SQL Server: Best practices for System Center 2012

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Data Center TSP
Microsoft Corporation
Session Overview

Design Choices
- SQL Version
- SQL Edition
- Virtual?
- Hardware planning

Configuration
- Collation
- Database and log file placement
- Database and log file sizing
- TempDB
- Autogrow/Shrink

Advanced Options
- Instance Sharing
- High Availability
- Backup
Part 1 | Design Choices
SQL Server Version

- **SQL Server 2008 SP1, SP2, SP3**
  - Supported for SC2012 RTM***
  - Not supported for SC2012 SP1***

- **SQL Server 2008 R2 RTM, SP1**
  - Supported for SC2012 RTM*** and SC2012 SP1***

- **SQL Server 2008 R2 SP2**
  - Only supported in SC2012 SP1***

- **SQL Server 2012 RTM, SP1**
## SQL Server Version – Cloudier?

<table>
<thead>
<tr>
<th>Component</th>
<th>SQL 2008 SP1</th>
<th>SQL 2008 SP2</th>
<th>SQL 2008 SP3</th>
<th>SQL 2008 R2 RTM</th>
<th>SQL 2008 R2 SP1</th>
</tr>
</thead>
<tbody>
<tr>
<td>App Controller</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Configuration Manager</td>
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<tr>
<td>Data Protection Manager</td>
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<td></td>
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<tr>
<td>Operations Manager</td>
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<td></td>
</tr>
<tr>
<td>Orchestrator</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service Manager</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Virtual Machine Manager</td>
<td></td>
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</tr>
</tbody>
</table>

- Configuration Manager: Requires CU9 Min in SQL 2008 SP1 and SQL 2008 SP2, CU4 Min in SQL 2008 SP3 and SQL 2008 R2 RTM, and CU6 Min in SQL 2008 R2 SP1.
- Data Protection Manager: Requires CU9 Min in SQL 2008 SP1, CU4 Min in SQL 2008 SP2, and CU6 Min in SQL 2008 R2 SP1.
- Operations Manager: Available in SQL 2008 SP1 and SQL 2008 SP2.
- Orchestrator: Available in SQL 2008 SP1 and SQL 2008 SP2.
- Service Manager: Available in SQL 2008 SP1 and SQL 2008 SP2.
- Virtual Machine Manager: Available in SQL 2008 SP1 and SQL 2008 SP2.
### SQL Server Version – SC 2012 SP1***

<table>
<thead>
<tr>
<th>System Center 2012 SP1 component</th>
<th>SQL Server 2008 R2 SP1</th>
<th>SQL Server 2008 R2 SP2</th>
<th>SQL Server 2012</th>
<th>SQL Server 2012 SP1</th>
</tr>
</thead>
<tbody>
<tr>
<td>AppController</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>DPM</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>OpsMgr</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Orchestrator</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Service Manager</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>VMM</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>
SQL Server Version – ConfigMgr 2012 SP1

<table>
<thead>
<tr>
<th>System Center 2012 SP1 component</th>
<th>SQL Server 2008 SP2 CU9</th>
<th>SQL Server 2008 SP3 CU4</th>
<th>SQL Server 2008 R2 SP1 CU6</th>
<th>SQL Server 2008 R2 SP2</th>
<th>SQL Server 2012 RTM CU2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ConfigMgr</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
## Editions

<table>
<thead>
<tr>
<th>Key concepts</th>
<th>SQL Server Standard</th>
<th>SQL Server Enterprise</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>License included in System Center</strong></td>
<td>• ConfigMgr CAS – up to 50,000 clients</td>
<td>• Recommended for the data warehouses.</td>
</tr>
<tr>
<td><strong>Great where advanced performance/features are not required</strong></td>
<td>• Suitable for test/dev/smaller deployments</td>
<td>• Recommended for ConfigMgr CAS for large environments (&gt;50,000 clients)</td>
</tr>
<tr>
<td><strong>ConfigMgr CAS – up to 50,000 clients</strong></td>
<td>• Recommended for ConfigMgr CAS for large environments (&gt;50,000 clients)</td>
<td>• Benefits for SCSM Analysis cubes in processing time, partitions, and powerpivot, decision made at SCSM install.</td>
</tr>
<tr>
<td><strong>Higher memory, socket, core support</strong></td>
<td>• Advanced high availability support</td>
<td>• Online/Parallel indexing</td>
</tr>
</tbody>
</table>
Virtual SQL or traditional hardware?

