(January 15th, 2019)

If you know someone who would benefit from being an Insider, feel free to forward this PDF to them so they can sign up here.

Note: As an Insider, you can read all prior Insider newsletters here.

Quick Tips for our Insider friends!

Hey Insiders,

Happy New Year!

This newsletter is coming to you from Redmond, where we're home until April, working hard on new content and enjoying the crisp, clear weather. Check out the #TBT section, where I've got links to thirteen cool SQL Server blog posts the team has published since the last newsletter!

And as a regular tradition I published my traditional end-of-year blog posts:

- *2018: the year in books – a new record!*
- *2018 review: the year by the numbers*

Start your New Year off with some training – from the comfort of your own location! See below…

And if you're in Europe, also check out Erin's SQLBits precon on February 27th!

SQLskills News

Glenn's latest Pluralsight course has been published! It's called ***SQL Server 2017: Diagnosing Performance Issues with DMVs***. Check out the details here.

Live, ONLINE classes: we're delivering six online classes running in the first quarter of 2019! It's the perfect way to keep learning, keep your systems moving forward, and stay motivated! And our format is receiving rave reviews: each class is held over three, *slightly-longer-than-half* days with a combination of lecture/demo and open Q&A. It's where you can really get your questions answered! Our online course line-up is as follows and now includes a **new class on columnstore indexes** taught by Jonathan:

- **IEQS**: Solving Common Performance Problems with Query Store
  - January 15-17 (started today)
- **IEPUM2017**: Planning and Implementing an Upgrade/Migration to SQL Server 2017
  - January 29-31
- **IEQUERY**: Fixing Slow Queries, Inefficient Code, and Caching/Statistics Problems

    - February 12-14
- **IETLB**: Transactions, Locking, Blocking, Isolation, and Versioning
    - February 26-28
- **IEVLT**: Very Large Tables: Optimizing Performance and Availability through Partitioning
    - March 12-14
- **IECS**: Columnstore Indexes
    - March 26-28 **** NEW ****

These classes will be delivered live from 10am-3pm PST, Tuesday-Thursday for three consecutive days. In total you'll receive roughly 12-13 hours of content including open Q&As, which is similar to two, full, workshop days without leaving the comfort of your home/office! And by dedicating only 3 half-days of your time you still have time to be productive to your company by getting regular work done. Finally, you'll also receive **lifetime** access to the recordings – for reviews and refreshers, you get amazing ROI!

The classes are priced at US$699 each (US$599 for past attendees) and we're offering a combo package of any three for US$1,749. You can find all the logistical, registration, and curriculum details by drilling down from the class schedule page here.

Live, IN-PERSON classes: we're back in Chicago in April/May 2019 and our classes are open for registration, including a **new class on Power BI** taught by Tim:

- IEPTO1: Performance Tuning and Optimization – Part 1
- IEPTO2: Performance Tuning and Optimization – Part 2
- IECAG: Clustering and Availability Groups
- IEPowerBI: Power BI, Power BI Report Server, and SSRS **** NEW ****
- IE0: Junior/Accidental DBA
- IEUpgrade: Upgrading and New Features
- IEPML: Practical Machine Learning
- IEAzure: Azure SQL Database, Azure VMs, and Azure Managed Instance

You can find all the logistical, registration, and curriculum details by drilling down from the class schedule page here.

Finally, even if you can't join us in person, I've put out a call for **2019 remote user group sessions** and we've got 29 scheduled this year already! If you'd like one of us to present for your user group, check out my blog post here.

Book Review

The last two books I read in 2018 were both really excellent…

Firstly, Dava Sobel's *A More Perfect Heaven: How Copernicus Revolutionized the Cosmos*, book #100 for 2018, equaling my record set back in 2009. I really enjoyed Sobel's *Longitude* when I read it in 2000, so was looking forward to this book, and I wasn't disappointed. It tells the story of Copernicus's *On the Revolutions of the Celestial Spheres*, which describes the heliocentric view of the solar system instead of the Ptolemaic Earth-centric view. It covers Copernicus's ecclesiastical life, his relationship with the young mathematics professor Rheticus, and the eventual publication of the book and its ramifications. Unusually, the center of the book is written as a play, with Sobel imagining the dialogues between Rheticus, Copernicus, and a few other contemporaries, but it works well.

