

**NAV
TECH
DAYS
2014**

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SQL SERVER SIZING & CONFIGURATION FOR GOOD PERFORMANCE

Jörg Stryk
(STRYK System Improvement)

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ABOUT ME – JÖRG STRYK

MS Dynamics NAV (Navision) since 1997

Since version 1.2

MS SQL Server since 2003

Since version 2000

100% focus on **NAV/SQL Performance Optimization**

STRYK System Improvement (since 2006)

Worldwide support of MS Dynamics Partners & Customers

Nearly 500 projects in about 25 countries on 5 continents – and counting!



Microsoft Most Valuable Professional

MVP MS Dynamics NAV since 2007

Book: “NAV/SQL Performance Field Guide”

ISBN 978-3-8370-1442-6

Software: “SSI Performance Toolbox”

<http://www.stryk.info/toolbox.html>

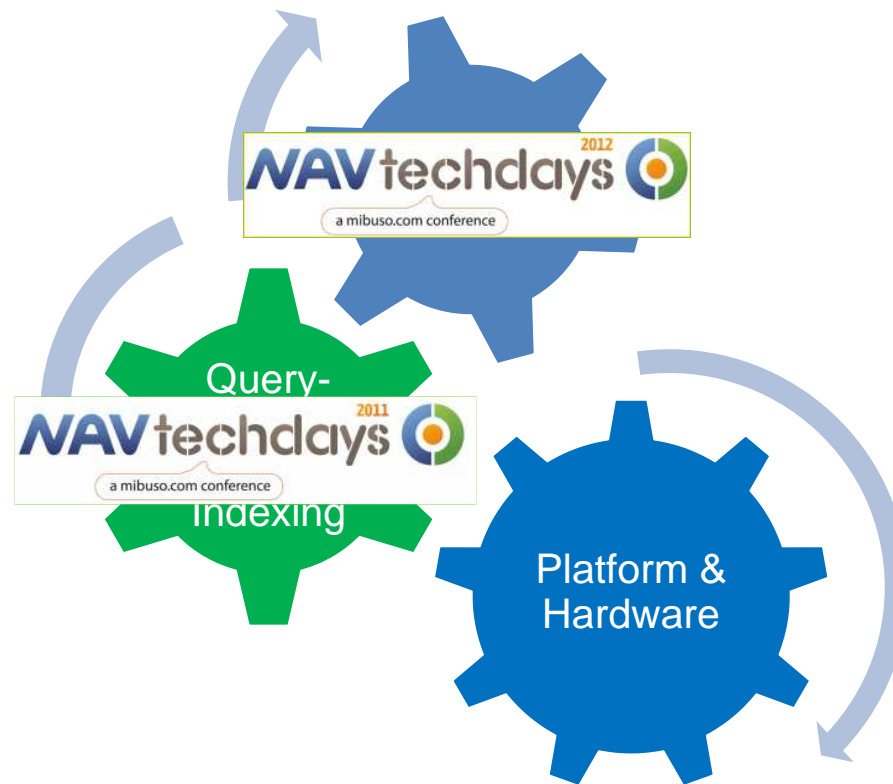
Blog: “NAV/SQL Performance – My Two Cents”

<http://dynamicsuser.net/blogs/stryk/>

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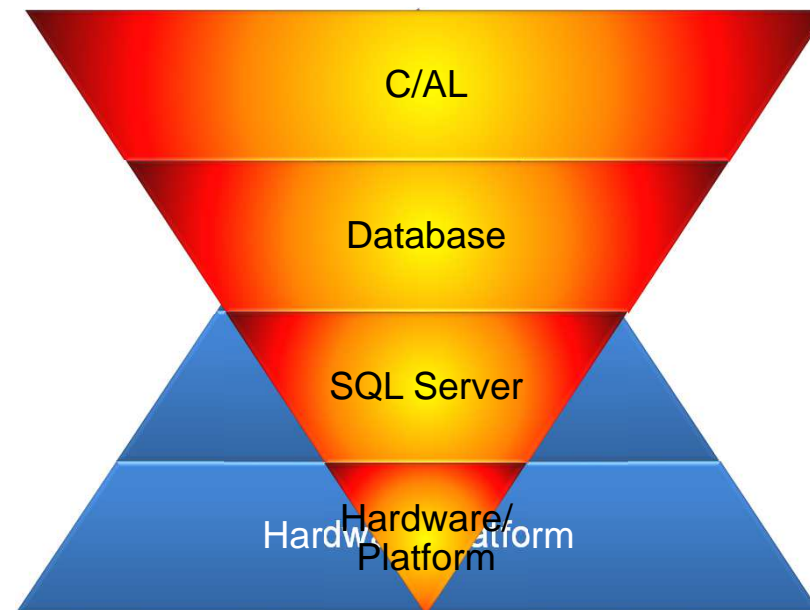


