PERFORMANCE TUNING

Get Big Bang For Your Buck

SIMPLE CHANGES
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PRESENTATION RULES

Always Ask Questions

Interrupt Me

This is a two-way conversation, let’s learn from each other’s experiences.
Start with the basics.

BEST PRACTICES
POWER PLAN

Windows Control Panel Power Options

Choose or customize a power plan

A power plan is a collection of hardware and system settings (like display brightness, sleep, etc.) that manages how your computer uses power. Tell me more about power plans

Preferred plans

- Balanced (recommended)
  - Automatically balances performance with energy consumption on capable hardware.

- High performance
  - Favors performance, but may use more energy.

See also

User Accounts
SERVICES

Why are you running this?
PATCHING

Build List
https://sqlserverbuilds.blogspot.com/

- Bug Fixes
- Performance Degradations
- Improvement
  SQL 2016 SP1 Optimizer
- Windows Patches
- Drivers on VM and NICs
- Support
  Microsoft Support

Drivers on VM and NICs

Windows Patches

Bug Fixes
Performance Degradations

Improvement
SQL 2016 SP1 Optimizer

Support
Microsoft Support
MEMORY
Proper configuration is vital

- Min and Max Memory
- Multiple Instances
- Extra Services SSRS, SSIS, SSAS
- Lock Pages in Memory *
- Set Memory Reservation for Your VM on Host
- Don’t over allocate!
TEMPDB

Everything Uses TEMPDB Make sure you don’t ignore it.

Pin to High Performing Disk

Multiple Files
1 file per CPU core up to 8 files

Traceflag 1118/1117
Pre 2016

Trace Flag 2453 to allow table variables to trigger recompile

Heavy Contention
2016-2017 fixed in CU 8 and CU 5
MAKE FRIENDS WITH NETWORK & STORAGE ADMINS

Their baby might be ugly
VIRTUAL ENVIRONMENTS

Over Provisioned Hosts

- Too Many VMs on One Host
- What Happens on One VM Now Effects Another
- VM Over/Under CPU Allocation
- Thin Provisioning
Row/Page Compression - More Data In MEMORY

Backup Compression: Less Data in STORAGE

COMPRESSION
More data in memory – It’s the GOLDEN EGG!
ALLOW SNAPSHOT ISOLATION & READ COMMITTED SNAPSHOT ISOLATION (RCSI)

RCSI option
Allows access to versioned rows under the default READ COMMITTED isolation level.
If set to OFF, you must explicitly set the level for each session in order to access versioned rows.

Ta-dah!
READERS CANT BLOCK WRITERS AND WRITERS CANT BLOCK READERS
<table>
<thead>
<tr>
<th>Maintain</th>
<th>Keep These Up To Date!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Updates</td>
<td>Sync vs Async</td>
</tr>
<tr>
<td>Trace Flags</td>
<td>Trace Flag 2371</td>
</tr>
<tr>
<td>Missing Stats</td>
<td>Did You Know You Can Make Your Own?</td>
</tr>
</tbody>
</table>

This is the magic sauce that helps the optimizer.

Defaulted in SQL 2016
## PARALLELISM

**CAUTION:** Using too many cores = more overhead to put things back together

### MAX Degree of Parallelism (MaxDop)

<table>
<thead>
<tr>
<th>&gt;= 8 maxdop 8 or lower</th>
<th>&lt;8 logical processors match number of logical processors or lower</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can specify maxdop for individual statements as a query hint.</td>
<td>CAUTION Changes Flushes Procedure Cache</td>
</tr>
</tbody>
</table>

### Cost of Parallelism Threshold (CoPT)

<table>
<thead>
<tr>
<th>“Cost” over this value qualifies for multiple processors to execute</th>
<th>Process Count defined in MaxDop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good start is 35-50 *Keeps small queries single threaded</td>
<td>Watch for CXPACKET waits too many then adjust CoPT higher*</td>
</tr>
</tbody>
</table>
INSTANT FILE INITIALIZATION (IFI)

Initialized instantaneously to avoid zeroing operations/ Reclaims used disk space

Add Data/Log Files

FAST EXECUTION On Data Files (Azure includes logs)

Create Database

Increase File Size & Autogrowth

SQL Server service account Perform VolumeMaintenance Tasks security policy in windows.
MINIMAL LOGGING

- SELECT INTO
- INSERT SELECT
- CREATE INDEX
- MERGE

Trace Flag 610
SQL Server 2008 - 2014

- Data Warehouse or Repeatable Loads
- High Volume Data Loads Faster
- Log Files Smaller
- No Point in Time Recovery
- Simple or Bulked Logged
- Logs Extent Allocation & Metadata
VIRTUAL LOG FILES

Performance boost on startup, insert/update/delete & backup/restore operations.

- A large number of VLFs can slow things down.
- VLF counts under 100 ideally
- Shrink files to two VLFs
- Grow in chunks back to the current size
- File Growth in excess 8GB grow in 8000MB chunks
- DBCC LOG INFO or sys.dm_db_log_stats (2016 SP2)
INDEXES

These are not set it and forget it.

Remove Un-Used Indexes

Find Missing Indexes

Covering Indexes

Wasted Write Disk IO
Disable then Delete

Wasted Read IO
Avoid Duplicates

Consolidate Indexes
Specific Query Tuning – Key Lookups
## EXECUTION PLANS

### Easy things to look at

<table>
<thead>
<tr>
<th>Index Needs</th>
<th>More Granular Review</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Missing Includes</td>
</tr>
<tr>
<td></td>
<td>Scans</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sorts</th>
<th>Does the data need to be sorted?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Can it be done elsewhere?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Lookups</th>
<th>Extra Reads</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Easily Avoided in Most Cases</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spills</th>
<th>Spills to TempDB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Forced to go to Disk</td>
</tr>
</tbody>
</table>
THANK YOU!

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DCAC

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Unburden your environment.