SQLintersection

Thursday, 11.30 – 12.45

DBA Mythbusters (Level 2-300)

Paul S. Randal
paul@SQLskills.com

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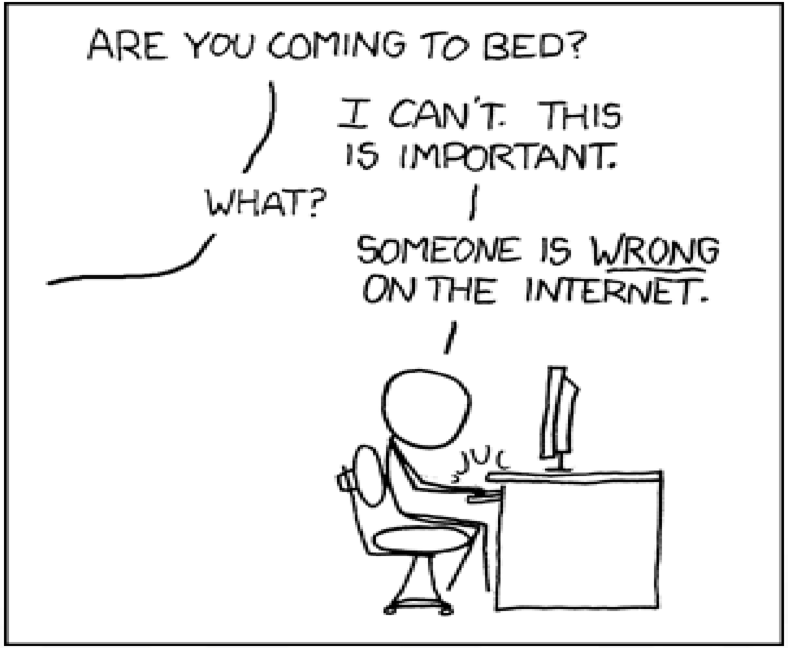
SQLskills
immerse yourself in sql server

This is me: Paul S. Randal

- Consultant/Trainer/Speaker/Author
- CEO, SQLskills.com
  - Email: Paul@SQLskills.com
  - Blog: http://www.SQLskills.com/blogs/Paul
  - Twitter: @PaulRandal
  - 5 years at DEC responsible for the VMS file-system and chkdsk
  - Almost 9 years as developer/manager in the SQL Storage Engine team through August 2007, ultimately responsible for Core Storage Engine
- Instructor-led training (US, UK, Australia), consulting (anything you need)
- Online training: pluralsight hardcore developer training http://pluralsight.com/
- Become a SQLskills Insider: http://www.sqlskills.com/Insider

MVP Microsoft Most Valuable Professional

And This is My Life…


ARE YOU COMING TO BED?
I CAN'T. THIS IS IMPORTANT.
WHAT?
SOMEONE IS WRONG ON THE INTERNET.

Source: http://xkcd.com/386/

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Why Is This Important?

- **Lots of myths and misconceptions have grown and persisted over the years about how SQL Server behaves**
- **Adherence to these misconceptions can lead to:**
  - Bad practices
  - Wasted time and resources
  - Confusion
  - Arguments ☺
- **Five years since I last did Mythbusters sessions and posts…**
  - See http://www.sqlskills.com/blogs/paul/CommonSQLServerMyths.pdf
- **Let's debunk some myths!**

Myth #0

BUSTED!!

- Oracle is much better than SQL Server
- This one's obviously untrue! ☺
- On to the real ones…

Myth #1

BUSTED!!

- Page life expectancy should be around 300

- Page life expectancy measures (in seconds) how long a new page is expected to stay in the buffer pool
  - Also can be thought of as measure of memory pressure on the buffer pool
- Do you think that flushing your 100GB buffer pool every 5 minutes is a sign of a healthy SQL Server?
- That guidance is from 10 years ago!
- Correct PLE is whatever is normal for *your* system
  - If it drops and stays dropped, there’s a problem

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Myth #2

IT DEPENDS !!

- Buffer Manager: Page life expectancy is the best counter to use

- If on a NUMA system, Buffer Manager PLE is the harmonic mean of PLEs from all Buffer Nodes
  - Buffer pool is split into partitions on NUMA system
- Monitor all Buffer Node: Page life expectancy counters
- Example harmonic mean calculation
  - 4 buffer nodes with PLE = 4000, 4000, 4000, 2200
  - Buffer Manager PLE = 4 / (1/(1000x4000) + 1/(1000x4000) + 1/(1000x4000) + 1/(1000x3300)) / 1000 = 3321

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Myth #3

BUSTED!!

- You can offload consistency checks to an availability group secondary

- The AG secondary is on a different I/O subsystem from the primary
- Running consistency checks on the secondary says nothing about the state of the primary
- You need to run consistency checks on the primary and ALL secondaries!

