

SQL Server Upgrade: take help from tools and best practices



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About me

- IT Experience

- Been in the IT field over 18+ years (using SQL Server ver.4.2 onwards)
- Principal Architect – D Bi A Solutions (consulting@dbiasolutions.co.uk)

- Publications

- Author: **Microsoft SQL Server 2008 R2 Administration cookbook** – Packt Publishers (May 2011)
- Co-author **for MVP Deep Dives Volume II** – Manning Publications (October 2011)

- Community Contributions

- SQL Server MVP since 2006
- Founder (SQLMaster) & blogs at www.sqlserver-qa.net; (SQL Server Knowledge Sharing Network)
- Contributing Editor & Moderator - www.sql-server-performance.com [SSP]
- Quiz Master & Blogger: www.beyondrelational.com & www.sqlservergeeks.com
- Active participation in assorted forums such as SSP, SQL Server Central, MSDN, SQL Server magazine, dbforums etc.





Quick answers to common problems

Microsoft SQL Server 2008 R2 Administration Cookbook

Over 70 practical recipes for administering a high-performance SQL Server 2008 R2 system

Foreword by Brad M McGehee, Microsoft SQL Server MVP and Director of DBA Education for Red Gate Software

Satya Shyam K Jayanty

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Before We Begin

- Covered
 - Upgrade strategies - planning, options, methodology and tools
 - Upgrade scenarios – Clustering, Mirroring and so on
 - Lessons learned and recommended practices
 - List of important issues & upgrade tricks
- Not Covered
 - End-to-end coverage or in-depth drilldown of all SQL Server 2008 or 2008 R2 features

Upgrade Planning (Checklist)

● Pre-Upgrade

○ Check environment

- Run SQL Server 2008 R2 Upgrade Advisor

- Ensure environment is clean

 - Check database consistency

 - Consider shrink Data file (read-only databases) and log files

 - Consider rebuild indexes

- Run SQL Server 2005/2000 Best Practices Analyzer (BPA)

○ Back up your environment

- System and user databases including DTS/SSIS packages

- Your system

Upgrade Planning (Checklist)

- The Upgrade
 - Document every step
 - Check server, storage, and network health
 - Perform the upgrade
 - Back up databases when upgrade completes
- Go/No-go (Checkpoint)
 - Test functionality and performance.
 - Review the logs to ensure everything is successful
 - Troubleshoot if there is an upgrade failure
 - Determine whether you need to roll back
 - Determine application acceptance (sanity test)

Upgrade Planning (Checklist)

- Preparing to Upgrade
 - Review upgrade documentation and resources
 - Identify upgrade requirements
 - SQL Server editions/features
 - Hardware considerations
 - Application compatibility
 - Decide on upgrade strategy
 - Establish plan to upgrade high-availability servers
 - Establish backup and rollback plans
 - Prepare Slipstream media to include latest SP/CU
 - Test the plan!!!

Test environment options

- Collect all in-house scripts, tools and knowledge. Determine what areas of functionality existing tools cover.
- Discuss with development & business to test key application functionality testing with parameters (upper & lower limits).
 - Create wrapper to call tested code
- Stress testing – RML utilities (www.codeplex.com)
 - ReadTrace & OSTRESS. (XML Notepad to read)
 - ReadTrace parses trace files and produces load scripts, and OSTRESS is a replay (loading) utility.
 - If existing set of scripts does not cover testing needs, you can use server traces to build your test environment.
 - Save trace to disk separated from data & log files

In-Place Upgrade

- Upgrades an existing installation
 - Instance name remains the same after upgrade
 - Old instance no longer exists
- User data and configuration is preserved
- Mostly automated process through SQL Server Setup
- Performed on same machine as existing installation

In-Place Upgrade

- Pros:
 - Generally faster and less effort than side-by-side
 - Setup automates moving data and configuration
 - Application connects to same instance after upgrade
- Cons:
 - Less granular (must upgrade all databases within instance)
 - Cannot change OS or platform (WOW64 → x64)
 - Complex rollback strategy

