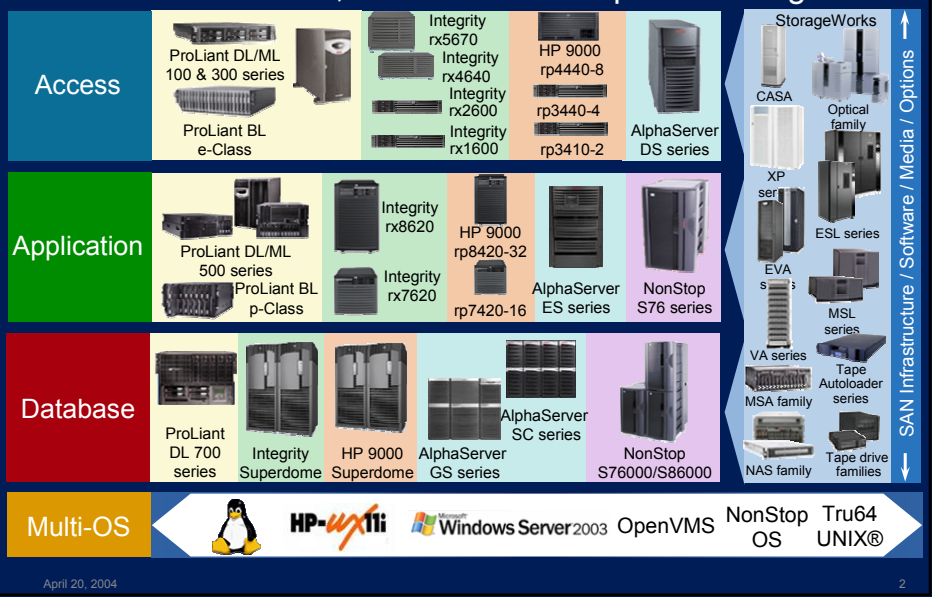
HP Server Strategy

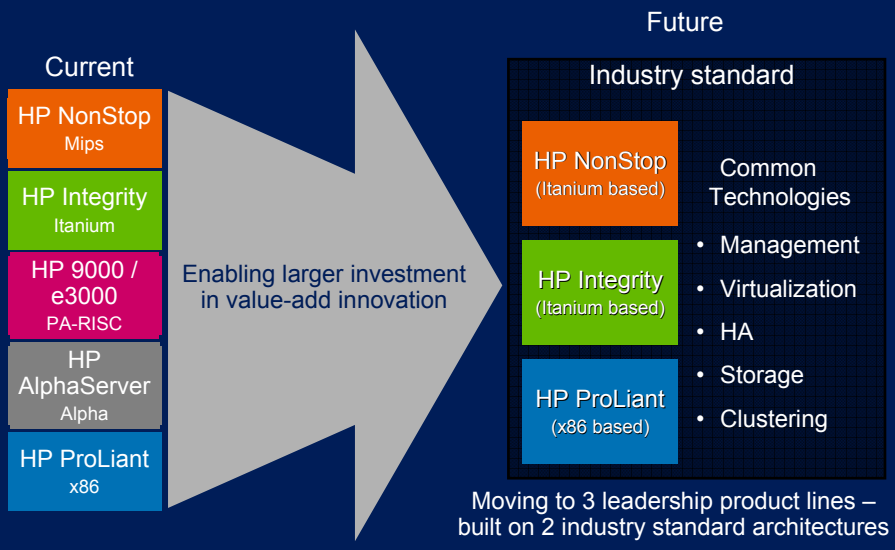
Manfred Willem
Business Unit Manager HPTC, HP Germany

HP server and storage portfolio

The world's broadest, most robust enterprise offering



HP's Industry Standards-Based Server Strategy

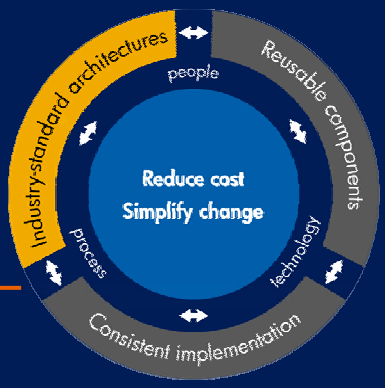


Moving to 3 leadership product lines – built on 2 industry standard architectures