PERFORMANCE AREAS



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PERFORMANCE AREAS



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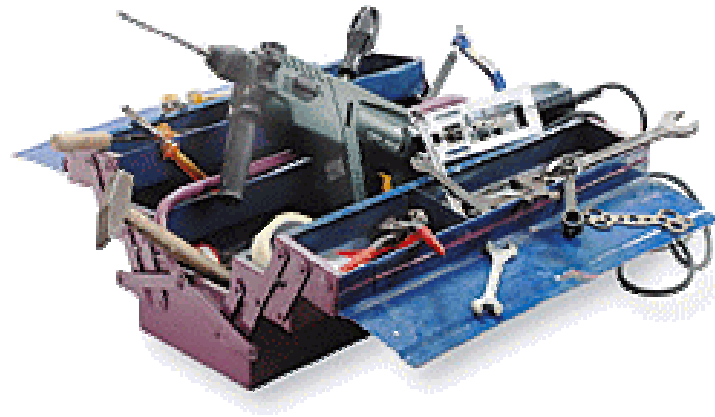
The Perfect Platform!?

It depends ...

A common mistake that people make when trying to design something completely foolproof is to underestimate the ingenuity of complete fools.

Douglas Adams

Windows Performance Monitor (PERFMON) SQL Server WaitStats



<http://www.sqlskills.com/blogs/paul/wait-statistics-or-please-tell-me-where-it-hurts/>

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Know the limits!



Windows	Foundation		Essential		Standard		Enterprise	
	CPU	RAM	CPU	RAM	CPU	RAM	CPU	RAM
Server 2008	n/a				4	32 GB	8	1 TB
Server 2008 R2					4	32 GB	8	2 TB
Server 2012	1	32GB	2	64 GB	64	4 TB	64	4 TB



SQL	Standard		Enterprise	
	CPU	RAM	CPU	RAM
Server 2008	4	max	max	max
Server 2008 R2	4	64 GB	max	max
Server 2012	4/16	64 GB	max	max
Server 2014	4/16	128 GB	max	max

64bit versions only!

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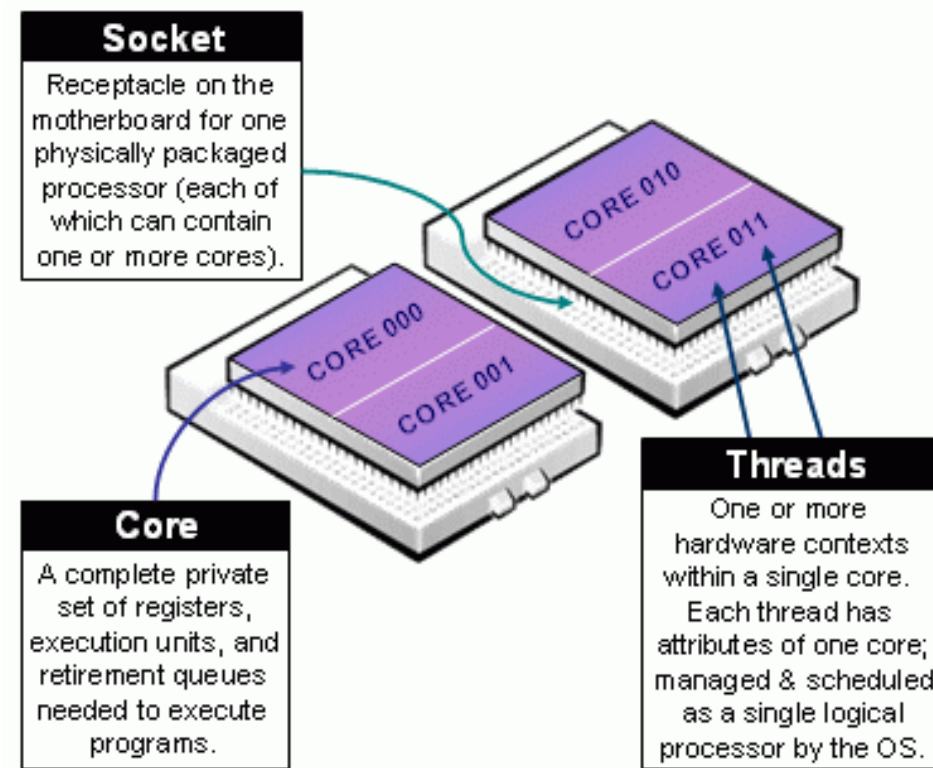


