 1/2 million servers and growing
- #1 Unix clustering and availability software revenue
- Forefront in driving mission-critical capabilities with Serviceguard
- Customers embracing integrated virtualization and management: 30% of soft partitioning shipped with HP Virtual Server Environment Suite in 2HFY06
- Long-term public roadmap focused on primary workloads in the UNIX market: business processing and decision support



HP-UX 11i on HP Integrity Servers

Mission-critical virtualization for enterprises of all sizes

BETTER RETURN ON IT



FLEXIBLE CAPACITY

HP Virtual Server Environment



SECURED AVAILABILITY

HP Serviceguard



SIMPLIFIED MANAGEMENT

HP Systems Insight Manager

HP-UX 11i: integrated design engineered for virtualization, mainframe-class availability and ease of management

Delivering mission-critical virtualization to enable an Adaptive Infrastructure

Today's announcement

- **New HP-UX 11i v3** delivers flexible capacity and mainframe-class availability for the most demanding workloads
 - 30% better performance on average over HP-UX 11i v2
 - Next-generation mass storage stack
 - Increased availability and manageability
- **Enhancements to HP-UX 11i and VSE** make mission-critical virtualization easier to deploy, secure and manage
 - Serviceguard portfolio enhancements
 - VSE Reference Architectures
- **New entry-level HP Integrity blade and server** with lower price points enable more customers to benefit from virtualization
 - HP Integrity blade: BL860c
 - HP Integrity rx2660

HP-UX 11i



New HP-UX version: HP-UX 11i v3

Ready for today's and tomorrow's most demanding workloads



Flexible Capacity

- Flexible Capacity: reaching a whole new level
 - Enable 100 million zettabytes of storage with a next-generation mass storage stack
 - Increase operating system performance 30% on average
 - Dynamically add memory and processors
 - Dynamically move memory across HP Virtual Partitions



Secured Availability

- Secured Availability: extending mainframe-class availability
 - Hot-swap memory, processors, and I/O cards
 - Online patching of HP-UX software with Dynamic Root Disk



Simplified Management

- Simplified Management: more automation
 - Invisible tuning with more auto-tuning of kernel
 - Automatic discovery and configuration of storage devices and I/O paths
 - Streamlined "single pane of glass" with HP-UX System Management Homepage

Binary Compatibility provides Investment Protection

Where Did Kilo, Mega, Giga and All Those Other Prefixes Come From?

Kilo	-	10³
Mega	-	10⁶
Giga	-	10⁹
Tera	-	10¹²
Peta	-	10¹⁵
Exa	-	10¹⁸
Zetta	-	10²¹
Yotta	-	10²⁴

Ok. So where did they come from?

Kilo comes from the Greek *khiloi* and means, curiously enough, 1000. It is interesting enough, the *only* prefix with a direct numerical meaning.

The next three come from Greek and Latin and are either descriptive or mythological.

Mega comes from the Greek *mega* meaning "great", as in "Alexandros O Megas" or "Megas Alexandros" (Alexander the Great).

Giga comes from Latin *gigas* meaning "giant".

Tera comes from Greek *teras* meaning "monster".

Now we return to numbers. Though not direct numerical references, the next two are indirect references.

Peta comes from the Greek *pente* meaning five. This is the fifth prefix (for 10005). This term, and the next one, were both added in 1975 by the General Conference of Weights and Measures (abbreviated CGMP because it is in France)

Exa comes from Greek *hex* meaning six. This is the sixth prefix (for 10006). Taking "Hexa" and making the "H" silent (as it is in France, home of the CGMP) gives "Exa".

Here we leave the numerical references again. Unable to return to the mythological (after great, giants and monsters what else is there), we move to the Latin alphabet. For reasons I don't know, we start with the last letter (Zetta), working backwards to the beginning.

Zetta, often mistaken for the Greek *Zeta*, is the last letter of the Latin alphabet. This prefix and the next one were added in 1990 by CGMP.

Yotta is the penultimate (next to last) letter of the Latin alphabet.

<http://www.jameshuggins.com/h/tek1/prefixes.htm>



Next-generation Mass Storage Stack in HP-UX 11i v3

Ready to manage data explosion



IT must efficiently support and manage dramatic increases in storage capacity driven by:

- Regulatory compliance
- Data mining for new business opportunities
- Video, audio, photos...

- Significantly increase storage by deploying HP-UX 11i v3
 - Almost unlimited growth architected for the future:
over 100 million zettabytes of total storage
 - Each disk up to 8 zettabytes in size and 16 million storage devices
- Applications have enhanced data availability
 - Self-healing of failed I/O paths and devices
 - Applications maintain throughput levels with automatic rebalancing of I/O workload with native multi-pathing and load balancing

New HP-UX 11i innovation for v3 and v2

Advancing mission-critical virtualization for HP-UX customers



Flexible Capacity

- Flexibility through reduced time-to-deployment
 - New HP Virtual Server Environment (VSE) Reference Architectures
 - Dynamically move memory across HP Virtual Machines



Secured Availability

- Security protection easier to deploy¹
 - Protect data-at-rest with encryption & key protection
 - Automated deployment of process isolation
- Availability strengthened
 - HP Serviceguard: cascading disaster tolerance across three sites



Simplified Management

- Management simplified with easier control
 - Warranty information now in HP SIM 5.1²
 - Automated patch & upgrade management
 - Online kernel patching with Dynamic Root Disk












1 - Announced 12/18/2006

2 - Announced 1/16/2007

New HP Virtual Server Environment Reference Architectures for HP-UX 11i

Reduce solution deployment time by half More information: www.hp.com/go/vserver

Expanding HP's unique best-practice portfolio

	Line of Business	Shared IT
Databases 	<ul style="list-style-type: none"> Oracle Database RAC Oracle Database 	<ul style="list-style-type: none"> Shared Database Infrastructure 
Application Servers 	<ul style="list-style-type: none"> Oracle Application Server WebLogic Server WebSphere Application Server   	<ul style="list-style-type: none"> Shared Application Server Infrastructure 
ERP 	<ul style="list-style-type: none"> SAP R/3 mySAP Business Suite – Development and Test 	
BI 	<ul style="list-style-type: none"> SAS Enterprise BI Server 	

HP Serviceguard for HP-UX

Delivering mission-critical availability

integrated with virtualization for enterprises of all sizes

HP Serviceguard: mainframe-class availability

- Continuous availability for Oracle Database
- Disaster tolerant solution (100km) built in
- 30% performance boost for Oracle file based solutions
- Maintain service levels with superior asset utilization
- Leadership high availability with a low cost of entry

Plus new Serviceguard innovation

Enhancements

Extend
Disaster Tolerance
with
cascading failover

Safeguard
Cluster File Systems
with
Continental clusters

Self heal/
self optimize with
Serviceguard Extension
for SAP

Protect with
Reliable
Transaction
Router

HP-UX 11i integrated security protection



Protecting

- Data
- Systems
- Digital Identities

Maximum protection against external and internal threats to HP-UX

Reduced risk and increased adherence to compliance standards

Comprehensive and automated set of security features to reduce IT time and required skill sets

HP-UX Security Leadership

Security Containment

Select Access - Identity Management Integration

Encrypted volume and file system *

System lockdown and Hardening *

Intrusion detection, analysis, prevention

Trusted Computing *

From expensive business necessity to streamlined business enablement

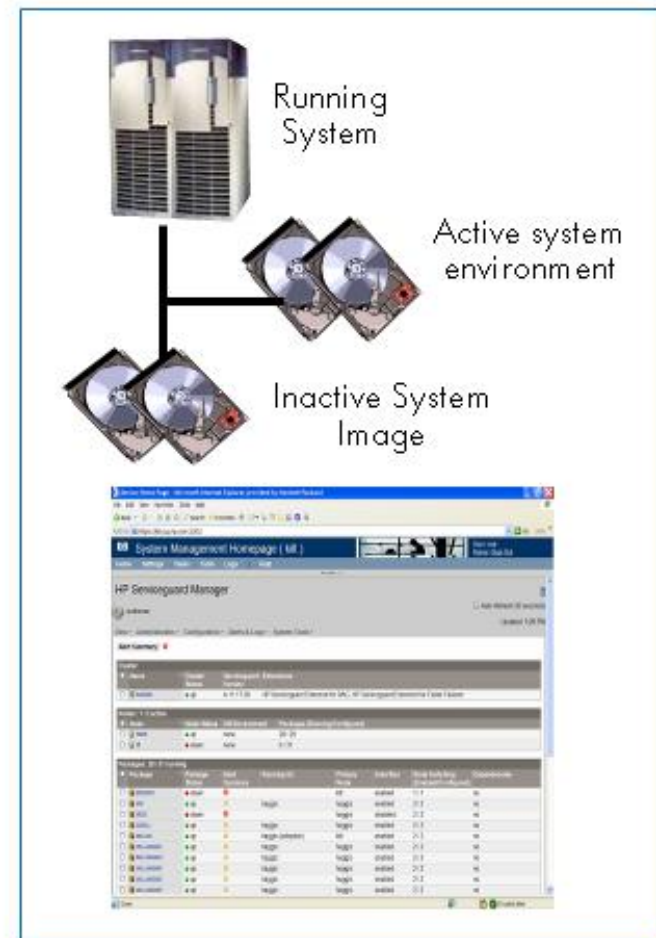
* New or enhanced



Next-generation simplified management

Making mission-critical virtualization servers easier to manage

- Online HP-UX software patching with Dynamic Root Disk
 - Install patches during normal business hours & reboot when convenient
- Automated patch management with Software Assistant
 - Simplifies patch and security vulnerability analysis and patch deployment
- System Management Homepage (SMH): Single pane of glass for HP-UX
 - Easy-to-use web-based interface with integrated tools and products
 - Manage single servers or cluster of servers



