



# Windows Server 2003 64-bit edition

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## Items

- Windows Server 2003 64-bit
- HP Integrity Servers
- The application case
- Benchmarks and case studies

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# Windows Server 2003 64-bit edition

*An Overview*

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# Windows Server Editions



Windows NT

Windows 2000

Windows Server 2003

Windows Server 2003 Datacenter Edition **Itanium**

Windows Server 2003 Enterprise Edition **Itanium**

Windows Server 2003 Standard Edition **Itanium (tbc)**

Windows Server 2003 Web Edition

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## Microsoft 64-bit Server Products today

### Windows Server 2003 operating system

- Datacenter Edition for Intel Itanium-based Systems
- Enterprise Edition for Intel Itanium-based Systems

### Windows XP operating system

- Professional Edition - Itanium

### SQL Server 2000 Enterprise Edition (64-bit)

- Released in April 2003 for Itanium

### Platform SDK (extension of Visual Studio) (now)

- Compilers/Tools for Win64 (compile on 32, run on 64)

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## Some Announced Beta products

- Windows Server 2003, **Standard** Edition for 64-bit Itanium 2 Systems
- Windows Server 2003, **Standard** Edition for 64-bit Extended Systems
- Windows Server 2003, **Enterprise** Edition for 64-bit Extended Systems
- “Longhorn” Operating system for 64-bit (Itanium/Extended)
- SQL Server 2004 “Yukon” (later)

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## 64-bit Windows Server - What you get: some important components



- Most features available as in 32-bit Windows
  - Identical **installation** process
  - Internet Information Server, Clustering, AD, Terminal Server, Remote Install Service, etc.
  - Equivalent functions (**API**) as that in 32-bit components
  - **Multilingual** User Interface support in German, French, Spanish, Italian, Japanese and Korean
- OEM Pre-Installation Kit, WinPE
- Software Development Kit (SDK)
- Driver Development Kit (DDK)

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## What you don't get



- .NET Framework
- Hot-add Memory
- Jet engine
- Subsystems: 16-Bit, POSIX, OS/2
- Windows Media Services, WM Player
- Fax Server/Client
- Windows Product Activation
- "Laptop" features (sleep states, infrared)
- Netmeeting

[www.microsoft.com/windowsserver2003/evaluation/features/compareeditions.mspx](http://www.microsoft.com/windowsserver2003/evaluation/features/compareeditions.mspx)

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## What 64-bit means to Windows

- Operating System can handle **more physical memory**
  - Can host more instances of applications (=consolidation)
  - Can scale-up more (compete in new “big-box” sectors)
- Applications can use **more virtual memory**
  - Some applications who were blocked by little memory can now run now unleashed (SQL Server)
- More **computing power**
  - New registry set and processor architecture
  - More integer and floating point registers.
  - Need improved compiler



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## Windows 32-bit and Memory

- Processes can “see” up to 4GB of **virtual** address space
  - But can address at most 3 GB, the rest is reserved for OS
- OS can see more **physical** memory (up to 64GB)
  - Thanks to Intel PAE (36 bit for OS in chip)
  - OS maps virtual 32-bit to physical 36-bit addresses
- AWE (Address Windowing Extensions )
  - “trick” to address more than 4GB of **virtual** memory by a process by reserving physical memory (requires PAE)
  - Requires **additional code** – it is compute intensive
  - Only SQL Server 2000 Enterprise Ed. implements it
    - Can reach 8GB on Adv. Server, 64GB on Datacenter

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## How much *MORE* memory?

Windows Server memory (in GB)

|                   | Physical   | Virtual       |
|-------------------|------------|---------------|
| IA32              | 4          | 3             |
| IA32 with PAE/AWE | 64         | 64            |
| <b>ITANIUM</b>    | <b>512</b> | <b>16,000</b> |



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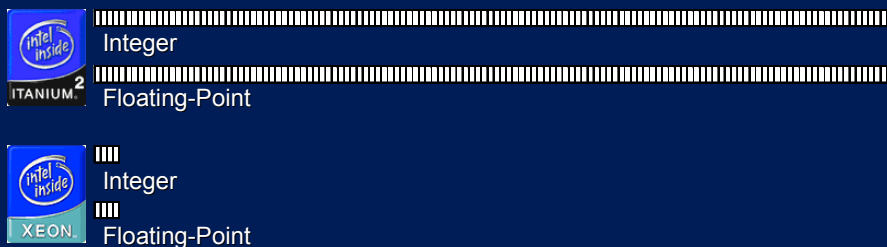
## How much *MORE* computing power?