In-Place Upgrade Paths

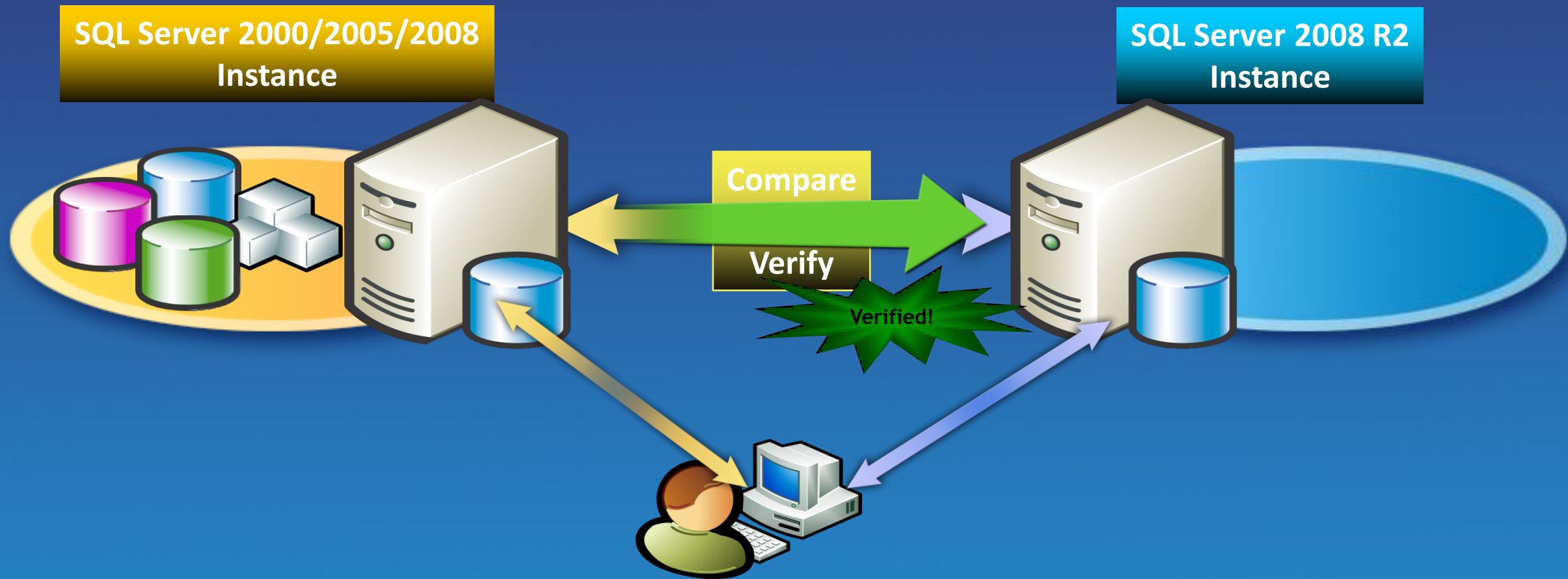
- Minimum Service Pack (SP)
 - SQL Server 2000 is SP4
 - SQL Server 2005 is SP3
- Edition Upgrade: Can go up but cannot go down
 - See <http://msdn.microsoft.com/en-us/library/ms143393.aspx>

From	To
SQL Server 2000/2005 Enterprise	SQL Server 2008 R2 Enterprise
SQL Server 2000/2005 Standard	SQL Server 2008 R2 Standard SQL Server 2008 R2 Enterprise
SQL Server 2005 MSDE	SQL Server 2008 R2 Express

Side-by-Side (Migration) Upgrade

- Install new instance of SQL Server without affecting existing instance
- Can be same or different server
- Database objects are manually copied to new instance
 - Copy Database Wizard
 - Detach -> Copy -> Attach
 - Backup -> Restore

Side-by-Side (Migration) Upgrade



Side-by-Side (Migration) Upgrade

● Pros:

- Ability to change platform (newer hardware or OS)
- Legacy instance continues to be available
 - Do you want to keep data in sync?
- Easier to fall back to old instance
- Better downtime control

● Cons:

- More effort and more complex
 - You manually transfer the data, SSAS cubes, configuration settings, security settings, Agent jobs, and SSIS packages
- A new instance name is created; applications may need to be changed to connect to new instance

