SQLintersection

DBA Mythbusters (Level 2-300)

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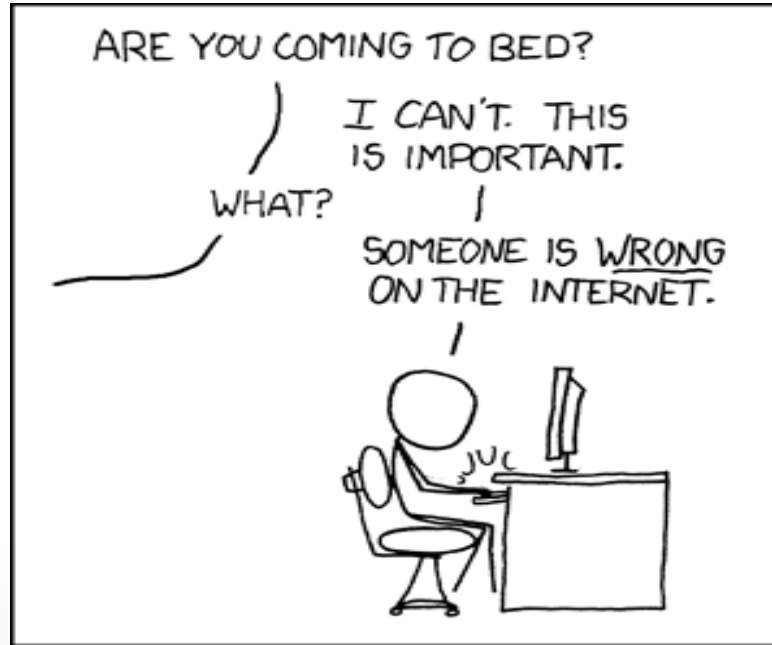# This is me: Paul S. Randal

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And This is My Life...

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

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 ☺
- **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…**

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Myth #1

B U S T E D !!

- **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 12 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

B U S T E D !!

- **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

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

B U S T E D !!

- **"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 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…**

Myth #10

B U S T E D !!

- **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?**

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Myth #11

B U S T E D !!

- **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

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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:**
  - 2017-10-15 13:16:20.07 spid7s   CHECKDB for database 'master' finished without errors on 2017-10-13 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;

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Myth #15

B U S T E D !!

- **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**

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**
- **Or the application server running slowly**
- **But it could be from using MARS in SQL Server**

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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**
- **Best option: increase 'cost threshold for parallelism'**
- **Set server MAXDOP to 8 or number of physical cores in a NUMA node**
- **Consider using Resource Governor**

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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**
- **2016 changes the default checkpoint mechanism**

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

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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**

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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)

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Myth #25

YES, IT REALLY DOES!!

- It depends

- 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

NOOOOOOOOO!!

- One exception: should auto-shrink be enabled?

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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?

Don't forget to complete an online evaluation!

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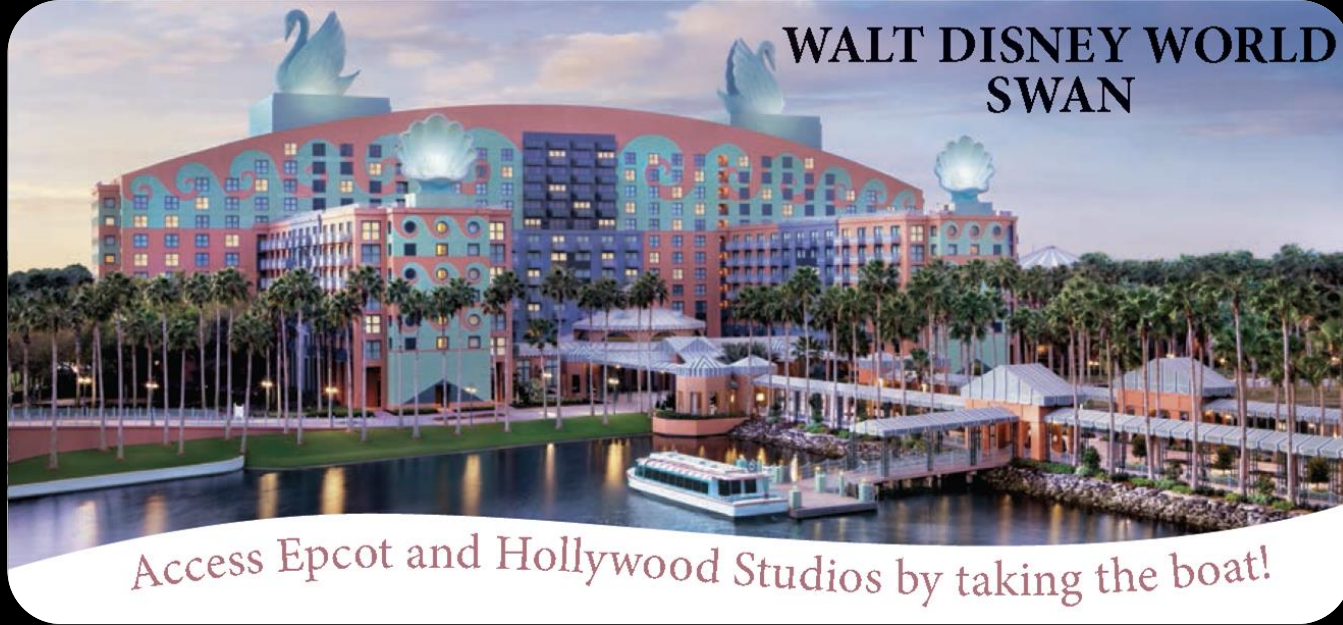
Thank you!

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