HP Integrity Server

Robert Sakic
Consultant, HP
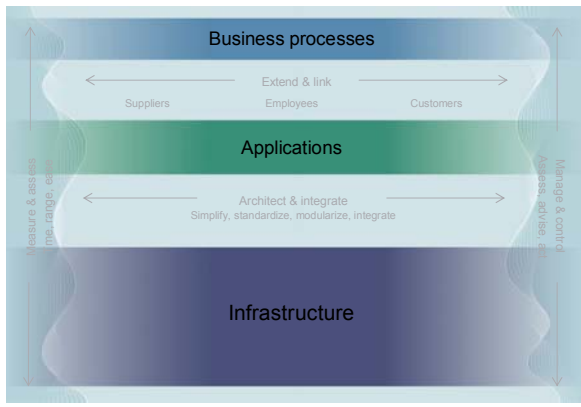
Adaptive enterprise vision

Business and IT synchronized to capitalize on change

Business processes

Extend & link

Suppliers   Employees   Customers

Applications

Architect & integrate
Simplify, standardize, modularize, integrate

Infrastructure

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Adaptive enterprise design principles

hp invent

Simplify	• Reduce number of elements
	• Eliminate customization

+

Standardize	• Standardize processes and resources on a foundation of innovative, modular building blocks

+

Modularize	• Break down monolithic structures
	• Create reusable components

+

Integrate	• Manage the dynamic link between business and IT
	• Connect apps and processes inside and outside
	• Automate change

Applied consistently across:
• Business processes
• Applications
• Infrastructure

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CIO challenges

hp invent

economics

it's all about ~~IT~~ features

improving quality of service—mandatory

$ITe = cost + quality + risk + agility$

customers need to mitigate risk!

enhanced business agility

MUST reduce cost of change

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HP server and storage portfolio
The world's broadest, most robust enterprise offering

Access	ProLiant DL/ML 100 & 300 series ProLiant BL e-Class	Integrity rx5670 rx4640 rx2600 rx1600	rp4440-8 rp3440-4 rp3410-2	AlphaServer DS series	StorageWorks CASA Optical family XP series
Application	ProLiant DL/ML 500 series ProLiant BL p-Class	Integrity rx8620 Integrity rx7620	rp8420-32 rp7420-16	AlphaServer ES series	NonStop S76 series ESL series EVA series MSL series VA series
Database	ProLiant DL 700 series	Integrity Superdome	HP 9000 Superdome	AlphaServer GS series	AlphaServer SC series / NonStop S76000/S86000 Tape Autoloader series MSA family NAS family / Tape drive families
Multi-OS	Linux	HP-UX 11i	Microsoft Windows Server 2003	OpenVMS	NonStop OS Tru64

SAN Infrastructure / Software / Media / Options

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HP server and storage portfolio
The world's broadest, most robust enterprise offering

	Industry standard servers	Traditional RISC servers	StorageWorks
Access	ProLiant Servers	HP9000 servers / Alpha servers	- Tape and optical storage - Storage arrays and NAS - SAN infrastructure, software,media
Application	Integrity Servers		
Database	NonStop Servers		
Multi-OS	Linux HP-UX 11i Microsoft Windows Server 2003 OpenVMS NonStop OS Tru64		

Management Services

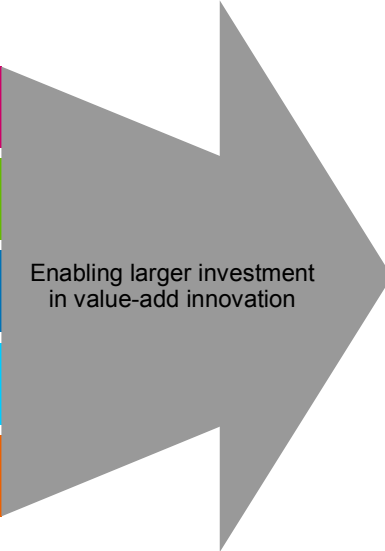April 21, 2004   6

Moving to 3 leadership product lines—built on 2 industry-standard architectures

Current

| HP NonStop servers |
| HP Integrity servers |
| HP 9000/ E3000 servers |
| HP AlphaServer systems |
| HP ProLiant servers |

