BRENT OZAR
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Mastering Index Tuning

Up first: intros, logistics, and kicking off your first lab.

1.1 p1

BRENT OZAR
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99-05: dev, architect, DBA
05-08: DBA, VM, SAN admin
08-10: MCM, Quest Software
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My job: 2-day SQL Critical Care®

Day 1, morning: rapidly assess a single SQL Server, database indexes, queries running against it, team

Day 1 afternoon & day 2 morning: write findings

Day 2 afternoon: deliver findings & training to get the team out of the emergency, quickly

This class: sharing my index techniques, experiences

I'll show you with lectures + labs.

This isn't about theory: it's about practice.

We'll step through this cycle repeatedly:

1. Lecture: you watch me for 1-2 hours
2. Hands-on lab: you spend 1 hour working on a lab about the concepts you just saw
3. I do the lab: you watch me spend 30-45 minutes on that same lab so you can check your work

Questions? Problems?

Leave a comment on the relevant module.

I answer those within a day or two.

For private help after finishing the class,
email Help@BrentOzar.com with:

- A note that you finished this class
- sp_Blitz @CheckServerInfo = 1
- sp_BlitzFirst @SinceStartup= 1

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This morning's cycle

1. Lectures & demos:
    1. My D.E.A.T.H. method for index tuning
    2. Do the D.E. parts on paper
    3. Understand the problems with the index usage DMVs
    4. See how sp_BlitzIndex displays those DMVs
2. Lab & lunch:
   you clean up indexes on an over-indexed server
3. Right after lunch: I do the same lab you just did

Then the cycle starts again.

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Continuing on this week

Adding indexes by interpreting the DMVs carefully

Tuning indexes for specific scenarios like:

- Blocking
- Small filters of a large table
- Reporting aggregates
- Non-sargable predicates
- Foreign keys & check constraints

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About my lab environment

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VMs I use

AWS i4i.xlarge:

- 4 cores so queries can go parallel
- ~32GB RAM so queries get workspace memory
- All solid state storage to create & test indexes fast

Installed & updated: SQL Server 2022, SSMS 19, First Responder Kit scripts

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Rules we're breaking

"Never remote desktop into the SQL Server."

"Never run SSMS on the SQL Server itself."

"Don't run applications on the SQL Server."

None of those are the root cause for the performance issues you'll be seeing.

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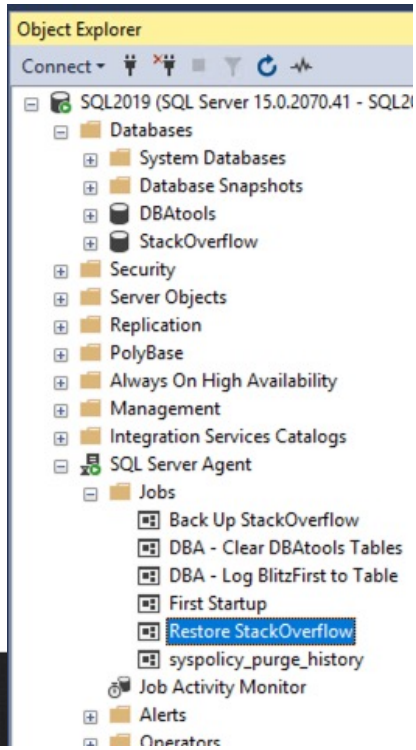
When you hit a problem

1. Close SQLQueryStress (end-task it if you have to)
2. Use the Agent jobs to restore your database if you have to (15min.)

Don't try to restart the lab: you won't have time.

Just set up for the next lab.



In this class, I don't put any land mines in the *server setup.*

SQL Server default setup, plus a few good tweaks:

- Cost Threshold for Parallelism = 50
- MAXDOP = 4
- StackOverflow in latest compat mode
- Databases in simple recovery model

You can change these if you like, but server changes aren't the point of this class.

I put a lot of land mines in the *T-SQL code and indexes.*

You can't really fix these with hardware.

In this class, solve problems by tuning indexes.

(There will be some labs where you'll have to change code to get the indexes to work, but start with index tuning alone.)

The database: StackOverflow.com

Q&A site: you ask, other people do your job

Database is available under Creative Commons

Download it via BitTorrent:
BrentOzar.com/go/querystack

I've added a lot of indexes.

Just like in the real world, you've inherited this database from "the last person."

Your first lab is going to involve figuring them out.

To do that, we need to have a running workload.

Let's go set up your first lab!

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We need a running workload.

In your midday lab, you'll be analyzing DMVs.