Continued innovation on HP-UX 11i v2 and v3

HP-UX 11i software roadmap

Extending mission-critical virtualization

2003

2007

2009 and beyond

- Major releases every 2-3 years; continuing enhancements to shipping releases
- Investment protection through binary compatibility and 10+ years of support life

**Enterprise UNIX for
HP Integrity & HP
9000 servers**

HP-UX 11i,
Serviceguard and
Virtual Server
Environment make
mission-critical
virtualization easier
to deploy, secure,
and manage

HP-UX 11i v2

VSE and extending availability, security, manageability, scalability

**Next level of
virtualization and
automation**

Flexible capacity &
mainframe-class
availability for the
most demanding
workloads

HP-UX 11i v3

Manage the data explosion, increase availability, automation

**24x7 lights out
computing & policy-
based services
provisioning**

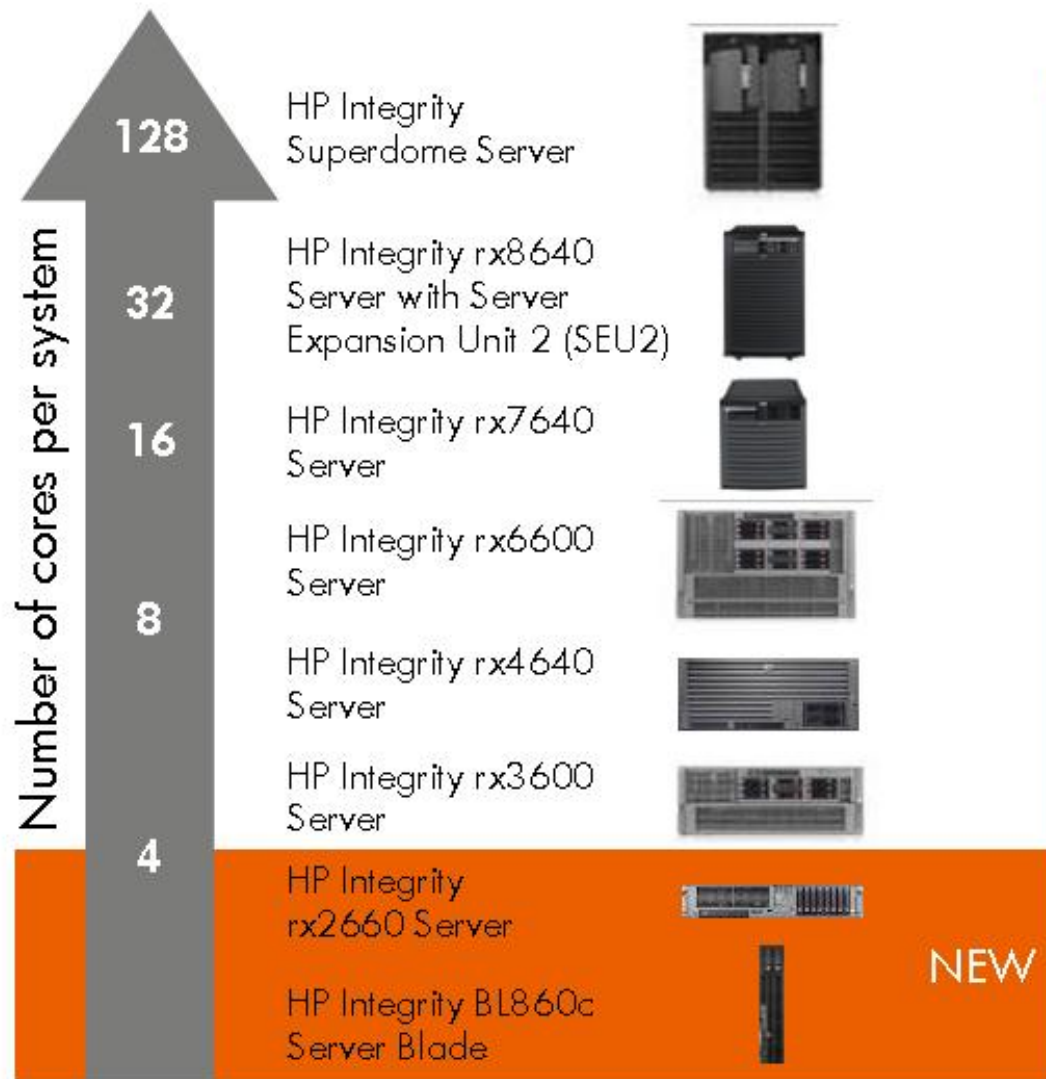
HP-UX 11i v4

Zero-downtime virtualization

Next generation

HP-UX 11i v5

HP Integrity Servers: Delivering the Adaptive Infrastructure



Better return on IT

- Flexible capacity
- Secured availability
- Simplified management



HP Integrity BL860c Server Blade

New Integrity Blade - An adaptive infrastructure with mission-critical virtualization in a 17-inch box

Integrity BL860c Advantage	
1. Capitalizing on the HP BladeSystem c-Class	<ul style="list-style-type: none">• Wire computing resources once and change them on the fly• Dynamically adjust power and cooling to reduce energy consumption• Increase administrative productivity up to tenfold
2. With HP-UX provide mission-critical virtualization to blade customers	<ul style="list-style-type: none">• Mission-critical reliability, availability and serviceability (RAS)• Performance: more than 200% ¹• TCO: up to 50% lower ¹
3. Deliver value of Integrity server architecture	<ul style="list-style-type: none">• Flexible capacity, simplified management, secured availability• Enhanced memory protection• Superior floating point performance



HP-ux11i



Microsoft Windows Server 2003



¹ - comparison BL860c to BL60p

Integrity BL860c Server Blade

- BL860c Server Blade brings HP Integrity to c-Class family
- 2-socket, full-height BladeSystem c-Class server
 - 3 Itanium Montecito processors
 - 1.6GHz/18MB; 1.4GHz/12MB; and 1.6GHz/6MB
 - Superior floating point performance for HPC environments
 - Support for up to 48GB memory with 12 DIMM slots
 - 4 Gbit Ethernet channels standard and 3 optional Mezzanine I/O slots
 - Support for Fibre Channel and Infiniband
 - 2 SAS SFF HDD
 - 36GB, 72GB, and 146GB each; both 10k and 15k
- Integrity, ProLiant, and StorageWorks blades can reside side by side in a single BladeSystem enclosure
- Management
 - Hardware is managed virtually identical to ProLiant server blades
 - HP-UX is managed virtually identical to other BCS entry-class rack optimized Integrity servers
 - Linux virtually identical to ProLiant server blades
 - Significant detail is in technical presentations



HP Integrity BL860c beats IBM JS21: Price parity – better performance

HP BL860c



Single and dual-core processors
2 Hot-plug drives
12 DIMM sockets
48GB max memory
4 Gbit Ethernet ports standard
3 PCI-e mezz I/O slots



HP-UX 11i v2
HP-UX Virtual Server Environment

- *Dynamic resource allocation in a multi-OS environment*
- *Consolidate, virtualize, and automate server resources*

Linux, Windows and OpenVMS support

Enterprise HP-UX value in an Integrity blade

IBM JS21

No memory expansion via I/O expansion blade
No storage expansion

PowerPC970

- *Why not a "real" Power processor*
- *2p/2c and 2p/4c*

No hot-plug drives

- *Reliability?*

Only 4 DIMM slots

- *High cost memory required for larger capacity*
- *16GB max memory*



2 NIC standard

- *Limited expandability*

1 Expansion slot

- *Limited expandability*

Support for AIX/Linux

- *No support for Windows*

Limited virtualization

- *Memory restrictions*

Limited expansion, limited memory, limited performance

LogicaCMG

Telecommunications/IT Services

Objective	Approach	Results
<ul style="list-style-type: none">• Launch the most feature rich release of the LogicaCMG Short Message Service Center (SMSC)• Enable telecom operators to realise more SMS revenues – double performance – and reduce costs• Guarantee customers' future price-performance improvements• Deliver continuity on a single, cost-effective, industry-standard platform• Accommodate Short Message Service growth	<ul style="list-style-type: none">• Make available to approx. 300 telecom network operators a feature rich, third-generation SMSC release on the Integrity rx3600 Server, and by mid-2007, on Integrity blades and the HP c7000 c-Class blade enclosure• Beta test the HP Integrity BL860c Blade Server with multi-core Intel® Itanium® 2 processors running HP OpenVMS• Plan the SMSC migration from the AlphaServer-OpenVMS platform to HP Integrity blade servers and OpenVMS	<ul style="list-style-type: none">• Hardware support to process text messages at 2 times the speed and at greatly reduced cost• Introduction of the SMSC release on an expandable, industry-standard platform• Simple platform upgrade: SMSC pre-certified on OpenVMS• Faster response to changing business conditions• Labor savings (automated & remote management)• Platform expansion without increasing staff• ROI in several months

HP Integrity rx2660 Server:

Great versatility in a small package

- Performance and Price/Performance: HP beats SUN T2000! ¹
- Mission-Critical Virtualization TCO: HP beats IBM hands down!
- Lowest Price Point in the Integrity product line
- Ultimate flexibility for customer choices
- Extending the HP VSE to lower system prices
- Great platform for robust application tier, porting, app development and testing