Secondly, Katie Hafner and Matthew Lyon's *Where Wizards Stay Up Late: The Origins Of The Internet*, book #101 for 2018, setting a new record for me. This is a great book that recounts the creation of the Arpanet by the consulting firm Bolt, Beranek, and Newman, which eventually led to NSFNET and the wider Internet. Back in the early '90s while I was doing my CS/EE degree in Edinburgh, I actually read many of the original RFCs for fun. Corrected a few misconceptions I had, including that it was developed as a way for a command-and-control network to survive a nuclear attack (wrong, it was to join together computing resources for researchers) and that the original nodes were based on DEC machines (wrong, they were Honeywell machines).

Both books are highly recommended!

The Curious Case of…

This section of the newsletter explains recent problems we've helped with on client systems; they might be something you're experiencing too.

I had an email last week from someone who was very concerned about the potential for EX latch contention on the *ACCESS_METHODS_HOBT_VIRTUAL_ROOT* latch (see here). Their concern was that when the EX latch is required, all other access to the index stops, because all accesses to an index need to find the page ID of the index's root page (which that latch protects).

I explained that the EX latch is only needed when the root page ID changes, and that only happens during regular operations when the root page has to split and the index becomes another level deeper. This is a rare operation, as indexes don't get deeper very often, and so contention for the latch when a thread is holding it in EX mode will also be rare.

As a nonsensical example, let's pretend your unique nonclustered index key size is 1,700 bytes (the maximum from SQL Server 2016 onward) and you have 1 billion rows. Each page can hold at most 4 records, and the index tree levels can also only hold 4 records (so the 'fanout' is 4). 1 billion records therefore require:

- 250,000,000 leaf level pages at level 0, tracked by
- 62500000 pages in level 1, tracked by

- 15625000 pages in level 2, tracked by
- …
- 15 pages in level 12, tracked by
- 4 pages in level 13, tracked by
- 1 page at level 14

So with at most 14 root page splits, that's only 14 times the EX latch is required during 1 billion inserts.

The problem here isn't the EX latch, it's the huge nonclustered index key! See my blog post *On index key size, index depth, and performance* for more information.

Bottom line: As the old saying goes, the more you know, the further you'll go ☺

Paul's Ponderings

(This editorial is adapted from my traditional first-newsletter-of-the-year editorial that I've been doing since 2014.)

At the start of every New Year it's always tempting to come up with a series of resolutions about things you're going to start doing, and it's tempting for me to write an editorial about planning to do new things. It's really easy to come up with ideas for cool things to *start* doing, which is why it's the easy route to take at the start of a new year.

But before you go too crazy with new ideas, consider a post mortem of your goals and plans from 2018. Look back at the year and see what didn't go well, and then figure out how to improve on those things. In my opinion, that's going to have a more positive effect on your life than continuing to do poorly on those things, and also try to add new things as well. (From 2014 to 2016, Kimberly commented *"the SQL development team could learn from this too…",* but with SQL Server 2016, they really did go back and fix a bunch of things that were broken or outdated.)

During 2015, one of the things I had reinforced through the year while I mentored folks in the SQL community is that *everyone* has something with which they need help or advice, and I continue to swap emails with a few mentees when they ask for advice (in the years since 2015). I strongly advise you to get a mentor outside your management chain (and preferably outside your company) – someone to whom you can bounce questions and one that has no vested interest – other than just helping you out.

And I'm not just talking about things in your work life; I'm also talking about things in your personal life. Here are some examples of things to think about and consider improving upon for 2019:

- Your work/life balance
- The support your immediate manager gave you
- Your interactions with some of your colleagues
- Your interest in some aspects of your job
- Your career/skills development
- Resistance to change
- Keeping on top of performance fires
- Keeping track of goals and to-do lists
- Saying 'no' when you're already overloaded
- Accepting a poor status quo at work instead of looking for a better job
- Finding time for disaster recovery planning/testing
- Finding time for all the little things that it's easy to procrastinate about
- Finding time for your hobbies
- Finding time and motivation to become/stay healthy
- Keeping in touch with old friends and distant family
- Finding time to reads some books or learn something new that's non-work
- Your work/life balance (again, because it's *so* important)

All of these can cause significant amounts of stress, so fixing them should be the first priority. Only once you have these items fixed, should you embark upon new and additional goals!