- Same argument holds for trying to offload consistency checks to a mirror, log shipping secondary, SAN mirror, etc. – you can't!

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Myth #4

BUSTED!!

- AG readable secondaries don't cause performance problems

- All queries on a readable secondary are converted to snapshot isolation
- This means 14-byte versioning tags must be present on the secondary
- This means the tags have to be added on the primary
  - As the primary and secondaries are exact physical copies of each other
  - But the tags don't have to be filled in on the primary, just the space needs to be accounted for
- All changes to the primary database will incur a versioning tag which will start to cause page splits and index fragmentation!

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Myth #5

MAYBE !!

- Automatic page repair can instantly fix broken pages

- Applies to database mirroring and availability groups
- The secondary/mirror cannot send the requested page back to the primary unless the page is known to be at the right point in time
  - □ What is the LSN in the primary when it requested the page image?
  - □ Secondary redo queue must be replayed to that LSN
  - □ Otherwise the secondary may be sending back the wrong version of the page

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Myth #6

BUSTED!!

- Using temp tables for intermediate query results is always a good idea

- Creating a temp table to hold intermediate results forces SQL Server to interrupt the data pipeline through a query to persist the results to disk
- Sometimes just doing one query rather than pre-aggregating or pre-sorting can be way more efficient and lead to far lower run time and tempdb usage
- Always compare the methods before production
- And if using temp tables, use minimum amount of data and correct indexes

Myth #7

BUSTED!!

- "Fully logged" means you'll always see one log record for each part of an operation

- Consider a rebuild of a 100,000 row index
  - You would expect to see 100 thousand LOP_INSERT_ROW log records, right?
  - Wrong – it will log about LOP_FORMAT_PAGE log records instead with full page images with the net effect of all the inserts on
- "Fully logged" simply means the transaction log contains enough information to reconstitute the transaction after a crash or restore
- What about TRUNCATE TABLE?

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Myth #8

BUSTED!!

- **NOLOCK / READ UNCOMMITTED means no locks**

- **First off, they're the same thing**
- **And they do have to acquire some locks:**
  - Schema-stability locks (Sch-S) to prevent the structure of the table/index changing
  - BULK_OPERATION locks on heaps to prevent reading of unformatted pages
- **And they still have to take latches to access the physical page images in memory, so there's still some potential for blocking at the latch level**

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Myth #9

BUSTED!!

- You should always plan a backup strategy

- Always plan a *restore* strategy
- Then plan what backups you need to take

- The other way can result in disaster

- Let me tell you a story…

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Myth #10

BUSTED!!

- The best thing to put on SSDs are always tempdb and transaction logs

- Don’t fall into the trap of listening to other people
- Investigate where your biggest I/O subsystem bottleneck is
  - Try to solve it within SQL Server
  - If not, put that on your SSD
- Or design a new I/O subsystem layout to take advantage of the SSD
- What about the RAID level to use?

Myth #11

BUSTED!!

- Using SSDs means you don’t have to care about index fragmentation

- Index fragmentation has two forms:
  - Logical fragmentation that stops efficient readahead
  - Low page density that wastes space
- SSDs make reads faster, but still a trip down/up I/O stack for each one
- SSDs don’t stop page splits from happening
  - Lots of extra transaction log
- SSDs don’t stop low page density from happening
  - Wasted disk space, wasted buffer pool memory

Myth #12

BUSTED!!

- Adding more memory is always a good idea

- Consider some of the potential problems
  - □ Shutting down the instance will take longer
  - □ P.O.S.T. of the server will take longer
  - □ Allocating buffer pool memory may take longer (see KB article 2819662)
  - □ Warming up the buffer pool will take longer
  - □ Could lead to complacency

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Myth #13

BUSTED!!

- Shrinking tempdb can cause corruption

- KB article 307487 was updated in 2014
- No problems with shrinking tempdb since SQL Server 2000
- However, just because you can, doesn't mean you should…
- And be aware of what happens to tempdb size on a server restart

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Myth #14

BUSTED!!

- **DBCC CHECKDB runs when SQL Server starts up**

- **The messages in the error log are confusing:**
  - 2015-05-15 13:16:20.07 spid7s   CHECKDB for database 'master' finished without errors on 2015-05-01 09:59:42.447 (local time). This is an informational message only; no user action is required.
- **This is just reporting the time that DBCC CHECKDB last completed without finding any errors**
  - Stored in the boot page of the database (file 1, page 9)
  - Check with DBCC TRACEON (3604); DBCC DBINFO;

Myth #15

BUSTED!!