Failover Cluster Rolling Upgrade – Overview

- Process is significantly different in SQL Server 2008
- Rolling upgrade with minimal downtime
- Use SQL Server Installation Center, and select Upgrade on each node
 - Start with passive node and end with active node
 - Failover happens automatically
- Tips:
 - If planning to upgrade to SQL Server 2008, use Slipstream in SP1 or SQL Server 2008 R2
 - Upgrading from SQL Server 2000 IA64 is not supported
 - Upgrading a clustered SQL Server 2000 Analysis Services to SQL Server 2008 (R2) is not supported

Failover Clustering Rolling Upgrade

Best Practice

- Pre-install prerequisites on all nodes before upgrade
 - Upgrade shared components starting with passive nodes.
 - This will install Microsoft .NET Framework 3.5 SP1, Microsoft Windows Installer 4.5, and Microsoft SQL Server 2008 Setup support files
 - For Database Engine installations on Windows Server 2003 SP2, install Windows Server hotfix needed for FileStream ([KB 937444](#))
 - Fail over to an upgraded node.
- Start failover cluster upgrade process with passive nodes, making your way toward the active node

Failover Clustering Rolling Upgrade

Customer case – Initial configuration

Active



Passive



Storage



➤ Windows Server 2003 R2
EE SP2, 64-Bit

➤ SQL Server 2000 EE SP4
64-Bit

Failover Clustering Rolling Upgrade

Customer case – Installation of prerequisites

Step #2:

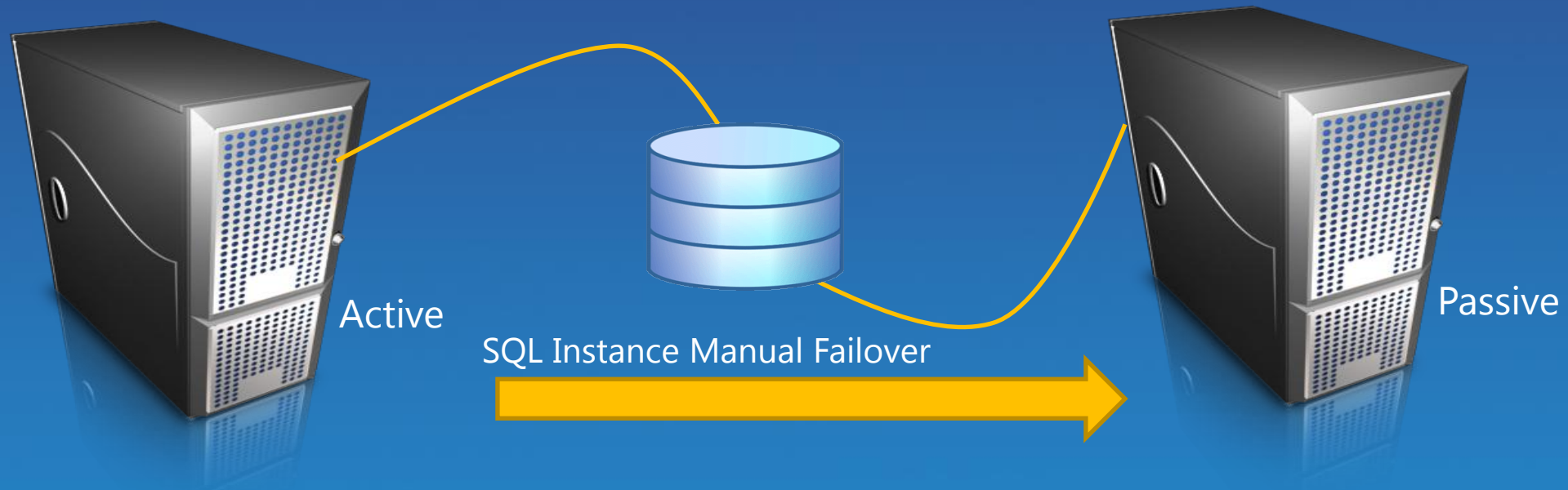
Install Prerequisites:

- 1- .Net Framework 3.5 SP1
 - 2- Windows Installer 4.5
 - 3- Windows QFE (KB937444)
 - 4- SQL2008 R2 Setup Support files
- REBOOT

Step #1:

Install Prerequisites:

- 1- .Net Framework 3.5 SP1
 - 2- Windows Installer 4.5
 - 3- Windows QFE (KB937444)
 - 4- SQL2008 Setup R2Support files
- REBOOT....