**Customer by customer business decision**

- All roles are supported on VM.
- Does the customer have established experience virtualizing highly transactional SQL servers?
- Does the virtualization environment have the necessary resources, including compute and I/O?
- What are the high availability requirements?
- If virtual – follow strict guidance
• CAS SQL server is co-located with CAS SMS provider
• 5 Primary sites
• 13 Secondary sites
• 225 Distribution points

Central Administration Site (CAS)
• No Clients
• Local SQL Server
• Administration & Reporting point

98% of all server roles hosted on HyperV except SQL Servers

Campus Site 1
- ~75,000 Clients
- Remote SQL Server
- Primary site with FSP and Application Catalog role
- 1 Physical & 15 Virtual Site Roles

Campus Site 2
- ~75,000 Clients
- Remote SQL Server
- Primary site with FSP and Application Catalog role
- 1 Physical & 15 Virtual Site Role

Americas Site
- ~40,000 Clients
- Remote SQL Server
- Primary site with FSP and Application Catalog role
- 1 Physical & 92 Virtual Site Roles

EMEA Site
- ~40,000 Clients
- Remote SQL Server
- Primary site with FSP and Application Catalog role
- 1 Physical & 92 Virtual Site Roles

APAC Site
- ~70,000 Clients
- Remote SQL Server
- Primary site with FSP and Application Catalog role
- 1 Physical & 49 Virtual Site Roles
Each product has unique requirements

- OpsMgr sizing helper

- Service Manager sizing helper

- Configuration Manager
## Hardware profile components

<table>
<thead>
<tr>
<th>PROCESSOR</th>
<th>MEMORY</th>
<th>DISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cores/logical CPU</td>
<td>Memory sized per the sizing</td>
<td>Typically the most critical</td>
</tr>
<tr>
<td>Speed/edition of physical core</td>
<td>helpers or documentation</td>
<td>component from a user experience</td>
</tr>
<tr>
<td></td>
<td>SQL loves RAM!</td>
<td>perspective</td>
</tr>
<tr>
<td></td>
<td>Memory is a common bottleneck</td>
<td>NTFS Allocation Unit size (64kb)</td>
</tr>
<tr>
<td></td>
<td>for SQL, plan for scalability</td>
<td>RAID configuration</td>
</tr>
<tr>
<td></td>
<td>and performance. This is one of</td>
<td>Spindles per LUN</td>
</tr>
<tr>
<td></td>
<td>the lowest cost upgrades you can</td>
<td>HBA config (queue depth and driver</td>
</tr>
<tr>
<td></td>
<td>make.</td>
<td>Shared storage</td>
</tr>
</tbody>
</table>

CPU is a common bottleneck on SQL servers hosting SCSM and OpsMgr.

Remember that minimum requirements are just that - MINIMUM.

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**SQL Server Best Practices:**
## HARDWARE USED - MSIT

<table>
<thead>
<tr>
<th>ConfigMgr Roles</th>
<th>Server Model</th>
<th>Memory</th>
<th>Processor count</th>
<th>Processor type</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS Server</td>
<td>HP Proliant SE326M1</td>
<td>64 GB</td>
<td>2 Sockets 12 cores 24 threads (HT)</td>
<td>Intel Xeon CPU L5640 @2.26GHz</td>
</tr>
<tr>
<td>Primary Site Server</td>
<td>Virtual Machine</td>
<td>12 GB</td>
<td>4 cores 4 threads</td>
<td>Intel Xeon CPU UE7450 @2.40GHz</td>
</tr>
<tr>
<td>Management Point</td>
<td>Virtual Machine</td>
<td>6 GB</td>
<td>4 cores 4 threads</td>
<td>Intel Xeon CPU UE7450 @2.40GHz</td>
</tr>
<tr>
<td>Software Update Point</td>
<td>Virtual Machine</td>
<td>6 GB</td>
<td>4 cores 4 threads</td>
<td>Intel Xeon CPU UE7450 @2.40GHz</td>
</tr>
<tr>
<td>Distribution Point</td>
<td>Virtual Machine</td>
<td>4 GB</td>
<td>2 cores 2 threads</td>
<td>Intel Xeon CPU UE7450 @2.40GHz</td>
</tr>
<tr>
<td>SQL Server &gt;50K Clients</td>
<td>HP Proliant DL 580 G5</td>
<td>64 GB</td>
<td>4 sockets 16 cores 16 threads</td>
<td>Intel Xeon CPU E7330 @2.40GHz</td>
</tr>
<tr>
<td>SQL Server &lt;50K Clients</td>
<td>HP Proliant SE326M1</td>
<td>48 GB</td>
<td>2 sockets 8 cores 16 threads (HT)</td>
<td>Intel Xeon CPU L5520 @2.26GHz</td>
</tr>
</tbody>
</table>

For more details related to disk configurations, disk spindles RAID levels please refer below link

Part 2 | SQL Configuration
# SQL Configuration

<table>
<thead>
<tr>
<th>Collation</th>
<th>DB and Log file placement</th>
<th>SQL Server Memory</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Performance TempDB</td>
<td>DB and Log file sizing</td>
<td>Auto Grow</td>
<td>Auto Shrink</td>
</tr>
</tbody>
</table>
SQL Config - Collation

What a mess!