CPU



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CPU



Source: <https://computing.llnl.gov>

CPU – Counters, Rules & Config

Object	Counter	Instance	Best Practice	Comment
Processor	% Processor Time	Total	15% to 25% (or less)	
Processor	% Privileged Time	Total	Less than 10%	
System	Processor Queue Length	n/a	Less than 2	
SQL Server: General Statistics	User Connections	n/a	n/a	The number of users working
SQL Server: SQL Statistics	Batch Request/sec	n/a	n/a	The number of queries processed
SQL WaitStats	CXPACKET	n/a	n/a	Depends on MAXDOP



1 CPU/Core per 20 to 25 User-Processes



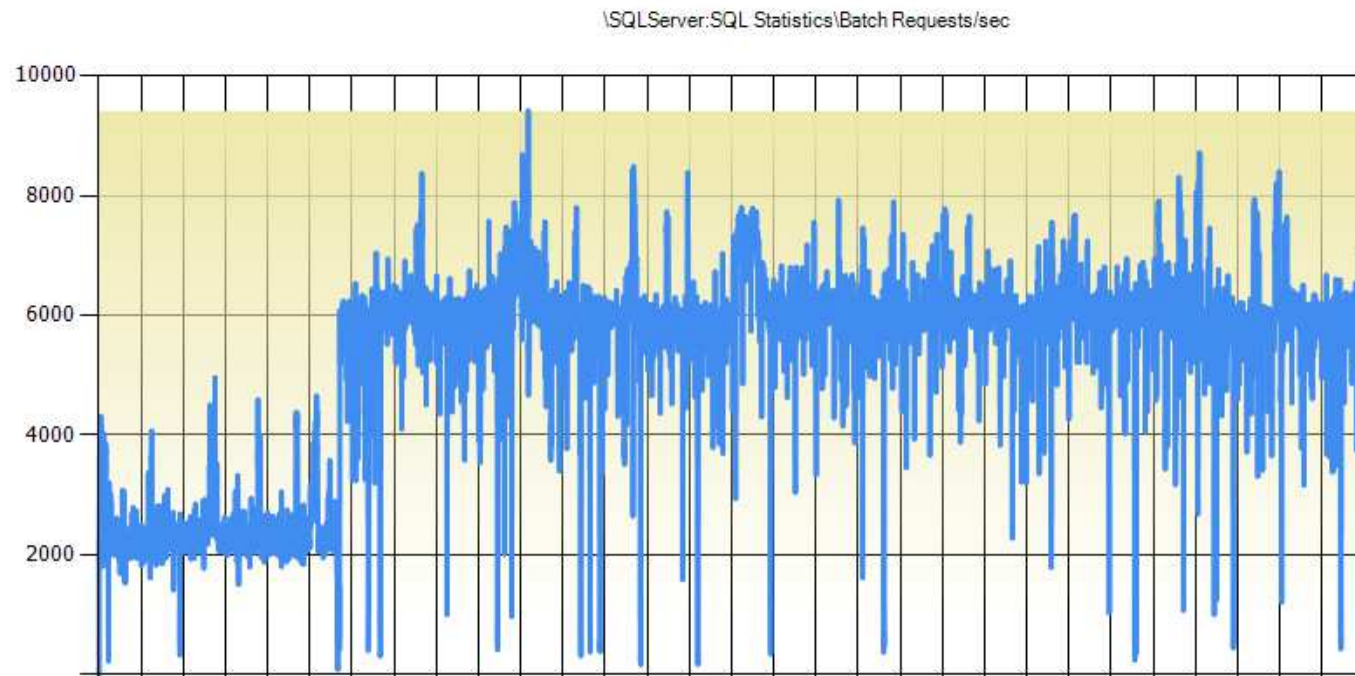
Windows Power Options → High Performance

