




HP Server Strategy











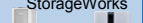
















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HP server and storage portfolio


The world's broadest, most robust enterprise offering

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

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HP's Industry Standards-Based Server Strategy



Current

- HP NonStop
Mips
- HP Integrity
Itanium
- HP 9000 /
e3000
PA-RISC
- HP
AlphaServer
Alpha
- HP ProLiant
x86

Enabling larger investment
in value-add innovation

Future

Industry standard

- HP NonStop
(Itanium based)
- HP Integrity
(Itanium based)
- HP ProLiant
(x86 based)


Common Technologies

- Management
- Virtualization
- HA
- Storage
- Clustering

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

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An adaptive enterprise starts with standards



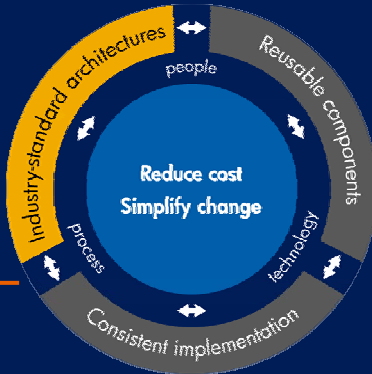
HP is:

- Committed to providing the best in **industry standard** components
- Providing more **customer choice** without compromise
- **Investing** in industry standards and focused innovation

x86 Itanium

Industry standard architectures




Complementary, modular approach
based on two standard architectures

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hp invent

Breaking through memory constraints and accelerating 64-bit computing

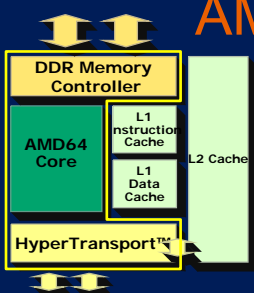
- x86 with 64-bit capability helps meet the growing daily demands for greater compute power
- Business and science continue the move toward 64-bit computing - HPTC
- Next generation x86 fosters commercial ISV support for 64-bit data structures
- Itanium is the leading edge performance 64-bit architecture into the future
- x86 64 Bit extensions enabling 32-bit ecosystem to begin transition to 64-bit computing



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x86 extensions – customer choice



**AMD
Opteron™**

Xeon extensions add

- Additional Registers
8- SSE & 8-Gen Purpose
- Double Precision (64-bit)
Integer Support
- Extended Memory Addressability
64-Bit Pointers, Registers

**Intel Xeon
64 Bit extension**

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HP Integrity servers: the platform that delivers more

- Flexible and "future-proof" infrastructure
 - Long term roadmap
 - Redeployable
- Complete range of scalable, high-performing Itanium 2-based systems
- Industry leading multi-operating system capabilities and support
- Comprehensive manageability, HA and security
- Full ecosystem including services across the IT lifecycle
- Broad range of ISV software and System Integrators to help design, develop, and deploy solutions

Itanium is the new generation:

Performance

Time

CISC ≤ 1 instruction/cycle

RISC ≈ 2 instructions/cycle

Itanium® architecture

Superscalar RISC ≈ 2 instructions/cycle

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

Demand
Agility
Accountability
RoIT

Extending the adaptive enterprise with industry standards, unique value.

Intel® Itanium® Architecture Processor Roadmap

For OEM use under NDA

Performance, RAS, Scalability

2002 2003 2004 2005 2006-Beyond

From Itanium® 2 processor to Montecito: 2-4X Performance*

2nd Generation EPIC architecture
+ on-die L3 cache
+ 6.4GB/s bus
+ New levels of RAS

Itanium® 2 Processor (1 GHz, 3MB L3)

Itanium® 2 Processor (Madison) (1.5GHz, 6MB L3)

Itanium® 2 Processor (Deerfield)

Itanium® 2 Processor (Madison 9M) (>1.5GHz, 9MB L3)

Itanium® 2 Processor (Deerfield)

Montecito (Dual Core)

Next Generation Platform

Next Generation Platform

+ Larger caches
+ 50%+ frequency increase
+ Same platform

+ Larger caches
+ Frequency increase
+ Same platform

+ Increase in frequency
+ Same platform

+ Same microarchitecture, approximately half the power
+ Optimized for density: Dual Processor rack & blade servers

