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# SQL Server Best Practices
## Install SQL Server like a boss

Andre Essing

Reloaded

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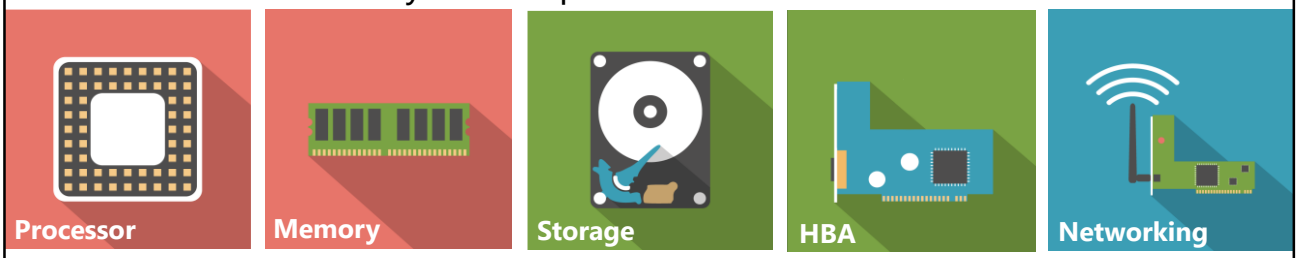
# The Key for a Perfect System

- Balanced system without bottlenecks
- SQL Server is only a small part




- Plan your system before you build it


# Andre Essing

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## Microsoft Deutschland GmbH


Andre advises, in his role as Technology Solutions Professional, customers in topics all around the Microsoft Data Platform. He is specialized in mission critical systems, high-availability, security, operating and of course the cloud.


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# Pre-Deployment

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## Hardware & Storage

- Use the optimal storage
- Handle volumes the right way
- Implement a good disk layout
- Do backups remotely
- Don't save power


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- **Use the right storage**
  - HDD, SSD or Flash
  - RAID Level
  - Direct Attached or SAN
  - iSCSI or FibreChannel
  - Read caching isn't necessary, SQL Server does the buffering
  - Prefer more smaller disks than one large
  - Low latency (Disk Access) is important
  - Don't use thin provisioning

- **Handle volumes the right way**
  - Check partition alignment
    http://msdn.microsoft.com/en-us/library/dd758814.aspx
  - Format volumes the right way
    - NTFS, 64KB, no quick format
  - Disable file indexing and automatic defragmentation

- **Implement a good disk layout**
  - Use more than one disks
  - Separate disks for data, transaction log and TempDB
  - Use mountpoints
  - Consider max IOPs / size per disk

- **Do backups remotely**
  - Consider a remote backup location
  - UNC Path works great

- Backup to Azure Blob Storage as offsite backup

- **Don’t save power**
  - Disable power savings everywhere

## Operating System

- Performance is important
- Don't forget about security…
- … and the user permissions
- Just in case, I talk about Windows here

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- **Performance is important**
  - Set power plan to high performance
  - Check what's better: Hyperthreading off or on
- **Don't forget about security…**
  - Antivirus software & exclusions
    https://support.microsoft.com/en-us/kb/309422
  - Windows Firewall & User Access Control is a good thing, enable them
  - A server is not a workstation, so don't use it as one
  - Think about Windows Server Core for SQL Server installations
- **… and the user permissions**
  - Local Security Policy -> SQL Server Service account rights are a must have
    - Lock Pages In Memory
    - Perform Volume Maintenance Tasks

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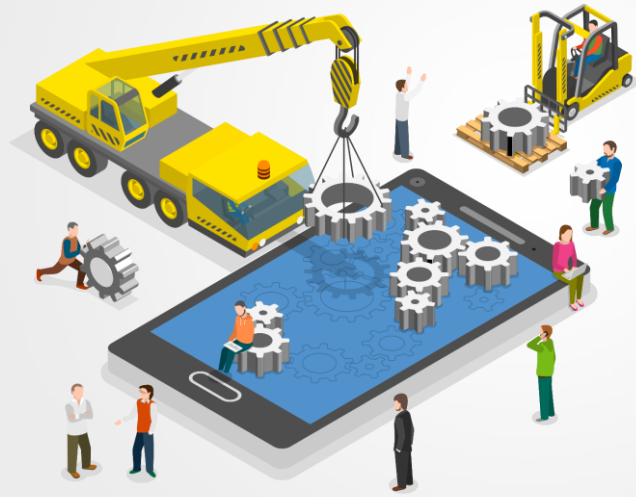
# Setup



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# Installation

- How much SQL you need
- Don't repeat yourself
- Security… again!
- A server is not a workstation

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- **How much SQL you need**
  - Only install components you really need
  - Choose the correct collation
- **Don't repeat yourself**
  - Install using a configuration file
- **Security… again!**
  - Don't forget to install updates
  - Use Service Accounts instead of "Local System"
  - BUILTIN\Administrators isn't a good idea for SQL Server DBAs
    - Use a domain group for DBAs only
- **A server is not a workstation**

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# Post-Deployment

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## Instance

- Make it easy to connect
- Security… again… are you kidding?
- Perhaps, Trace Flags
- Instance Settings

