

Managing Your SQL Servers

When You Don't Have A DBA



Who Is This Guy?

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- Started in IT in 1999 as a “Webmaster”
- Developer for 14 years
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 - Data Platform
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What Are We Going To Learn?

- SQL Server Settings
- Database Configurations
- Maintenance & Scripts
- Monitoring Tools
- Helpful Resources

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SQL Server Settings



SQL Server Settings

Using sp_configure

- Displays or changes global configurations ([MSDN](#))
- 3 Uses:
 - Return a complete list of options
 - *EXEC sp_configure*
 - Return an individual option configuration
 - *EXEC sp_configure 'option_name'*
 - Set new value for option
 - *EXEC sp_configure 'option_name', 'value'*
 - Must run RECONFIGURE after changing an option

SQL Server Settings

Configuration Options:

- The following options should be enabled:
 - Backup Compression Default ([MSDN](#))
 - Backup Checksum Default ([MSDN](#))
 - Checks data pages for corruption by the I/O subsystem
 - Not a full corruption check
 - Optimize For Ad Hoc Workloads ([MSDN](#))
 - Helps to relieve memory pressure by not allowing the plan cache to become filled with compiled plans that are not reused

SQL Server Settings

Configuration Options:

Max Server Memory

- How much memory does SQL Server need?
 - Set by default to over 2 Petabytes
 - But Windows likes memory too
 - So does SSIS, SSRS, SSAS, Full Text Search, and some In-Memory OLTP operations

SQL Server Settings

Configuration Options:

Max Server Memory

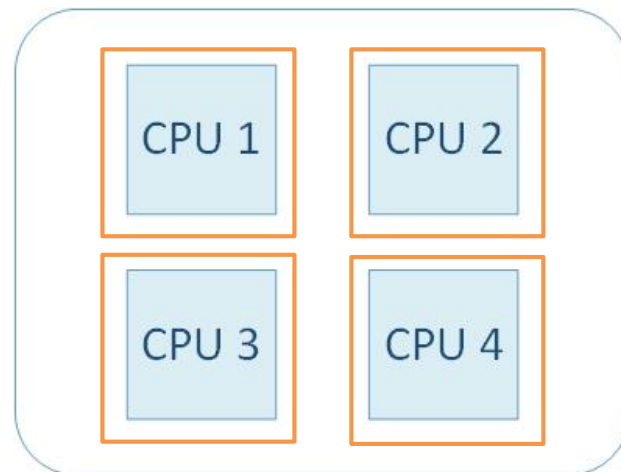
- What should you set it to?
 - Recommended to limit Max Server Memory so that memory is available for other operations
 - SQLskills: [How much memory does my SQL Server actually need?](#) (provides calculation)
 - Glenn Berry: [Suggested Max Memory Settings for SQL Server 2005/2008](#) (provides good starting estimates)

SQL Server Settings

Configuration Options:

Maximum Degree of Parallelism (MAXDOP)

- What is Parallelism?
 - For expensive queries, multiple threads are used to gather the data quicker



SQL Server Settings

Configuration Options:

MAXDOP

- By default SQL Server can create as many parallel threads as there are processors
- This is great!
 - Multiple threads gathering data means faster queries
- No, Wait...this is a problem!
 - If too many queries are using all of the processors, you can get CPU bottlenecks

SQL Server Settings

Configuration Options:

MAXDOP

- MAXDOP limits the number of processors that are used in parallel plans ([MSDN](#))
- What should my MAXDOP be?
 - Default value for MAXDOP is 0 (Unlimited)
 - Less than 8 logical processors: Keep MAXDOP at or below # of logical processors ([MSDN Guidelines for MAXDOP](#))
 - MSSQLTips: [What MAXDOP setting should be used for SQL Server](#)

SQL Server Settings

Configuration Options:

Cost Threshold for Parallelism ([MSDN](#))

- Determines whether or not a query will go parallel
- The number of seconds that the query optimizer has determined a statement will take based on its execution plan
- Default is 5 seconds (set by [Nick's machine](#))
- Recommended to set higher so smaller queries won't consume multiple threads

SQL Server Settings

Configuration Options:

Cost Threshold for Parallelism

- What should my Cost Threshold for Parallelism be?
 - It depends, every environment will be different
 - Start at 25-50, and tune from there
 - Goal is to allow larger queries to work in parallel, and minimize the number of smaller queries that do
- SQLskills: [Tuning 'cost threshold for parallelism' from the Plan Cache](#) (Query to search the plan cache for existing parallel plans and see the cost associations)

SQL Server Settings

Configuration Options:

```
EXEC sp_configure 'Show Advanced Options', 1  
RECONFIGURE
```

```
EXEC sp_configure 'backup checksum default';  
EXEC sp_configure 'backup compression default';  
EXEC sp_configure 'cost threshold for parallelism';  
EXEC sp_configure 'max degree of parallelism';  
EXEC sp_configure 'max server memory';  
EXEC sp_configure 'optimize for ad hoc workloads';
```

