

# 64-bit Solutions on SQL Server 2005

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## Microsoft Application Platform





## Schwerpunkte von SQL Server 2005

**Enterprise Data Management**

Mission Ready

- Vielfältige Erweiterungen bei den Verfügbarkeits-Technologien
- Mehr Sicherheit und Geschwindigkeit
- Selbstmanagement und Optimierung

**Developer Productivity**

Developer Ready

- Integration mit Visual Studio und .NET
  - Native XML-Unterstützung
  - Interoperabilität durch Webservices

**Business Intelligence**

Decision Ready

- Business Intelligence out-of-the-Box
- Datenintegration und -aufbereitung (ETL)
- Entscheidungsunterstützung durch umfangreiches Datamining und Reporting

## Microsoft SQL Server 2005

Datenmanagement- und Analyse-Plattform der nächsten Generation

Microsoft Office

Microsoft SharePoint Portal Server 2003

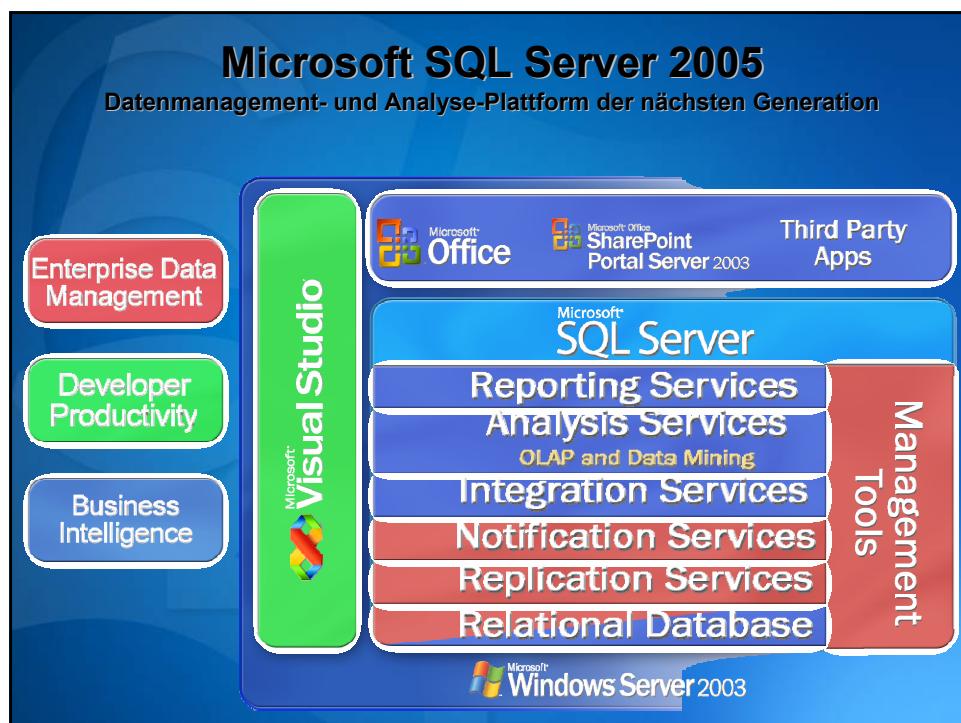
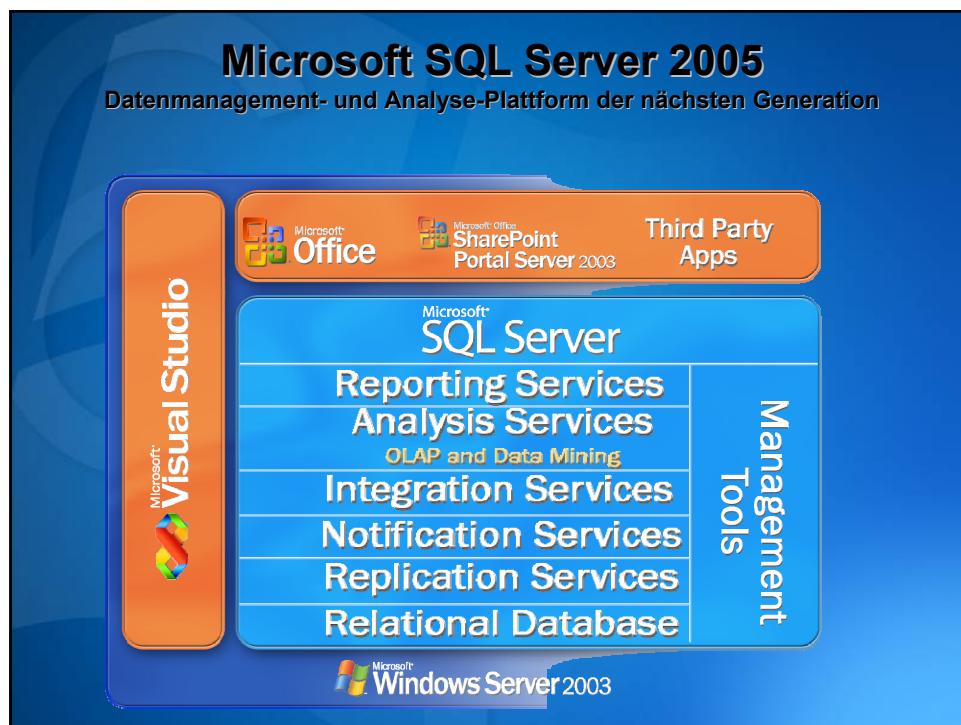
Third Party Apps