	New Integrity rx2660	IBM p510Q	SUN T2000
Processors	1-2 Dual Core Intel Itanium 2	4c POWER 5+	8c T1
Virtualization	54 Integrity Virtual Machines	40 IBM micro partitions	0
Maximum Memory	32GB	32GB	64GB
Internal hard drives (SAS 2.5")	8	4	4
Form Factor options	3	1	1

1 - based on SPECjAppServer 2004 JOPS results

Integrity rx2660 Server Overview

Management

- Integrated Lights Out (iLO2) standard
- iLO 2 Advanced Pack firmware license option
- HP System Insight Display

I/O subsystem

- 3 'public' IO slots (2 cage options) :
 - 1 @ PCI-X-133; 2 @ PCI-X-266
 - 2 @ 8x PCI-e; 1 @ PCI-X-133
- 2 SAS (Serial Attached SCSI) Channels
- 2 x 1 Gigabit ports
- USB, VGA, serial ports

Internal peripherals

- 8 hot-plug SFF SAS HDDs
- DVD-ROM or DVD-RW
- integrated RAID 1

Processors and chipset

- 1 or 2 Intel ® Montecito dual-core processors
 - Dual Core 1.6GHz/18MB
 - Dual Core 1.4GHz/12MB
 - Single Core 1.6GHz/6MB
- HP zx2 Chipset
- Upgrade to Montvale Q4CY07

Memory

- 1GB to 32GB
- PC4200 ECC chip spare DDR2

Form factor

- 2 EIA units (U) or 3.5" height
- 21 servers per 42U (2m) rack
- Standalone, pedestal option *
- 'Office Friendly' version *

High availability

- Memory double chip spare
- Redundant hot-plug power
- Redundant hot-plug fans
- Dual SAS channels
- Internal SAS RAID option
- CPU de-allocation on failure
- Dynamic processor resilience

Operating Environments

- HP-UX 11i v2 & v3 **
- Linux Red Hat and SuSE
- Windows Server 2003 Enterprise and Datacenter Editions
- OpenVMS 8.3



**3-year Next day,
on-site Warranty**

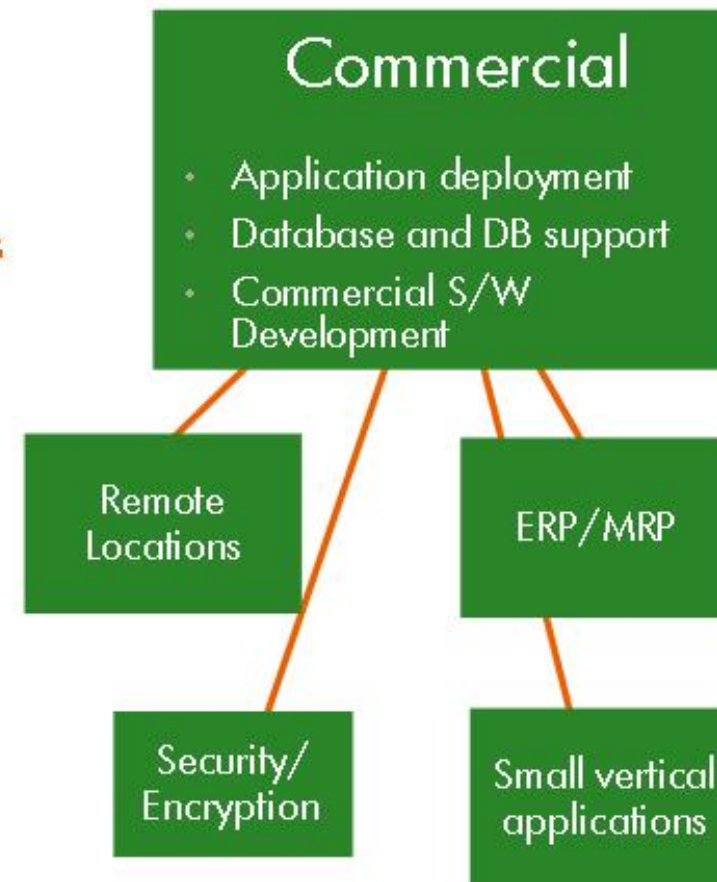
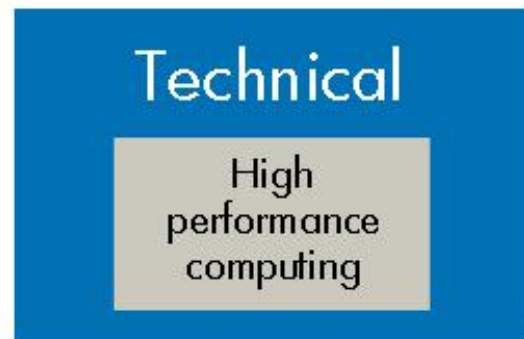
* Pedestal and Office Friendly version available in Q207

** HP-UX 11i v3 not factory integrated at initial ship release

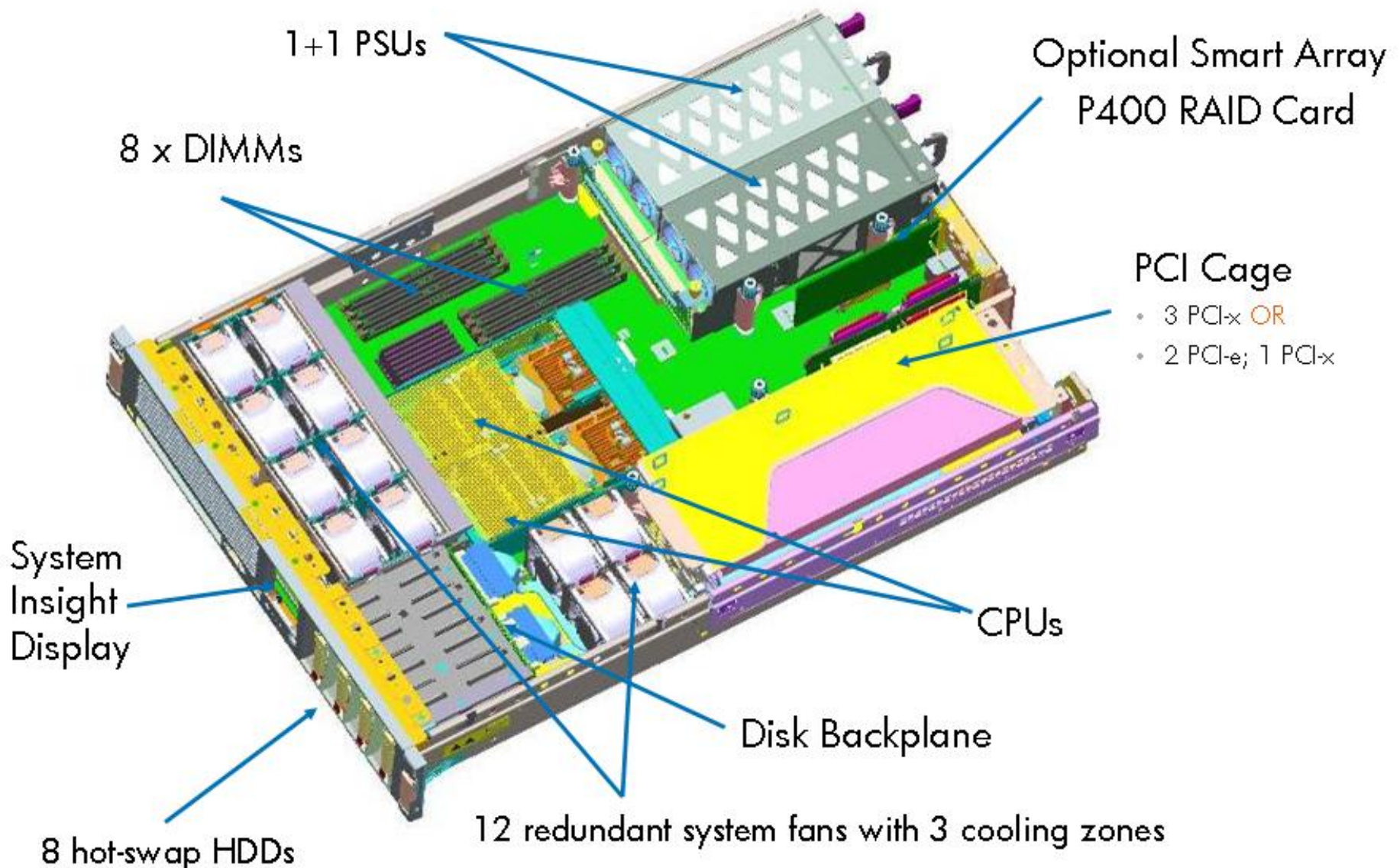
HP Integrity rx2660 Server

Typical Customer Usage Models

The Integrity rx2660 Server has flexibility, performance, and availability for a wide range of enterprise commercial applications as well as technical computing.