Failover Clustering Rolling Upgrade

Customer case – Upgrade clustered components

Step #3:
Upgrade to SQL Server 2008 R2 on Passive Node

SQL Server 2008 R2

Removed from
Cluster Group
Possible Owners

Passive
Active



No client connection for 1-2
minutes while db is being
upgraded to 2008 on the left
node

Step #4:
Upgrade to SQL Server 2008 R2 on Active Node

SQL Server 2008 R2

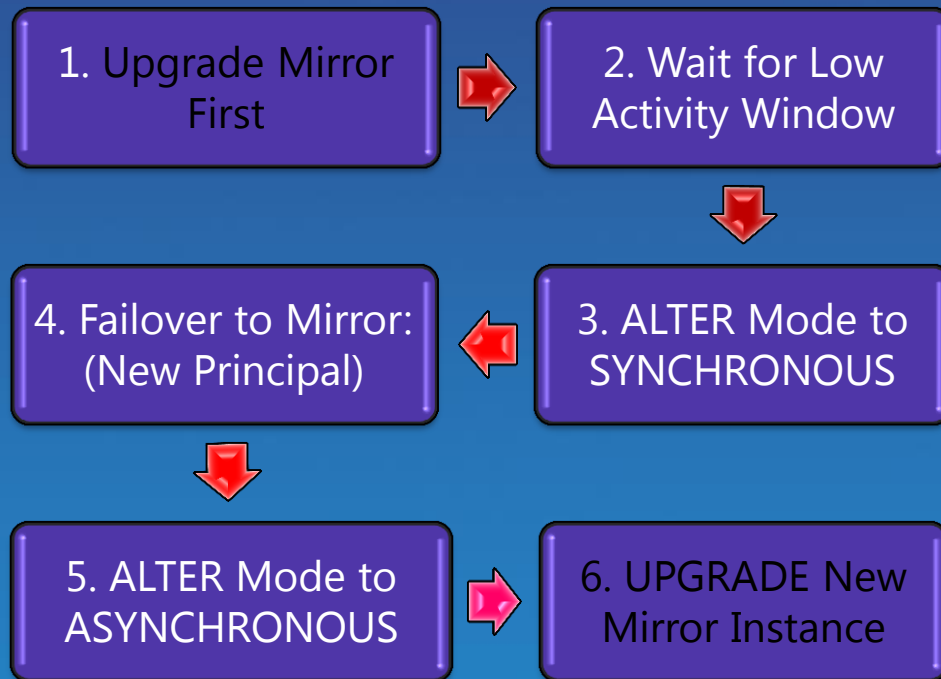
Active



Step 5: SQL Instance Automatic Failover

Additional Upgrade Scenarios Database mirroring

- Rolling upgrades supported to minimize impact
- Mirror version must be equal or newer than Principal
- At least one manual failover required
- Typical upgrade flow



Asynchronous
Mirroring: Steps 1 -
6

Synchronous
Mirroring: Steps 1,
4, 6

Additional Upgrade Scenarios

Customer case – Failover cluster with mirroring

Step#4: Manual Failover to the database mirroring partner for each database

Step #1:
Upgrade to SQL Server 2008 R2 on mirrored instance

SQL
Server
2008 R2



Active

Step #3:
Upgrade Cluster to
SQL Server 2008 R2



Passive

SQL 2008 R2

Mirrored SQL

Mirroring
resumed



Upgrading Analysis Services

- Upgrade 2005 to 2008 – Either an in-place or side-by-side upgrade
- Upgrade 2000 to 2008 – Analysis Services Migration Wizard is recommended

The screenshot displays the SQL Server Enterprise Manager interface. In the Object Explorer, a context menu is open over a Microsoft Analysis Services instance, with 'Migrate Database...' selected. A blue arrow points from this menu item to the 'Analysis Services Migration Wizard' dialog box. The wizard is on the 'Specify Source and Destination' page, showing the source server as 'DBIA-SSQA\SQL2K' and the destination server as 'DBIA-SSQA\SQL2K8R2_SE'. The 'Next >' button is highlighted, with a tooltip that reads 'Moves to the next wizard page'.