Microsoft Visual Studio

Reporting Services  
Analysis Services  
Microsoft OLAP and Data Mining  
Integration Services  
Notification Services  
Replication Services  
Relational Database

Management Tools

Microsoft Windows Server 2003



## SQL Server 2005 features that benefit from 64-bit

- Snapshot isolation
- Partition tables
- Analysis Services
- Integration Services (ETL)

## Snapshot Isolation

- Increased data availability for read applications
  - Allows non-blocking consistent reads in an OLTP environment
  - Writers don't block readers
  - Readers don't block writers
  - Enabled with tempdb
- Scenarios
  - Read-mostly database with relatively few writes – Reporting
  - Migration from Oracle to SQL Server
  - Mixed user / batch workload – PSFT Financials

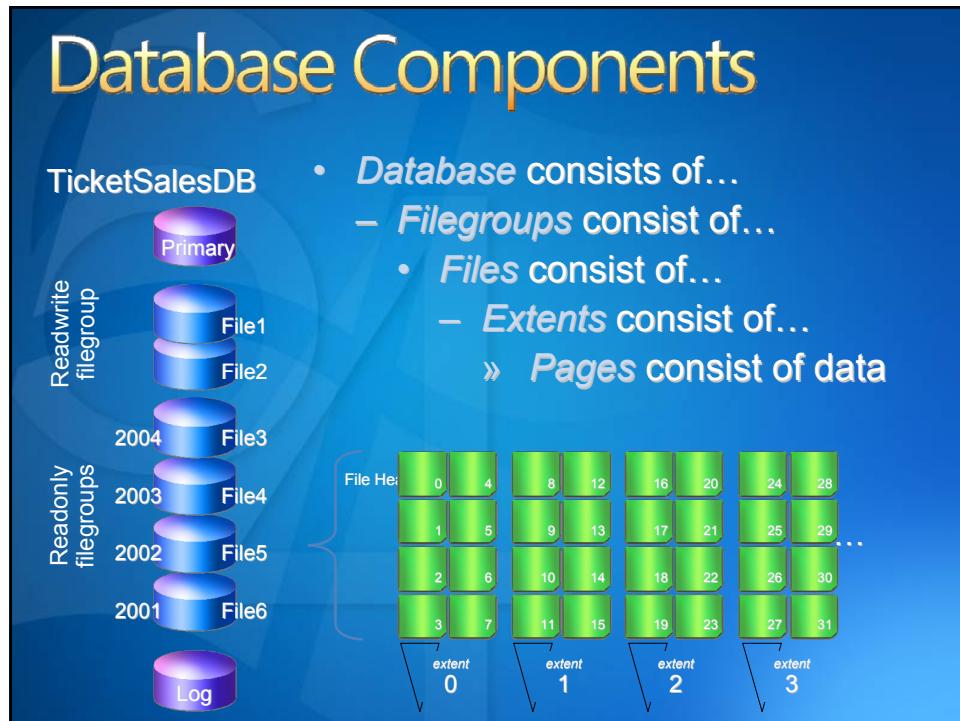
## Database Snapshots

- Snapshot of a database at a point in time
  - Created instantly
  - Read only
- Does not require a complete copy of the data
  - Shares unchanged pages of the database
  - Requires extra storage only for changed pages
  - Uses a “copy-on-write” mechanism
- Recover from User, Application or DBA error
  - Rewind database to Database Snapshot

