



Microsoft®
System Center

**System Center Configuration Manager
2007:**

***Sample Configurations and Common Performance
Related Questions***

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Executive Summary

This document is designed to provide an overview of sample hardware configurations used in stress and scale testing for different size environments. Additionally, it answers common questions about planning and configuring for optimal performance in Configuration Manager 2007.

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Overview

This document is designed to provide an overview of sample hardware configurations used in stress and scale testing for different size environments. Additionally, it answers common questions about planning and configuring for optimal performance in Configuration Manager 2007.

Testing for a zero-day exploit update scenario

Testing Methodology:

The primary goal of our testing was to model the worst-case scenario for site system load in a software update deployment requiring the enterprise-wide deployment of 10 security updates in a short period of time. The following assumptions exist in this case:

- All site systems roles are running 32-bit Windows Server 2003 Enterprise Edition SP2.

Note: While isolated scenarios were tested, the complete end-to-end scenario described here was not attempted using 64-bit Windows Server installations.

- All required prerequisites were met for site server and site system installation, including SQL Server 2005 SP2 and Windows Server Update Services 3.0.
- All sites were configured to operate in native mode using a Windows Server Certificate Authority to provide PKI services. It is estimated that native mode site operations are 10-15% slower in overall performance as compared to sites configured to operate in mixed mode.
- The settings for all discovery methods, inventory, and other client communication traffic-generating items were left at installation defaults.
- All site systems were connected using 1 Gigabit Ethernet network connections with no additional network traffic load other than Configuration Manager network communication. Scenarios involving differing network communication speeds or loads were not tested.
- To identify performance characteristics for large client loads in a simple hierarchy, the following initial object loads were generated for the largest test environment of 200,000 managed clients (proportionally sized loads were generated for the smaller environments) consisting of one central site and two child primary sites of 100k each:
 - 2140 collections
 - 1000 packages
 - 1000 programs
 - 1000 advertisements
 - 100 distribution points
 - 200 boundaries
 - 1000 metering rules

- 200,000 full software inventory files
 - 200,000 full hardware inventory files, including Asset Intelligence data
 - 200,000 delta software inventory files
 - 200,000 delta hardware inventory files
 - 200,000 registration discovery records
 - 200,000 data discovery records
- During the zero-day exploit scenario testing management point, site server, and site database server performance loads were generated using a single software update deployment consisting of ten security updates that were deployed to all 200,000 simulated clients in the environment. All clients successfully received and installed all ten software updates and reported software updates compliance using state messages.
 - For the test to be successful, all client software update installation state messages had to be returned to the central site for reporting **within 24 hours of the software update deployment**. During this time, the distribution of software update binaries to distribution points, management point creation of client software update installation policies, client receipt of policy to install those updates, installation of applicable updates by clients, and state message reporting of results for the deployment from each client had to occur.
 - Distribution point or generated network load related to download of applicable updates was not modeled and this scenario assumes that an adequate number of distribution points and that sufficient network bandwidth is available to accommodate the demand.

We did not model the performance for a large, complicated Configuration Manager 2007 hierarchy during performance testing. Keep in mind that additional processing and network overhead is generated as the number of sites increase. As a result, when designing a hierarchy consider reducing the number of primary sites to the minimum number possible that will meet your requirements.

Hardware configurations used in testing:

This section documents the hardware configurations used in testing each sized environment. Use this information only as a general guide for hardware selection, as there are other factors that may affect performance including available network bandwidth and configuration and frequency of enabled feature usage.

Note: In this testing, the best practice of isolating the operating system installation,

ConfigMgr installation and inboxes, SQL Server data files, SQL Server log files, SQL Server temp database, and VSS shadow copy storage required for backup operations was not followed for all configurations in order to represent environments with less available disk resources and more readily identify stressful activity. To achieve optimal performance, even in smaller environments detailed in this document, follow the best practices for hard disk volume usage described in the larger scenarios of the 100K client primary site and 200k client central site.