Enabling larger investment in value-add innovation

Future

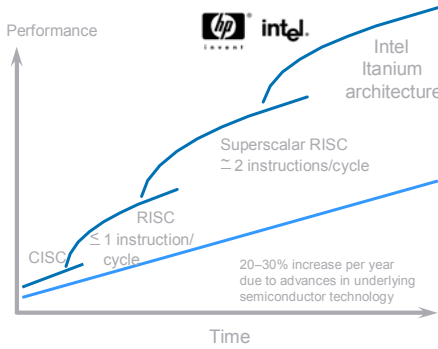| Industry standard	Value-add innovation
HP NonStop (Itanium®-based) servers '04	Consistent technologies
HP Integrity (Itanium-based) servers	• HA • Clustering • Virtualization
HP ProLiant (IA-32–based)	• Management • HP StorageWorks

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HP Integrity Servers: the platform that delivers more

- Flexible and "future-proof" infrastructure
  - Platform for the next 20 years
  - Multi-OS "redeployable": HP-UX 11i v2, Windows, Linux, OpenVMS
  - 2-way to 64-way systems, all based on the high-performance Intel® Itanium® 2 processor
- Full ecosystem including services across the IT lifecycle

Intel® Itanium® architecture is the new generation:

Performance
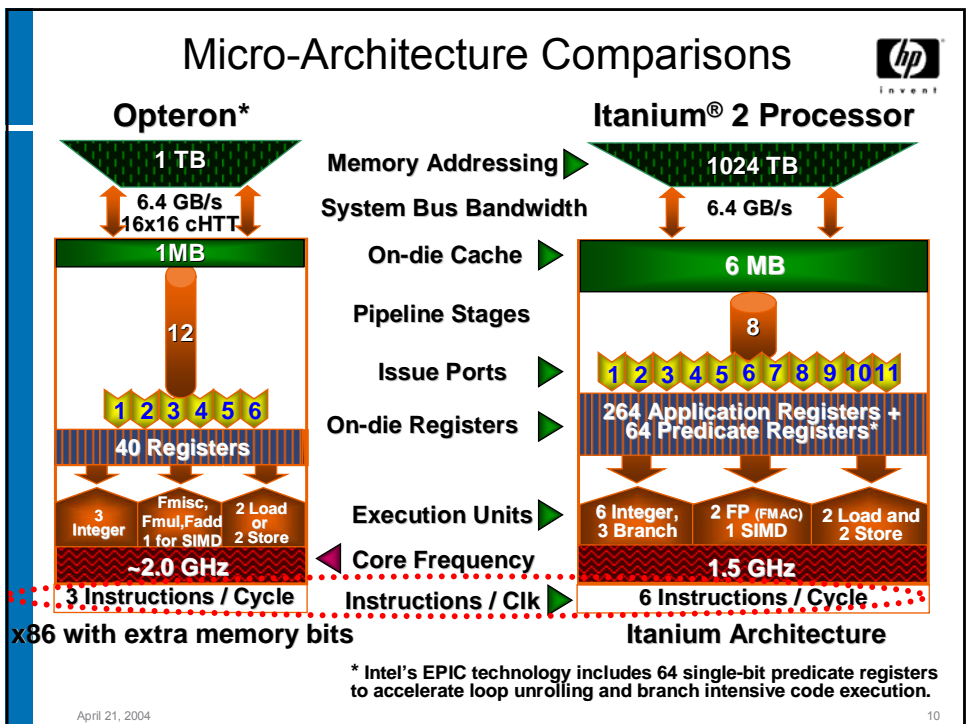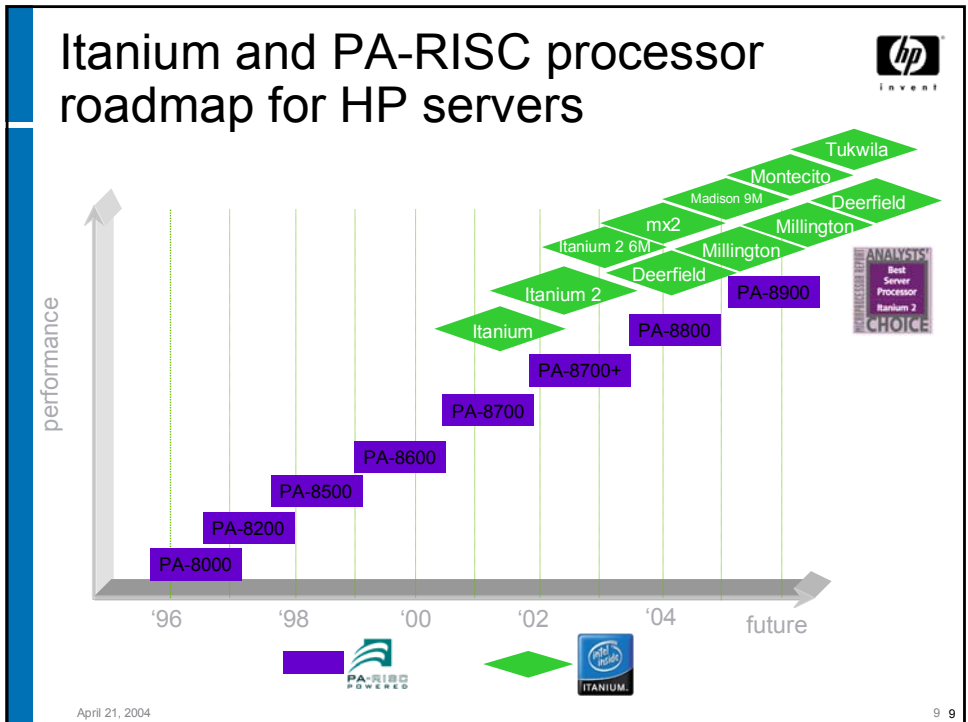
Intel Itanium architecture