[BIOS → CPU Power Saving disabled]

Max. Degree of Parallelism → 50% of CPU → worst case (NAV!) → MAXDOP = 1

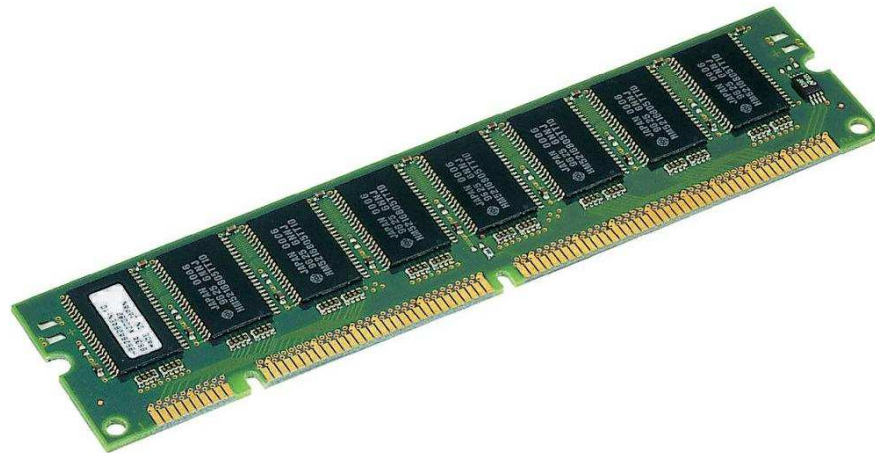
Don't change the „Affinity Masks“!

CPU



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RAM



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RAM – Counters, Rules & Config

Object	Counter	Instance	Best Practice	Comment
Memory	Available MB	n/a	More than 500 MB	
Paging File	% Usage	n/a	n/a	
SQL Server: Buffer Manager	Buffer Cache Hit Ratio	n/a	Greater than 95%	
SQL Server: Buffer Manager	Free Pages	n/a	Greater than 640	
SQL Server: Buffer Manager	Page Life Expectancy	n/a	Greater than 300	
SQL Server: Memory Manager	Target Server Memory	n/a	n/a	Max. Memory by Configuration
SQL Server: Memory Manager	Total Server Memory	n/a	n/a	Current Memory Usage