## Functional Partitioning

Strategies to separate Objects/Data

- Related Object-groupings
  - ↳ Separate tables – strategically placed on different filegroups
- Time-based data placement/partitioning
  - ↳ Structures designed for sliding window scenario
- List-based groupings/partitioning
  - ↳ Range-based partitioning based on complete lists
- To fully leverage Partial Database Availability for partitioned objects – use Partitioned Tables
- Partitioned Tables – new feature in SQL Server™ 2005 to further simplify the process of building large data warehouses



# Analysis Services

Why Analysis Matters

Microsoft  
SQL Server 2005  
Analysis Services

A screenshot of the Microsoft SQL Server Management Studio (SSMS) interface showing the Analysis Services Project Explorer and the Data Model Designer. The Project Explorer displays various objects like cubes, dimensions, and measures. The Data Model Designer shows a data model with entities, relationships, and keys.

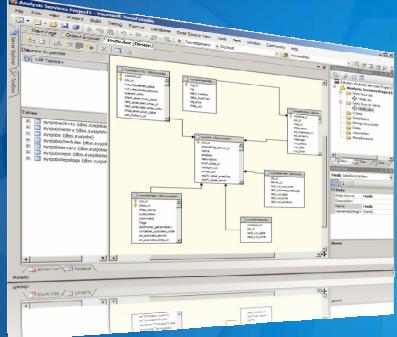
- Powerful calculations to express business logic
- Real-time insight, high performance
- Model-driven and data-driven insight into the business
- Data insight and advanced analytics
- A data model end users understand

*Central, consistent business view!*

# Analysis Services

Enhanced OLAP and Data Mining Capabilities

**Microsoft SQL Server 2005 Analysis Services**



- Unified Dimensional Model
- Pro-active caching
- Advanced Business Intelligence
  - Key Performance Indicators
  - Custom Aggregations and Semi-Additive Measures
- Web services
- Data Mining in the platform
- Integrated Developer Tools
- Failover Clustering

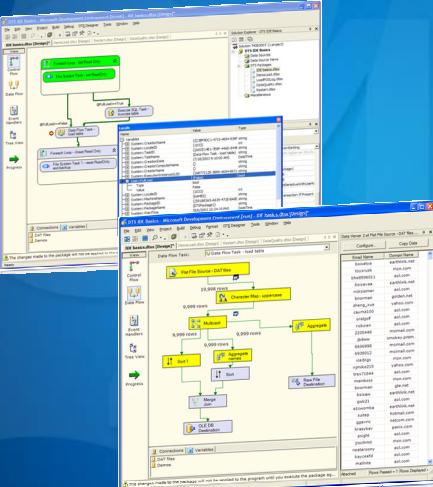
|   |   |  |  |  |  |  |   |
|---|---|--|--|--|--|--|---|
| <br>Decision Trees | <br>Clustering | <br>Time Series | <br>Naïve Bayes | <br>Sequence Clustering | <br>Association | <br>Neural Net | <i>plus...</i><br>★ Logistic Regression<br>★ Linear Regression<br>★ Text Mining |
|---|---|--|--|--|--|--|---|

*Introduced in SQL Server 2000*

# Integration Services

Why Data Integration Matters

**Microsoft SQL Server 2005 Integration Services**



- Reliable, high-quality, compliant data
- Lower data acquisition costs
- Integrated data from diverse sources
- Real-time data access
- Enriched data delivered to diverse destinations

*Quality, timely data provided with confidence!*

# Integration Services

## Breakthrough ETL Capabilities

**Microsoft SQL Server 2005  
Integration Services**

- Enterprise ETL platform
  - High performance
  - High scale
  - More trustworthy and reliable
- Best in class usability
  - Rich development environment
  - Source control
  - Visual debugging of control flow and data
  - Great range of transforms out-of-the-box
- Highly extensible
  - Custom tasks
  - Custom enumerations
  - Custom transformations
  - Custom data sources