Superscalar RISC ≃ 2 instructions/cycle

RISC ≤ 1 instruction/cycle

CISC

20–30% increase per year due to advances in underlying semiconductor technology

Time

HP-UX 11i Version 2   **Windows Server 2003**

Extending the adaptive enterprise with industry standards, unique value

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Itanium and PA-RISC processor roadmap for HP servers

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Micro-Architecture Comparisons

Opteron*	Memory Addressing	Itanium® 2 Processor
1 TB	Memory Addressing	1024 TB
6.4 GB/s 16x16 cHTT	System Bus Bandwidth	6.4 GB/s
1MB	On-die Cache	6 MB
12	Pipeline Stages	8
1 2 3 4 5 6	Issue Ports	1 2 3 4 5 6 7 8 9 10 11
40 Registers	On-die Registers	264 Application Registers + 64 Predicate Registers*
3 Integer / Fmisc, Fmul, Fadd 1 for SIMD / 2 Load or 2 Store	Execution Units	6 Integer, 3 Branch / 2 FP (FMAC) 1 SIMD / 2 Load and 2 Store
~2.0 GHz	Core Frequency	1.5 GHz
3 Instructions / Cycle	Instructions / Clk	6 Instructions / Cycle
x86 with extra memory bits		Itanium Architecture

* Intel's EPIC technology includes 64 single-bit predicate registers to accelerate loop unrolling and branch intensive code execution.

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Itanium® Architecture: Optimized for performance growth

