

Common non-configured options on a Database Server

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Data Platform MVP



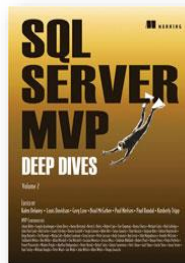
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Vice Presidente



www.manning.com/books/sql-server-mvp-deep-dives-volume-2



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November 26th, 2016



Agenda

- Common misconfigured options
 - Hypervisor level
 - Balloon Driver
 - OS & Storage level
 - Power Profile
 - Network Card Optimizations
 - Instant File Initialization
 - Instance level
 - Memory settings
 - Tempdb data files
 - Cost threshold of parallelism

Memory Ballooning

HYPERVISOR

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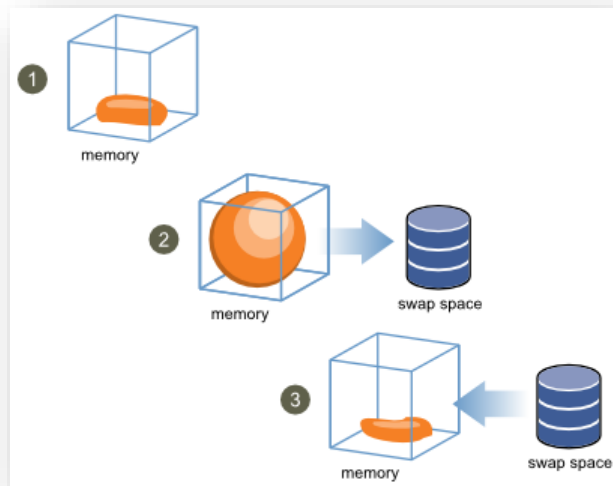
Ballon Driver

- Balloon driver is loaded into the guest operating system as a “pseudo-device” driver
- No external interfaces to the guest operating system
- It communicates with the hypervisor through a private channel

Memory Ballooning

- Hypervisor is not aware of the guest OS memory management (used or free)
- When memory pressure occurs on the hypervisor, it requires reclaiming some memory from VMs, it will utilize the “Balloon Driver”
- Memory is paged to disk in guest OS

Memory Ballooning



▼ 'Memory	
RAM (*)	16 GB
Reservation (*)	16 GB
	<input checked="" type="checkbox"/> Reserve all guest memory (All locked)
Limit	Unlimited MB
Shares	Normal 163840
Memory Hot Plug	<input type="checkbox"/> Enable

Memory Ballooning

- If your SQL Server is designed for performance, we have to eliminate any chance of paging memory to disk!
- Setting Memory Reservation
 - Hypervisor won't be able to reclaim memory from the guest OS
 - [SQL Server on VMware: Best Practices Guide](#)
 - [SQL Server on Hyper-V: Best Practices Guide](#)
- Leave the Balloon Driver installed to manage memory pressure and prevent loss of service

Power Profile, Network Optimizations, I/O

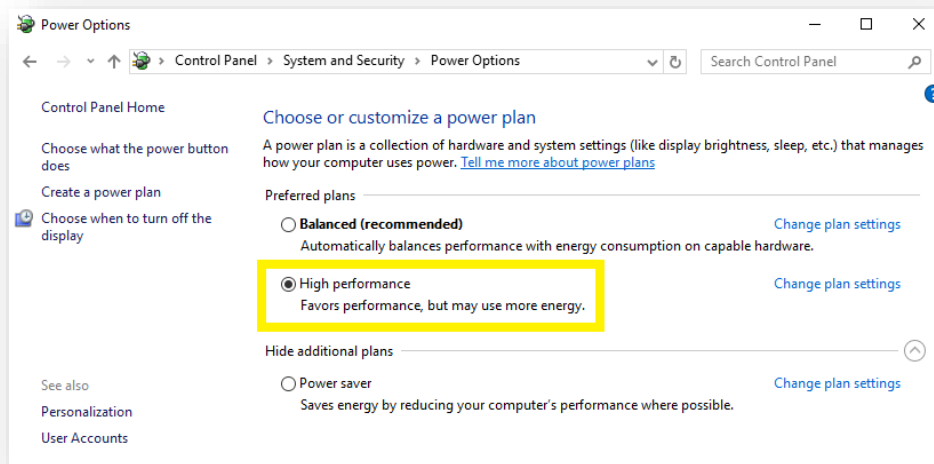
OS & STORAGE

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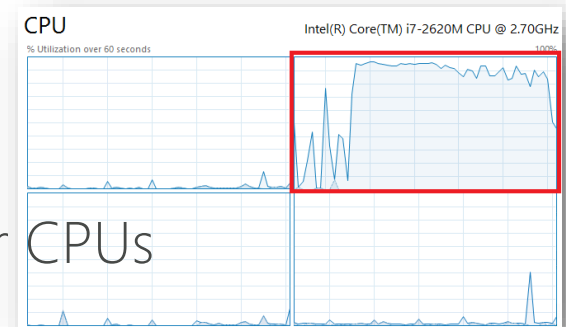
Power Profile