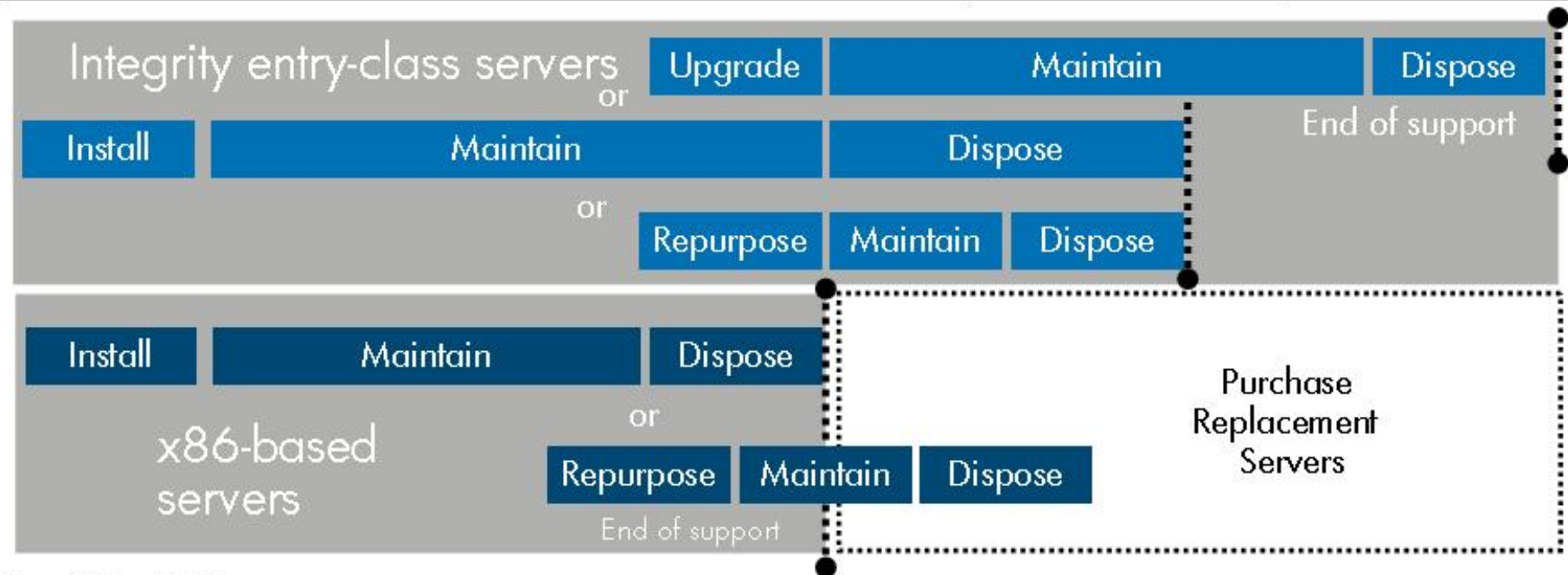
Under the covers of the HP Integrity rx2660 Server



HP Integrity for greater RAS & longer duty cycles

RAS features

	Integrity zx2-based servers	x86-based Servers
double chip spare	✓	X
dynamic processor resiliency	✓	X
full cache parity/ECC	✓	X
data bus error recovery/ECC	✓	X
address bus parity protection	✓	X



Unparalleled choice of 64-bit operating systems



Proven quality, availability and manageability



Industry standard MS Windows now available on 64-bit servers



Openness, flexibility and cost savings



OpenVMS

Secure, feature rich, stable and with investment protection

Choice of operating systems gives you maximum flexibility for deployment and redeployment in an Adaptive Enterprise.

Trusted Computing on HP Integrity Servers

What:

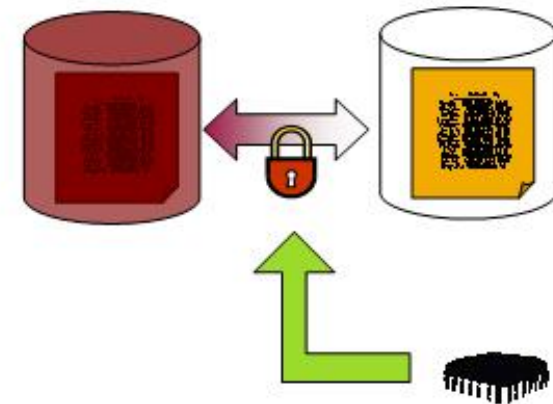
- Embedded security chip option available on zx2 based Integrity Servers (rx2660, BL860c, rx3600, & rx6600)
- Supporting HP-UX 11i software integrating the chip with key security applications

Why:

- Strong, 'machine-bound' protection for cryptographic keys to help eliminate vulnerabilities in software-only solutions
- Maintain the security in transparent encryption services while enabling HA features such as 'auto-boot'
- Provides foundation for advanced security services such as remote verification of hardware and software, e.g. security policy auditing and reporting

Details:

- Option available on Integrity rx2660, BL860c, rx3600 and rx6600 servers
- HP-UX s11i software enablement: Trusted Computing Services (TCS)
 - Available, free of charge, from www.software.hp.com (Q1 2007)
 - Comprised of: hardware (TPM) driver, software stack and DDK, management applications, support for HP-UX 11i Encrypted Volume & Filesystem, command line file/directory encryption



HP-ux11i

"The new HP Integrity rx2660 fits perfectly with our effort to bring new levels of security and performance to the enterprise. With the rx2660's on-board TPM chip, iLO 2 management framework and slim form factor, HP allows us to offer new genuinely secure, high performing internet-facing applications. This includes our soon-to-be announced product, which leverages the Itanium 2 processor, HP's zx2 chipset and our own SourceT micro OS to make mission-critical enterprise applications immune to compromise from rootkits and malware, and resistant to denial of service attacks."

Steve Goodbarn
CEO
Secure64

How Montecito-based Integrity entry-class beats p5

IBM

IBM p5 550Q



IBM p5 520Q



IBM p5 550



IBM p5 520



IBM p5 510Q



HP

Winning Points

rx6600



- 3X memory
- Nearly 2X internal I/O slots
- 4X hotswap disks & RAID integrated w/core I/O
- Superior HA protection**
- In-chassis upgradeable to next generation
- 1/3 less expensive Oracle DB (save \$80k)*

rx4640



- 2X memory
- Protects customers' current investment
- Superior HA protection**
- 1/3 less expensive Oracle DB (save \$80k)*

rx3600



- 3X memory of 520Q, 50% more than 550
- 50% more internal I/O slots vs. 550
- RAID integrated w/core I/O
- Superior HA protection vs. 520Q**
- In-chassis upgradeable to next generation
- 1/3 less expensive Oracle DB (save \$40k)*

rx2660



- 50% less space than 520/520Q
- Greater investment protection with future processor upgrades
- Superior HA protection vs. "Q" models**
- 1/3 less expensive Oracle DB*

* Based on US List prices and Oracle ratio/core pricing

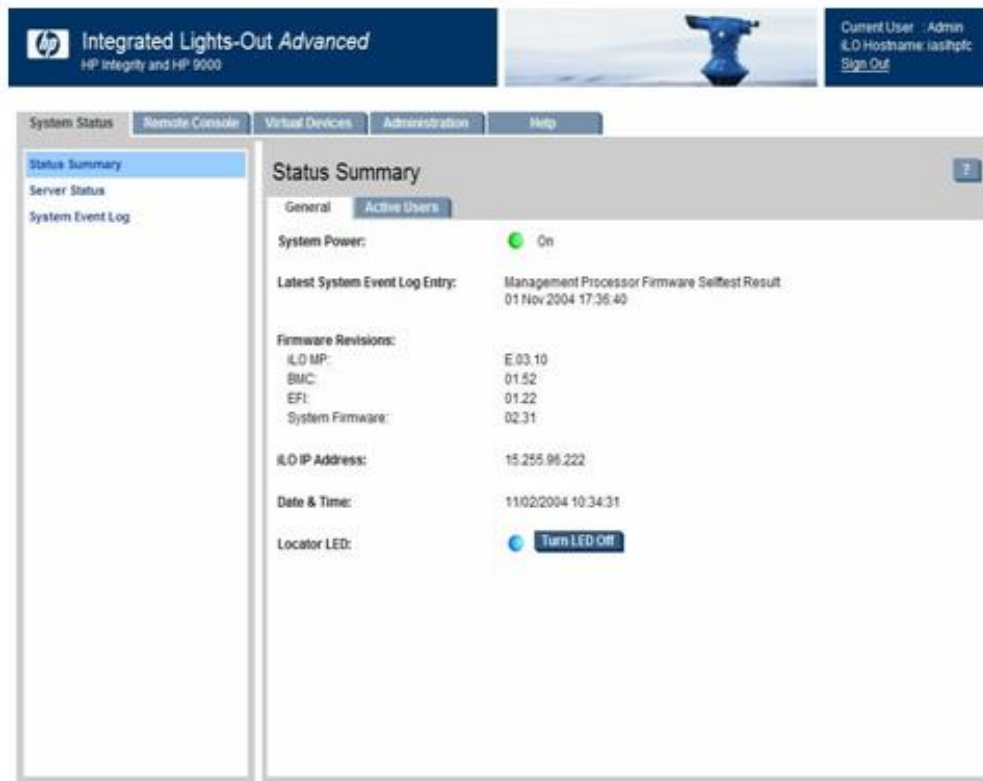
** e.g., ECC cache, double chip spare (zx2 models only), no "QCM" SPOF

31 22 March 2007

Virtualization advantages (SRP, Integrity VM superior I/O, integration & automation, etc.)
Simplified manageability (iLO, SIM, etc.)



Integrated Lights-Out (iLO) for Entry-Class HP Integrity Servers



* All of the functionality available with the HP Integrity/9000 management processor (MP) prior to this release has been carried forward into the standard feature set of Integrated Lights Out (iLO) for Entry Class HP Integrity servers.