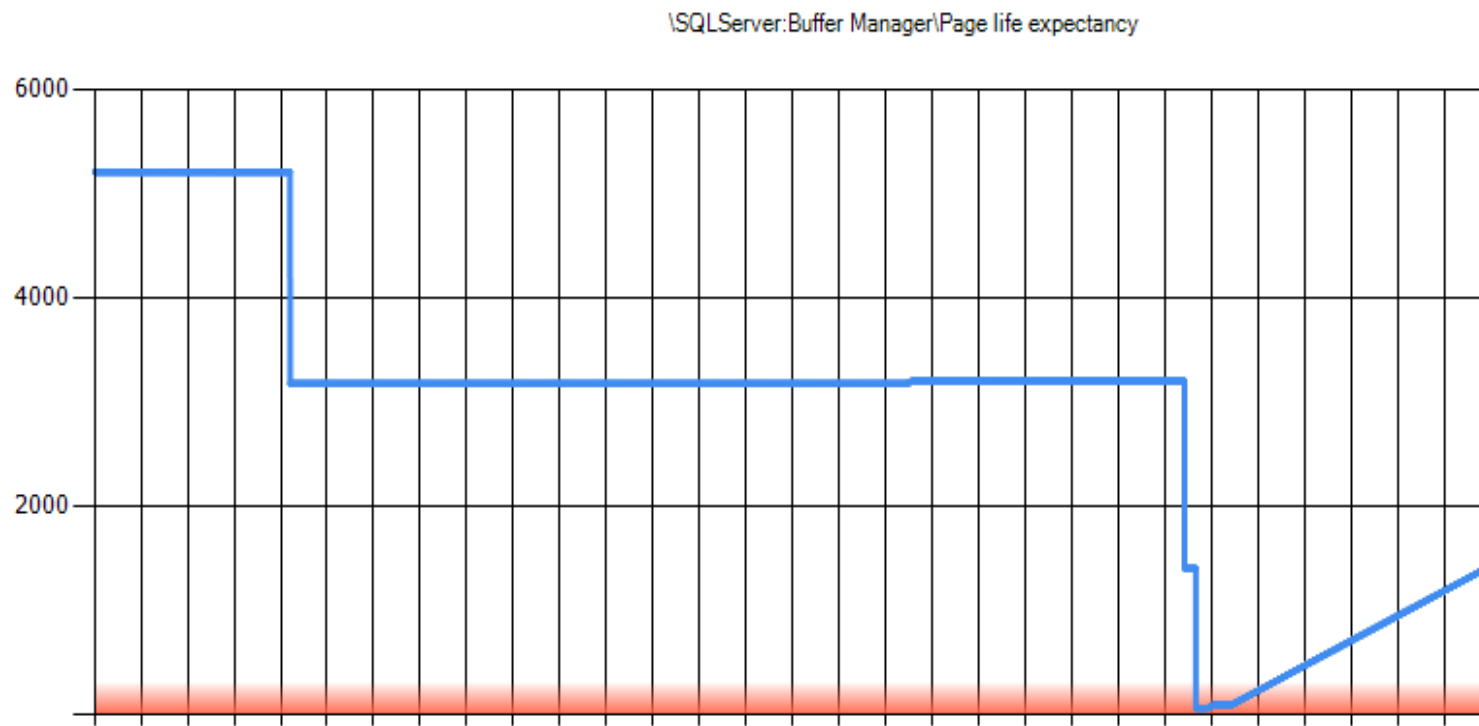


The more the better; 16GB +
Depends on limitations of the OS and SQL Server Version & Edition



Max. Server Memory → Physical Memory – 2 (to 4) GB (for the OS) [– requirements of other apps/services]
Min. Server Memory → 25% to 50% of Max. Server Memory
Local Group Policies → „Lock Pages in Memory“ for SQL Server service account [Traceflag 845]

RAM



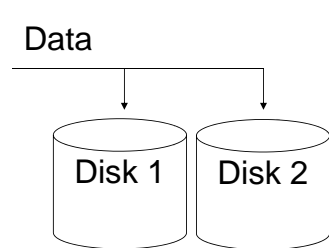
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DISKS

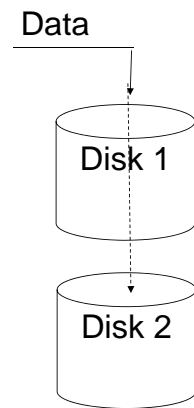


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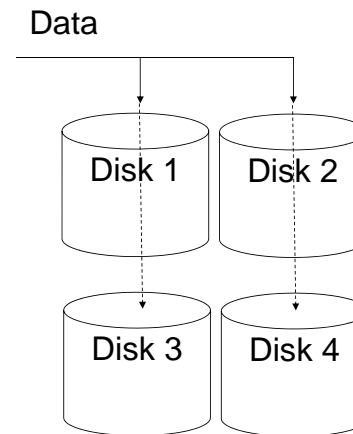
DISKS – Redundant Array of Independent Disks (RAID)