Database Configurations



Database Configurations

Compatibility Level

- Sets database features to be compatible with the specified version of SQL Server ([MSDN](#))

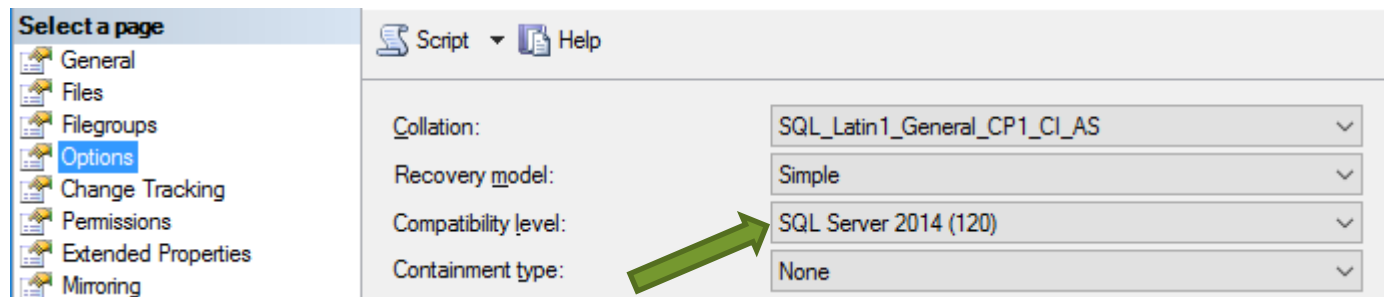
Cardinality Estimator
Change →

Product	Compatibility Level
SQL Server 2017	140
SQL Server 2016	130
SQL Server 2014	120
SQL Server 2012	110
SQL Server 2008	100
SQL Server 2005	90
SQL Server 2000	80

Database Configurations

Compatibility Level

- How do I find my database's Compatibility Level?
 - Query the built in [sys.databases](#) view
 - SSMS > Right click database > Properties > Options



Database Configurations

Files & Sizes

- Do not use the default auto-growth settings
 - **Auto-growth** should be enabled
 - Default settings of 1MB and 10% are way too low for data and log file auto-growth.
 - Set auto-growth defaults to something more appropriate to your workload
 - Paul Randal: [Choosing Default Sizes for Your Data and Log Files](#)
 - **Auto-shrink** should not be enabled for a database
 - Thomas LaRock: [When To Use Auto Shrink](#) (Never!)

Database Configurations

Data & Log Files

- DO NOT shrink a database's **data** file
 - Causes massive fragmentation
 - Should not be part of regular maintenance
 - SQLskills: [Why you should not shrink your data files](#)
 - Brent Ozar: [Stop Shrinking Your Database Files. Seriously. Now.](#)
- Shrinking a **log** file should be avoided and should not be part of regular maintenance

Database Configurations

Data & Log Files

- Only shrink log files if:
 - Log has grown out of control
 - To remove excessive VLF fragmentation
 - MSSQL Tips: [How to determine SQL Server database transaction log usage](#)
 - SQLskills: [Transaction Log VLFs – too many or too few?](#)
- How can I find database file growth settings?
 - SQL Scripts: [Find Data And Log File Information](#)

Database Maintenance



Database Maintenance

Backups

- The frequency of your backup determines the potential data loss if you have to recover from backup
 - Set a Recovery Point Objective (RPO) and let it dictate your backup schedule
 - RPO = the amount of data you are willing to lose
- Don't forget to backup the System databases!
 - What if you have to reinstall everything? (Agent Jobs? Logins? Permissions?)

Database Maintenance

Backups

- Are they valid?
 - Use WITH CHECKSUM option when creating backups
 - Checks for **some** corruption (but not all)
 - MSDN: [Enable or Disable Backup Checksums During Backup or Restore](#)
 - RESTORE VERIFYONLY
 - Verifies the backup is complete and readable but does not restore it ([MSDN](#))
 - RESTORE VERIFYONLY FROM DISK = 'c:\yourdb.bak';

Database Maintenance

Backups

- Types of backups:
 - **Full** - contains all the data in a specific database
 - **Differential** - contains only the data that has changed since the last full backup
 - **Log** - based on the latest full backup, includes all transactions since previous log backup
 - **Full Copy_Only** - A special-use backup that is independent of the regular sequence of backups; used for Ad-hoc backups
 - [MSDN Backup Overview](#)

Database Maintenance

Recovery

- Restore your backups regularly!
 - “If you don't test your backups, you don't have backups, you just have files” – Thomas LaRock
- Be ready for a crisis
 - Know how long it takes to get your hands on the backup
 - Know how long it takes to restore the database and log files to get it current
 - Have your restore scripts tested and ready to go
 - Don't rely on a wizard in a crisis
 - Don't wait until disaster to start Googling

Database Maintenance

Database Integrity Checks

- DBCC CHECKDB ([MSDN](#))
 - Run regularly for corruption check, possibly as part of your backup process
 - Resource intensive! May need to restore the backup on another server and then run DBCC CHECKDB
 - MSSQL Tips: [SQL Server DBCC CHECKDB Overview](#)
- How often should you run it?
 - How much data can you afford to lose?