+ Two cores per die
+ Hyper-Threading Technology
+ Higher frequency
+ New thermal technologies

+ Multi-core
+ 10s of GB of cache
+ Fast, high memory capacity
+ High RAS memory & I/O
+ PCI Express

+ Same power envelope as Deerfield
+ Enhanced Microarchitecture

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HP Integrity servers provide breakthrough flexibility

Supporting different and/or multiple operating environments

- Superior solutions for single operating systems

Flexibility to meet heterogeneous needs

Why multi-os?

- Standardization
- Streamline Operations
- Future Proof
- Shared Resources
- Increased Utilization
- Greater Consolidation

Only Delivered By HP!

*OpenVMS in 2004

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Itanium® Architecture: Optimized for performance growth

- Parallel execution leadership: only Intel has all 3:**
 - Multi cores on same die
 - Multi threads on same core
 - Explicit Parallelism in each core
- EPIC*: inherent advantages for multi-core, multi-thread**
 - Architecture: Parallelism + many registers to keep data on-chip
 - Core size: Smaller than IA-32, up to 2X more cores per die on Tukwila (than on IA-32)

Performance*

* For Enterprise & Technical Computing Application Segments

Itanium® Processor family delivers >2X Moore's Law performance


* EPIC is Itanium's architecture "Explicitly Parallel Instruction Set Computing"


All products, dates, and figures are preliminary and are subject to change without notice.

intel

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Lowering the Itanium® platform cost





Platform Cost**

ITANIUM® = +30%-60% in '04

XEON™ = 1.0

~0% in '07+

'04 '07+

*Data based on Intel projections

**'04 Price based on comparable OEM systems


- Today: Itanium exceeds RISC performance & price / performance
- Today: Itanium platform delivering superior price / performance vs Xeon™ on transaction processing
 - 30% more transactions at 10% incremental cost of platform/ OS / DB**
- Enabling technologies to achieve Itanium® platform cost parity with Xeon™ platforms by '07
 - Common platform components to lead to common platform infrastructure over time

By 07, Itanium® platform up to 2X Xeon™ platform in:

- Enterprise & technical application performance
- Number of cores / die
- Price/ performance



** 30%-60% or higher. Based on web pricing. 4P Xeon processor MP & Itanium platforms (2GB RAM) from Ion Computer. 2P platform (4GB RAM) from Dell

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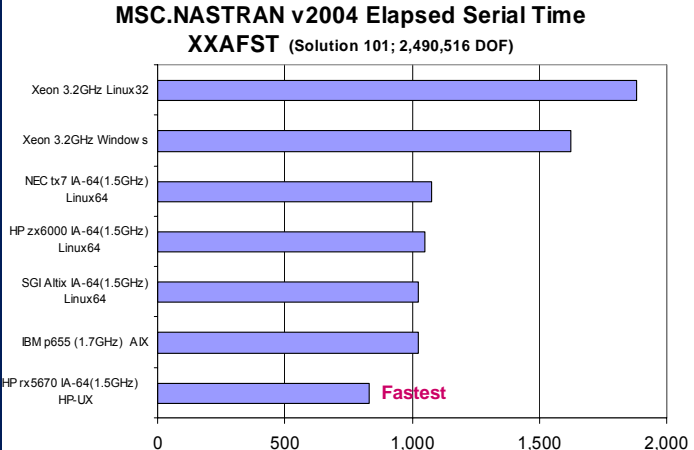


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MSC.NASTRAN Public Benchmark

MSC.NASTRAN v2004 Elapsed Serial Time
XXAFST (Solution 101; 2,490,516 DOF)