Lowering the Itanium® platform cost

HP Integrity Servers: the broadest line of Itanium®-based systems

CPUs

64	HP Integrity Superdome server	Up to 64-way scalability and hard-partitioning capability for leading consolidation	• Up to 64 Intel® Itanium® 2 processors • Up to 512 GB memory • 192 PCI-X slots (with I/O expansion) • Up to 16 hard partitions
16	HP Integrity rx8620 server with server expansion unit (SEU)	16-way scalability and hard-partitioning capability for consolidation	• 2- to 16-way Intel Itanium 2 processors • Up to 128 GB memory • 32 PCI-X slots (with SEU) • Up to 4 hard partitions • 2 servers per 2m rack
8	HP Integrity rx7620 server	8-way flexibility with high-performance, density, and partitioning capabilities	• 2- to 8-way Intel Itanium 2 processors • Up to 64 GB memory • 15 PCI-X slots • Up to 2 hard partitions • 4 servers per 2m rack
4	HP Integrity rx4640 and rx5670 servers	4-way high-performance servers in ultra-dense and highly scalable models	• 1- to 4-way Intel Itanium 2 processors • Up to 64 and 96 GB memory, resp. • 6 and 9 PCI-X slots, respectively • 10 and 5 servers per 2m rack, resp.
2	HP Integrity rx2600 and rx1600 servers	2-way ultra-dense, power-packed server redefines entry-level computing	• 1- to 2-way Intel Itanium 2 (rx2600) or Low Voltage Itanium 2 (rx2600—1.4 and 1.0 GHz; rx1600—1.0 GHz) processors • 1U (rx1600) and 2U (rx2600) form factors • Up to 24 GB memory • 4 PCI-X slots • 20 servers per 2m rack

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HP Integrity and HP 9000 Server Roadmap

Revision 3.1   Mar-04

	Current offering	2004	2005	2006
4-128P	HP 9000 Superdome		CPU: PA-8900 (dual-CPU) OS: HP-UX 11iv1, v2, v3*	New Chipset CPU: PA-8900 OS: HP-UX
2-32P	HP Integrity Superdome	CPU: mx2 dual processor module OS: HP-UX11iv2, Windows	CPU: Itanium2 9M OS: HP-UX11iv2, Windows, Linux*	CPU: Itanium2 "Montecito" New Chipset OS: HP-UX 11iv2, v3* Windows, Linux, OpenVMS	
	HP 9000 rp7410-8, rp8400-16 rp7420-16, rp8420-32		CPU: PA-8900 (dual-CPU) OS: HP-UX 11iv1, v2, & v3*	New Chipset CPU: PA-8900 OS: HP-UX
2-16P	HP Integrity rx7620-8, rx8620-16	CPU: mx2 dual processor module OS: HP-UX11iv2, Windows	CPU: Itanium2 9M OS: HP-UX11iv2, Windows, Linux*,	CPU: Itanium2 "Montecito" New Chipset OS: HP-UX 11iv2, v3* Windows, Linux, OpenVMS	
	HP 9000 rp4440-8		CPU: PA-8900 (dual-CPU) OS: HP-UX 11iv1, v2, v3*	
1-8P	HP Integrity rx4640-4	CPU: mx2 dual processor module OS: HP-UX11iv2, Windows, OpenVMS*	CPU: Itanium2 9M OS: HP-UX11iv2, Windows, Linux*, OpenVMS	CPU: Itanium2 "Montecito" OS: HP-UX 11iv2, v3* Windows, Linux, OpenVMS	New 8p Server and Chipset CPU: Itanium2 "Montecito" OS: HP-UX, Windows, Linux, OpenVMS
	HP 9000 rp3440-4		CPU: PA-8900 (dual-CPU) OS: HP-UX 11iv1, v2, v3*	
1-4P	HP Integrity rx2600-2		CPU: Itanium2 9M OS: HP-UX11iv2, Windows, Linux*, OpenVMS	CPU: Itanium2 "Montecito" OS: HP-UX 11iv2, v3* Windows, Linux, OpenVMS	New 4p Server and Chipset CPU: Itanium2 "Montecito" OS: HP-UX, Windows, Linux, OpenVMS
1-2P	HP Integrity rx1600-2		CPU: Low voltage Itanium2 (+) OS: HP-UX 11iv2, v3*, Windows, Linux, OpenVMS	CPU: Next Gen Low voltage Itanium2 OS: HP-UX, Windows, Linux, OpenVMS

Timeframes not to scale   **Plans subject to change**   **All upgrades "in-box" except as noted**   ***Not available at initial processor release**

4/21/2004   14

What's happened since the last HP Integrity Server launch in November?