| Product                                | 32-Bit |         |     | 64-Bit* |  |
|--|--------|---------|-----|---------|--|
|  | x86    | Itanium | X64 |         |  |
| Windows XP 64-Bit Edition              | N/A    | -       | ✓   |         |  |
| Windows Server 2003 Web Edition        | ✓      | ✗       | ✗   |         |  |
| Windows Compute Cluster Server 2003    | ✗      | ✗       | ✓   |         |  |
| Windows Server 2003 Standard Edition   | ✓      | ✗       | ✓   |         |  |
| Windows Server 2003 Enterprise Edition | ✓      | ✓       | ✓   |         |  |
| Windows Server 2003 Datacenter Edition | ✓      | ✓       | ✓   |         |  |
| .NET Framework 2.0                     | ✓      | ✓       | ✓   |         |  |
| SQL Server 2005                        | ✓      | ✓       | ✓   |         |  |

\*) English only, MUI available

## Properties of Itanium (IA64)

- Runs 64-bit Windows, drivers and software specifically compiled for the Itanium instruction set
- Runs 32-bit software without being recompiled
  - New 32-bit execution layer  
<http://www.microsoft.com/windowsserver2003/64bit/tpf/ia32el.mspx>
- Cannot act like an x86 processor or boot 32-bit Windows
- Does not run versions of Windows or 64-bit drivers compiled for x64

## Intel Itanium-2 offerings

- 4 socket and above servers (→ 64 sockets)
  - 1.6Ghz and 9MB L3 cache (at 6.4 gigabits/sec system bus bandwidth)
  - Recent bump to 1.66Ghz but faster 667Mhz FSB (at 10.6 gigabits/sec)
- Future versions of the processor
  - Montecito
    - Dual-core, huge cache (24MB L3), but still 1.66 Ghz
    - Initial release slated mid 2006
  - Montvale+
    - Multi-core and massive cache, slated 2007
  - Massive scalability database target market

## Properties of x64

- Runs 64-bit Windows, drivers and software specifically compiled for X64 instruction set
- Runs 32-bit software without recompilation
- Can act like an x86 processor when an X64 system is booted into a 32-bit operating system and as such runs all 32-bit versions of Windows commercially available today
- Does not run Itanium versions of Windows nor drivers compiled for Itanium

## x64 Offerings

- Two chip vendors, same OS required
  - AMD (Opteron)
    - Eliminates FSB and uses HyperTransport
    - Currently limited to 1MB L2 cache
  - Intel (Xeon EM64T)
    - Large cache, NetBurst & Hyperthreading
    - Features 4MB and 8MB L3 cache versions
- First to offer dual-core
- Generally aimed at <= 4-socket, however...
  - Unisys - 32 socket (8 socket interconnect)
  - IBM – 16 socket (4 socket interconnect)
- Some vendors offer both AMD & Intel (usually max @ 4-sockets)

## Multicore and Hyperthreading

- Multicore chips scale very effectively
  - Dual-core offers >> 50% performance benefit relative to single core
  - SQL Server's operates as though each core is a separate CPU
    - Separate SQL Scheduler assigned to each core
  - But SQL is priced per socket, not per-core
- Hyperthreading does *not* benefit typical SQL workloads
  - Recommend disabling Hyperthreading
  - Potentially overloads a single core with multiple concurrent scheduler tasks
  - Multiple threads can thrash the CPU cache

## Windows on Windows (WOW)

*What is it?*

- WOW allows 32-bit applications to run on 64-bit Operating Systems
- **SQL Server will NOT support both 32-bit SQL in WOW and native 64-bit SQL co-existing on same server**
  - Example: Once you install 32-bit SQL Server Engine the server Cannot run 64-bit Engine on same hardware