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



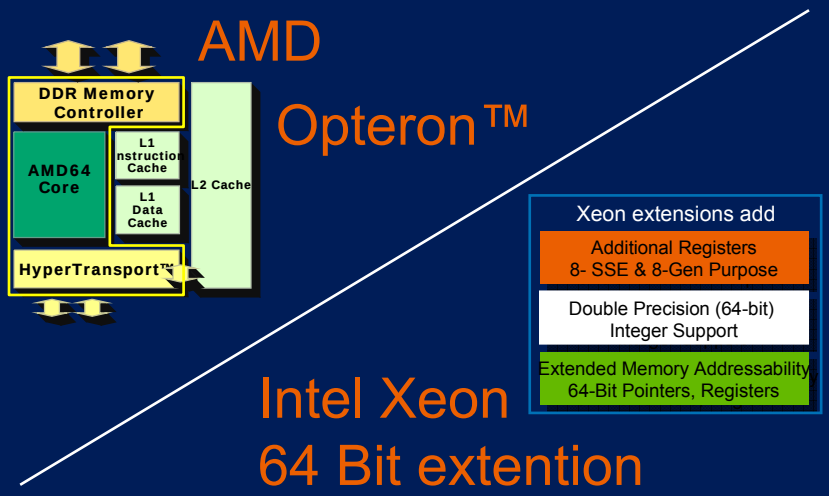
Complementary, modular approach based on two standard architectures

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



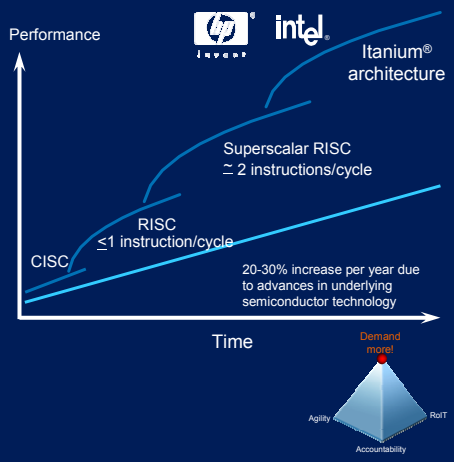
x86 extensions – customer choice



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:



Extending the adaptive enterprise with industry standards, unique value.

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Intel® Itanium® Architecture Processor Roadmap

For OEM use under NDA

Performance , RAS, Scalability

Itanium® 2 Processor (1 GHz, 3MB L3)
+ 2nd Generation EPIC architecture
+ on-die L3 cache
+ 6.4GB/s bus
+ New levels of RAS

Itanium® 2 Processor (Madison) (1.5GHz, 6MB L3)
+ Larger caches
+ 50% + frequency increase
+ Same platform

Itanium® 2 Processor (Deerfiled)
+ Same microarchitecture, approximately half the power
+ Optimized for density: Dual Processor rack & blade servers

Itanium® 2 Processor (Madison 9M) (>1.5GHz, 9MB L3)
+ Larger caches
+ Frequency increase
+ Same platform

Itanium® 2 Processor (Deerfield)
+ Increase in frequency
+ Same platform

Montecito (Dual Core)
+ Two cores per die
+ Hyper-Threading Technology
+ Higher frequency
+ New thermal technologies

Deerfield follow-on
+ Same power envelope as Deerfield
+ Enhanced Microarchitecture

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

Next Generation Platform

2002 | 2003 | 2004 | 2005 | 2006-Beyond

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

April 20, 2004

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HP Integrity servers provide breakthrough flexibility

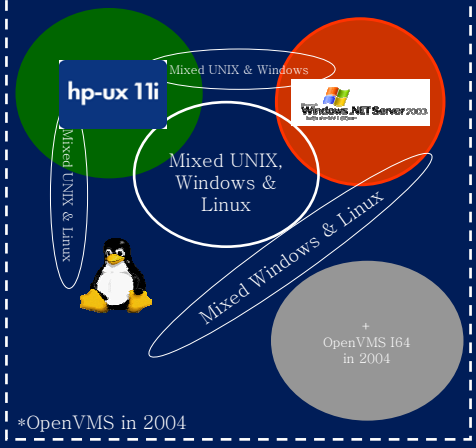
- Superior solutions for single operating systems

Flexibility to meet heterogeneous needs

Why multi-os?
- Standardization
- Streamline Operations
- Future Proof
- Shared Resources
- Increased Utilization
- Greater Consolidation

Only Delivered By HP!

