SQLintersection

Session: Monday, 3:30PM – 4:45PM

SQL Server Performance Tuning: Server and Instance Metrics

Tim Radney
tim@sqlskills.com

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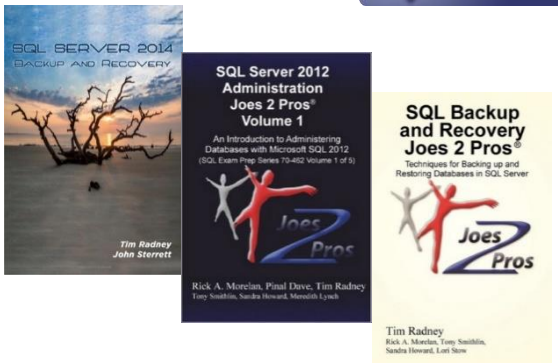
immerse yourself in sql server

Tim Radney



- **Consultant/Trainer/Speaker/Author**
- **Principal Consultant, SQLskills.com**
  - Email: Tim@SQLskills.com
  - Blog: https://www.SQLskills.com/blogs/Tim
  - Blog: http://www.timradney.com
  - Twitter: @TRadney
- **Microsoft Data Platform MVP**
- **Chapter Leader "Columbus GA SQL Users Group"**
- **PASS Regional Mentor "South East USA"**
- **Outstanding PASS Volunteer**
- **Regular presenter at worldwide conferences on administration, disaster recovery and performance tuning.**
- **Friend of Red Gate**
- **(I also like electronics, aquaponics, farming chickens, goats, veggies, and tilapia)**

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Reminder: Intersect with Speakers and Attendees

- **Tweet tips and tricks that you learn and follow tweets posted by your peers!**
  - Follow: #SQLintersection and/or #DEVintersection
- **Join us – Tuesday Evening – for SQLafterDark**
  - Doors open at 7:00 pm
  - Trivia game starts at 7:30 pm

    Winning team receives something fun!
  - Raffle at the end of the night

    Lots of great items to win including a seat in a SQLskills Immersion Event!
  - The first round of drinks is sponsored by SentryOne and SQLskills

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SQLskills immerse yourself in sql server & SentryOne™

Overview

- Statistics
- Index maintenance
- Memory settings
- MAXDOP and cost threshold for parallelism
- tempdb
- Power savings
- Workload tuning

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Having Out-of-Date Statistics

- **Impacts of statistics to the Query Optimizer**
  - The Query Optimizer uses statistics to help choose the execution plan
  - Out-of-date statistics can negatively impact the Query Optimizer from determining a “good enough” execution plan
  - “Auto Update Statistics”
    - Updates after approximately 20% + 500 rows change
  - Trace Flag 2371 (2008 R2+) decreases the threshold of auto update statistics

Having Out-of-Date Statistics

- **Are your statistics up-to-date?**
  - You need a process to manually update statistics
  - sp_updatestats – sample or full scan
  - Database Maintenance Plan – sample or full scan
  - Ola Hallengren – option to update statistics only where row modifications have occurred
    - System databases include MSShippedObjects = 'Y'

Not Having Index Maintenance

- **Fragmentation**
  - Data modifications (insert, update, deletes)
- **Impact of fragmentation on query performance**
  - A whitepaper from Microsoft stated fragmentation can slow down systems from 13% to 460% based on the size of the environment and fragmentation level
  - https://technet.microsoft.com/en-us/library/cc966523.aspx

Not Having Index Maintenance

- **Controlling fragmentation**
  - Rebuild, reorganize or disable-and-rebuild (in a transaction) the index
  - Schedule rebuilds or reorganizations in a maintenance plan <= 2014
  - Schedule rebuilds and reorganizations based on fragmentation levels 2016+
  - Use a custom script in a SQL Agent job such as Ola Hallengren's Index Optimize script
  - Ola Hallengren – to include system databases include MSShippedObjects = 'Y'
  - Use third-party tools