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- **Make it easy to connect**
  - Use same port for all instances / availability groups
    - Easier for migrations
    - Easier to remember
  - Use DNS alias for easy access
    - Use A-Records to avoid problems with Kerberos Auth
    - Transparent access for the users
    - No application changes on migrations and database moves
- **Security… again… are you kidding?**
  - Don't use SQL Logins, Windows Auth is more secure
  - Set SPNs to use Kerberos authentication with Windows Auth
- **Perhaps, Trace Flags**
  - Trace Flag 1117
    - Equally grows all data files
    - Replaced in 2016 by filegroup option (AUTOGROW_ALL_FILES - sys.filegroups)
    - Recommended for all filegroups and databases
  - Trace Flag 1118
    - Force use of unified extents for objects
    - Replaced in 2016 by database option (MIXED_PAGE_ALLOCATION - sys.databases)
    - Default in SQL Server 2016 for new databases
- **Instance Settings**

- Configure memory limits, especially “max server memory“
- Enable “Optimize for ad hoc workloads”
- Configure Max Degree of Parallelism
  - Not higher than cores per socket / NUMA Node
  - Some apps need a value of 1, check documentation
- Configure Cost Threshold for Parallelism
  - Good start value for OLTP workloads: 40
  - Good start value for DWH and mixed workloads: 25

## TempDB

- Split into multiple files
- Size and growth does matter
- Keep an eye on it
- Before SQL 2016, remember the Trace Flags

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- **Split into multiple files**
  - There are a lot of complicated rules out there
  - Just use TempDB with 8 files, more usually achieve no big advantage
  - Always 8 files is easier to maintain
  - In some rare cases more then 8 files brings some advantage
- **Size and growth does matter**
  - Size depends on TempDB usage
  - Monitor old system, ask the vendor or guess
  - Start with 2GB per data file and 8GB log (if you don’t know)
  - Growth: 256MB for data and 1GB for log
- **Keep an eye on it**
  - Monitor TempDB usage
  - If TempDB grows, set new size as initial size (include a buffer)
- **Before SQL 2016, remember the Trace Flags**
  - Set Trace Flag 1117 and 1118

## Database

- Take care of the defaults
- Keep as reliable as you can
- The physical design matters
- Don't mess-up with the security

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- **Take care of the defaults**
  - Set the default fill factor
    - 0 means 100%
    - Best practice is 70% or 80%
    - The setting is just for "new" objects
    - Keep an eye on fragmentation
  - Never enable Auto_Close or Auto_Shrink
    - It always leads you into performance issues
    - With Auto_Shrink enabled, disk fragmentation is your new friend ;o)
  - Enable Auto_Create_Statistics and Auto_Update_Statistics
    - Most database haven't the right statistics implemented
    - Normally the settings increase the speed of your queries
    - Should be enabled if not forbidden by the software vendor

- **Keep as reliable as you can**
  - Always use Full Recovery Model, without exception
  - For temporary databases and staging databases the Single Recovery Model is ok
  - Usually reliability is more important than speed
  - Don't be afraid, using Full Recovery Model is easier than it sounds
  - Don't forget to do transaction log backups

- **The physical design matters**
  - When possible, primary filegroup only for MDF
    - Create extra filegroups for your data
    - If not possible, just add files to primary filegroup
    - Start with 4 files per filegroup
  - Set size and growth of files
    - Estimate the database size for the next year(s)

        - The files shouldn't grow automatically
        - Keep autogrowth enabled for safety reasons
        - 256MB autogrowth for data and 1GB for log
    - Keep an eye on VLFs
        - DBCC LOGINFO

- **Don't mess-up with the security**
    - Don't assign DB_Owner role to users
        - Build user roles with the right permissions instead
    - Don't assign the dbo to a normal user
        - Assign to sa or to special login

## Maintenance

- Don’t forget instance and database maintenance
- Backup checksum and compression
- Don’t do plans, script the tasks
- Never shrink during maintenance

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- **Don’t forget instance and database maintenance**
  - Daily Backups (Full and perhaps differential)
  - Transaction log backups (every 5 – 15 minutes)
  - Integrity checks (daily)
  - Index reorganize or rebuild (daily)
  - Update statistics (daily)
  - Clean up backup and job history (daily)
  - Cleanup mail items (daily)

- **Backup checksum and compression**
  - Enable Compress Backups by default
    - Saves I/O and disk space
    - Faster backups
    - A bit more CPU usage during backup
    - No reason to not turn it on
  - Checksum default
    - No GUI, not documented, but ok to use
      - EXEC sp_configure ‘backup checksum default’, 1; GO RECONFIGURE WITH OVERRIDE; GO
    - No reason to not turn it on

- **Don‘t do plans, script the tasks**
  - Don’t use maintenance plans
  - Scripts are…
    - …better reuseable
    - …more flexible
    - …more intelligent
  - Use maintenance scripts

- Ola Hallengren (https://ola.hallengren.com/)
- or from other vendors
- or build your own

- **Never shrink during maintenance**
  - Same problems as AUTO_SHRINK

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Questions & answers…

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