10k Client (Single Computer) Configuration

Site Server / management point:

- 2x2 Xeon @ 3 GHz
- 4GB RAM
- SAS write back / read ahead cache (with battery backup) options for all volumes

Volume	Purpose	RAID Type	# of Disks
1	Operating System/SQL Server temp database	RAID 1	2
2	Configuration Manager 2007 installation files and SQL Server site database	RAID 1	2

25k Client Site (Dual Computer) Configuration

Site Server:

- 2x2 Xeon @ 3 GHz
- 4GB RAM
- SAS write back / read ahead cache (with battery backup) options for all volumes

Volume	Purpose	RAID Type	# of Disks
1	Operating System	RAID 1	2
2	Configuration Manager 2007 installation files	RAID 1	2
3	SQL Server site database	RAID10	4

Management point:

- 2x2 Xeon @ 3 GHz
- 4GB RAM
- SAS write back / read ahead cache (with battery backup) options for all volumes

Volume	Purpose	RAID Type	# of Disks
1	Operating System	RAID 1	2
2	Configuration Manager management point component installation files	RAID 1	2

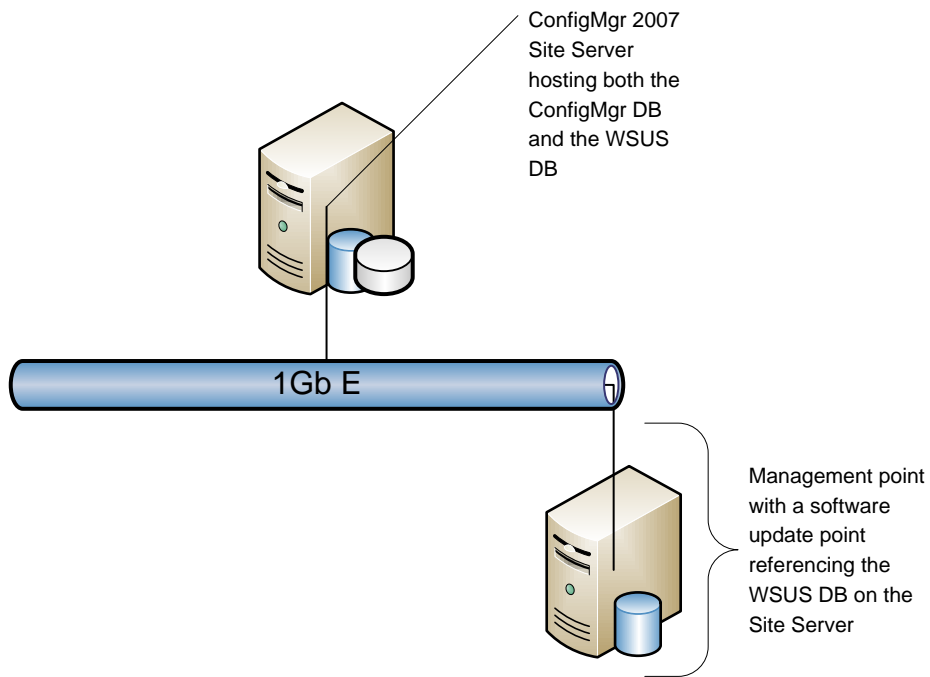


Figure 1

50k client site with separate management points configured in a network load balancing cluster and configured to access a site database replica.

Site Server:

- 2x2 Xeon @ 3 GHz
- 4GB RAM
- SAS write back / read ahead cache (with battery backup) options for all volumes

Volume	Purpose	RAID Type	# of Disks
1	Operating System	RAID 1	2
2	Configuration Manager 2007 installation files	RAID 1	2
3	SQL Server site database configured for site database replication	RAID10	4

Management points (x2):

- 2x2 Xeon @ 3 GHz
- 4GB RAM
- SAS write back / read ahead cache (with battery backup) options for all volumes

Volume	Purpose	RAID Type	# of Disks
1	Operating System/SQL Server temp database	RAID 1	2
2	Configuration Manager 2007 installation files	RAID 1	2
3	SQL Server site database replica	RAID 10	4