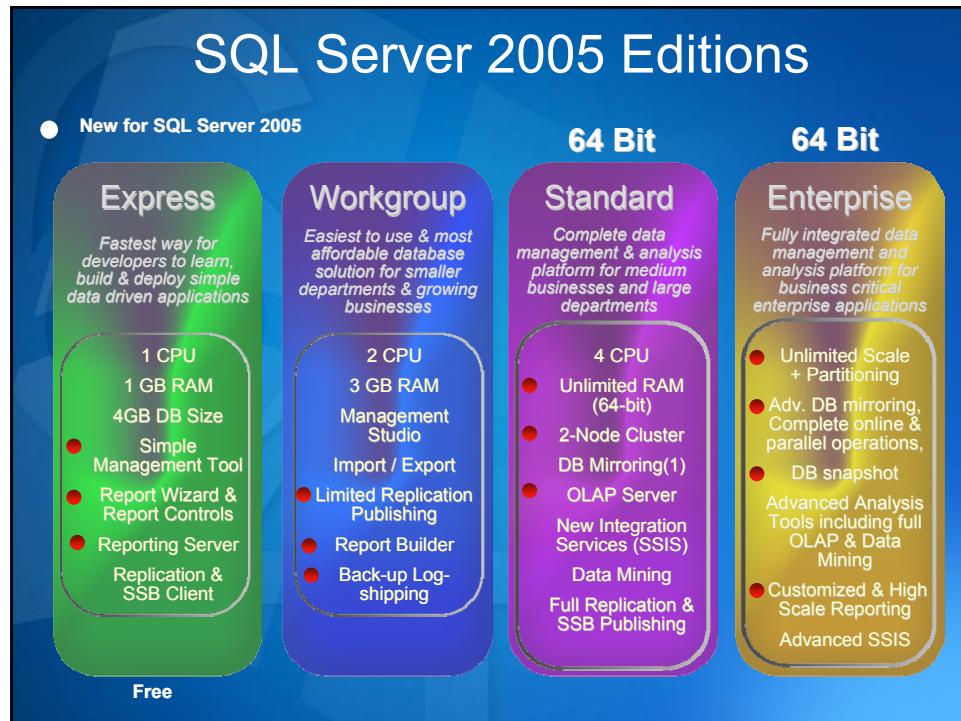


## SQL Server on X64, Itanium

| SQL Server Edition              | x64       |           |           | Itanium   |           |
|---------------------------------|-----------|-----------|-----------|-----------|-----------|
|                                 | 32-bit OS | 64-bit OS | 64-bit OS | 64-bit OS | 64-bit OS |
|                                 | WOW64     |           |           | WOW64     |           |
| SQL Server 2000 32-bit (SP4)    | Yes       | Yes       | No        | No        | No        |
| SQL Server 2000 64-bit Itanium  | No        | No        | No        | No        | Yes       |
| SQL Server 2005 32-bit          | Yes       | Yes       | No        | No        | No        |
| SQL Server 2005 64-bit x64*     | No        | No        | Yes       | No        | No        |
| SQL Server 2005 64-bit Itanium* | No        | No        | No        | No        | Yes       |
| SQL Server Express 32-bit       | Yes       | Yes       | No        | No        | No        |
| SQL Server Mgmt Studio 32-bit   | Yes       | Yes       | No        | Yes       | No        |
| SQL Server BI Dev Studio 32-bit | Yes       | Yes       | No        | No        | No        |

## What is 64-bit SQL Server 2005?

- Same codebase as 32-bit SQL Server
- Flat memory addressing
- IA64 and X64
- Data files compatible with 32-bit SQL
  - Easy Database Migration & Integration
    - Detach/Attach, Log shipping, Replication etc.
- Massive Scale-up support
  - 64-way IA64\*, 32-way IA64, 32-way X64
  - >1,000,000 TPC number\*
- 8-node Fail-over clustering support



## 64-bit gaps in SQL 2005

- VS not supported on Itanium
  - Although management tools are supported
- So BIDS not supported on Itanium – affects SSIS
  - Must develop and debug packages on a 32-bit server and deploy to 64-bit
  - Watch for driver compatibility
- x64 BIDS runs in the WOW
  - SSIS needs 32-bit drivers at pipeline construction time and 64-bit drivers at execution time
    - Some x64 drivers for external RDBMS are still problematic

## 32-bit SQL Server on x64

- 32-bit SQL Server 2005 (server & tools) supported on x64 running 64-bit Windows
  - Under WOW64, SQL Server can access FULL 4GB of RAM, as well as AWE
- Why would you want to run 32-bit OS instead?
  - Drivers
  - Coexistence with other applications or tools that aren't WOW-certified

## Warum auf SQL Server 2005 migrieren?

- 35% schnellere Verarbeitung von Transaktionen
- 5x schnelleres Failover ermöglicht 99,999% Verfügbarkeit
- 50% mehr Leistung bei ETL-Operationen

- Bis zu 40% schnellere Entwicklung mit VS- & .NET-Integration
- Bis zu 60% schnellere Entwicklung von verteilten Applikationen durch Verwendung des Service Brokers
- Eliminierung von Routinetätigkeiten durch Automatisierung