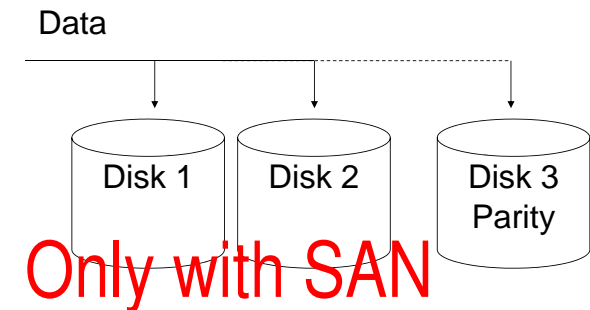
RAID 0 „Striping“



RAID 1 „Mirroring“

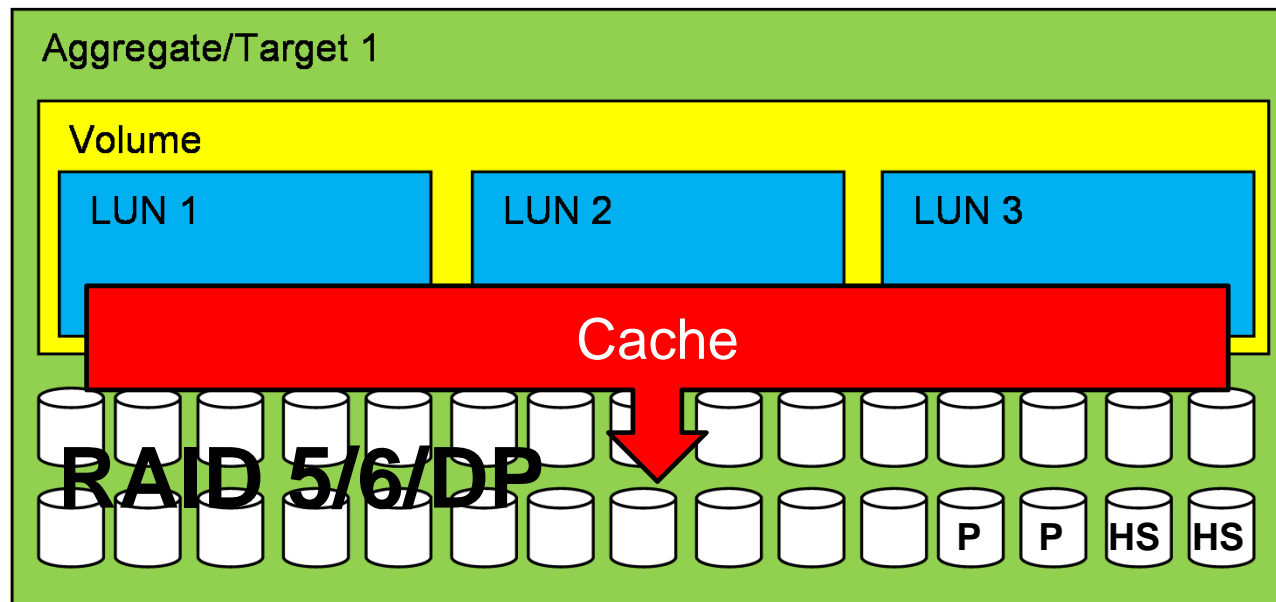


RAID 10 „Striping & Mirroring“

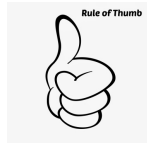


RAID 5 „Striping with Parity“

DISKS – Storage Area Network (SAN)



DISKS – HDD vs. SSD



SSD cost per GB is 10 times more expensive than HDD

SSD cost per IOPS is 10 times cheaper than HDD



Usually 10 000 or 15 000 rpm SAS drives		
0.1 ms	Access times SSDs exhibit virtually no access time	5.5 ~ 8.0 ms
SSDs deliver at least 6000 io/s	Random I/O Performance SSDs are at least 15 times faster than HDDs	HDDs reach up to 400 io/s
SSDs have a failure rate of less than 0.5 %	Reliability This makes SSDs 4 - 10 times more reliable	HDD's failure rate fluctuates between 2 ~ 5 %
SSDs consume between 2 & 5 watts	Energy savings This means that on a large server like ours, approximately 100 watts are saved	HDDs consume between 6 & 15 watts
SSDs have an average I/O wait of 1 %	CPU Power You will have an extra 6% of CPU power for other operations	HDDs' average I/O wait is about 7 %
the average service time for an I/O request while running a backup remains below 20 ms	Input/Output request times SSDs allow for much faster data access	the I/O request time with HDDs during backup rises up to 400~500 ms
SSD backups take about 6 hours	Backup Rates SSDs allows for 3 - 5 times faster backups for your data	HDD backups take up to 20~24 hours

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DISKS – Counters, Rules & Config