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Max Server Memory

- **Default value is 2,147,483,647**
- **Required on 64-bit systems to prevent memory pressure and out-of-memory conditions**
  - If you do not set a max, SQL Server will consume as much memory as it can
- **This value only applies to the buffer pool in 2008 R2 and below, it does not set the total amount of memory used by SQL Server**
  - Additional memory for thread stacks and multi-page allocators
  - Memory for thread stacks = (max worker threads) x (stack size)

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Max Server Memory

- **(Total system memory) minus (memory for thread stacks) minus (OS memory requirements ~ 2-4GB) minus (memory for other applications)**
- **How we typically do it:**
  - 1GB for each 4GB between 4-16GB
  - 1GB for each 8GB above 16GB in the server
- **If in doubt, err on the lower side**
- **Then monitor Memory\Available Mbytes > 500MB and adjust as necessary**
- **Post: How much memory does my SQL Server actually need?**
  - http://www.sqlskills.com/ie0/instancememory

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Max Degree of Parallelism

- **Defaults to 0**
  - Any parallel query can use up to *n* processors for execution, where *n* is the number of processors available to SQL Server
- **MAXDOP limits:**
  - Maximum number of processors a query can use concurrently
  - Maximum number of threads is more complex:
    - 1 + (number of parallel zones in the plan x MAXDOP)

Max Degree of Parallelism

- **It is recommended to specify a value other than 0**
  - Some applications may mandate a value of 1 (e.g., SharePoint)
  - For non-NUMA systems, set MAXDOP no higher than the number of physical cores, with a maximum value of 8
    - If you have only 4 CPUs, can set to 0 or 2 (it depends on workload)
  - For NUMA systems, set MAXDOP equal to the number of physical cores in a single NUMA node

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Cost Threshold for Parallelism

- **Defaults to 5**
  - When the cost value for a serial plan is above 5, SQL Server may create and execute a parallel plan for a query
- **This value is ignored if there is only 1 CPU available to SQL Server, or if MAXDOP = 1**
- **Typically recommended to increase this to a value of, say, 25**
- **If desired, examine the plan cache to see if this value needs to be adjusted**
  - Post: Tuning Cost Threshold for Parallelism From the Plan Cache
    - http://www.sqlskills.com/ie0/tuningcostthreshold

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Improperly Sized tempdb

- **Special characteristics for tempdb**
  - Recreated at startup
  - Only one tempdb database per instance
  - Modeled after the model database
- **Considerations**
  - With 8 cores or less, create equal-size data files per the number of cores
  - With more than 8 cores, start with 8 equal size data files and increase by 4 files based on contention
  - http://support.microsoft.com/kb/2154845
  - Enable trace flag 1118 always
  - Place data files on separate disk with fast I/O, if needed

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Improperly Sized tempdb

- **SQL Server 2016**
  - Prompts to create equal size data files based on number of logical cores
  - Behavior for trace flag 1117 enabled by default
  - Behavior for trace flag 1118 enabled by default

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Using Balanced Power Savings

- **Power savings has a negative impact for SQL Server**
  - Can under-clock your CPU
  - Not conducive to SQL Server CPU behavior
  - Set power setting to “High Performance” rather than “Balanced Power”
  - Disable power savings in BIOS
  - Free tool CPUz can show clock speed in use
    - www.cpuid.com
  - Other power settings can be bad such as putting a NIC to sleep

Workload Tuning

- **File statistics**
  - http://www.sqlskills.com/blogs/paul/how-to-examine-io-subsystem-latencies-from-within-sql-server/
- **Wait statistics**
  - http://www.sqlskills.com/blogs/paul/wait-statistics-or-please-tell-me-where-it-hurts/
- **High cost queries**
  - http://www.sqlskills.com/blogs/glenn/category/dmv-queries/

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Demo

Finding and changing instance settings, checking file latencies, wait stats, high cost queries

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Review

- Statistics
- Index maintenance
- Memory settings
- MAXDOP and cost threshold for parallelism
- tempdb
- Power savings
- Workload tuning

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Questions?

Don’t forget to complete an online evaluation!

SQL Server Performance Tuning: Server and Instance Metrics

Your evaluation helps organizers build better conferences and helps speakers improve their sessions.

Thank you!

Save the Date

www.SQLintersection.com

Oct 30-Nov 2, 2017

We're back in Vegas baby!

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