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## Essential DBA Skills: Best Practices Every SQL Server Developer Should Know to Administer Their SQL Servers

Brad M McGehee  
SQL Server MVP  
Director of DBA Education  
Red Gate Software  
[www.bradmcgehee.com](http://www.bradmcgehee.com)

# My Assumptions About You

- You may be a DBA Administrator or DBA Developer.
- You may be a part-time or full-time DBA.
- You probably have less than one year's experience as a SQL Server DBA, but you are familiar with SQL Server basics.
- If you are an experienced DBA, then you probably are already familiar with most of this content. On the other hand, maybe you may pick up a tip or two, or may be reminded about something you need to do, but have forgotten about.

# What We are Going to Learn Today

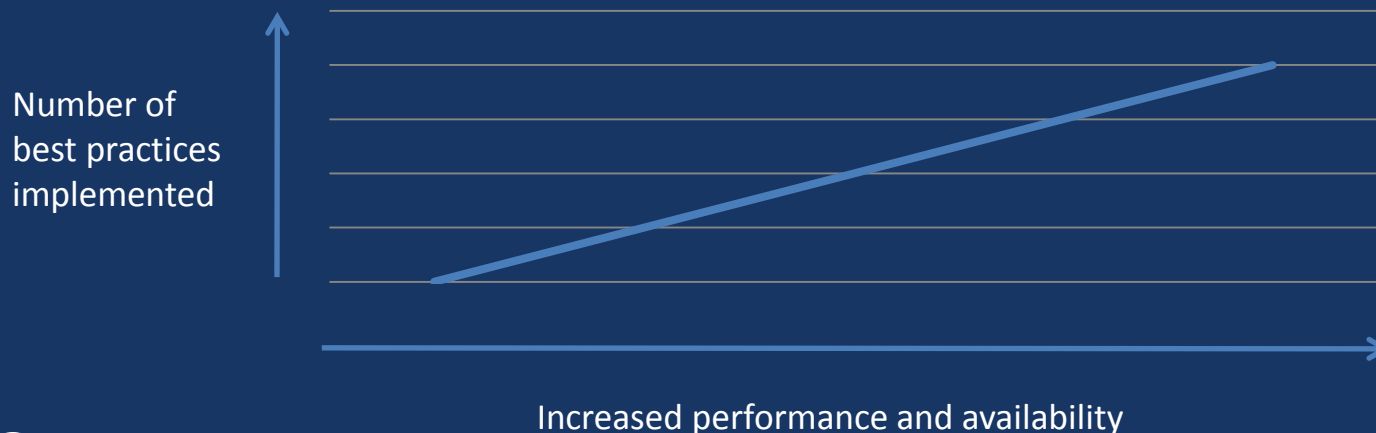
- A brief explanation why following best practices are beneficial to you as a DBA.
- Common best practices all DBAs should follow.
  - Our focus today is on **what to do**, not how to do it.
  - These best practices are just the basics, there is a **lot more to do and learn**.
  - These best practices are based on many of the **common mistakes** I see novice DBAs make.
  - There are always **exceptions to every best practice**, and not every recommendation discussed here may fit your environment.

# Benefits of Focusing on Best Practices

- By focusing on SQL Server **best practices** basics, it helps you as a DBA to:
  - Optimize SQL Server performance
  - Maximize SQL Server availability
  - Be proactive, reducing the amount of time you spend being in “crisis mode”

# Everything Counts

- While many of the best practices I discuss today might seem small in scope, the **accumulative effect** of following each and every recommendation can be huge.
- By following best practices consistently, SQL Server **performance and availability** can be boosted substantially.



# Best Practices You Should be Following

- Maintain a Standard Environment
- Installing & Upgrading SQL Server
- General Server Configuration
- Security Basics
- SQL Server Property Settings
- Memory Configuration
- User Data and Log File Management
- Don't Shrink Files
- Tempdb Management
- Database Property Settings
- Configuring Jobs—General Guidelines
- Create Index Rebuilding/Reorganize Job
- Create Data Corruption Detection Job
- Set Up Alerts for Critical Errors
- Implement a Backup/Restore Strategy
- Create a Disaster Recovery Plan
- Document Everything
- Test Everything

# Maintain a Standard Environment

- Ideally, your SQL Server environment should be as standardized as much as possible.
  - Use identical servers and hardware configurations
  - Use identical OS versions and configurations
  - Use identical SQL Server versions and configurations
  - Use identical database maintenance jobs
  - Develop an internal “Standards Guide”
- **Not always possible or appropriate**, but the more standardized your environment, the less headaches you will experience.

# Installing & Upgrading SQL Server

- Generally, when **installing** a new SQL Server instance:
  - Use the newest hardware firmware and OS drivers.
  - Use the newest OS version with latest SP and patches.
  - Use the newest SQL Server version with latest SP & Hot Fixes.
  - Test, and once stable, be wary of making changes.
- Generally, when **upgrading** an existing SQL Server instance:
  - Don't upgrade **unless you have a good reason** to upgrade. If your instance is working well, don't mess with it.
  - For example, **upgrade if** you need new features, or have problems with an old installation, or need to upgrade hardware.
  - It is always safer to upgrade to a new server with a fresh installation of the OS and SQL Server than to upgrade in place. This allows you to test more effectively, and also gives you a **"back out" option**.