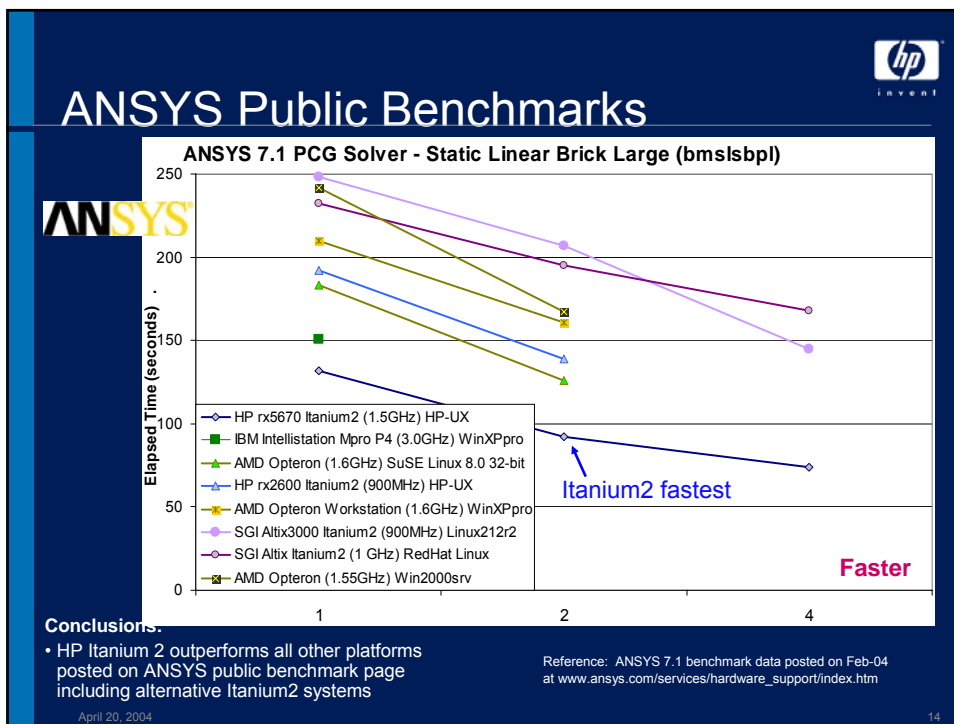
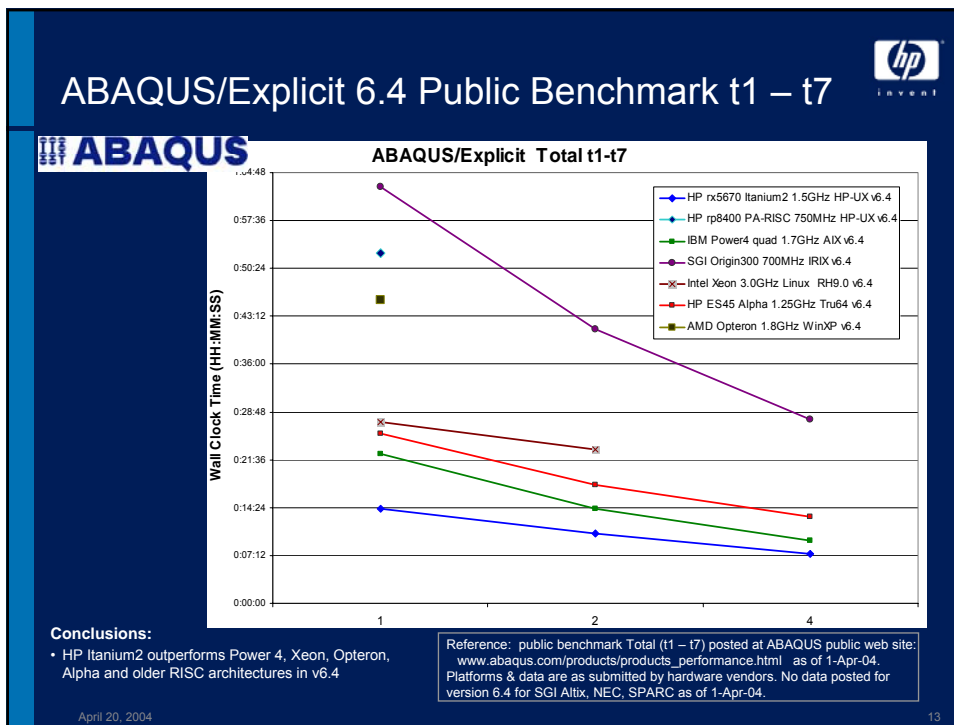
Configuration	Elapsed Serial Time (Approx. seconds)
Xeon 3.2GHz Linux32	1800
Xeon 3.2GHz Windows	1600
NEC tx7 IA-64(1.5GHz) Linux64	1100
HP zx6000 IA-64(1.5GHz) Linux64	1050
SGI Altix IA-64(1.5GHz) Linux64	1000
IBM p655 (1.7GHz) AX	1000
HP rx5670 IA-64(1.5GHz) HP-UX	800 (Fastest)