More registers (128 vs. 4) – Both int and fp (floating point)

New processor architecture (**EPIC**)

Requires optimized compilers

SPEC\*2000 results: **1.2** times better than Xeon on int, **2.2** on fp



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## 64-bit Windows – When ?

- Large **data warehouses** and analysis applications, business intelligence, decision support systems.
- **Consolidation** of various applications
- Application with high **OLTP** workload (billing, reservations).
- High performance technical computing (**HPTC**), scientific and financial modelling applications
- Large scale **web applications** (e.g. e-commerce) with a high levels of concurrent users.
- **Encryption**/decryption of data.

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## HP Integrity servers' line and Windows Server 2003



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## HP Integrity Systems for Windows

| Model     | Nickname    | Proc.        | Max RAM (GB) | Date available* | Upgrade to mx2 |
|-----------|-------------|--------------|--------------|-----------------|----------------|
| rx1600    | Nemesis     | 2            | 16           | Nov 2004        | no             |
| rx2600    | Long's Peak | 2            | 24           | Now             | no             |
| rx5670    | Everest     | 4            | 48           | Now             | no             |
| rx4640    | M.Diablo    | 4 (sockets)  | 64           | Now             | yes            |
| rx7620    | Eiger       | 8 (sockets)  | 64           | Now             | yes            |
| rx8620    | Olympia     | 16 (sockets) | 128          | Now             | yes            |
| Superdome | Orca        | 64 (sockets) | 512          | Now             | yes            |

\*Availability (shipping) of system Certified for Windows Server 2003

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## Superdome Flavors today

|                            | CPUs | Memory | PCI slots            |
|----------------------------|------|--------|----------------------|
| Integrity Superdome 64-way | 6-64 | 512GB  | 192 (w I/O expander) |
| Integrity Superdome 32-way | 2-32 | 256GB  | 96                   |
| Integrity Superdome 16-way | 2-16 | 128GB  | 48                   |



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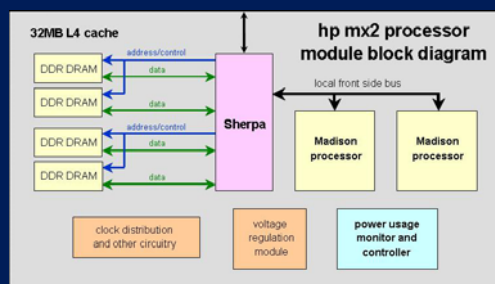


## HP **mx2** dual processor module



- Jointly developed with Intel
- A daughter card that combines two Itanium® 2 processors.
- Includes 32MB L4 cache
- Pin-compatible with standard Madison sockets (board swap)
- Available early 2004, Certified on Windows Nov 2004
- Performance boost well over 50%

Much more than 2-Itanium in a can!



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## Superdome and rx7\* rx8\* **partitioning**



- **Cell** (4 CPUs) concept
- Cells are quasi independent machines (power, boot)
- Partitions are made of cells
- Partitions can be extended (requires reboot on Windows)
- Partitions can run different OS



OpenVMS

HP-UX 11i

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## Writing Applications for Win-64

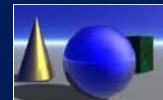


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## Preparing applications for Win64

- Source code compilation
  - Available for C++, Fortran
  - Microsoft Tool: Platform SDK
  - Other Intel tools available
- Byte code re-use (with JIT compiler)
  - Java
  - .NET
- Executable code, copy & go
  - Wow64 emulation environment
  - IAEL accelerator
- Move JUST the Database portion



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## Build 64-bit binaries: Simple Cookbook



- Install Visual Studio on 32bit (2002 or 2003 version) - Optional
- Install **Platform SDK** (it contains win64 libs/tools) on same node
- Check Migration compatibility issues in your code
- Clean your code
- Compile & link with Win64 flags enabled
- Copy your .EXE on 64bit and check that it's working
- Debug
- Optimize



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## 64-bit byte code applications



- JVMs (**Java**) available from various vendors
  - BEA Weblogic **JRockit** 8.1