Object	Counter	Instance	Best Practice	Comment
Physical Disk	Avg. Disk Sec/Read	Each drive	Less than 0.015	HDD; SSD less than 0.005
Physical Disk	Avg. Disk Sec/Write	Each drive	Less than 0.015	HDD; SSD less than 0.005
SQL WaitStats	PAGEIOLATCH	n/a	Less than 0.015	HDD; SSD less than 0.005
SQL WaitStats	WRITELOG	n/a	Less than 0.015	HDD; SSD less than 0.005
SQL WaitStats	IO_COMPLETION	n/a	Less than 0.015	HDD; SSD less than 0.005



Use separate drives for

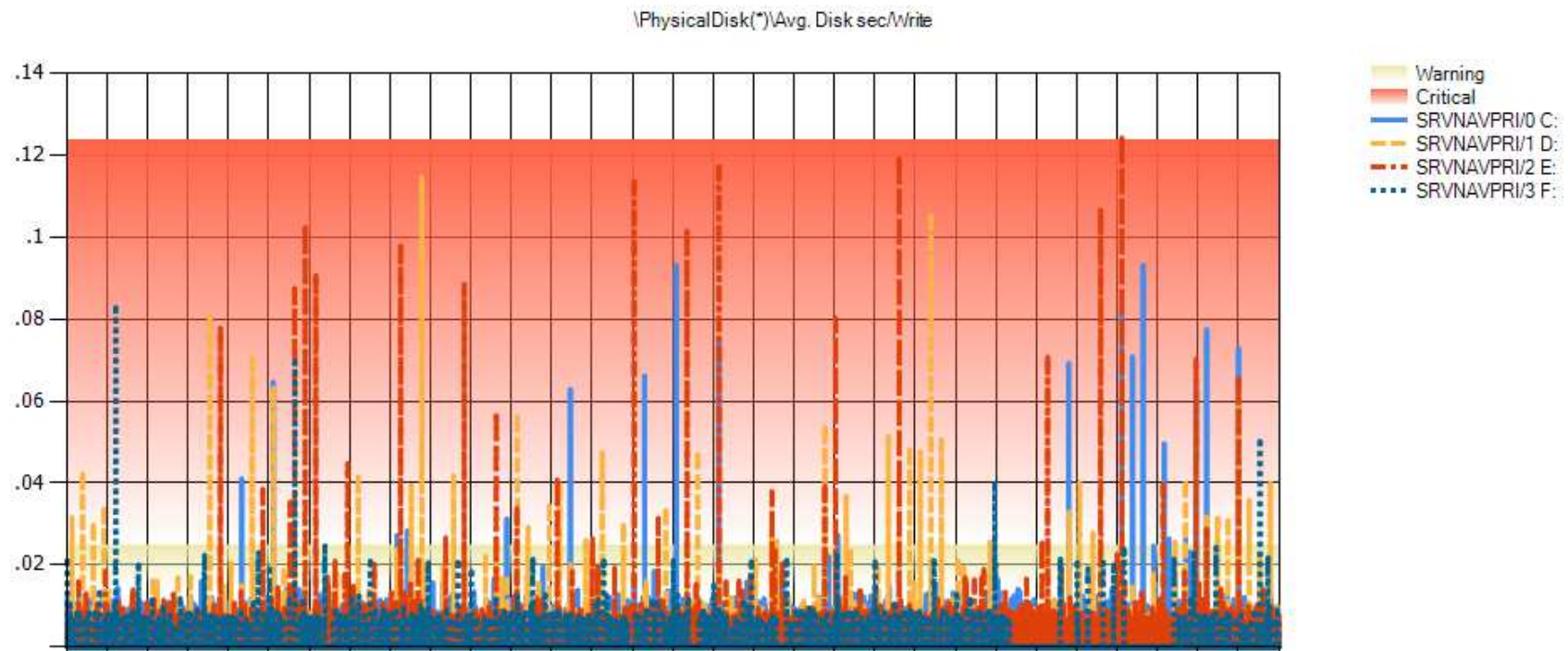
- OS, Programms, etc.
- SQL Server tempdb
- NAV DB Data (mdf/ndf)
- NAV DB Log (ldf)
- Local Backups & Misc