Conclusions:


- Itanium2 (1.5GHz) HP-UX outperforms IBM 1.7GHz and Altix servers on this large benchmark and others
- Xeon is performance laggard
- IBM Opteron data posted but 2,705 sec is too slow to plot (?)




Reference: v2004 data posted at www.msc-software.com/support/nastran_support/nastran/performance/v04_engl.cfm as of 20-Feb 2004. XXAFST is Solution 101 run on Propeller Housing model. This benchmark is the largest benchmark (2.5MDOF) offered on the MSC web site.

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Leading performance across multiple workloads



	Benchmark	Result/HP	Result/IBM	Result/Sun
 <p>Superdome</p>	TPC-C	Coming Soon!	763,898 p690	No results published
	SPECjbb2000 (32-way)	574,912 HP-UX	339,484 AIX	433,166 72-way, Solaris
	Linpack NxN	335 GFLOPs	143 GFLOPs	No results published
 <p>rx5670</p>	TPC-C (4-way)	121,065 \$4.97/tpmC Windows/SQL	139,153 \$5.07/tpmC (8-way) x445 Windows/SQL	No results published
	SAP SD (4-way)	860 HP-UX / Oracle	570 (6-way) p660 AIX / DB2	600 (8-way) V880 Solaris / DB2
	SPECjbb2000 (4-way)	116,466 HP-UX	96,337 P665 AIX	18,489 SF420R Solaris
 <p>rx2600</p>	SPECweb99_SSL (2-way)	1,873 HP-UX	1,799 Intel Pentium 4 (3.06GHz) Linux	1,008 UltraSparc III Cu (1.2GHz) Solaris
	SPECint_base2000	1,320 (est) HP-UX	1,077 Power 4+ (1.7GHz)	642 UltraSparc III Cu (1.2GHz) Solaris
	SPECfp_base2000	2,110 (est) Linux	1,598 Power 4+ (1.7GHz)	1,074 UltraSparc III Cu (1.2GHz) Solaris


System Model: hp superdome; Operating System/Database: HP-UX 11.10; tpmC: \$tpmC; Available: 08/01/03; System Model: IBM p690; Operating System/Database: AIX 5L V5.2; tpmC: \$tpmC; Available: 08/01/03
 System Model: hp rx5670; Operating System/Database: MS Windows Server 2003 Ent. Edition; tpmC: \$tpmC; Available: 04/07/03; System Model: IBM x445; Operating System/Database: MS Windows Server 2003 DC Edition; tpmC: \$tpmC; Available: 03/08/03
 System Model: hp rx2600; Operating System/Database: MS Windows Server 2003 Ent. Edition; tpmC: \$tpmC; Available: 04/07/03; System Model: IBM x445; Operating System/Database: MS Windows Server 2003 DC Edition; tpmC: \$tpmC; Available: 03/08/03

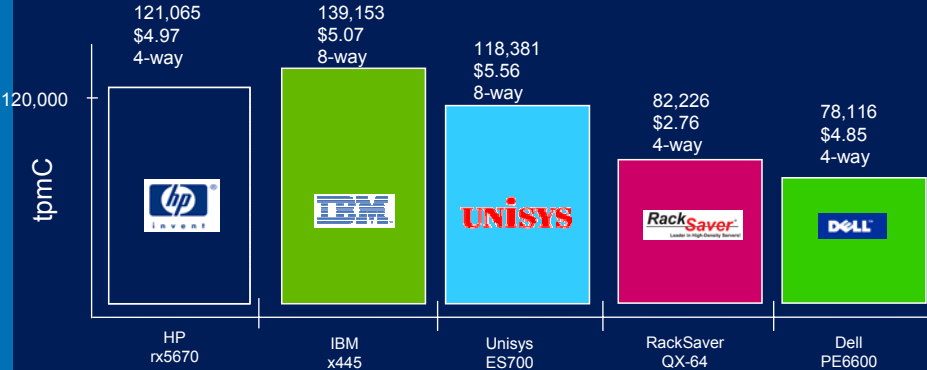
All HP Integrity server benchmark tests completed with Intel Itanium 2 processor 6M at 1.5GHz