Integrated Lights Out (iLO)

Remote Management available with Entry Class HP Integrity servers

- Web GUI or Text Interface
- System Console access
- Virtual Power
- DHCP/DNS
- SSL Security
- Event Notifications
- IPMI over LAN
- Virtual Serial Port
- Remote F/W update

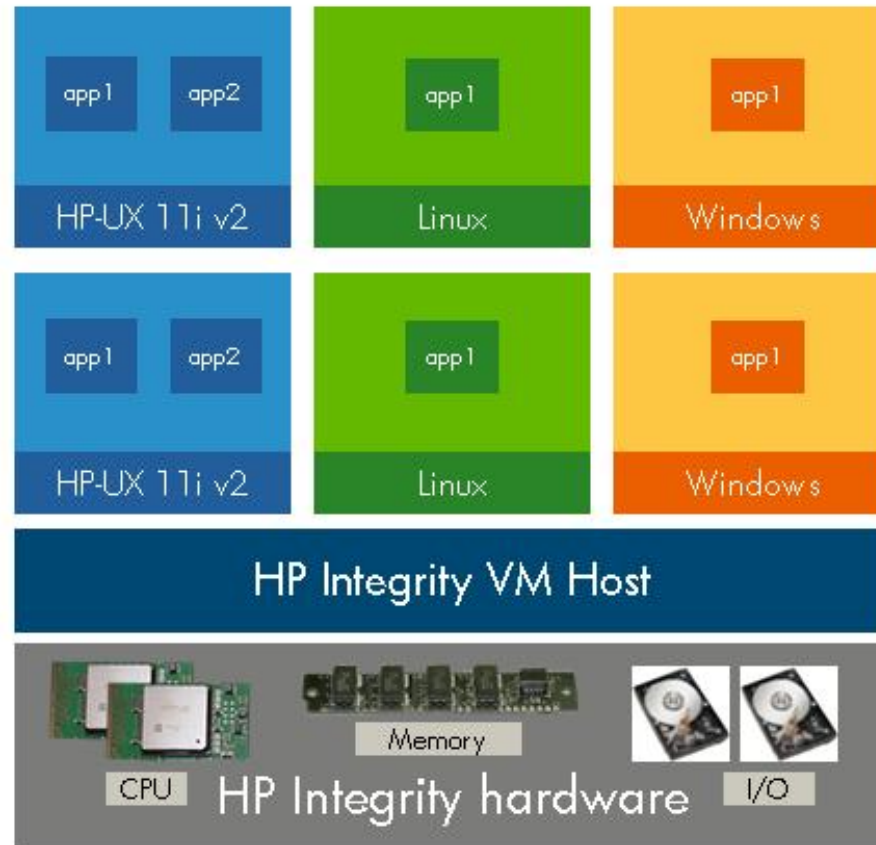
And more features in the

iLO Advanced Pack (AB500A)

- LDAP directory services
- SSH security
- Group actions (with HP Systems Insight Manager)

HP Integrity Virtual Machines (VM)

Optimum utilization across multiple OS



HP-UX 11i software can be licensed by virtual machine!

- Sub-CPU virtual machines with shared I/O
- Runs on any HP Integrity server or nPartition
- Dynamic resource allocation built in
- Resource guarantees as low as 5% CPU granularity
- OS fault and security isolation
- Designed for off-the-shelf multi OS:
 - HP-UX 11i v2 available as of Nov 05
 - Windows® as of Dec 06
 - RedHat LINUX (planned for 2Q CY07)
 - OpenVMS (planned for future)
- Integrated with VSE

HP Services: Mitigate risk and improve ROI for new customers

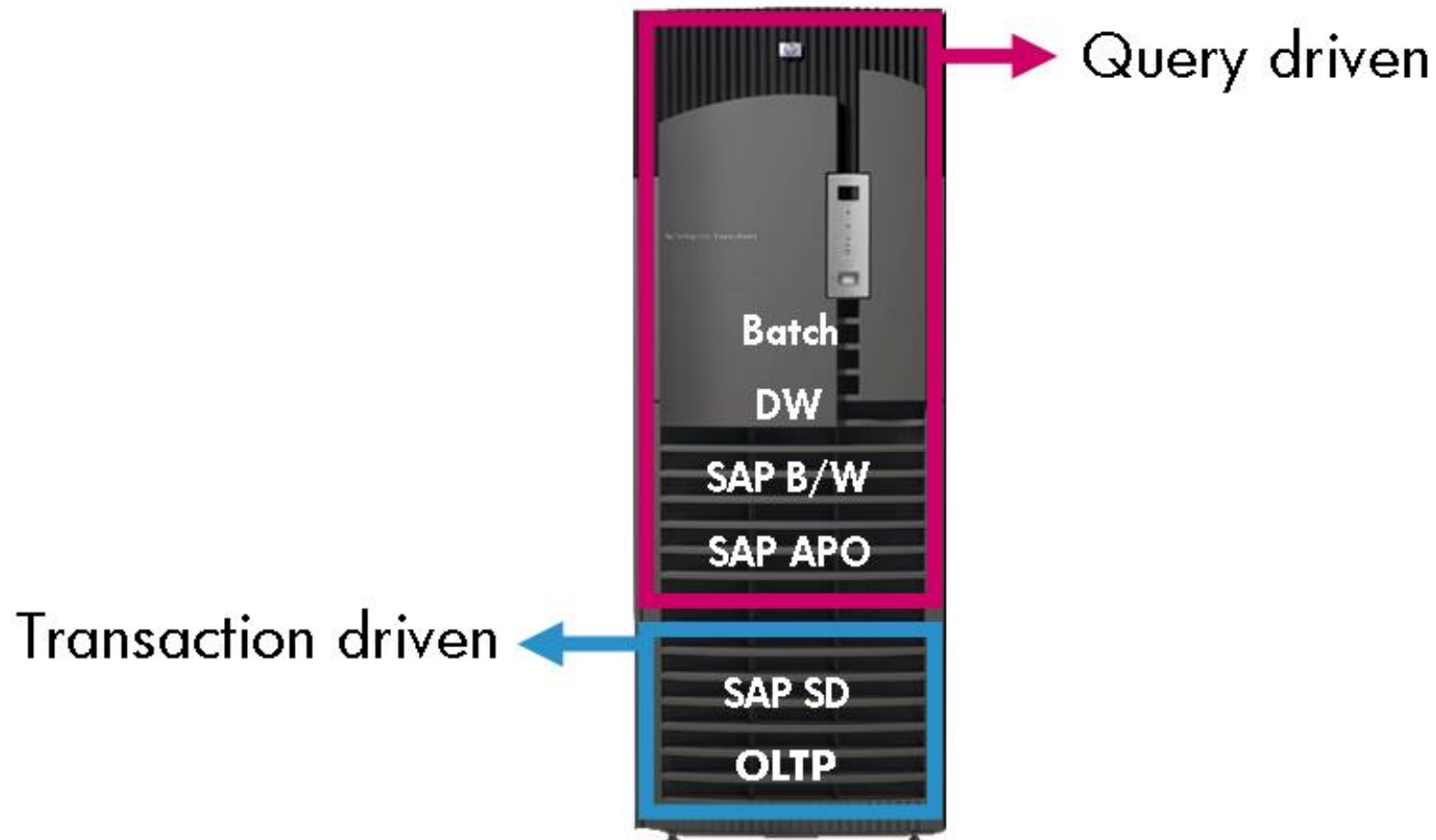


- Introduce Itanium[®]-based systems quickly
 - 65,000 service professionals
 - 18,000 UNIX experts
 - 28,000 Microsoft Windows experts and 5,000 certified engineers
 - 5,000 Linux experts
 - World-class porting and migration services
 - Detailed analysis and planning
 - Select, customize, and develop appropriate migration tools
 - Port and migrate applications, including integration with existing applications and tuning
- Solution lifecycle-based implementations for HP Superdome servers
- As co-developer of the Intel[®] Itanium[®] processor, HP has industry-leading expertise and knowledge of Itanium-based systems

HP Integrity *balanced performance*



IT performance needs in the enterprise: Real world is a mix of workloads








What counts is the balanced performance

HP Integrity Servers

Leading Balanced Performance



Workload	HP System	Benchmark	Beats IBM
Java	HP Integrity rx2660	SPECjbb2005	IBM p5 505Q 1.65 GHz POWER5+
	HP Integrity rx6600	SPECjbb2005	IBM p5 550Q 1.65 GHz POWER5+
	HP Integrity rx6600  #1	SPECjAppServer2004	IBM p5 550 1.9 GHz POWER5+
OLTP	HP Integrity rx6600  #1	TPC-C (4-core)	IBM p5 570 1.9 GHz POWER5
	HP Integrity Superdome  #1	TPC-C	IBM p5 595 2.3 GHz POWER5+
Data Warehouse	HP Integrity rx8640  #1	TPCH @1000GB (16- core)	IBM p5 570 1.9 GHz POWER5
SAP® Solutions	HP Integrity Superdome  #1	Two-tier SAP SD Standard Application Benchmark	IBM p5 595 2.3 GHz POWER5+
Compute Intensive - Integer	HP Integrity Superdome	SPECint_rate2000	IBM p5 595 2.3 GHz POWER5+
Compute Intensive – Floating Point	HP Integrity Superdome	SPECfp_rate2000	IBM p5 595 2.3 GHz POWER5+

Results as of 02/27/2007

Substantiation: See the slide labeled "Benchmark Data vs. IBM"

SPECjAppServer2004, SPECjbb2005, SPECint_rate2000, SPECfp_rate2000 are trademarks of the Standard Performance Evaluation Corp. (SPEC). Reference: TPC-C, TPCH are trademarks of the Transaction Processing Performance Council. SAP, mySAP and other SAP products and services mentioned herein as well as their respective logos are trademarks or registered trademarks of SAP AG in Germany and in several other countries all over the world.