- 5X increase in 2003 of the Itanium®-based server market (units and revenue)
- New 1U HP Integrity rx1600 server (1.0 GHz)—less than $3000 entry
- HP Integrity rx2600 servers with low-voltage processors (1.0, 1.4 GHz) for less than $5500 entry
- XC cluster nodes, Lustre file systems
- HP InfiniBand products (available March '04)
- HP operating systems update
  - Linux: leverage rx1600/rx2600 entry price for volume market
  - HP-UX 11i v2: continued momentum with ISVs & customer adoption
  - Microsoft Windows: broader availability and adoption
  - OpenVMS: on schedule, second evaluation release now available
- Performance leadership
  - TPC-C (HP-UX 11i v2, Linux, MS Windows), 10 TB TPC-H, SAP SD (2-tier, 3-tier), SPECjbb, SPECjAppServer, and Hyperion

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HP Integrity Servers provide added benefits to existing operating environments

HP-UX 11i Version 2	Robust, mission-critical solution with added performance and virtualization
Windows Server 2003	Unparalleled scalability, performance
(Linux)	Industry standard for 64-bit
OpenVMS	Bulletproof, secure, feature rich, reliable, investment protection

Choices in
- Operating environments
- Types of systems
- When to adopt new technology
- Applications
- Scale-up and scale-out

Benefits
- Standardization
- Streamlined operations
- Future-proof
- Increased asset utilization
- Consistent support levels

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HP-UX 11i v2 momentum continues with recent HP Integrity Server achievements

Gaining customer adoption

- Across broad industries: Sai Global, University of Oslo, CitiStreet, Otto

Growing the ISV ecosystem

- 99+% top commercial ISVs committed
- Now! All leading databases
- Now! Leading BI, ERP, NSP, and middleware portfolio

HP-UX 11i v2

- Virtualization (VSE)
- High availability
- Manageability
- Reliability
- Security

Extending performance leadership

- OLTP: First to break 1 million tpmC
- Java: #1 SPECjbb2000 & SPECjAppServer, etc.
- ERP: #1 SAP SD

Robust, mission-critical-ready foundation for the adaptive enterprise

April 21, 2004   www.hp.com/go/hpux11iv2   17

Windows Server 2003 Editions

- Target: Datacenters, large RDBMS, LOB apps, DW
- 32-bit, support for up to 32-way SMP & 64 GB RAM, HT
- 64-bit, support for up to 64-way SMP & 512 GB RAM, IA-32 EL
- 8-node clustering, NUMA, WSRM (resource manager)

Windows Server 2003 Datacenter Edition

- Target: Medium to large enterprises, LOB apps, DB
- 32-bit, support for up to 8-way SMP & 32 GB RAM, HT
- 64-bit, support for up to 8-way SMP & 64 GB RAM, IA-32 EL
- 8-node clustering, NUMA, WSRM (resource manager)

Windows Server 2003 Enterprise Edition

- Target: Small or departmental environments, enabling basic file and print and collaboration
- 32-bit, support for up to 4-way SMP & 4 GB RAM, HT
- 64-bit, support for up to 4-way SMP & 32GB RAM, IA-32 EL*

Windows Server 2003 Standard Edition

- Target: Built for Web serving and hosting, platform for rapidly developing and deploying Web services and apps
- Support for up to 2-way SMP & 2 GB RAM
- Hyper-Threading

Windows Server 2003 Web Edition

Microsoft Small Business Server 2003

Windows Server 2003 Family

* Standard Edition for Itanium-based systems available at SP1

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HP Integrity Servers offer unprecedented and sustained performance leadership

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Across diverse workloads

(TPC, SAP, Java, Oracle apps, SPEC CPU, and SPECweb99_SSL)

Across multiple operating systems

(HP-UX 11i v2, Linux, Microsoft Windows)

Across multiple servers

(Superdome, rx5670, and rx2600)