Supporting different and/or multiple operating environments



*OpenVMS in 2004

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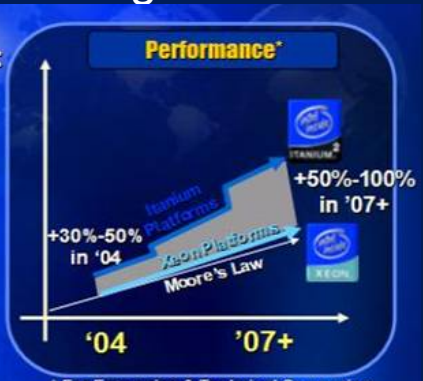
Itanium® Architecture: Optimized for performance growth

- **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)



* For Enterprise & Technical Computing Application Segments

Itanium® Processor family delivers >2X Moores' 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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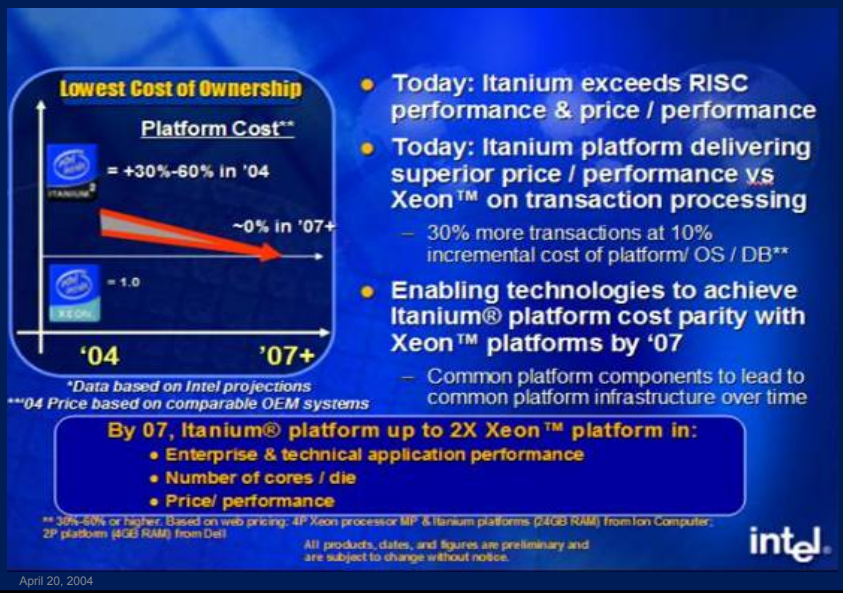
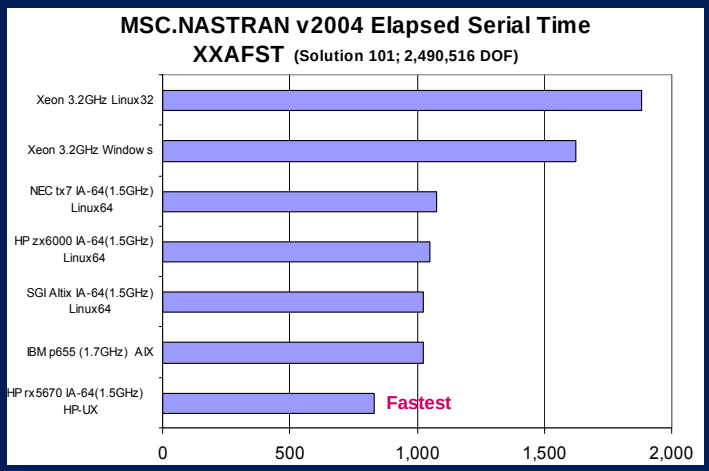
Lowering the Itanium® platform cost