Industry Standard Benchmark Coverage

Best result for each system



	HP Integrity Superdome <i>with dual core Itanium2</i>		IBM p5 595 <i>with POWER5+</i>	
TPC-C	4,092,799 tpmC \$2.93/tpmC Avail: 08/23/07		4,033,378 tpmC \$2.97/tpmC Avail: 01/22/07	
TPC-H@10TB	171,380 QphH \$38.98/QphH Avail: 04/01/07		No result (?)	
SPECjbb2005	2,054,864 BOPs 64 chips/128 cores/2 cores per chip		No result (?)	
SPECint_rate2006	1,650 64 chips/128 cores/2 cores per chip		No result (?)	
SPECfp_rate2006	1,480 64 chips/128 cores/2 cores per chip		No result (?)	
Balanced Performance Validated?				
	Yes		No	

Why has IBM focused on TPC-C and avoided other industry standard benchmarks?

Results as of 2/27/2007, see www.tpc.org and www.spec.org

Commercial benchmarks only. SPECjAppServer2004, SPECjbb2005, SPECint_rate2006, SPECfp_rate2006 are trademarks of the Standard Performance Evaluation Corp. (SPEC). Reference: TPC-C, TPC-H are trademarks of the Transaction Processing Performance Council.











HP-UX 11i Version 3 World Records



HP-ux11i

HP-11i v3

World Record Performance

Workload	HP System		Benchmark
OLTP	HP Integrity Superdome	 HP-  11i	TPC-C
Java	HP Integrity rx6600	 HP-  11i	SPECjAppServer2004
Data Warehouse	HP Integrity Superdome	 HP-  11i	Single-System TPC-H @10000GB
SAP® Solutions	HP Integrity Superdome	 HP-  11i	Two-tier SAP SD Standard Application Benchmark

World record results versus all other results from any vendor

Results as of 02/27/07

Substantiation: See the slide labeled "Benchmark Data World Records"

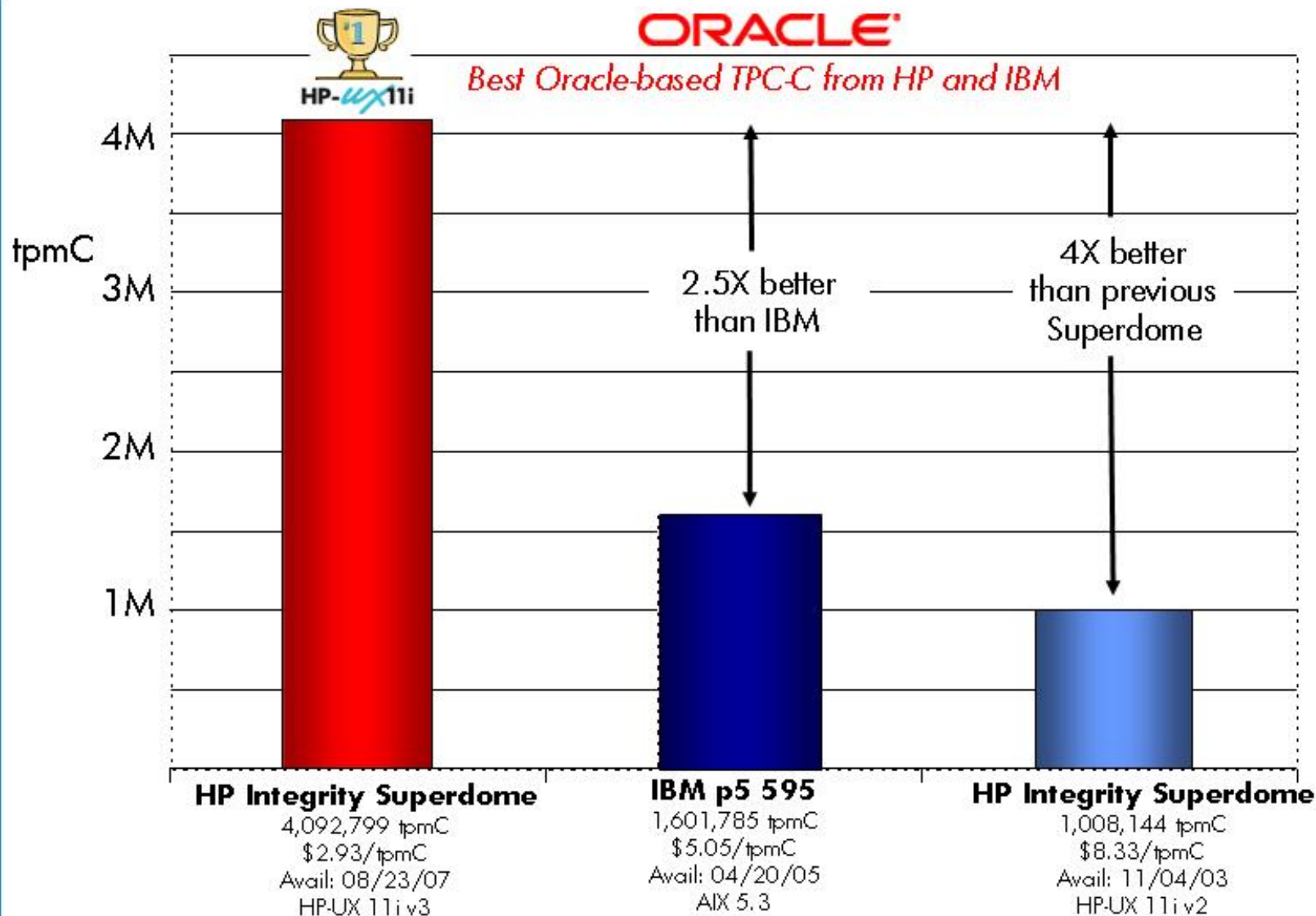
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40 22 March 2007



HP Integrity Superdome

unmatched Oracle performance



Results as of 02/27/07, see: www.tpc.org, TPC-C is a trademark of the Transaction Processing Performance Council.



Benchmark Data vs. IBM

4 core SPECjbb 2005 HP Integrity rx2660, 1.6GHz 18M Itanium2, 2 chips/4cores/2 cores per chip, 80,884 BOPS, 80,884 BOPS/JVM. IBM p5 505Q, 1.65GHz POWER5+, 2 chips/4 cores/2 cores per chip, 63,544 BOPS, 31,772 BOPS/JVM. Results as of 2/26/07. See: www.spec.org

8 core SPECjbb 2005; HP rx6600, 1.6 GHz 24M Itanium2, 4 chips/8cores/ 2 cores per chip, No HW threading,, **158,174** BOPs, 39,544 BOPS/JVM. IBM p5 550Q, 1.65 GHz POWER5+, 4 chips/8cores/ 2 cores per chip, HW threading enabled , **127,851**, 15,981 BOPS/JVM. Results as of 2/26/07 see: www.spec.org

SPECjAppServer2004; HP Integrity rx6600, 1.6GHz 24M Itanium2, 24chips/48cores/2 cores per chip, 6 Nodes, 7,629.45 JOPS. Integrity rx6600, 1.6GHz 24M Itanium2, 16chips/32cores/2 cores per chip, 4 Nodes, 4,915.49 JOPS. IBM p5 550, 1.9GHz POWER5+, 16 chips/32cores/2 cores per chip, 8 Nodes, 2921.48 JOPS. Results as of 2/26/07. See: www.spec.org

4 core TPC-C; HP rx6600, 1.6 GHz 24M Itanium2, 2 processors/4 cores/8 threads, **230,569** tpmC, **\$2.63** USD/tpmC, availability **12/1/2006**. IBM p5 570, 1.90 GHz POWER5, 2 processors/4 cores/8 threads, **203,440** tpmC, **\$3.93** USD/tpmC, availability **10/17/2005**. Results as of 02/26/07 see: www.tpc.org

TPC-C; HP Integrity Superdome, 1.6 GHz 24M Itanium2, 64 processors/128 cores/256 threads, **4,092,799** tpmC, **\$2.93** USD/tpmC, availability **08/23/2007**. IBM p5 595 2.3 GHz POWER5+, 32 processors/644 cores/128 threads, **4,033,378** tpmC, **\$2.97** USD/tpmC, availability **01/22/2007** Results as of 02/27/07 see: www.tpc.org

16 core TPC-H @ 1000 GB; HP rx8640 1.6 GHz 24M Itanium2, 8 processors/16 cores/16 threads, **27,144** QphH@1000GB, **36.00** US \$ per QphH@1000GB, availability **01/01/2007**. IBM p5 570, 1.90 GHz POWER5, 8 processors/16 cores/32 threads, **26,156** QphH@1000GB, **53.43** US \$ per QphH@1000GB, availability **12/15/2004**. Results as of 2/26/07 see: www.tpc.org

Two-tier SAP Sales and Distribution (SD) Standard Application Benchmark; Certification number 2006089-HP Integrity Superdome, 64 processors/128 cores/256 threads, Dual-Core Intel Itanium 2 9050 1.6 GHz, running the mySAP™ ERP2005 application and HP-UX 11i v3 and Oracle 10g achieved 30,000 SAP SD Benchmark users. Certification number 200645 - IBM p5 595 64 processors/64 cores/128 threads, 2.3 GHz POWER5+, running mySAP ERP2004 and AIX v5.3 and DB2 v9 achieved 23,456 SAP SD Benchmark users. Results as of 02/26/07 see: www.sap.com/benchmark