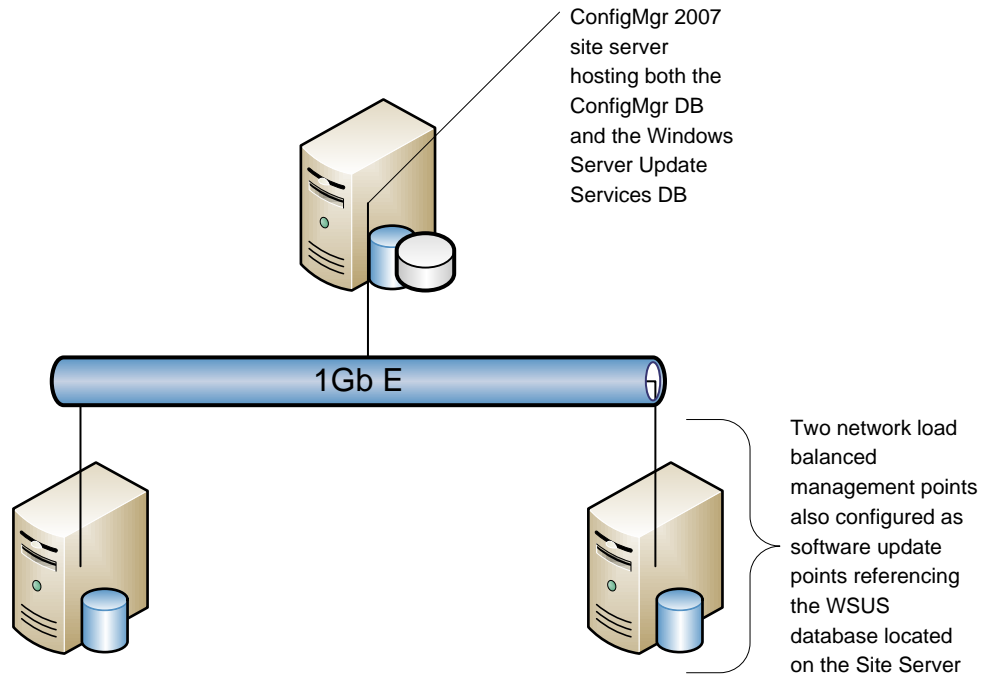


Figure 2

100k client single site with 4 management points configured in a network load balancing cluster and configured to access a site database replica.

This configuration details the recommended hardware platform and site layout to support 100,000 clients assigned to a Configuration Manager 2007 site configured to operate in native mode. In this configuration we see a high end server running the Configuration Manager 2007 site server role as well as the Configuration Manager 2007 site database server which hosts the site and WSUS databases. The management point site system role is placed on four mid range servers operating in an NLB cluster. The four management point servers are also hosting the WSUS web front end servers and the related software update point site roles.

Site Server:

- 4x2 Intel Xeon @ 2.66 GHz
- 16 GB RAM
- SAS write back / read ahead cache (with battery backup) options for all volumes

Volume	Purpose	RAID Type	# of Disks
1	Operating System	RAID 1	2
2	SQL Server temp database	RAID 1	2
3	Configuration Manager 2007 installation files	RAID 10	4
4	SQL Server data files	RAID 10	4
5	SQL Server log files	RAID 10	2
6	SQL Server database replication distribution database	RAID 1	2

Management points (x4):

- 2x2 Xeon @ 3 GHz
- 4GB RAM
- SAS write back / read ahead cache (with battery backup) options for all volumes

Volume	Purpose	RAID Type	# of Disks
1	Operating System/SQL Server temp database	RAID 1	2
2	Configuration Manager 2007 installation files	RAID 1	2
3	SQL Server database replication	RAID 10	4