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performance of an 8-way, and at a lower price





IBM withdrew their x440 4-way results

System Model	Operating System/Database	tpmC	\$tpmC	Available	System Model	Operating System/Database	tpmC	\$tpmC	Available
hp rx5670	MS Windows Server 2003 Ent. server; MS SQL 2000 (64-bit)	121,065	\$4.97	04/07/03	RackSaver QX-64	MS Windows server 2003 Ent. server; MS SQL 2000 (64-bit)	82,226	\$2.76	02/20/03
IBM x445	MS Windows server 2003 DC edition; MS SQL 2000 (64-bit)	139,153	\$5.07	03/08/03	Dell PE6600	MS Windows/Ent. server; MS SQL 2000 (64-bit)	78,116	\$4.85	02/21/03
Unisys ES700	MS Windows Server 2003 DC edition; MS SQL 2000 (64-bit)	118,381	\$5.56	03/08/03					





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HP delivering choice in Industry Standard Servers

Scale-up, Scale-out, Scale-simply







XEON



AMD
64
Opteron



With 64-Bit
Extension
Technology




ITANIUM²

<ul style="list-style-type: none"> • Price/performance leadership for 32-bit apps • Extensive 32-bit ecosystem • Optimized clock speed • Scale-out for simple, highly parallel workloads (2p nodes) • Linux & Windows 	<ul style="list-style-type: none"> • x86 performance leadership with 32/64-bit co-existence • Extensive 32-bit, and emerging 64-bit ecosystems • Large memory footprint, high bandwidth • Scale-out for moderate workloads (2p/4p nodes) • Linux & Windows 	<ul style="list-style-type: none"> • Highest performance 64-bit processor architecture • Extensive 64-bit ecosystem (and 32/64-bit on HP-UX) • Highest SMP scalability (to 128p) • Leading performance for complex workloads • HP-UX for mission-critical technical computing • HP-UX, Linux, Windows & OpenVMS
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Customer choice



HP ProLiant Servers
1 to 8-way
x86 processor architecture

ProLiant and Integrity servers

HP Integrity Servers
1 to 128-way*
Itanium® processor architecture


- Small to medium scale application and databases
- Well-defined, less-complex workloads
- Primarily front-end/network edge & application tier
- Scale out and small to mid-size scale up

- Large scale applications and databases
- Complex workloads – technical and commercial
- Primarily back end DB & application tier
- Enterprise scale up and scale out
- Server consolidation

Customer-specific needs driven

* Future


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Customers win

- HP continues to lead the industry in meeting customer needs for choice, innovation and value
- Innovations from Intel® and AMD continue to improve performance for existing applications while x86 extensions accelerate pervasive 64-bit computing
- Combination of Integrity servers with Itanium processors and ProLiant systems with x86 extensions provide customers with superior flexibility and choice
 - Ultimate performance, scalability and availability for the most demanding apps
- Unprecedented choice for building an adaptive enterprise

HP is the only vendor committed to bringing industry standard architectures to all tiers of the datacenter



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Summary

- **HP Integrity + ProLiant + NonStop servers = advantage for HP customers**
- **HP is focused on industry standard servers**
 - HP direction is to incorporate Intel® Xeon & AMD Operton processors with 64-bit extension technology across ProLiant servers
 - HP NonStop servers will move to Itanium® processors
 - Integrity servers are HP's strategic platforms for 64-bit enterprise computing
- **x86 extensions will further accelerate the market for Itanium processors**