SPECint_rate2000; HP Integrity Superdome 1.6 GHz 24M Itanium2, 64 chips/128 cores/2 cores per chip, Hyper-Threading Technology disabled, SPECint_rate2000: **2,367**. IBM p5 595, 2.3 GHz POWER5+, 32 chips/64 cores/ 2 chips per core. SMT on, SPECint_rate2000: **1,513**. Results as of 02/26/07 see: www.spec.org

SPECfp_rate2000; HP Integrity Superdome 1.6 GHz 24M Itanium2, 64 chips/128 cores/2 cores per chip, Hyper-Threading Technology disabled, SPECfp_rate2000: **2,837**. IBM p5 595, 2.3 GHz POWER5+, 32 chips/64 cores/2 chips per core, SMT on, SPECfp_rate2000: **2,406**. Results as of 02/26/07 see: www.spec.org

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Benchmark Data World Records



TPC-C; TPC-C; HP Integrity Superdome, 1.6 GHz 24M Itanium2, 64 processors/128 cores/256 threads, **4,092,799 tpmC**, \$2.93 USD/tpmC, availability 08/23/2007. Results as of 2/27/07 see: www.tpc.org



SPECjAppServer2004; HP rx6600, 1.6 GHz 24M Itanium2, 24chips/48cores/2 core per chip, 6 Nodes, **7,629.45 JOPS**.. Results as of 2/26/07 see: www.spec.org



Single system TPC-H @ 10,000 GB; HP Integrity Superdome 1.6 GHz 18M Itanium2, 64processors/128 cores/128threads, **171,380 QphH@10,000GB**, **32.91 US \$** per QphH@10000GB, availability **04/01/2007**. Results as of 2/26/07 see: www.tpc.org



Two-tier SAP Sales and Distribution (SD) Standard Application Benchmark; Certification number 2006089-HP Integrity Superdome, 64 processors/128 cores/256 threads, Dual-Core Intel Itanium 2 9050 1.6 GHz, running the mySAP™ ERP 2005 application and HP-UX 11i v3 and Oracle 10g achieved 30,000 SAP SD Benchmark users- Results as of 2/26/07 see: www.sap.com/benchmark

SPECjAppServer2004, SPECjbb2005, SPECint_rate2000, SPECfp_rate2000 are trademarks of the Standard Performance Evaluation Corp. (SPEC). Reference: TPC-C, TPC-H are trademarks of the Transaction Processing Performance Council. SAP, mySAP and other SAP products and services mentioned herein as well as their respective logos are trademarks or registered trademarks of SAP AG in Germany and in several other countries all over the world.

New HP 9000 servers with HP sx2000 chipset: even stronger availability and performance

Number of cores per system

128

HP Superdome Server with HP sx2000 chipset



Up to 64p/128c scalability and hard-partitioning capability for leading consolidation

32

HP 9000 rp8440 Server with Server Expansion Unit 2 (SEU-2)



16p/32c scalability and hard-partitioning capability for consolidation

16

HP 9000 rp7440 Server



8p/16c flexibility with high-performance, density, and hard-partitioning capabilities

4/8

HP 9000 rp4440 Server



4p/8c versatile application and database server

2/4

HP 9000 rp3440 Server



2p/4c high-performance, server for multi-purpose entry-class computing

2

HP 9000 rp3410 Server



1p/2c low-cost server for multi-purpose entry-class computing with HP-UX

sx2000 chipset



invent

HP 9000 Servers with HP sx2000 chipset

- Launching three new HP 9000 servers with HP sx2000 chipset
 - Midrange HP 9000 rp7440 Server
 - Midrange HP 9000 rp8440 Server
 - High-end HP 9000 Superdome with sx2000
- Based on the HP sx2000 chipset and HP PA-8900 processor
 - *One SKU supported 1.068GHz / 533 MHz FSB / 64MB cache*
 - Easy upgrade to HP Integrity due to the use of shared components
- Significant improvements in performance and high-availability
 - Up to **15%** improvement in midrange & up to **25%** improvement in high-end vs. HP sx1000/PA-8900 (1.1 GHz) servers for variety of workloads



Royal London Mutual Insurance Society Limited

Financial Services



Objective	Approach	Results
<ul style="list-style-type: none">• Improve response times for customer support queries• Manage fluctuating workload demands more efficiently• Reduce the cost of supporting multiple applications	<ul style="list-style-type: none">• Consolidate applications on an HP Integrity rx4640 Server with HP-UX 11i v2• Set up an HP Virtual Server Environment (VSE) using HP Virtual Machines (VM) and Process Resource Manager• Use an Integrity rx8620 Server to power the Oryx application & another Integrity rx8620 Server configured with 4 partitions (nPars) for development tasks• Deploy 2 HP StorageWorks 6000 Enterprise Virtual Arrays and HP OpenView Operations for UNIX	<ul style="list-style-type: none">• Faster, more efficient service to customers• Higher performance for the customer support application• Nearly US\$200,000 in savings (cost avoidance)• Reduction of physical servers from 3 to 1• Automated flexibility to handle fluctuating workloads – without buying more hardware• Simplified management• Reduced power & cooling requirements

Creating an HP VSE Channel Partner expert community

Capitalize on the growing virtualization market space – reach enterprises of all sizes via certified VAR partners



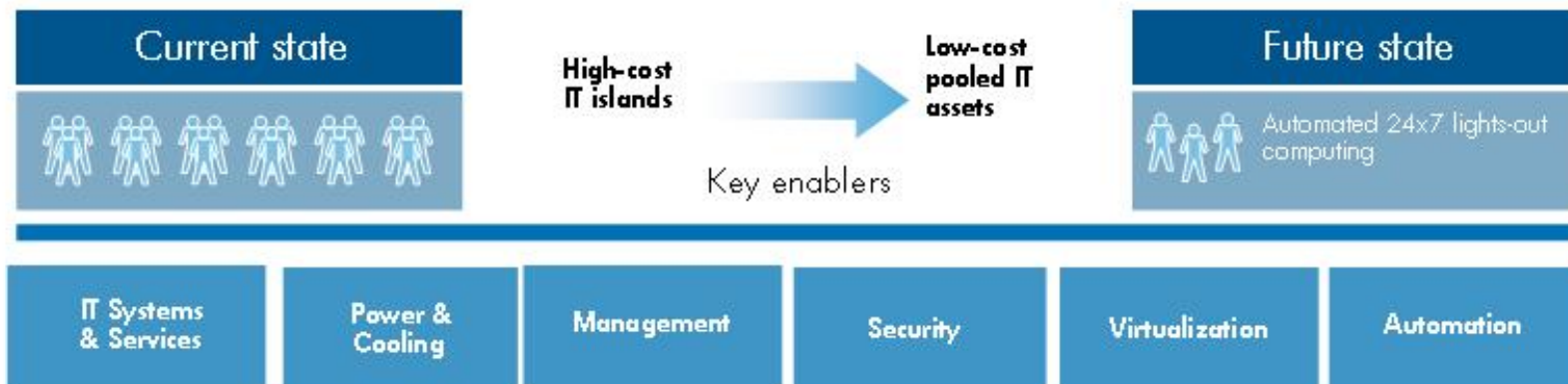
Advancing the value of Integrity Systems

2006		2007		Beyond
<ul style="list-style-type: none"> • New VSE RAs & new capabilities to flex, add, and move resources • HP sx2000 chipset in Midrange and High-end Servers 	<ul style="list-style-type: none"> • HP-UX integrated security protection • Support for Dual-core "Montecito" Intel Itanium 2 processors • HP zx2 chipset • Two new entry level servers 	<ul style="list-style-type: none"> • New HP-UX 11i v3 • Additional VSE RAs • New Integrity Blade BL860c • New rx2660 entry-level server 	<ul style="list-style-type: none"> • Integrity NonStop support Dual-core Intel Itanium 2 processors • Provisioning & workload migration for VSE • Support for next generation Itanium 2 processors (Montvale) 	<ul style="list-style-type: none"> • Continue to drive AI enabler features • HP-UX 11i v4 and beyond • Next Generation Integrity

Advancing the Adaptive Infrastructure

Recent and upcoming HP announcements

- Jan 24: Expanded availability of HP Virtualization Services
- Feb 5: New storage consolidation and virtualization offerings
- Feb 15: HP-UX and Integrity deliver mission-critical virtualization
- Late Feb: HP delivers first I/O virtualization products for HP BladeSystem c-Class



HP extends mission-critical UNIX virtualization leadership to enable an Adaptive Infrastructure



- **New HP-UX 11i v3** delivers flexible capacity and mainframe-class availability for the most demanding workloads
- **Enhancements to HP-UX 11i and VSE** make mission-critical virtualization easier to deploy, secure and manage
- **New Integrity blade and entry-class server** with lower price points enable more customers to benefit from virtualization

Agenda


- Adaptive Enterprise & Adaptive Infrastructure
- HP StorageWorks solutions
 - StorageWorks technology
 - HP Servers & Storage
 - Business continuity & availability
 - IT Consolidation
 - Compliance
- Simplified customer experience



StorageWorks Solutions

Putting Information to Work

StorageWorks Solutions



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The Adaptive Enterprise

Business and IT synchronized to capitalize on change



Simplicity

- Reduce IT cost and complexity
- Make it easier to implement change
- Ensure resources work together