- Rebuilding indexes solves performance problems even when there's no index fragmentation

- It's the query plan recompilation that 'fixes' the performance problem
- Rebuilding an index causes plan recompilation for plans on that table
- If a poor query plan had resulted (e.g. from parameter sniffing), the next plan to be compiled might be better
- Also, updating statistics in 2012+ doesn't invalidate plans if no table rows changed (this is a good thing!)

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Myth #16

MAYBE !!

- Adding an extra file to tempdb will help solve contention issues

- Adding an extra file means SQL Server can alternate between the files
- But allocation also takes into account proportional fill
  - It will allocate proportionally more from files with more free space
- If the existing file is quite full, the new file becomes allocation hot spot
  - No alleviation of contention issues!
- Make sure to take that into account when working with tempdb

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Myth #17

BUSTED !!

- Lots of OLEDB waits always means linked-server problems

- OLEDB waits mean that the OLE-DB protocol is being used
  - OLE-DB is not just used by linked servers
- How long are the waits?
  - 0 – 1-2ms = not linked servers
  - 10s or 100s of ms are likely to be linked servers

Myth #18

BUSTED !!

- ASYNC_NETWORK_IO waits always means network problems

- Rare for it to be the network
- The word NETWORK is horribly misleading in the name
- More likely the application doing RBAR processing

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Myth #19

BUSTED !!

- CXPACKET waits mean disable parallelism

- Check you expect parallelism for that query
- Check you don't have skewed parallelism
- Consider altering MAXDOP for query
- Consider setting server MAXDOP (8 or number of cores in a NUMA node)
- Consider using Resource Governor
- Better: increase 'cost threshold for parallelism'

Myth #20

BUSTED !!

- Checkpoints only write committed changes to disk
- Checkpoint writes all pages marked dirty regardless of whether the change was made by a committed or uncommitted transaction
  - Crash recovery takes care of fixing things up if there’s a crash
- Use sys.dm_os_buffer_descriptors to examine the relative proportion of dirty vs. clean pages in the buffer pool

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Myth #21

BUSTED !!

- DBCC DROPCLEANBUFFERS flushes the buffer pool

- Look at the name carefully – drop clean buffers
- It doesn't flush dirty pages
- You have to do a checkpoint for that, and then DROPCLEANBUFFERS

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Myth #22

BUSTED !!

- Tempdb data files should be 1:1 with processor cores

- SQL Server 2000: rule was #files = #logical processor cores, and TF 1118
  - E.g. my laptop CPU has 4 physical cores plus hyperthreading = 8 logical cores
- SQL Server 2005 onwards: Microsoft guidance was same until 2011
  - Everyone else said to start with ¼ to ½ the number of logical processor cores
- Universal guidance now in KB article 2154845
  - < 8 cores, start with #files = #cores
  - > 8 cores, start with #files = 8
  - Increase in blocks of 4 if still seeing contention

Myth #23

BUSTED !!

- Multiple log files will help performance

- SQL Server will always use log files sequentially
- You may see them all having I/Os, but that’s just updating the file header pages
- The only time another log file is needed is if the first one fills up and cannot grow, you cannot take a log backup, and you do not want to break the log backup chain
- Remove additional log files once you don’t need them

Myth #24

BUSTED !!

- The log should always be as small as possible

- The log needs to be as big as it needs to be
- Do not regularly shrink the transaction log
  - It'll just have to grow again, and can't use instant initialization
- How big should the log be?
  - Single largest transaction (ETL, large index rebuild, large update)
  - Asynchronous database mirroring/AG SEND queue
  - How long is the longest data backup?
  - Transactional replication (beware of CDC too)

Myth #25

- It depends

YES, IT REALLY DOES!!

- The answer to all questions about SQL Server that do not have obvious yes/no answers always starts with ‘it depends’
- The trick is then to explain *why* it depends, *what* it depends on, and *when* it depends
- Don't accept ‘it depends’ as an answer with no follow-on explanation

NOOOOOOOO!!

- One exception: should auto-shrink be enabled?

Plenty More Myths Around…

- **Repair**
  - It can fix everything
  - Safe to repair system databases
  - SQL Server causes corruptions
  - Corruptions can disappear
- **Performance**
  - You can't override MAXDOP
  - Always use data compression
  - Nested transactions exist
- **The transaction log**
  - Log records can move
  - The log is zeroed when cleared
  - BULK_LOGGED lowers backup size
- **High availability**
  - Just use a cluster
  - Replication isn't an HA solution

ALL BUSTED !!

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Summary and Resources

- Make sure you corroborate what you read online
- If something sounds fishy, try it yourself!

- Blog:
  - http://www.sqlskills.com/blogs/paul/category/misconceptions/
- Pluralsight
  - SQL Server: Myths and Misconceptions

Questions?

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Thank you!