■ HP ■ IBM ■ Sun

Relative performance

Benchmark	HP	IBM	Sun	Group
TPC-C		+7%	???	Integrity Superdome
SPECjbb	+82%		+9%	
LINPACK	+75%		-44%	
TPC-C	+150%		???	Integrity rx5670
OASB	+14%		-8%	
SAP SD 2-tier	+52%		+6%	
	+91%			Integrity rx2600
SPECint	+100%		-9%	
SPECfp	+142%		+12%	

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HP Integrity Servers: the only servers to break the 1 million tpmC threshold – *twice in 35 days*

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Record TPC-C results

HP Integrity Superdome
1,008,144 tpmC
64 processors
Oracle 10g
HP-UX 11i v2

HP Integrity rx5670 Server
1,184,893 tpmC
Cluster of 16 nodes
Oracle 10g RAC
Red Hat Enterprise Linux AS 3

Scale-up

Scale-out

Sustaining our performance leadership
(# of leadership positions)

New benchmarks include: TPC-C (HP-UX, Linux, MS Windows), 10 TB TPC-H, SAP SD (2-tier, 3-tier), SPECjbb, SPECjAppServer, and Hyperion

www.hp.com/products1/servers/integrity/performance.html#byserver

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Announcing a new TPC-C world record!!
1,184,893.38 tpmC @ $5.52/tpmC

- 16 HP Integrity rx5670 servers
  - Each with 4 Intel Itanium 2 processors

- Oracle Database 10*g* RAC
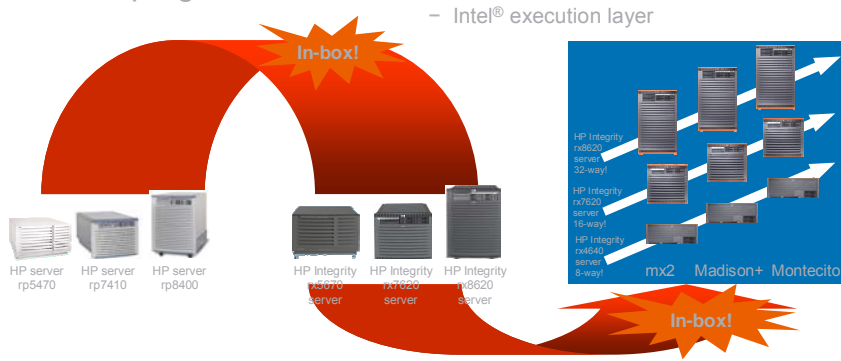
- Red Hat Enterprise Linux AS 3

April 21, 2004 Data as of December 8, 2003. See complete results at www.tpc.org.

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Future-proof your IT investment

- In-box upgrades

- Business systems evolution programs

- OS compatibility
  - HP-UX 11i data, source, and binary compatibilities
  - OpenVMS mixed clusters of HP AlphaServer and HP Integrity servers
  - Linux binary and source compatibilities
  - Intel® execution layer

In-box!

HP server rp5470   HP server rp7410   HP server rp8400

HP Integrity rx5670 server   HP Integrity rx7620 server   HP Integrity rx8620 server

HP Integrity rx8620 server 32-way!
HP Integrity rx7620 server 16-way!
HP Integrity rx4640 server 8-way!   mx2   Madison+   Montecito

In-box!

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HP Integrity Servers: proven in-box investment protection over time

- In-box upgrades
  - Cell board/chipset swap

- Binary compatibility
  - PA-RISC Aries
  - Intel® execution layer
  - Source
  - ABI

- Customer evolution

- Road to tripling the commercial performance

- Continued leadership in return on IT investment

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Key applications that customers need are available today!