Database Maintenance

Index Maintenance

- Regular index maintenance is required to keep query performance at optimum levels
- Indexes become fragmented
 - Fragmented Clustered Index = Fragmented Table
 - Fragmented Nonclustered Index = Slower Queries
- SQL Scripts: [How To Find Index Fragmentation](#)

Database Maintenance

Index Maintenance

- Duplicate indexes and unused indexes can hurt!
 - Wasted storage, wasted memory, and bloated backups
 - Can interfere with INSERT, UPDATE, & DELETE operations
- Regular index reviews are required to ensure only valuable indexes are supported and maintained
 - Brent Ozar's [sp_BlitzIndex](#)
 - SQL Scripts: [How To Find Index Usage](#)

Database Maintenance

Statistics Maintenance

- Statistics are used by the Query Optimizer to determine a good execution plan for your query
 - [SQL Server Statistics Basics](#) & [Statistics in SQL Server](#)
- Ensure the following settings on all databases
 - Auto Create and Auto Update Statistics – Enabled
 - Tutorial @ [MSSQL Tips](#)
- Statistics are updated automatically by default, but not as often as they should be
 - Can improve query performance by updating statistics more frequently ([MSDN](#))

Database Maintenance

Backups, Corruption, Indexes, Statistics....

- That's a lot of stuff to keep check on!
- It will take forever for me to integrate this maintenance into my SQL Servers!
- Is there something that can handle this stuff for me?

Database Maintenance

Maintenance Solutions

- Ola Hallengren's Maintenance Solution
 - Backups (with CHECKSUM, VERIFY, COMPRESSION)
 - Integrity Checks
 - Index and Statistics Maintenance
 - All Free!
 - <https://ola.hallengren.com>
- Installation defaults to Master database
 - May want to create a "DBA" database instead

Database Maintenance

Maintenance Solutions

- MinionWare
 - Backups
 - Free w/ Enterprise upgrade option
 - Integrity Checks
 - Free w/ Enterprise upgrade option
 - Index and Statistics Maintenance
 - Free w/ Enterprise upgrade option
 - <http://minionware.net>
- Useful for large environments with lots of servers

Server Maintenance & Monitoring



Server Maintenance & Monitoring

SQL Server Patching

- Why should I keep up to date with the latest Service Packs (SPs) and Cumulative Updates (CUs)?
 - Bug fixes and security updates
 - Recently, SQL Server SP updates have introduced or unlocked new features
 - [SQL 2012 SP4](#) - 24 new features or enhancements
 - [SQL 2014 SP2](#) - 22 new features or enhancements
 - [SQL 2016 SP1](#) - 19 new features added; 12 “Enterprise Only” features enabled for lower versions
- How can I tell what patch level my SQL Server is at?
 - `SELECT @@VERSION`

Server Maintenance & Monitoring

SQL Server Agent Alerts

- Can notify you when internal errors occur
- Set up alerts for Severity Levels 19-25 & 825
 - Fatal errors related to resources, processes, integrity, I/O issues, etc...
- Requires Database Mail and a SQL Agent Operator to be configured
- Step-by-step tutorial @ SQLPerformance.com

Server Maintenance & Monitoring

Monitoring Tools

- SentryOne: [SQL Sentry](#)
 - Additional Free Tools
- Idera: [SQL Diagnostic Manager](#)
 - Additional Free Tools
- Redgate: [SQL Monitor](#)
 - Additional Free Tools
- SolarWinds: [Database Performance Analyzer](#)
 - multi-platform (SQL Server, Oracle, MySQL, etc...)

Thank You!

Eric Cobb

Blog: <http://www.sqlnuggets.com>

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Helpful Resources



Helpful Resources

Ask For Help

- DBA Stackexchange:
<http://dba.stackexchange.com>
- SQL Performance:
<https://answers.sqlperformance.com>
- SQL Server Central:
<https://www.sqlservercentral.com/Forums/>
- Twitter: [#sqlhelp](#)

Helpful Resources

- Reading
 - [Simple Talk](#)
 - [Brent Ozar](#)
 - [SQLskills](#)
 - [SQLPerformance](#)
 - [SQLBlog](#)

Helpful Resources

Training

- [SQLskills](#) (in person - paid)
- [PASS](#) (online - free)
- [SQLsentry.tv](#) (online - free)
- [Microsoft Virtual Academy](#) (online - free)