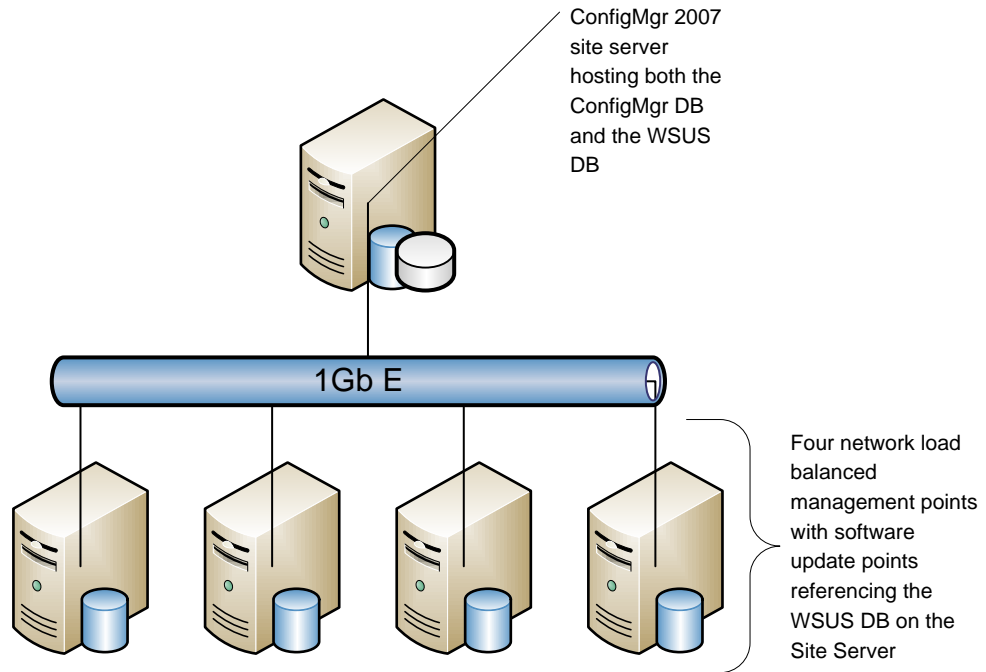


Figure 3

200k client hierarchy - central site with two primary child sites

Site Server:

- 4x2 Intel Xeon @ 2.66 GHz
- 16 GB RAM
- SAS write back / read ahead cache (with battery backup) options for all volumes

Volume	Purpose	RAID Type	# of Disks
1	SQL Server temporary database	RAID 1	2
2	Configuration Manager 2007 installation files	RAID 10	4
3	SQL Server data files	RAID 10	4
4	SQL Server log files	RAID 10	2
5	Operating System	RAID 1	2

Management points

No management points are used in this central site configuration. It is recommended that clients are not assigned to a central site when supporting client levels above 100K so that the central site can provide better availability and performance for centralized administration, as well as the rollup and reporting of inventory, status, and compliance data. Instead, all clients should be assigned to child sites.

Frequently asked questions:

How should I configure my SQL Server database, Configuration Manager 2007 (ConfigMgr) site installation, and operating system hard disk storage for optimal performance at the central site for a large hierarchy? What about a primary site with a large number clients assigned to it?

File I/O is usually the first bottleneck encountered in a central or primary site for a large hierarchy. You should design your disk subsystem for site server and site database server site system roles for fault tolerance, then ensure that the primary consumers of I/O each get their own channel to physical disk(s) in the disk subsystem. Review the following topic in the product documentation for more information:

[Best Practices for Central and Primary Site Hardware and Software Configuration](http://technet.microsoft.com/en-us/library/bb932180.aspx)

(<http://technet.microsoft.com/en-us/library/bb932180.aspx>)

Should I install SQL Server on the same computer used as the ConfigMgr central site server, or should I use a separate computer?

As opposed to guidance given for Systems Management Server 2003 (SMS 2003), you will generally achieve better overall performance if SQL Server is hosted on a separate computer from the Configuration Manager 2007 site server computer, provided there is a high speed (1 Gbps or faster) connection between the site server and the SQL server computers, and the connection is dedicated for this purpose. For a central site in a large (100,000 or more managed computers) hierarchy, and/or an environment with frequent management activity and reporting, consider hosting the site database on a separate computer running SQL Server. Review the following topic in the product documentation for more information:

[Performance Considerations When Designing Configuration Manager Sites](http://technet.microsoft.com/en-us/library/bb932210.aspx)

(<http://technet.microsoft.com/en-us/library/bb932210.aspx>)

Are there any important configuration considerations for backup?

ConfigMgr uses Volume Shadow copy Service (VSS) to create point-in-time backups of site information and the SQL Server site database files. To do this, it uses a shadow copy storage area to store data. Note this space is in addition to the space used by actual backup data created by the ConfigMgr backup task. To improve performance and prevent backup failures due to insufficient disk space, consider configuring VSS to use a separate dedicated volume on a separate I/O channel with sufficient disk space for the shadow copy storage area. You can use the vssadmin tool included with Windows Server 2003 or Windows Server 2008 to configure this. For more information on shadow copy storage and vssadmin, see the following:

[Event ID 4001 — VSS Storage Space Availability](http://technet2.microsoft.com/windowsserver2008/en/library/afec9384-fdea-45dc-8496-96104f4215281033.mspx?mfr=true)

(<http://technet2.microsoft.com/windowsserver2008/en/library/afec9384-fdea-45dc-8496-96104f4215281033.mspx?mfr=true>)

[Determining storage options for shadow copies](http://go.microsoft.com/fwlink/?LinkId=104777) (<http://go.microsoft.com/fwlink/?LinkId=104777>)

[Vssadmin](http://go.microsoft.com/fwlink/?LinkId=104777) (<http://go.microsoft.com/fwlink/?LinkId=104777>)

Should I install Configuration Manager 2007 site system roles on a 64 bit operating system? Will this improve performance?