- 
- Other MS environments depend on .NET framework
    - Visual Basic, C#, J#
    - Not commercially available today (beta)
    - .NET for 64-bit available with “Whidbey”, or “Visual Studio 2004” (beta in Q1 CY 2004)



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## WOW64 (Windows 32 On Windows 64)



- **Executes** 32 bit environment On 64 bit platform
  - Cooperates with Itanium 32bit compatibility chipset
- Allows running most Win32 applications
  - Meant for **personal productivity** appl, not servers
- Performance is *acceptable*
  - Is implemented in user mode.
  - Performs some kernel calls when doing type conversions
  - Allows hybrid 32-64 bit invocations from DLLs (exceptional)



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## Wow64: Office (32 bit) just works



**System Information**

| Item                | Value   |
|---------------------|---|
| OS Name             | Microsoft(R) Windows(R) Server 2003, Enterprise Edition |
| Version             | 5.2.3788 Build 3788                                     |
| OS Manufacturer     | Microsoft Corporation                                   |
| System Name         | ITANIUM2  |
| System Manufacturer | hp  |
| System Model        | server rx5670   |
| System Type         | Itanium (TM) -based System                              |
| Processor           | ia64 Family 31 Model 0 Stepping 7 GenuineIntel ~900 Mhz |
| Processor           | ia64 Family 31 Model 0 Stepping 7 GenuineIntel ~900 Mhz |
| Processor           | ia64 Family 31 Model 0 Stepping 7 GenuineIntel ~900 Mhz |
| Processor           | ia64  |

Microsoft Excel - Book1

Excel XP working on Win2003 64-bit

Microsoft PowerPoint - (Presentation3)

Powerpoint XP

On Windows Server 2003 64bit

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## Intel Execution Layer

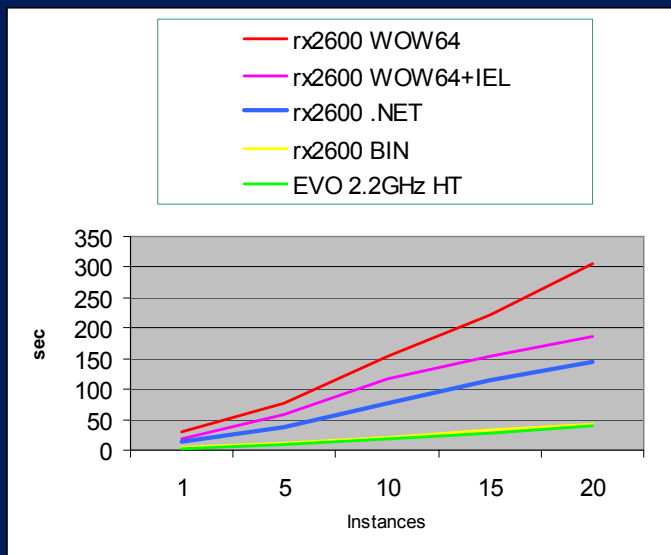
- Known as IA-32 EL
- Freely downloadable
- It's a **driver**, works at kernel level
- IA-32 HW instructions are translated into IA-64 ones
- No 32-bit chipset involved
- Triggered by registry boolean flag
  - HKLM\SOFTWARE\Microsoft\WOW64\IA32Exec\Enable

[www.microsoft.com/windowsserver2003/64bit/ipf/ia32el.msp](http://www.microsoft.com/windowsserver2003/64bit/ipf/ia32el.msp)

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## Little Performance test



- Fibonacci numbers.
- Parallel calculations of Fibo(40).
- Rx2600 is 900MHz

### DISCLAIMER

- This data just provided "as is" for informational purposes only

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## Transition From 32-bit to 64-bit SQL Server Seamlessly



# SQL



- **Plug in the disks and go!**
  - on-disk structure is 100% the same
- Networking layer of MS SQL Server accepts input from 32 bit clients just as with 64 bit clients
- Run your 32-bit application on 32-bit, move your database on 64-bit!!