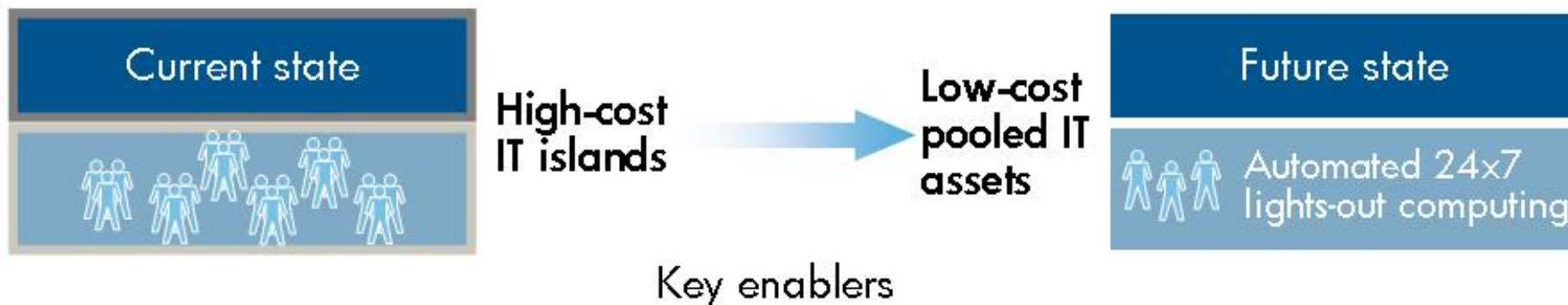
Agility

- Adapt in real time to business needs
- Drive change to create competitive advantage

Value

- Enable growth and profitability
- Unlock the value of assets
- Free up resources for innovation

Driving data center evolution



Modularity	Power & Cooling	Management	Security	Virtualization	Automation
<ul style="list-style-type: none"> Innovative, standardized architectures Clustered, Grid-Based Storage Cost-effective implementation 	<ul style="list-style-type: none"> Energy-efficient Free up production resources 	<ul style="list-style-type: none"> Unified Infrastructure Management Storage Resource Management 	<ul style="list-style-type: none"> Proactive data protection Secure Archives 	<ul style="list-style-type: none"> Pooling and sharing of IT resources to Pooled Storage 	<ul style="list-style-type: none"> Dynamic IT deployment Policy-based Data Migration Scale to demands

Business brings change – is IT ready?

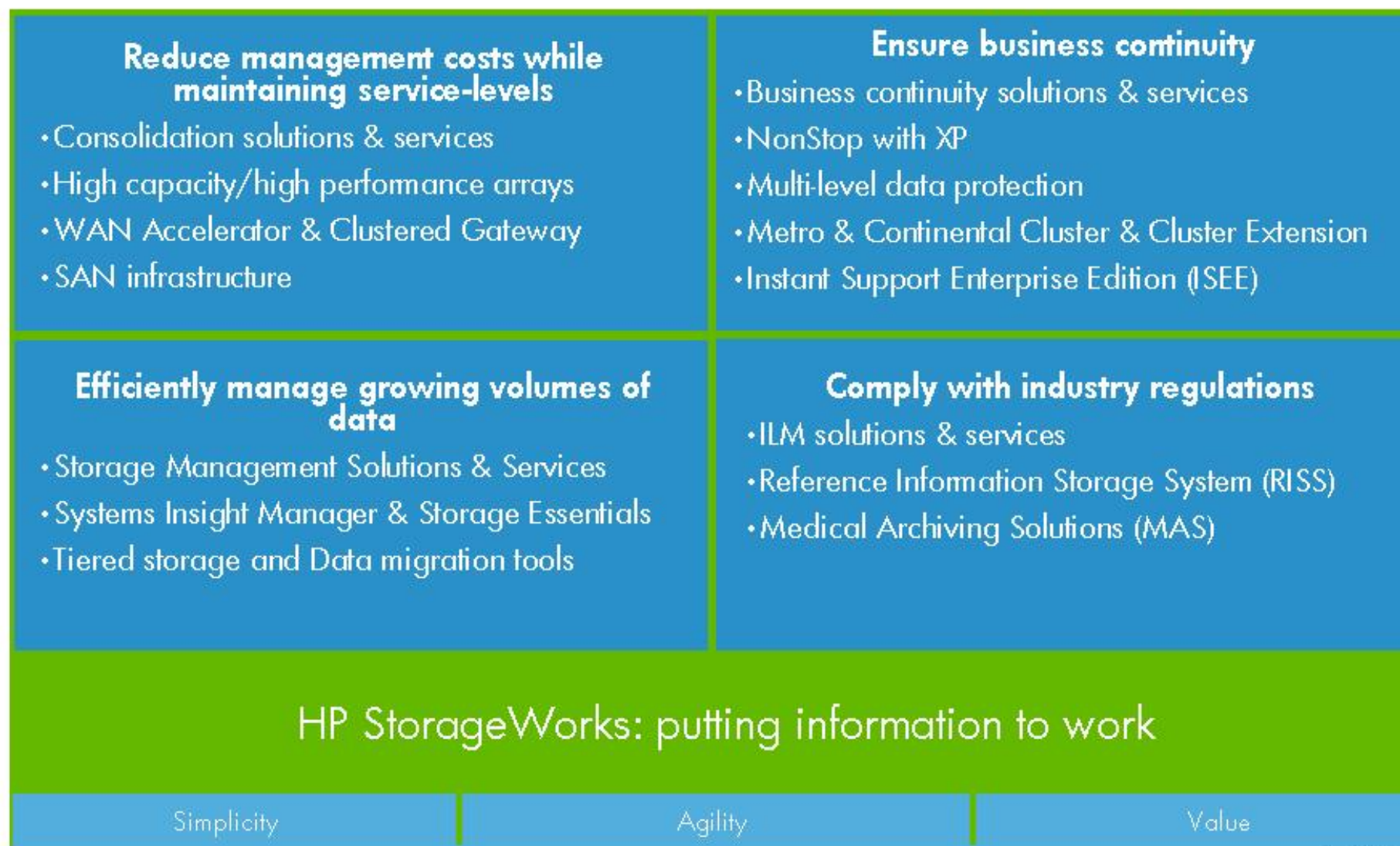
Information

	Continuity	<ul style="list-style-type: none">• Maintaining a secure and resilient enterprise• Protect corporate reputation• Ensure business performance
	Consolidation	<ul style="list-style-type: none">• Reduce IT environment complexity and lower costs• Free resources for innovation throughout the solution lifecycle
	Control	<ul style="list-style-type: none">• Measure and assess key business indicators• Better information and control• Integrated management
	Compliance	<ul style="list-style-type: none">• Comply with a changing regulatory environment• Minimizing risk, improve control and efficiency• Reduce costs
	Collaboration	<ul style="list-style-type: none">• Integrate & manage content, processes & workflow• Across the extended enterprise – partner, employee, customer

StorageWorks technology & solutions



Broadest portfolio of storage & end to end IT solutions: HP + StorageWorks



HP StorageWorks Tiered Storage

Putting Information to Work

Always-on availability

up to 332 TB
Data center consolidation + disaster recovery
Large scale Oracle/SAP apps.
HP-UX, Windows, OVMS, Tru64 + more including mainframe

Low cost consolidation

up to 24 TB
WEB, Exchange, SQL
Simple DAS-to-SAN (ProLiant)
Windows, HP-UX, Linux, Netware, OVMS, Tru64 + more

Simple, affordable, scalable HP StorageWorks NAS

ProLiant Storage Servers
Affordable, easy-to-use Windows powered NAS solutions
- Up to a 100-fold increase in wide-area network (WAN) throughput for file, email, and web traffic



Powerfully simple

Up to 72 TB
Storage consolidation + disaster recovery
Simplification through virtualization
Windows, HP-UX, Linux, OVMS, Tru64 + more

Archive Platform, Grid scalability

Integrated search & retrieve
Grid architecture scaling to billions of objects
Open connectivity

Disk-based solution

Dramatically improves backup and restore performance
Integrates seamlessly into the existing backup environment

Efficient multi-level Nearline storage

Wide range of capacities and performance
From directattach to large-scale SANs
Cost-effective removable media

HP StorageWorks Software

Putting Information to Work

MANAGE SOFTWARE

HP Storage Essentials

PROTECTION SOFTWARE

HP OpenView Data Protector -
Comprehensive and scalable data protection
for heterogeneous IT environments
HP Flex Copy
HP Continuous Information Capture -
Exchange and Database online protection
and versioning

Management Software - SRM

Protection Software



Optimization Software - Automated Movement & Archiving

SOFTWARE for Availability, Performance, Security

HP RIM for Messaging - Automatically capture records in a central archive
HP RIM for Databases - Automatically and transparently relocates database information to and from an online archive database
HP Business Copy - real-time local mirroring
HP Continuous Access - Real-time synchronous/asynchronous remote mirroring
HP File migration agent - Archives the data that remains inactive in production systems
HP OpenView Storage Mirroring
HP StorageWorks Secure Path - Multi-path, high availability

HP StorageWorks Solutions for Applications

Putting Information to Work



Management Software - SRM

Protection Software



Optimization Software - Automated Movement & Archiving

ORACLE Solutions

- Automated movement & archiving with HP RIM for Databases & tiered storage
- Best practice for Oracle data protection across different platforms
- Best practice for Oracle replication/HA across different platforms

SAP Solutions

- SAP BI - Automated movement & archiving with HP RIM for Databases & tiered storage
- BI Accelerator for SAP
- Best practices for performance & configuration across tiers of storage

MICROSOFT Solutions

- HP RIM for Messaging & RISS for Compliance & Consolidation
- HP File migration agent & tiered storage for consolidation
- Best practice for Exchange data protection
- Best practice for Exchange replication/HA
- Best practice for Exchange migration