- 2x höhere Leistung bei großen OLAP-Dimensionen
- Report Builder als neues Reporting-Tool für Endbenutzer
- SQL Server Integration Services als Datenintegrationsplattform

## Performance leadership with Integrity servers and SQL Server 2005!

|                                  |  |
|----------------------------------|--|
| OLTP Database                    | <ul style="list-style-type: none"> <li>• #1 Windows TPC-C1 with Integrity Superdome at 1.2M+ tpmC!</li> <li>• #1 Itanium-2 based 16p TPC-C with rx8620-32<sup>2</sup></li> </ul>   |
| Data Analytics                   | <ul style="list-style-type: none"> <li>• A leading OLAP APB-1 Release II (4 × rx5670-4)<sup>3</sup></li> </ul>   |
| Enterprise Resource Planning     | <ul style="list-style-type: none"> <li>• #1 Windows SAP 3-tier SD with Integrity Superdome<sup>4</sup></li> <li>• A leading 4-way 64-bit Windows SAP 2-tier SD with rx4640-8<sup>4</sup></li> <li>• #1 4-way 64-bit Windows SAP 3-tier SD with rx4640-8<sup>4</sup></li> <li>• A competitive 16-way Integrity Superdome 2-tier SAP SD<sup>4</sup></li> </ul> |
| Supply Chain Management          | <ul style="list-style-type: none"> <li>• #1 SAP APO-DP 3-tier with rx5670-4<sup>4</sup></li> <li>• #1 SAP 4-way 2-tier APO-DP with rx5670-4<sup>4</sup></li> </ul>   |
| Business Intelligence            | <ul style="list-style-type: none"> <li>• #1 4-way SAP BW with rx5670-4<sup>4</sup></li> <li>• #1 16p Itanium 2-based 1TB TPC-H with rx8640-32<sup>5</sup></li> <li>• #1 32p Itanium 2-based Windows 3TB TPC-H Integrity Superdome<sup>6</sup></li> </ul>   |
| Customer Relationship Management | <ul style="list-style-type: none"> <li>• #1 4-way Windows Siebel 7.7 PSPP with rx4640-8<sup>7</sup></li> <li>• #1 8-way Windows Siebel 7.7 PSPP with rx8620-32<sup>7</sup></li> <li>• #1 16-way Windows Siebel 7.7 PSPP with rx8620-32<sup>7</sup></li> </ul>  |
| Java Application Server          | <ul style="list-style-type: none"> <li>• A leading SPECjAppServer2002 dual-node category (2 × rx4640-8)<sup>8</sup></li> </ul>   |

<sup>1</sup> HP Superdome with Microsoft SQL Server 2005 (SP1), 1,231,433 tpmC @ \$4.82/tpmC<sup>2</sup> HP Superdome with Microsoft SQL Server 2005 (SP1), 33,951 QphH @ 76.82 \$QphH, available May 5, 2006.  
<sup>2</sup> See www.tpc.org  
<sup>3</sup> HP rx8620-32, 332,266 tpmC @ \$4.48/tpmC, available now. See www.tpc.org for details.  
<sup>4</sup> See full details on results @ www.hyperion.com/partners/benchmarks.  
<sup>5</sup> For full details on SAP benchmarks, see www.sap.com/benchmarks.  
<sup>6</sup> For full details on SAP benchmarks, see www.sap.com/benchmarks.  
<sup>7</sup> See full details on results @ www.siebel.com.  
<sup>8</sup> For full details on results @ www.spec.org  
<sup>9</sup> All results and comparisons as of 11/17/2005

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## SQL Server 64-bit Top Deployments

|   |  |
|---|--|
| <br><b>CORNELL</b><br><br><br><br><br><br> | <p><b>64-bit Trading application</b><br/>Also, 5000 user OLAP application</p> <p><b>Scientific computing application</b></p> <p><b>Relational DW &amp; OLAP Data Marts</b><br/>Multiple applications</p> <p><b>Large, near real-time data-warehouse</b></p> <p><b>Workload consolidation, multiple applications</b></p> <p><b>Analytical DW application using OLAP</b><br/>1 TB of data</p> <p><b>Data Merchant finds 64-bit OLAP compelling</b></p> <p><b>Runs all customer systems on SQL Server</b><br/><b>5 TB data warehouse, 20-CPU HP</b></p> |
|---|--|