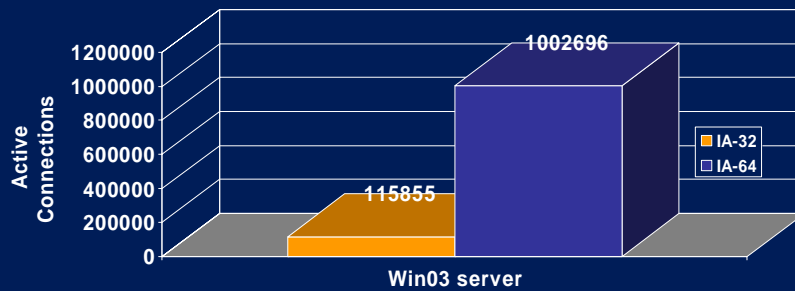
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## BENCHMARKS AND CASE STUDIES



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## TCP/IP Connections



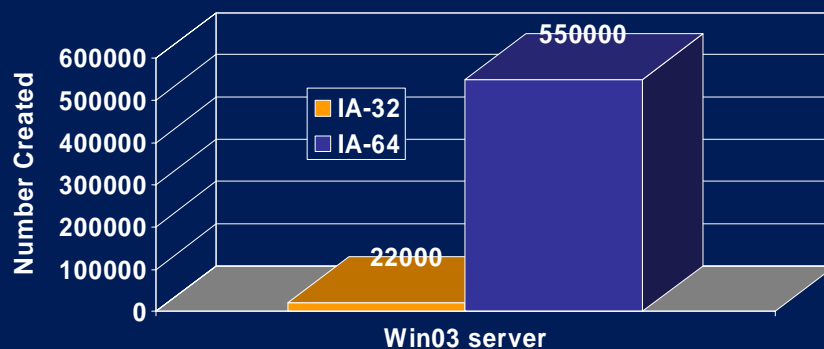
- Nonpaged Pool Usage:
  - 240 Mbyte on 32 bit (limited by VA)
  - 2.97 Gbyte on 64 bit (not even close to limit)
- Tests on 4-processor nodes

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## Process And Thread Creation



### Max Number of Single Threaded Processes



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## Win64 TPC-C


[www.tpc.org](http://www.tpc.org)

## Top Ten Non-Clustered TPC-C by Performance

Version 5 Results As of 3-Mar-2004 7:20 AM [GMT]

Print Version

Note 1: The TPC believes it is not valid to compare prices or price/performance of results in different currencies.

☐ All Results
 ☐ Clustered Results
 ☒ Non-Clustered Results
 Currency: All

| Rank | Company | System                                 | tpmC      | Price/tpmC | System Availability | Database  | Operating System  | TP Monitor                     | Date Submitted |
|------|---------|--|-----------|------------|---------------------|---|---|--------------------------------|----------------|
| 1    | IBM     | IBM eServer pSeries 690 Model 7040-681 | 1,025,486 | 5.42 US \$ | 08/16/04            | IBM DB2 UDB 8.1                                     | IBM AIX 5L V5.2   | Microsoft COM+                 | 02/17/04       |
| 2    | HP      | HP Integrity Superdome                 | 1,008,144 | 8.33 US \$ | 04/14/04            | Oracle Database 10g Enterprise Edition              | HP UX 11.1v2 64-bit Base OS                             | BEA Tunedo 8.0                 | 11/04/03       |
| 2    | HP      | HP Integrity Superdome                 | 786,644   | 6.49 US \$ | 11/23/03            | Microsoft SQL Server 2000 Enterprise Edition 64-bit | Microsoft Windows Server 2003 Datacenter Edition 64-bit | Microsoft COM+                 | 08/27/03       |
| 4    | IBM     | IBM eServer pSeries 690 Turbo 7040-681 | 768,839   | 8.55 US \$ | 02/29/04            | Oracle Database 10g Enterprise Edition              | IBM AIX 5L V5.2   | TXSeries Developers for AIX V5 | 09/12/03       |

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## 16 CPUs: best price/performance



| Machine                 | ENV            | Tpmc   | \$/tpmc |
|-------------------------|----------------|--------|---------|
| Unisys ES7000 Aries 420 | Windows SQL    | 309036 | 4.49    |
| HP Integrity rx8620     | Windows-SQL    | 301225 | 4.20    |
| Unisys ES7000 Aries 420 | Windows Oracle | 291411 | 4.97    |



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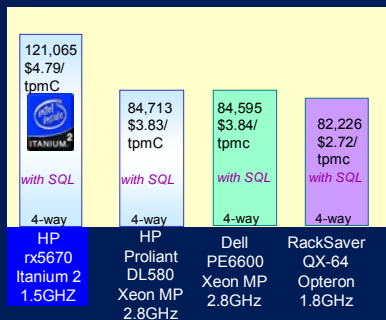
## HP 4-way Itanium OLTP



### #1 4-way performance for Windows!

HP Integrity **rx5670** with next generation Itanium 2 processors and 64-bit Windows tops all other 4-way and 8-way Windows servers!