• Microsoft primarily tested SQL_Latin1_General_CP1_CI_AS as it was default collation on a US_English OS deployment.

• Other countries regional settings default to different collations, which might have caused issues.

• SQL_* collations are being deprecated.

• Broke SCSM>OM connections, reports, when using different locales and different collations.

• Follow each products documentation, but plan for integration.

• This is being addressed in SP1, we will begin to use current Windows (not SQL_*) collations and streamline across the SC products for different locales.

Different I/O patterns

- Database writes are random, log writes are sequential
- Separate these write I/O patterns on different Volumes/LUNS/Arrays
  - Isolation at the physical level
- If you have multiple log files from numerous DB’s, you have random writing across the disk.
- Use simple recovery model where applicable
Pre-configure DB size

- Auto growths consume I/O. Preconfigure DB sizes to reduce this.
- Pre-sizing reduces fragmentation on disk.
- Different products have guidance on t-log sizes.
  - OpsMgr OpsDB tlog is 20% - 50% of DB file size
  - If no guidance is given, use autogrow and monitor
- Some products have specific free space requirements.
Huge performance impact - critical

- Default configuration is worst practice
- Pre-size: 8GB/2GB minimum. 20-30% of the DB file size is a rule of thumb.
- Isolate at the physical layer - RAID 1+0
- Set Auto Grow to 500/100
- Divide TempDB database file into multiple files of equal size – one per CPU/Core. Even if on same volume. (max 8)
- OpsMgr, SCSM, large ConfigMgr Primary site servers (non-CAS)

SQL disk – MSIT ConfigMgr Example

**SQL > 50,000 Clients**
- OS Volume: 2-disk RAID1
- App Volume: 2-disk RAID1
- DB File Volume: 24-disk RAID1+0
- DB Log Volume: 20-disk RAID1+0
- Backup Volume: 14-disk RAID1+0
- TempDB Volume: 12-disk RAID 6

**SQL < 50,000 Clients**
- OS Volume: 2-disk RAID1
- App Volume: 2-disk RAID1
- DB File Volume: 12-disk RAID1+0
- DB Log Volume: 8-disk RAID1+0
- Backup Volume: 5-disk RAID5
- TempDB Volume: 4-disk RAID 6

SQL Config – Memory

Set minimums and maximums

- Shared SQL and App/Reporting
- 80-90%: Reserve memory for the OS
- Cluster scenarios: A/P, A/A
- Monitor for SQL Memory pressure, and OS
  - Memory \ Available Mbytes
  - Memory \ Pages/sec
  - Logical Disk \ Avg disk sec/Write/Read \ C:
  - SQLServer: Buffer Manager: Buffer Cache Hit Ratio
SQL Config – Database files

**Auto-grow / Auto-shrink**

- Pre-size is always preferred - use auto-grow as an insurance policy
- Set Auto-growth max size limits, and 500mb/100mb
- NEVER SHRINK!

**Recovery Model**

- Use defaults. Simple is set for a reason!
- High availability scenarios
- Monitoring becomes more critical

<table>
<thead>
<tr>
<th>Initial Size (MB)</th>
<th>Autogrowth</th>
</tr>
</thead>
<tbody>
<tr>
<td>8000</td>
<td>By 500 MB, restricted growth to 20000 MB</td>
</tr>
<tr>
<td>2400</td>
<td>By 100 MB, restricted growth to 10000 MB</td>
</tr>
</tbody>
</table>
Databases: Autogrow set to 1MB
Databases are identified with auto grow set to percentage growth
Databases have been identified with next Auto Growth increment greater than 1GB.
SQL Server maximum memory allocation is unlimited
SQL: Max server memory set to default
Site database automatically closes
Site database automatically shrinks
Site database not configured with Simple recovery model
Site database not enabled for recursive triggers
Site database not enabled to automatically create optimization statistics
Site database not enabled to automatically update optimization statistics
SQL: ConfigMgr database with Page Verify option not set to CHECKSUM
SQL: Affinity mask set inappropriately
SQL: Min memory per query set inappropriately
Part 3 | Advanced Options
Instances

How many instances do I need?

• Shared Instances risk performance
  • SQL Memory
• System Center design principles, and what's next
• Shared reporting issues
• Collation conflicts
High Availability - Clustering

- Stand alone SQL servers vs. SQL Server Multi-Instance Failover Cluster vs. Replicated databases, Highly available VM's
Backup

Best practices:

- Use SQL backup to Disk
- DPM > Disk > Tape/Offsite/Replica
- Schedule backups outside of predefined maintenance windows
- Monitor for length of job and success
- Frequency should be defined by your SLA
- On shared infrastructures, understand the I/O impact of multiple backups
Questions?