MSC.NASTRAN Public Benchmark

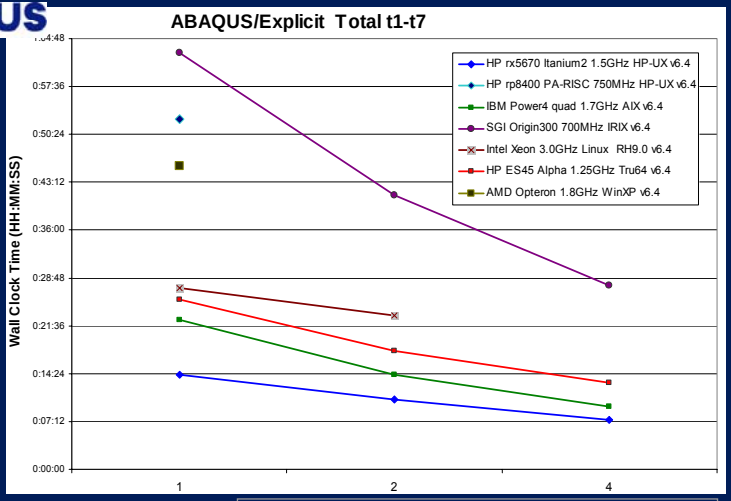


Conclusions:

- 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.mscsoftware.com/support/prod_support/nastran/performance/v04_sngl.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.

ABAQUS/Explicit 6.4 Public Benchmark t1 – t7



Conclusions:

- HP Itanium2 outperforms Power 4, Xeon, Opteron, Alpha and older RISC architectures in v6.4

Reference: public benchmark Total (t1 – t7) posted at ABAQUS public web site: www.abaqus.com/products/products_performance.html as of 1-Apr-04. Platforms & data are as submitted by hardware vendors. No data posted for version 6.4 for SGI Altix, NEC, SPARC as of 1-Apr-04.

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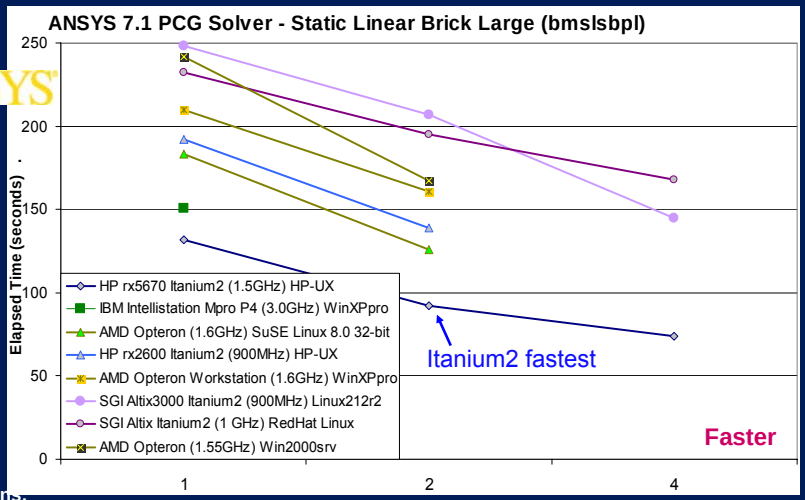
ANSYS Public Benchmarks



Conclusions:

- HP Itanium 2 outperforms all other platforms posted on ANSYS public benchmark page including alternative Itanium2 systems

Reference: ANSYS 7.1 benchmark data posted on Feb-04 at www.ansys.com/services/hardware_support/index.htm

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Leading performance across multiple workloads