OLTP tpmC  
with Windows



Tpm-C and \$/tpm-C results as of Sept 16, 2003

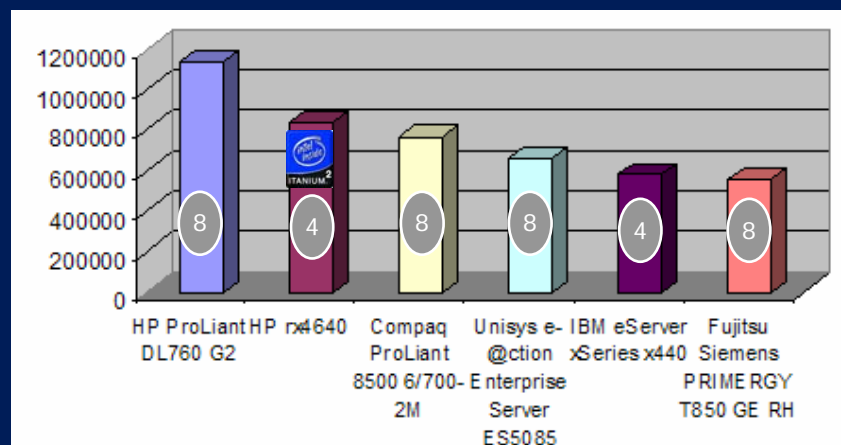
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## SAP SD 3-tier: DB Servers (8 CPUs or less)



Line items  
per hour

CPUs



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## Case studies, wins and proof points



















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## Raymond James Financial





- One of the largest financial services firms in the United States
- Financial planning, investment banking, asset management, banking and trust services
- Over **2,100 locations** worldwide.

*"Our **data warehouse** and decision support system will ultimately be made available to more than **5,000 financial advisors** nationwide as well as thousands of employees.*

*We needed an architecture with exceptional performance and scalability that would help us drive down IT costs. We are fortunate enough to have access to the HP Integrity Superdome server running 64-bit versions of Microsoft SQL Server 2000 and Windows Server 2003, Datacenter Edition. Preliminary benchmark results show a **five-fold performance increase** over our previous 32-bit systems, and we expect those results to improve with further testing.*

*At the same time, because we are dealing with technology based on **industry standards**, we can achieve exceptional performance while lowering our total cost of ownership."*

Tim Eitel – CIO -Raymond James Financial

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## Raymond James Financial



**RAYMOND JAMES**

Customer's Proof of Concept (POC) database

generated on DL760G2's directly to Superdome/SQL64 with no problems

- Update across fact table (2.8 million rows) took **2 minutes** - this had taken **14 hours** on a DL760G2
- Building the POC cube in Analysis Services took only **10 minutes**! This was at 100% aggregation with a projected disk cost of 670 MB. This same cube at only 50% aggregation took **24 hours** on a DL760G2.

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## Multiyork

**MULTIYORK**



- "HP, **SAP** and Itanium processing power is a winning combination -- the latest ERP technology at the best price/performance ratio currently available. This is a tailor-made solution for a tailor-made business."





*Peter Mallinson, chief executive,  
Multiyork.*


<http://www.hp.com/hpinfo/newsroom/press/2003/030218d.html>

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# DenizBank

- Branch offices: **164**
- Corporate clients: **6,500**
- Customer accounts: **500,000**
- Credit cards: **356,000**
- Most applications on Windows (HP Proliant).




**WHY HP SUPERDOME?**




- Superdome is the best **consolidation platform** for existing **applications** needing high Reliability, Availability and Scalability.
- Superdome is the ideal foundation for the new **Data Warehouse** project on Microsoft SQL Server, thanks to its capacity of 64 CPUs and 512GB of memory.

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# Wrapping up



It's here  
It works  
Benchmarks are very positive  
Customers are adopting it

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