ConfigMgr is a native 32-bit application and there is a slight performance overhead when running 32-bit applications on 64-bit Windows in the WOW64 subsystem. In most cases, however, this performance difference is negligible. If your organization is adopting and standardizing on 64-bit Windows Server, performance should be sufficient on adequately sized hardware in all but the most extreme circumstances.

Should I install SQL Server 64 bit edition on a 64 bit operating system instead of SQL Server 32 bit edition on a 32 bit operating system?

SQL Server 2005 64-bit edition offers advantages in physical memory addressability and the 64-bit capable operating system and hardware combination offers more scalability and better performance. The most pronounced advantage is due to the increase in addressable physical memory. SQL Server design attempts to minimize I/O operations to the database on physical disk by using memory as buffer for data pages. With larger memory (8GB or more) computers performance gains may be seen. The SQL Server site database for a central site for a large hierarchy with over 100,000 clients, 64-bit SQL Server should be considered as an option for improving current performance, accommodating anticipated growth in the number of managed clients, increased frequency of management activities such as inventory collection, software distribution, software updates, or desired configuration management reporting.

Having said all that, under most loads we generated in testing, SQL Server 2005 64-bit performance was not significantly different from the 32-bit version with extended memory through Address Windowing Extensions was available.

Should I use Address Windowing Extensions (AWE) for SQL Server 2005 32-bit editions?

On computers with greater than 4 GB of physical memory running a 32-bit operating system, enabling Address Windowing Extensions (AWE) for SQL Server allows it to map and unmap database pages directly to memory outside the user-mode virtual address space for the SQL Server service. It does not directly provide for mapping of other objects, such as users, threads, or queries outside SQL server's virtual address space. By providing additional memory for buffering, physical I/O to the database files on disk can be reduced and will result in overall increased performance.

Should I configure SQL Server to use a specific amount of memory?

In general, you should use the default SQL Server automatic memory configuration settings. In a situation where a primary site server has extremely low physical memory (2 GB or less), such as in a virtual PC environment used for demonstration purposes, you may consider setting the SQL Server maximum memory setting to a lower value to prevent potential paging by the operating system. For example, on a computer used for demonstration purposes with only 1GB or RAM you could set the SQL Server maximum memory option to 384MB, which would provide a more responsive system if using a local administrator console or other applications.

Should I use Network Load balancing for my management points?

If you have a site with more than 25,000 active clients assigned to it, you need to configure two or more management points behind an NLB. For each additional 25,000 clients, you should add another management point to the NLB cluster. Up to 100,000 clients assigned to a primary site are supported using four load-balanced management points.

Should I use a replicated SQL Server site database for my management points?

If you use an NLB cluster of management points, you should configure them to use a SQL Server site database replica instead of the site database server directly.

See the following topic for more information on using management points configured to operate in a network load balancing cluster accessing a site database replica:

[Performance Configuration Recommendations](http://technet.microsoft.com/en-us/library/bb932186.aspx) (<http://technet.microsoft.com/en-us/library/bb932186.aspx>)

Should I use network load balanced software update points running Windows Server Update Services (WSUS)?

Like the management point site system role, the software update point site system role supports a maximum of 25,000 clients per computer. You must use an NLB of software update points to support additional clients in the same manner as the management point. This means that you must configure WSUS on each computer in the NLB cluster, and then configure them as software update points. To configure WSUS in an NLB configuration, please refer to the following documentation:

[Appendix C: Configure WSUS for Network Load Balancing](http://technet2.microsoft.com/windowsserver/en/library/b17d7555-81fd-4e32-8e8b-92b4c79221161033.mspx)
(<http://technet2.microsoft.com/windowsserver/en/library/b17d7555-81fd-4e32-8e8b-92b4c79221161033.mspx>)

How can I troubleshoot performance issues in Configuration Manager 2007?

Check the product documentation for common performance issues and potential solutions:

[Troubleshooting Configuration Manager Performance](http://technet.microsoft.com/en-us/library/bb932206.aspx) (<http://technet.microsoft.com/en-us/library/bb932206.aspx>)

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