(Kimberly added: *And, don't get us wrong, this is just as hard for us as it is for you! And we both failed miserably at a couple of our goals too. But, we just have to look back and see why – and work to make it better from here. No reason to dwell, only to improve!*)

Call to action: Before you set cool, new goals for 2019 (whether at work or at home), do a post-mortem and work to fix the stuff from 2018 that was broken or didn't go so well. Not only will it feel good but it'll also reduce stress. And try to get a mentor!

Glenn's Tech Insights

This section of the newsletter highlights recent news and views from the hardware and Windows worlds that we think will be interesting to SQL Server community members.

Early Leaks about 7nm AMD Ryzen 3000 Series Processors

On January 2, 2019, a Russian retailer leaked the full model line and specifications for AMD's upcoming 7nm Ryzen Zen2 mainstream desktop processors, which range from the 6 core/12 thread Ryzen 3 3300 (with a base clock of 3.2 GHz and Turbo clock of 4.0 GHz) to the 16 core/32 thread Ryzen 9 3800X (with a base clock of 3.9 GHz and Turbo clock of 4.7 GHz). These processors are supposed to work with existing AMD AM4 socket motherboards.

The model numbers and specifications in this leak align pretty closely with what was leaked on YouTube by AdoredTV a few weeks ago, along with more current speculation on December 31. The Scottish analyst behind AdoredTV has a very good track record for AMD-related leaks. We will find out the truth behind all of this speculation on January 9, 2019, when AMD President and CEO Dr. Lisa Su presents the corporate keynote at the CES 2019 show. She is probably going to formally announce introduce these processors during the keynote.

If the specifications (and performance) of these upcoming AMD mainstream desktop processors lives up to the hype (which I think is pretty likely), then Intel is going to be under even more competitive pressure, which is very good for consumers. For example, we may actually see the 12 core/24 thread 7nm Ryzen 7 3700X having better single-threaded performance than the 8 core/16 thread Intel Core i9-9900K, along with a significant core count advantage and roughly equivalent pricing.

Possible Windows Kernel Performance Issue with AMD EYPC and Threadripper Processors

Wendell at Level1Techs has done some pretty extensive testing and troubleshooting on AMD Ryzen Threadripper 2990WX and AMD EPYC 7551 systems to try to figure out why these systems often see some very significant performance regressions on some benchmarks on Windows vs. on Linux.

The initial assumption when the 32 core/64 thread AMD Ryzen Threadripper 2990WX was first released was that these performance issues were because that processor only has four memory channels that are unequally spread across four "chiplets" (with eight cores each), so that two of the chiplets don't have direct access to memory (so they have to cross an Infinity Fabric link).

Further testing has shown that the same slowdowns happen (on Windows) with the server-class AMD EPYC 7551 processor that has eight memory channels (each chiplet has two channels that connect to its own memory). Even more testing reveals that both of these processors have excellent performance on Linux on these same cross-platform benchmarks.

The current theory is that this may have been caused by a previous Windows hotfix for Extreme Core Count (XCC) Intel Xeon processors that ended up causing this issue for both the high-end AMD Ryzen Threadripper and for the AMD EPYC processors. Jeremy Collake has developed a utility that seems to correct this issue (and the linked page also has more details about the issue and the fix)

You can read more about this here and here, or watch Wendell's YouTube video here.

#TBT

(Turn Back Time…) This section highlights some older resources we've referred to recently that you may find useful, plus blog posts we've published since the previous newsletter.