Right-click logo, and open Hyperlink for public case-study, where available

## SQL Server 64-bit Top Deployments

**Pitney Bowes**  
Engineering the flow of communication

**JOHNS HOPKINS UNIVERSITY**

**Level(3)<sup>™</sup> COMMUNICATIONS**

**CLALIT HEALTH SERVICES**

**BANCO SANTOS**

**VTG-LEHNKERING AG**

**123 multi media**

**MULTIYORK MASTER FURNITURE MAKERS**

**Network monitoring application**  
**Shipping application**  
**Batch times improved from 96 to 4 hours!**

**Scientific computing application**

**Data warehouse application with OLAP**  
**Oracle/Sun migration**

**1 TB Relational DW, Informix migration**

**Transaction System**

**64-bit mySAP.com ERP system**

**Multiple Systems, including OLTP & OLAP**  
**Uses full range of SQL Server features**

**64-bit SAP R/3 ERP system**

Right-click logo, and open Hyperlink for public case-study, where available

### Record SAP 3-Tier SD Windows performance with HP Integrity Superdome and SQL Server 2005!



Result achieved with HP Integrity Superdome with 64 Itanium2 1.6GHz processors, running Microsoft SQL Server 2005 and Windows Server 2003, Datacenter Edition

Results as of 11/7/06  
For more information, see [www.sap.com](http://www.sap.com)  
HP Integrity Superdome Server with Microsoft SQL Server 2005 (SP1) available 5/5/06.

RISC-level SAP performance and scalability in a flexible standards-based solution!

SAP SD Standard mySAP ERP 2004 application benchmark:

- 93,000 users supported
- 9,360,000 order line items/hr
- 468,000 SAPS
- 1.92 seconds average dialog response time

© December 2006

**Record SAP 2-Tier SD Windows with HP<sup>®</sup> Integrity Superdome and SQL Server 2005!**



#1 Windows SAP 2-Tier SD

Result achieved with HP Integrity Superdome with 64 Itanium2 1.6GHz processors with sx2000 chipset, running Microsoft SQL Server 2005 and Windows Server 2003, Datacenter Edition

Outstanding SAP performance and scalability in a flexible and highly reliable, standards-based solution!

SAP SD Standard mySAP ERP 2004 application benchmark:

- 8,575 SD users supported
  - 43,050 SAPS
- 861,000 fully processed line items per hour
- 1.95 seconds average dialog response time

Results as of 6/9/06  
For more information see [www.sap.com](http://www.sap.com)  
HP Integrity Superdome Server with Microsoft SQL Server 2005 (SP1) currently available.

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**HP Integrity rx8620 Server running SQL Server 2005 supports record number of Siebel 7.7 users!**

- 30,000 concurrent users on single Microsoft SQL Server 2005 database<sup>1</sup>
  - Single mid-range HP Integrity rx8620 Server with 16 Intel® Itanium® 2 1.6GHz processors and 64GB of RAM
  - Microsoft Windows Server 2003, Datacenter Edition
- 804,000 business transactions per hour
  - Simulated 30,000 active users in a large corporation, working on Siebel Financial Services Call Center and Siebel Partner Relationship Management (PRM) transactional applications
  - Eight HP ProLiant DL585 application servers ran Siebel 7.7
- Exceptional performance and scalability for even the largest Siebel implementations!

#1 Siebel 7.7 result

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1 See <http://www.siebel.com/comparisons/benchmarks.htm> for more information on the Siebel 7.7 Platform Sizing and Performance Program (PSPP) benchmark.

## Resources

- SQLCAT Team Blog:  
<http://blogs.msdn.com/sqlcat>
- SQL Server memory management, 64-bit and NUMA
  - Slava Oks Blog
    - <http://blogs.msdn.com/slavao>
- Analysis Services Configuration and Performance
  - Project REAL
    - <http://www.microsoft.com/sql/bi/projectreal>
- Integration Services
  - Blogs by Ashvini Sharma, Donald Farmer at [sqljunkies.com](http://sqljunkies.com)
    - [http://www.sqljunkies.com/WebLog/donald\\_farmer](http://www.sqljunkies.com/WebLog/donald_farmer)
    - <http://www.sqljunkies.com/WebLog/ashvinis>

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