1500+ ISV applications available now for HP Integrity servers:

Key HP-UX 11i v2, Windows, and Linux ISVs in place

Very strong business intelligence, ERP, and middleware portfolios

Over 600 applications from over 280 ISVs committed to OpenVMS for HP Integrity servers

More each week

HP has a complete program for continued aggressive recruitment of ISVs to the HP Integrity family

To help achieve customers' success, HP has a defined "must win" process to complete a customer's ISV solution stack if an application is not yet available

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HP Integrity rx1600 and rx2600 Servers

HP Integrity rx1600 Server

New 1U server

- 1U form factor
- 1–2 Low Voltage "Deerfield" Intel® Itanium® 2 processors
- HP zx1 Chipset
- Below $3000 entry price (U.S. list)
- February 2004 availability
- Ideal for HPTC, telco, security, and access tier
- HP-UX 11i v2, Linux, OpenVMS

HP Integrity rx2600 Server

New lower-priced 1.4 and 1.0 GHz processors

- 2U form factor
- HP zx1 Chipset
- 1–2 Low Voltage "Deerfield" or standard "Madison" Intel Itanium 2 processors
- Below $5500 entry price (U.S. list)
- Available NOW
- Ideal for enterprise application tier, remote offices, and HPTC
- HP-UX 11i v2, Linux, Windows, OpenVMS

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HP Integrity rx4640 Server At-a-glance

HP Integrity rx4640 server

- 1- to 4-way Itanium® 2–based system
  - 1.5 GHz (6 MB cache)
  - 1.3 GHz (3 MB cache)
- Up to 64 GB memory
- 6 available PCI-X slots
- 10 servers per 2m rack

Unsurpassed OS support
- Runs HP-UX 11i v2, Linux, Windows Server 2003, and OpenVMS (2H 2004)
- Broad choice of applications

Unmatched performance density
- Rack-dense 4U chassis
- Blazing fast HP zx1 Chipset
- Performance comparable to the HP Integrity rx5670 server

Easy to install and service
- Fast, "no-tools" rack installation
- Quick Find LED diagnostic panel accelerates problem isolation
- Designed for "no-tools" customer repair with swap-out components

Solid high availability
- Redundant, hot-plug power supplies, fans, and hard disk drives
- HP Serviceguard for HA clustering

Leading rapid deployment
- Available site prep, installation, and custom configuration

Excellent investment protection
- In-box upgradable to future Intel® Itanium processors, including the HP mx2 dual-processor module

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HP Integrity rx5670 Server
At-a-glance

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HP Integrity rx5670
server

- 1- to 4-way Itanium® 2–based system
  - 1.5 GHz (6 MB cache)
  - 1.3 GHz (3 MB cache)
- Up to 96 GB memory
- 9 available PCI-X slots
- 5 servers per 2m rack

Broad OS support

- Runs HP-UX 11i v2, Linux, and Windows Server 2003
- Wide choice of applications

Unmatched 4-way performance

- Rack-dense 4U chassis
- Blazing fast HP zx1 Chipset
- #1 benchmark results for TPC-C, SAP SD 2T, Oracle Apps, and more

In-box upgrade from HP 9000

- HP 9000 rp54xx PA-RISC servers can be upgraded to become rx5670 Itanium 2–based systems via in-box upgrade

Solid high availability

- Redundant, hot-plug power supplies, fans, and hard disk drives
- HP Serviceguard for HA clustering

Leading rapid deployment

- Available site prep, installation, and custom configuration

Deployment flexibility

- Available in rack-optimized and deskside form factors

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HP Integrity rx7620 Server
At-a-glance

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HP Integrity rx7620
server

- 2- to 8-way Itanium® 2–based sysetms
  - 1.5 GHz (6 MB cache)
  - 1.3 GHz (3 MB cache)
- 64 GB memory
- 15 PCI-X slots
- 1 removable media device (DAT/DVD)
- 4 internal disk drives
- 2 core I/O
- Up to 2 hard partitions

Unsurpassed OS choice

- Runs HP-UX 11i v2, Windows Server 2003 (1H 2004), Linux (1H 2004), and OpenVMS (2005)
- Supports multiple operating systems in the same server
- Unmatched application choice

Complete investment protection

- In-box upgradable to future generations of Intel® Itanium and PA-RISC processors (including dual-core CPUs)
- In-box upgradable to future high-performance chipsets

Broad utility pricing offerings

- Pay per use*
- Pay per forecast*
- Instant capacity on demand*
- Temporary capacity on demand*
- Cell iCOD*
  - * HP-UX 11i v2 only