# Security Basics

- Don't give users **more permissions than they need** to perform their job. (Critical. Sounds simple, often hard.)
- **Don't use the SA account** for anything. Assign it a complex password, and keep it handy just in case. Use a domain account that is a member of the sysadmin role.
- Don't allow an application to use the **SA or a sysadmin** account to access SQL Server.
- Use **Windows Authentication** security whenever possible. (Applicable for in-house development).
- Don't give **vendors** sysadmin access to your servers.
- **Log off or lock** your SQL Server (or workstation) when done.

# General Server Configuration

- Ideally, SQL Server instances should run on a **stand-alone** server (physical or virtual) with no other major apps running on it. Small monitoring apps are generally OK.
- Avoid **multiple instances** unless you have a really good reason to use them. Consider virtualization instead.
- **Unnecessary SQL Server services** should be uninstalled or turned off.
- Ideally, **don't run antivirus/antispymware software** locally.
  - If your organization's policy requires running antivirus/antispymware software locally, exclude MDF, NDF, LDF, BAK, and TRN files.

# SQL Server Property Settings

- Don't change any of the default SQL Server instance-wide configuration property settings unless you thoroughly understand the implication of making the change. Examples of Server Property settings include:
  - Memory
  - Processors
  - Security
  - Connections
  - Database Settings
  - Advanced
  - Permissions
  - (Demo if time)

# Memory Configuration

- Ideally, use **64-bit** hardware and the **64-bit** version of the OS and SQL Server.
- Generally speaking, if using 64-bit memory, turn on “**Lock Pages in Memory**,” and let the instance dynamically manage its own memory (especially 2008).
- If using the 32-bit version of SQL Server, and if using 4 GB or more of RAM, ensure that /3GB switch and AWE memory are correctly configured. Correct settings depend on available RAM.

# Data and Log File Management

- Remove **physical file fragmentation** before creating new MDF or LDF files.
- When creating new MDFs and LDFs, **pre-size** them to eliminate/minimize autogrowth events.
- **MDF** files should be located on their own disks.
- **LDF** files should be located on their own disks.
- BAK and TRN **backup files** should be located on their own disks.

# Instant File Initialization

- **Enable instant file initialization**, which prevents MDF files from being zeroed out when they are grown, allows MDF files to be created quickly. LDF files are not affected.
- **Speeds up** CREATE DATABASE, ALTER DATABASE, RESTORE DATABASE, Autogrowth.
- **Requires** SQL Server 2005/2008, and Windows Server 2003/2008 (or higher version).
- Instant file initialization is turned on if the SQL Server (MSSQLSERVER) **service account has been granted the SE\_MANAGE\_VOLUME\_NAME permission by adding the account to the Perform Volume Maintenance Tasks security policy.** Members of the local Windows Administrator group automatically have this right.

# Don't Shrink Files

- If you properly size your MDFs and LDFs, then **you should never have to shrink a file.**
- **Don't schedule** database or file shrinking operations.
- If you **must** shrink a database:
  - Do so manually
  - Rebuild the indexes after the shrink is complete
  - Schedule these steps during the slow time of the day
- **Benefits** of not automatically shrinking files:
  - Eliminates grow and shrink syndrome
  - Reduces physical file fragmentation
  - Reduces resources used for these operations, allowing more important tasks to use them

# Tempdb Management

- **Pre-size tempdb** so autogrowth doesn't have to happen often (8MB is default, which is very low).
- **Set autogrowth** to avoid many growth spurts, use a **fixed amount** that minimizes autogrowth use. (10% is default, which causes lots of autogrowth).
- If tempdb is very active, locate it on its **own disks**.
- If very active, **consider dividing the tempdb into multiple physical files** so that the number of files is  $\frac{1}{4}$  to  $\frac{1}{2}$  the number of CPU cores, up to 8 files. Each physical file must be the same size.

# Database Property Settings

- **Don't change** database property settings unless you have a very good reason. Some key ones:
  - **Auto Create Statistics:** On
  - **Auto Update Statistics:** On
  - **Auto Shrink:** Off
  - **Autogrowth:** Leave on. Use mainly for catching mistakes. File growth should be managed manually. Use fixed amount that minimizes autogrowth occurrences.
  - **Recovery Mode:** Set to full for all production databases so transaction log backups can be made.
  - **Page Verify:** Use Checksum (2005/2008), don't turn off.
  - **Compatibility Level:** Should be set to match current server version, unless there are compatibility problems.
  - (Demo if time)

# Configuring Jobs—General

- If your server doesn't have any jobs, then there is a problem, as **all servers need jobs**.
- Try to **schedule jobs so they don't interfere** with production.
- Try to **prevent jobs from overlapping**.
- **Set alerts** on jobs so you are notified if they fail.
- **Check jobs daily** to verify that they have run correctly (not hung, not run abnormally long, etc).
- If you use the Maintenance Plan Wizard, be careful to use it properly. If **misused**, it can create maintenance jobs that hurt performance.