Superdome

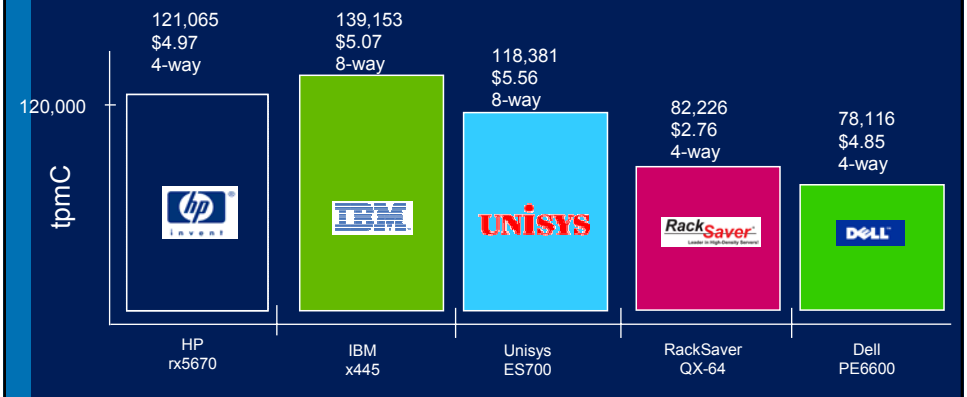
rx5670

rx2600

Benchmark	Result/HP	Result/IBM	Result/Sun
TPC-C	Coming Soon!	763,898 p690 $8.31/tpmC	No results published
SPECjbb2000 (32-way) #1	574,912 HP-UX	339,484 AIX	433,166 72-way, Solaris
Linpack NxN #1	335 GFLOPs	143 GFLOPs	No results published
TPC-C (4-way) #1	121,065 Windows/SQL $4.97/tpmC	139,153 (8-way) x445 Windows/SQL $5.07/tpmC	No results published
SAP SD (4-way) #1	860 HP-UX / Oracle	570 (6-way) p660 AIX / DB2	600 (8-way) V880 Solaris / DB2
SPECjbb2000 (4-way) #1	116,466 HP-UX	96,337 P655 AIX	18,489 SF420R Solaris
SPECweb99_SSL (2-way) #1	1,873 HP-UX	1,799 Intel Pentium 4 (3.06GHz) Linux	1,008 UltraSparc III Cu (1.2GHz) Solaris
SPECint_base2000 #1	1,320 (est) HP-UX	1,077 Power 4+ (1.7GHz)	642 UltraSparc III Cu (1.2GHz) Solaris
SPECfp_base2000 #1	2,110 (est) Linux	1,598 Power 4+ (1.7GHz)	1,074 UltraSparc III Cu (1.2GHz) Solaris

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

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



IBM withdrew their x440 4-way results

HP delivering choice in Industry Standard Servers

Scale-up, Scale-out, Scale-simply

With 64-Bit Extension Technology

• 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	• 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	• 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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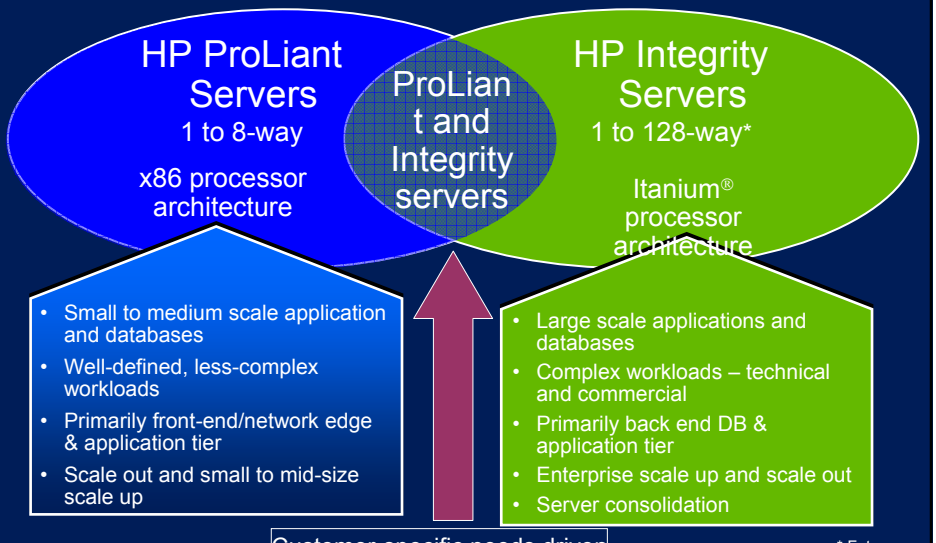
Customer choice



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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**