Object Explorer

SQLQuery4.sql - not connected* Object Explorer Details

DBIA-SSQA\SQL2K8R2_SE (Microsoft Analysis Server 10.50.1600.1 - DBIA-SSQA\ssqa.net)

Name

Databases

Connect...
Disconnect
Register...
New Query
Migrate Database...
Policies
Facets
Start
Stop
Pause
Resume
Restart
Reports
Refresh
Properties

Analysis Services Migration Wizard

Specify Source and Destination
Migrate the databases now, or save a script to a file and migrate the databases later.

SQL Server 2000 Analysis Services source server:
DBIA-SSQA\SQL2K

SQL Server 2008 R2 Analysis Services destination server:
 Server (or server\instance):
DBIA-SSQA\SQL2K8R2_SE
 Script file: Browse...

Description:
Type the name of the SQL Server 2000 Analysis Services source server.

< Back Next > Finish Cancel

Moves to the next wizard page

Upgrading Reporting Services (RS)

- Single server, RS db within same instance
 - Database engine and Reporting Services components will all be upgraded
- Remote Installation or different instance of RS db
 - RS component can be upgrade without upgrading the database engine
 - The RS db schema will be updated

Upgrading Data Transformation Services (DTS) and Integration Services (SSIS)

- DTS is depreciated
 - SQL Server 2005/2008 still includes DTS functionality, but future version may not
- DTS upgrade Options:
 - Migration DTS packages to SSIS
 - DTS Migration Wizard (DTSMigrationWizard.exe)
 - 3rd party tools available, such as www.dtsxchange.com
 - Continue to run DTS packages using the DTS runtime
 - No design/runtime support on 64-bit or 32-bit on IA64
 - Incorporate DTS package into SSIS packages
- SSIS use the SSIS package upgrade Wizard

Real-time Scenario & Solution....

- Case 1: A big ReInsurance data warehouse (approximately 10 terabytes of data) upgrade from SQL Server 2005 to SQL Server 2008 R2.
- 6 + 1 weeks to complete
 - 6 weeks of very-intensive preparation + 1 week focused on performance gains of the new platform & testing functionality.
 - Database compression (`sp_estimate_data_compression_savings`) and Sparse columns features used (tested).
 - Query & Table hints used
 - Few number of very complex queries – used Filtered statistics & partitioned tables feature after the upgrade. See SQLCAT article: [Using Filtered Statistics with Partitioned Tables](#)

Real-time Scenario & Solution....

- Case 2: A retail-chain with data (a couple of terabytes) was upgrading their replication infrastructure between HQ and regional shops from SQL Server 2000 to SQL Server 2008.
 - 3 months to complete (very intensive)
 - 32-bit SQL Server 2000 Cluster with heavy use of transactional replication (110 subscribers, 67 articles)
 - Poor connectivity across subscribers caused upgrade without replication resynchronization.
- Upgrade to the 64-bit version of SQL Server 2008 made an in-place upgrade impossible. See SQLCAT article: [Upgrading Replication from SQL Server 2000 32-Bit to SQL Server 2008 64-Bit without re-initialization](#)

Real-time Scenario & Solution....

- Case 3: A large, mission-critical banking application (complex business logic) on "surrounding" technologies like DB mirroring, replication, SQL Server Reporting Services, and DTS. Upgrade from SQL Server 2000/2005 to SQL Server 2008 R2.
 - 1 month to complete
 - DB mirroring pair upgrade
 - Reporting Services upgrade
 - DTS migration – DTSXchange & SSIS migration
 - Complex Biz logic: Spent time fighting execution plans that changed after migration (reads):
 - SET STATISTICS IO ON
 - SET STATISTICS PROFILE ON
 - SET STATISTICS TIME ON
 - Most cases SELECTS involving 6 or more joins – new indexes on post-upgrade

SQL Server 2008 R2 Upgrade Advisor

- Analyzes SQL Server database, trace and script files
- Read-only operation, can be CPU and I/O intensive
- Supports remote execution
- Generates a report of detected issues
 - Blocking issues
 - Pre-upgrade issues
 - Post-upgrade / migration issues
- Provides suggestions for addressing issue
- Check for updates before running