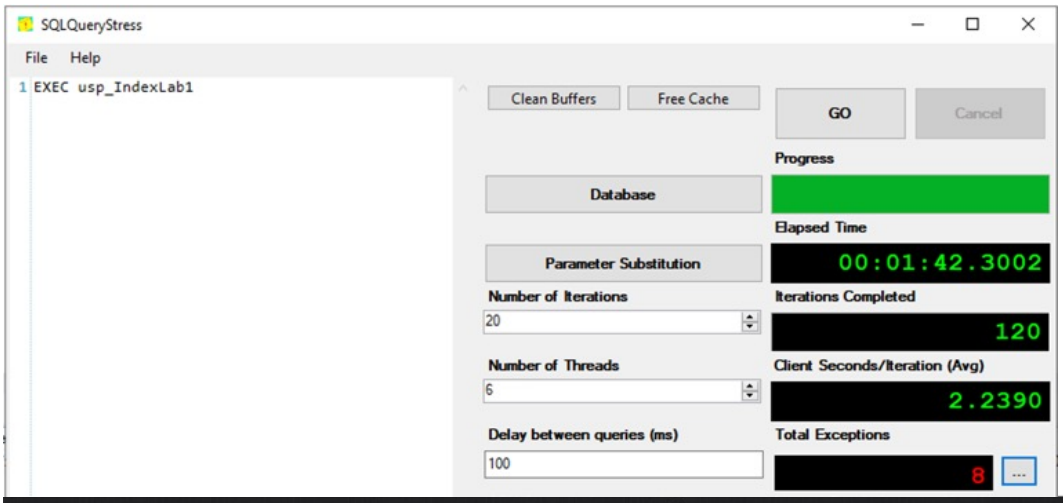
To do that, we need real workloads doing selects, inserts, updates, and deletes.

(This is also why tools like sp_BlitzIndex don't work very well in development & offline environments: none of the indexes are really getting used.)

Labs 1, 2, & 3 use the same SQL:

1. If you've been playing around adding/dropping indexes, restore your StackOverflow database
2. Copy & run the setup script for Lab 1
3. Start SQLQueryStress:
    1. File Explorer, \Labs, double-click SQLQueryStress.exe
    2. Click File, Open, \Labs\IndexLab1.json
    3. Click Go

What SQLQueryStress is



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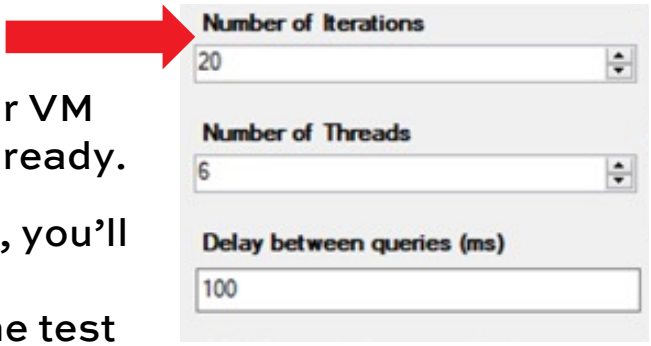
Set iterations to 100000.

Set this to 100000.



This makes sure your VM stays busy til you're ready.

For the success test, you'll be using the regular iterations to see if the test completes quickly enough.

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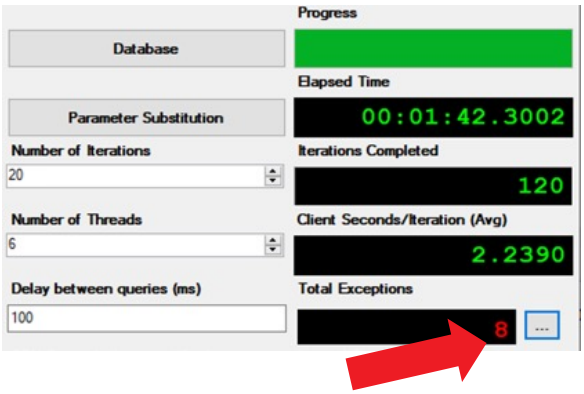
A few errors are okay.
100% error rate is not.

OK errors:

- Divide by zero
- Transaction count
- Deadlock

But if you get errors about procs not being found or syntax errors, stop and ask for help, include screenshots.



You can stop it at any time.

You don't need the queries running live as you work for labs 1-3. (Lab 4 will be different.)

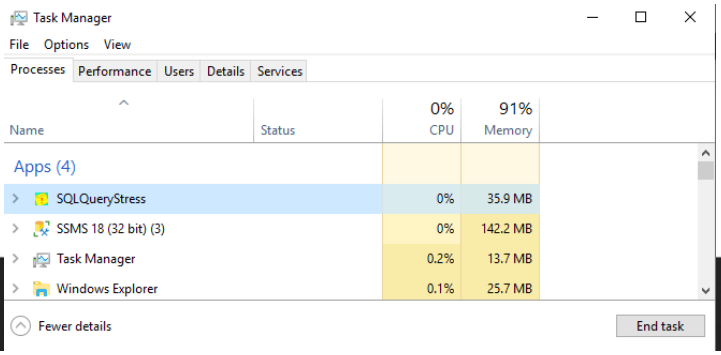
Click Cancel on SQLQueryStress whenever you want: you don't have to wait for it to finish the lab.

Just let it run for at least ~30 minutes to build up data in your index usage DMVs.

Sometimes, it goes rogue.

Sometimes you'll cancel it and close it, but it will keep running in the background, headless.

Go into Task Manager to make sure it's not there.
If it is, end-task it a couple of times to kill it.



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Set yours up now.

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