Use RAID Mirroring for fault-tolerance
Use RAID Striping for speed



Local Group Policies → „Perform Volume Maintenance Tasks“ for SQL Server service account
Format DB drives with 64KB (Caution: regard special SAN requirements!)
SAN: adjust Host Bus Adapter (HBA) queue depth (depends, something between 32 and 128)

DISKS



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DISKS – Special requirements

tempdb



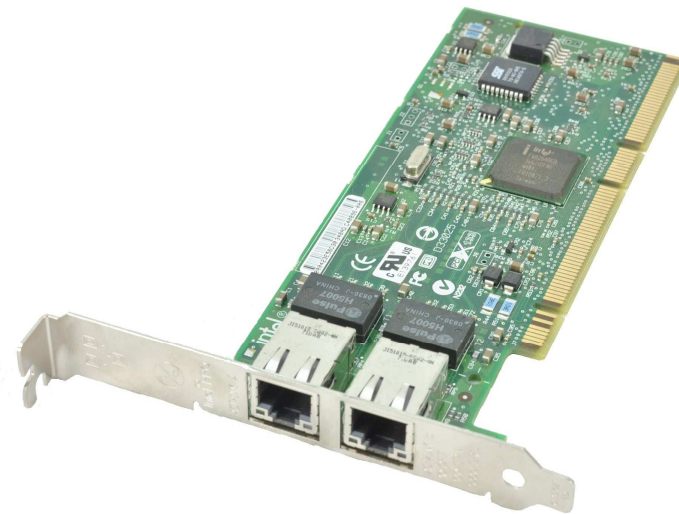
Data Size → equal to estimated maximum (e.g. 1000 MB to 5000 MB)
Auto Growth Data → fix value (e.g. 100 MB to 500 MB)
1 data-file per CPU; no more than 8 to 12 data-files in total
Log Size → 100 MB to 500 MB
Auto Growth Log → fix value (e.g. 100 MB to 500 MB)
Maybe Traceflag 1118

NAV database



Data Size → 10% free space minimum
Auto Growth → fix value „Data Filegroup 1“ (e.g. 1000 MB to 5000 MB)
Log Size → depends on Log Backup frequency; max. 20% of net data-size
Auto Growth Log → fix value (e.g. 500 MB to 1000 MB)

LAN



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LAN – Counters, Rules & Config

Object	Counter	Instance	Best Practice	Comment
Network Interface	Current Bandwith	each adapter	n/a	Should equal desired bandwidth
Network Interface	Output Queue Length	each adapter	0	
Network Interface	Packets Outbound Errors	each adapter	0	
SQL WaitStats	OLEDB	n/a	Less than 1 msec	
SQL WaitStats	ASYNC_NETWORK_IO	n/a	Less than 1 msec	

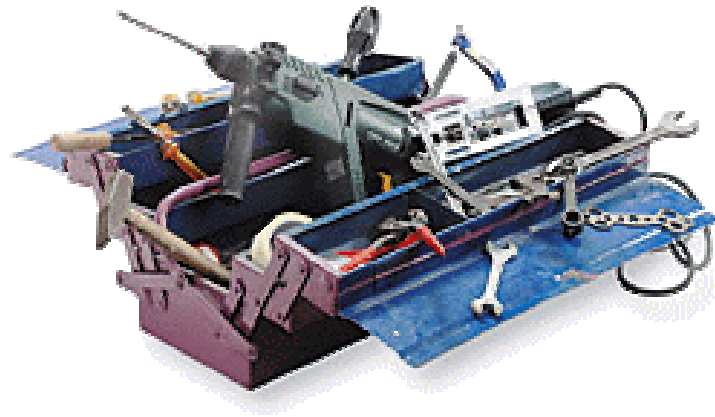


Gigabit
Regard LAN/WAN requirements
Dedicated Server-to-Server connections



Regard special requirments in virtual environments!
[TCP Offloading? UDP Offloading? Checksum Offloading? Receive Side Scaling (RSS)?]

Performance Analysis of Logs (PAL)



<https://pal.codeplex.com/>
<https://pal.codeplex.com/releases/view/21261> (optional: Perfmon Log Translator (PLT))

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Any Questions?

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Twitter: <https://twitter.com/navsqlperf>

THANK YOU

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DINNER

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