Our first Pluralsight course of the year is on DMVs, so that's the theme for this TBT:

- Glenn's course: *SQL Server 2017: Diagnosing Performance Issues with DMVs*
- Glenn course: *SQL Server 2017: Diagnosing Configuration Issues with DMVs*
    - *(These replace Glenn's three DMV courses from 2014)*
- Glenn's monthly-updated DMV queries
    - Covering SQL Server 2014-2019 plus Azure SQL Database

Here are a few of the blog posts we've published since the last newsletter:

- Paul: *2018: the year in books – a new record!*
- Paul: *2018 review: the year by the numbers*
- Glenn: *More CPU Competition Coming for Intel*
- Glenn: *SQL Server Diagnostic Information Queries for January 2019*
- Glenn: *New Year Technology Maintenance*
- Glenn: *How to Check if Your Processor Supports Second Level Address Translation (SLAT)*
- Glenn: *Performance and Stability Related Fixes in Post-SQL Server 2014 SP3 Builds*
- Glenn: *SQL Server 2014 Service Pack 3 CU1 Released*
- Jonathan: *Availability Group Readable Secondaries – Just Say No*
- Jonathan: *CPU Ready Impact on SOS_SCHEDULER_YIELD*
- Jonathan: *Improve Performance of UDFs with NULL ON NULL INPUT*
- Erin: *Workload Tuning Training*
- Erin: *Different Query Store Settings for a Database in an Availability Group*
- Erin: *Handling Dates in Query Store*
- Erin: *Using Track Causality to Understand Query Execution*

I hope you find these useful and interesting!

Video Demo

The video demo this time is from Glenn's brand new Pluralsight course *SQL Server 2017: Diagnosing Performance Issues with DMVs*. In the demo he demonstrates his DMV query to show all the missing indexes in all databases on the instance, and how to determine which ones might be worth creating.

The video is about 4 minutes long and you can get it here.

Enjoy!

Upcoming SQLskills Events

Our first set of 2019 live, in-person events has been announced for Chicago in April/May and we've also published our full 2019 Q1 lineup of live, online classes.

Each and every event has a different focus as well as different benefits – from deep-technical training in our Immersion Events to wide-ranging topics at SQLintersection where you can learn more effectively how to keep moving forward in both your environment and your career! And, of course, one benefit you'll always get from in-person events is networking; we hope to meet/see you at an event soon!

To help your boss understand the importance of focused, technical training, we've also added a few items to help you justify spending your training dollars with us:

- Letter to your boss explaining why SQLskills training is worthwhile
- So why do you want to come to our training? And the winners are…
- Community blog posts about our classes
- Immersion Event FAQ

LIVE, ONLINE Immersion Events:

- **IEQS**: Immersion Event on Solving Common Performance Problems with Query Store
  - January 15-17 (started today)
- **IEPUM2017**: Immersion Event on Planning and Implementing an Upgrade/Migration to SQL Server 2017
  - January 29-31
- **IEQUERY**: Immersion Event on Fixing Slow Queries, Inefficient Code, and Caching/Statistics Problems
  - February 12-14
- **IETLB**: Immersion Event on Transactions, Locking, Blocking, Isolation, and Versioning
  - February 26-28
- **IEVLT**: Immersion Event on Very Large Tables: Optimizing Performance and Availability through Partitioning
  - March 12-14
- **IECS**: Immersion Event on Columnstore Indexes
  - March 26-28 **** NEW ****

LIVE, IN-PERSON Immersion Events:

Chicago, IL, April/May 2019

- **IEPTO1**: Immersion Event on Performance Tuning and Optimization – Part 1
  - April 29-May 3
- **IECAG**: Immersion Event on Clustering and Availability Groups
  - April 29-30
- **IEPowerBI**: Immersion Event on Power BI, Power BI Report Server, and SSRS
  - April 29-30 **** NEW ****
- **IE0**: Immersion Event for the Junior/Accidental DBA
  - May 1-3
- **IEUpgrade**: Immersion Event on Upgrading SQL Server
  - May 1-3
- **IEPTO2**: Immersion Event on Performance Tuning and Optimization – Part 2
  - May 6-10
- **IEPML**: Immersion Event on Practical Machine Learning
  - May 6-10
- **IEAzure**: Immersion Event on Azure SQL Database, Azure VMs, and Azure Managed Instance
  - May 6-9

Click here for the main Immersion Event Calendar page that allows you to drill through to each class for more details and registration links.

Summary

We hope you've enjoyed this issue - we really enjoy putting these together.

If there is anything else you're interested in, we'd love to hear from you - drop us a line.

Thanks,
Paul and Kimberly

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