SQL Server 2008 R2 Upgrade Advisor

Available at the following locations:

- The SQL Server Installation Center
- On the source media in the [Servers\redist\Upgrade Advisor] folder
- Through the SQL Server 2008 R2 Feature Pack at <http://www.microsoft.com/downloads/details.aspx?displaylang=en&FamilyID=ceb4346f-657f-4d28-83f5-aae0c5c83d52>

Demo

SQL Server 2008 Upgrade Assistant

- Used for Application Compatibility Testing (ACT) along with Upgrade Advisor
- Allows testing of actual T-SQL execution
- Can detect changes in execution method, path, and results – Upgrade Advisor does not
- Leverages Profiler/Trace capability
- Collaborative development between SQL Server development team, DPE, and Scalability Experts
- Free download from www.scalabilityexperts.com/ssua

SQL Server 2008 Upgrade Assistant

Demo

SQL Server: Deprecated Feature Object

- Monitors number of times your application is submitting commands that will be deprecated in a future release.
- You should plan for the removal of these deprecated commands within your application.
- Very useful in post-upgrade to capture code to ensure backward compatibility is ensured.

SQL Server: Deprecated Feature Object

- Available through Profiler

Demo

Discovery of SQL Server Instances

- Built-in discovery tool
 - Available off of the Installation Center
- Microsoft Assessment and Planning (MAP) Toolkit
 - Requires Word, Excel & individual SQLExpress installation
- WMI provider, details at <http://msdn.microsoft.com/en-us/library/dd981032.aspx>

Built-in Discovery Tool

Demo

Upgrade Checklist



- Post-Upgrade Tasks
 - Determine application acceptance (end-to-end)
 - Integrate the new instance into the new environment
 - Decommission and uninstall after a side-by-side or new hardware install
 - Apply latest security updates
 - Review security settings
 - Revisit Upgrade Advisor recommendations
 - Run the SQL Server 2008 R2 BPA

Recommended practices



- SQL Server 2008 R2 BPA
 - based on Microsoft Baseline Configuration Analyzer 2.0 – manual install
- Analyze the complex queries in Database Tuning Advisor - statistics
- Code changes
 - old style code:

```
SELECT t1.c1, t1.c2, t3.c3 FROM table1 t1, table3 t3 WHERE t1.c2=t3.c1
```
 - new style change:

```
SELECT t1.c1, t1.c2, t3.c3 FROM table1 t1 JOIN table3 t3 on t1.c2=t3.c1
```
 - Even better change:

```
SELECT t1.c1, t1.c2, t3.c3 FROM table1 t1 INNER HASH JOIN table3 t3 on t1.c2=t3.c1
```
- Complex queries: more than five joins – check execution plan (estimated vs actual)
- No room for code change: Use Plan guides, Plan caching and Query hints (USE PLAN).
- Storage optimization – disk partition alignment & pre-deployment I/O practices articles from Technet.

Upgrade Resources



- SQL Server 2008 R2 Administration cookbook (few sections are dedicated on upgrade topic) – www.packtpub.com
- SQL Server 2008 Upgrade Technical Reference
 - <http://www.microsoft.com/downloads/details.aspx?FamilyID=66d3e6f5-6902-4fdd-af75-9975aea5bea7&displaylang=en>
 - SQL Server Community: blogs, Channel 9, newsgroups, videos, and webcasts
 - <http://msdn.microsoft.com/en-us/sqlserver/bb671050.aspx>
 - <http://sqlserver-qa.net/blogs/Bloggers.aspx>
- Download latest SQL Server Books Online to know about deprecated, discontinued and break existing features, especially the “What’s New” & “Backward Compatibility” sections.



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Coming up...

Speaker	Title	Room
Klaus Aschenbrenner	Understanding SQL Server Execution Plans	Aintree
Thomas Kejser	Finding the Limits	Lancaster
Alberto Ferrari	Many-to-Many Relationships in DAX	Pearce
Mark Whitehorn	MDX and DAX-compare and contrast	Boardroom
Bob Duffy	SQL tuning from the dot.net perspective	Empire
Francesco Quaratino	The forgotten DBA daily essential checklist	Derby

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Questions and Answers