- “Balanced” or “Power Saved” by default
- “High Performance” is better for SQL Server ☺



Network Card Optimizations

- Speed & Duplex
 - Don't use "Auto Negotiation" (default), set speed explicitly
 - Whole network must supports the speed you have chosen
- Jumbo packets
 - They are extra-size network packets, reduce network protocol overhead
 - Normal: 4096 bytes
 - Jumbo frames: ~9000 bytes
- Receive Side Scaling (RSS)
 - Disabled by default
 - It allows to better distribute workload over CPUs



Network Card Optimizations

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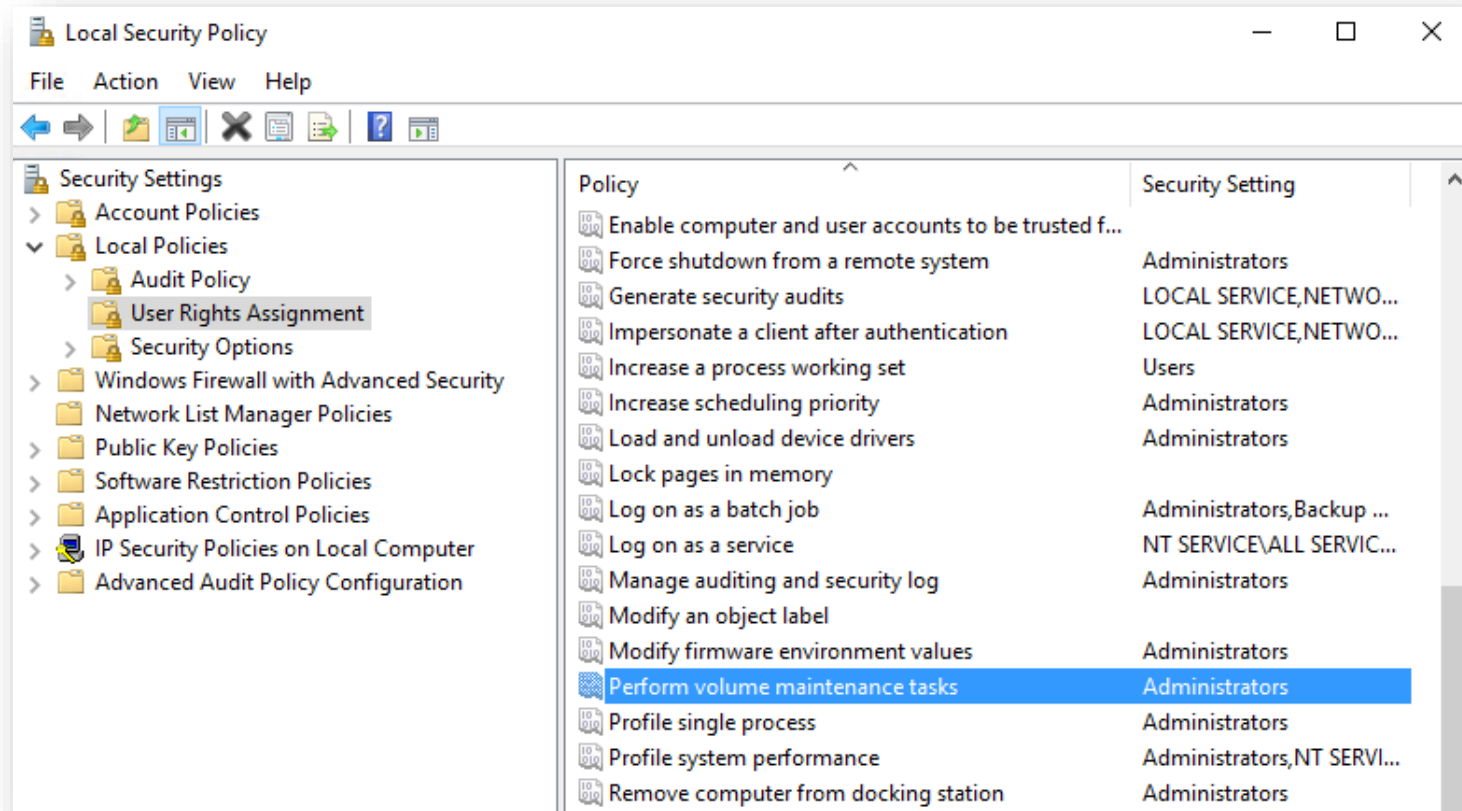
Database File Initialization

- By default, for security reasons, Data and Log files are first initialized by filling the space with zeros when SQL Server performs a
 - CREATE or ALTER DATABASE
 - RESTORE
 - AUTOGROW
- Zero-initialization takes lots of time, especially for large space allocation