# Create Index Rebuilding/Reorganize Job

- **Indexes need to be rebuilt or reorganized regularly** to minimize fragmentation and reduce wasted space.
- Ideally, you should **only rebuild or reorganize indexes that need it**. Use `sys.dm_db_index_physical_stats` to identify what tables/indexes need to be rebuilt/reorganized.
- Consider **rebuilding** an index if it is heavily fragmented (>30%). In Enterprise Edition, can perform online. If Standard Edition, consider it an off-line job. This **automatically updates statistics**, so you don't need to do this again.
- Consider **reorganizing** an index if it is not heavily fragmented (>5% and <= 30%). This is an online operation and doesn't use a lot of resources. You **must update statistics afterwards**, as this is not automatically done for you. Indexes with **<5% fragmentation** can be ignored.

# Create Data Corruption Detection Job

- Ideally, run DBCC CHECKDB as **frequently as practical**.
- If you have a problem, you want to find it as soon as possible to reduce the risk of data loss.
- Create an appropriate job to run this (or similar) command:

```
DBCC CHECKDB ('DATABASE NAME') WITH  
NO_INFOMSGS, ALL_ERRORMSGS;
```

Note: Consider using PHYSICAL\_ONLY option for large or busy production servers to reduce run time.

- **Don't use the DBCC CHECKDB repair option** unless you fully understand its implications.

# Implement a Backup/Restore Strategy

- Create a job to perform **full backups daily** on all system and user production databases, plus **log backups hourly** (or similar variation). Include differential backups if appropriate.
- If a database **uses the bulk or full recovery model**, you must back up the transaction log to keep it from growing uncontrollably.
- Backup using **RESTORE WITH VERIFYONLY** to help verify backup integrity. (Does not guarantee good backups.)
- Periodically **test backups** to see if they can be restored.
- Set up an appropriate backup **retention policy**.
- Store backups **securely and off-site** (not on same disk array or SAN).
- If you have a limited backup window, or have limited disk space, use **backup compression**. Can be a big time saver.

# Sample Maintenance Scripts

- Sample database maintenance scripts to check out:
- <http://ola.hallengren.com/>
- <http://sqlfool.com/2010/04/index-defrag-script-v4-0/>
- [http://www.grics.qc.ca/YourSqlDba/index\\_en.shtml](http://www.grics.qc.ca/YourSqlDba/index_en.shtml)

# Set Up Alerts for Critical Errors

- Create a **SQL Server Event Alert** for all events with a severity of 19 [fatal] and higher.
- Have **alerts sent to you** or whoever is responsible for day-to-day monitoring.
- Consider a **third-party alerting tool** if SQL Server Alerts doesn't meet all of your needs.

# Create a Disaster Recovery Plan

- **You must** create a document that outlines, step-by-step, in great detail, how you will recover your SQL Servers in the case of any problem, small or large.
- You need to **practice** using the plan so you are familiar with it and can easily implement it.
- Keep **Microsoft SQL Server's Product Support** phone number handy. Paste it near your computer.
- **Remember:** Most “disasters” are small, such as a corrupted database. Big “disasters” occur very rarely, if ever. But you **need to be prepared** for both.

# Document Everything

- Yes, documentation is very boring, but it is very **critical to being a successful DBA**. Be sure to document:
  - The installation and configuration of each instance.
  - The installation and configuration of any application that uses SQL Server as its back end (as related to SQL Server).
  - Troubleshooting tasks, as the same problem may reoccur, and you don't want to reinvent the wheel.
  - *Any time any change is made to any instance for any reason.*
- Be sure that documentation is easily available to everyone who needs access to it.

# Test Everything

- Before you make any change on a production SQL Server, be sure you **test it first in a test environment**.
  - NO EXCEPTIONS!
  - I mean it!
  - Really!
  - No kidding.
  - I wouldn't lie to you.
  - You don't want to lose your job.
  - You'd be crazy not listening to this advice.
  - Civilization as we know it may lie in your hands.
- Never forget, DBAs are the **protectors of the organization's data**. You took this oath when you accepted the job of DBA (whether you like it or not).

# Take Homes for Today

- By **focusing on best practices**, you gain the following:
  - Better SQL Server performance
  - Higher SQL Server availability
  - Being proactive helps to you prevent being in a “crisis” mode all the time
- The **total effect** of following each and every recommendation made today can be huge.
- What you learned today is only the **tip of the iceberg**, you will need to take time to learn many other best practices.
- When you get back to work, use this as a mini **checklist** to give your SQL Servers a quick health check.

# Find Out More

- Free E-Books on SQL Server:
  - [www.sqlservercentral.com/Books](http://www.sqlservercentral.com/Books)
- Check these websites out:
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