Unmatched high availability

- Best core high-availability technologies
- Full Uptime Institute certification

Optimized physical specifications

- Leading 64-bit performance density
- "No-tools" accessibility and serviceability

Leading rapid deployment

- Free site prep and installation
- Free custom configuration

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HP Integrity rx8620 Server At-a-glance

HP Integrity rx8620 server

- 2- to 16-way Itanium® 2–based systems
  - 1.5 GHz (6 MB cache)
  - 1.3 GHz (3 MB cache)
- 128 GB memory
- 16 PCI-X slots
- 4 internal disk drives and 2 removable media devices (DAT/DVD)
- 2 core I/O
- Up to 2 hard partitions

Server expansion unit (SEU)

- 16 PCI-X slots
- 4 internal disk drives and 2 removable media devices (DAT/DVD)
- 2 core I/O
- Enables up to 2 additional rp8400/rx8620 hard partitions
- 9U height (fits in same rack as rp8400/rx8620 server)

nsurpassed OS choice
- Runs HP-UX 11i v2, Windows Server 2003 (1H 2004), Linux (1H 2004), and OpenVMS (2005)
- Supports multiple operating systems in the same server
- Unmatched application choice

Complete investment protection
- In-box upgradable to future generations of Intel® Itanium and PA-RISC processors (including dual-core CPUs)
- In-box upgradable to future high-performance chipsets

Broad utility pricing offerings
- Pay per use*
- Pay per forecast*
- Instant capacity on demand*
- Temporary capacity on demand*
- Cell iCOD*

  * HP-UX 11i v2 only

nmatched high availability
- Best core high-availability technologies
- Full Uptime Institute certification (for both rx8620 and SEU)

Optimized physical specifications
- Leading performance density
- "No-tools" accessibility and serviceability

Leading rapid deployment
- Free site prep and installation
- Free custom configuration

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HP Integrity Superdome Server At-a-glance

HP Integrity Superdome

- 2- to 64-way Itanium® 2–based system
- 512 GB memory
- 192 PCI-X slots
- Up to 16 hard partitions
- Concurrent multi-operating system support
- Ideal for multi-OS consolidation
- Balanced record of performance across a variety of benchmarks

Unsurpassed OS choice
- Runs HP-UX 11i v2, Linux, Microsoft Windows Server 2003 Datacenter Editions, and OpenVMS (2005)
- Supports multiple operating systems in the same server simultaneously
- Unmatched application choice

Complete investment protection
- In-box upgradable to future generations of Intel® Itanium processors (including dual-core CPUs)
- In-box upgradable to future high-performance chipsets

Broad utility pricing offerings
- Pay per use*
- Pay per forecast*
- Instant capacity on demand*
- Temporary capacity*
- Cell iCOD*

  * HP-UX 11i v2 only

Unmatched high availability
- Best single-system high-availability technologies
- Outstanding high-availability clustering
- Full Uptime Institute certification

Redeployability
- Repurpose systems based on changing business needs enabled by multi-OS
- Minimizes IT risk

Leading rapid deployment
- Includes site prep and installation
- Includes custom configuration

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HP Integrity Servers—better ROI

- Speedy deployment and time-to-deployment
- Protection of investment
- Availability of business applications and infrastructure solutions
- Utility computing, grid computing, and resource virtualization

- Deployment time
- Administrative cost
- Downtime

- Investment protection
- Productivity
- Application choice
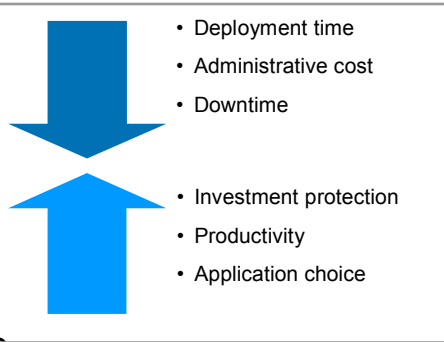
Better ROI: Simple and fast integration with existing IT infrastructure, better utilization of assets, and extension of asset life

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