Database Instant File Initialization

- If you don't need SQL Server is doing zero-initialization on data file, you can configure the "Performance Volume Maintenance Task" privileges at OS level
- It works only for Data file allocation
- Log file are always zero-initialized, no way around that
- Service restart is required

Database Instant File Initialization



Database Instant File Initialization

> Performance considerations

Performance Test with Zero Initialization

Hardware: Dell Precision 670 Dual Proc (x64) with Dual Core, 4 GB Memory, RAID 1+0 array w/4-142 GB, 15000rpm disks

CREATE DATABASE with 20 GB Data file = **14:02 minutes**

ALTER DATABASE BY 10 GB = **7:01 minutes**

RESTORE 30 GB DATABASE (EMPTY Backup) = **21:07 minutes**

RESTORE 30 GB DATABASE (11GB Backup) = **38:28 minutes**

Performance Test with Instant Initialization

Hardware: Dell Precision 670 Dual Proc (x64) with Dual Core, 4 GB Memory, RAID 1+0 array w/4-142 GB, 15000rpm disks

CREATE DATABASE with 20 GB Data file = **1.3 seconds**

ALTER DATABASE BY 10 GB = **.4 seconds**

RESTORE 30 GB DATABASE (EMPTY Backup) = **5 seconds**

RESTORE 30 GB DATABASE (11GB Backup) = **19:42 minutes**

Instant Initialization – What, Why and How? (Kimberly Tripp)

Database Instant File Initialization

> Security Considerations from BOL <http://bit.ly/1dK32Dc>

- Deleted disk content is overwritten only as new data is written to the files
 - Deleted content might be accessed by an unauthorized principal
- While the database file is attached to the instance, this information disclosure threat is reduced by the discretionary access control list (DACL)
- When the file is detached or backed up, it may be accessed by a user or service that does not have SE_MANAGE_VOLUME_NAME

Instant File Initialization

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Memory settings, Tempdb data files, Cost threshold of parallelism

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Memory settings

- SQL Server hasn't a memory configuration by default (Min and Max server memory)
- Setting the Maximum Server Memory is a good thing for the OS
 - $\text{Max Memory} = (\text{Max Physical Memory} - 3 \text{ GB})$
 - Based on the services you have on the server
 - Take care to other services such as SSIS, SSRS, SSAS, etc..

Tempdb

- It stores
 - User objects
 - Work objects (worktable for Sort and Spool, ...)
 - Version Store (Row Versioning)
- It's always recreated after SQL Server restart
- It uses Simple recovery model
- One tempdb for the entire instance = It's a **bottleneck by design!!**

User objects in tempdb

- Local temporary tables
 - Prefix "#", Scope limited to the local session
 - Auto dropped after the session is closed
- Global temporary tables
 - Prefix "##", Visible in all sessions
 - Auto dropped after the session is closed
- Table variables
- Tables returned from the "Table Valued Functions"

Creating a temp table on tempdb means

- Reading the SGAM page (2:1:3) to find an extent with free space
 - An exclusive latch is active during the update
- Reading the PFS page (2:1:1) to find a free page within the extent
 - An exclusive latch is active during the update
- A PAGELATCH_* wait type occurs
 - Resources have the form 2:x:x
 - 2:1:1, 2:1:2 and 2:1:3

How to reduce Allocation Contention

- Turn on the traceflag 1118
 - It changes the allocation from single-page to extent
 - For tempdb, it's enabled by default on SQL Server 2016
- Multiple tempdb data files
 - 4 files to start
 - From 1/4 to 1/2 of the CPU cores, including HT
 - NOT one-to-one mapping <http://bit.ly/1f9sQYZ>
 - All data files **must** have the same size and auto-grow

Reduce Allocation Contention on tempdb

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Cost threshold of parallelism

- Specify the threshold at which SQL Server Query Optimizer creates and runs parallel plans for queries
- Determines which queries are considered “short”, so they should be run using “serial” plans
- The default value is 5, queries above that cost are executed with parallelism
 - Is it a good thing or not?

Parallelism

- Parallelism in an OLTP system is not so good!
 - CXPACKET: Parallelism issue through Parallel Execution Plan, threads are not given equal amount of work to do
- Cost threshold for parallelism
 - Set it to a much higher value than the default
 - Usually, values from 10 to 50 are good values
- MAXDOP
 - Set it to 1 is not the “wizard solution”
 - Limit it to the max core in the NUMA node [KB 2806535](#)

Cost threshold of parallelism

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Resources

- SQL Server in a virtual environments
 - [SQL Server on VMware: Best Practices Guide](#)
 - [SQL Server on Hyper-V: Best Practices Guide](#)
- Disk Alignment
 - [Disk Partition Alignment Best Practices for SQL Server](#)
- Database Instant File Initialization
 - [What, Why and How?](#)
 - [Misconceptions around IFI](#)

Q&A

- Questions?

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THANKS!

Thanks for attending this session!