Hardware Guide

Microsoft Dynamics™ NAV 5.0

Hardware Guide for Dynamics – NAV

White Paper

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Microsoft Dynamics™

Acknowledgements

This white paper is a collaboration of Customer Service and Support and Business Systems Architecture Engineers from the North America, Europe-Middle East-Africa, and Asia Pacific regions. The following individuals contributed in the creation and maintenance of this document:

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Table of Contents

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Purpose, Terms & Conditions

Microsoft Dynamics™ NAV is designed for midmarket segment companies with typically between 5-500 employees and 2-100 users, with revenue of between $1-500 million USD. Microsoft Dynamics™ NAV is ideal for companies with complex business processes and a strong need for a vertical focus. Industries are Wholesale, Manufacturing, and Business Services, in that order, with IT resources that range from super-user to one-person IT staff.

The purpose of this document is to inform customers and partners of the appropriate hardware sizing which may support Microsoft Dynamics™ NAV for up to 250 users. It outlines available resources for large deployment projects that fall outside the product's traditional target market.

When you engage with prospects that plan to have more than 100 concurrent users in Microsoft Dynamics™ NAV you must involve the Technical Presales Advisory Group (TPAG) and Microsoft Business Solutions Consulting. These resources will be of help to you if you do not have proven experience with customers of this size.

The Technical Presales Advisory Group (TPAG) is a virtual team within Microsoft with Microsoft Dynamics™ software expertise. This team was formed to assist Microsoft partners who are authorized to provide Microsoft Business Solutions licensed software to their customers. It provides in-depth technical evaluations of pre-sales proposals based on industry standards and Microsoft best practices. The team can be a proactive resource for your organization.

The TPAG is available for Microsoft Dynamics™ AX, Microsoft Dynamics™ CRM, Microsoft Dynamics™ NAV and Microsoft Dynamics™ GP. You can read more about TPAG at

https://mbs.microsoft.com/partnersource/communities/consulting/mbsconsultingservices/tpag.htm

Please review and understand the following before using this document for deployment:

- All implementations utilizing these guidelines should include a performance testing cycle as well as a database settings and index tuning analysis prior to production implementation.

- The information provided and the recommendations made are based on existing Customer environments and white papers previously released by Microsoft. These designs do contain margins of error that can be reduced with additional testing and research of the specific customer environment.

- If the prospect has a high level of transaction volume or other extraneous factors exist which could hinder performance or introduce additional complexities, the recommendations in this document may be inadequate and should not be followed.

- The general recommendations in this document are specific only to Microsoft Dynamics™ NAV version 5.0.

Microsoft Dynamics™ NAV Environment Overview

Microsoft Dynamics™ NAV Database Server

Microsoft Dynamics™ NAV Database Server enables many users to share common information that is stored in one database on a server. Microsoft Dynamics™ NAV 5.0 Database Server was designed specifically for and is tightly integrated with the Microsoft Dynamics™ NAV application.

It is possible to run two or more Microsoft Dynamics™ NAV Database Servers with the same database. With this configuration, you could have one server running TCP/IP and another one running NetBIOS on the same database. All servers need to be installed on the same machine, and the limitations of the Microsoft Dynamics™ NAV Database Server apply at the machine level:

- Upper limit of the database cache for all servers on 1 machine: 1GB

- Upper limit of the number of CPUs used by all servers on 1 machine: 1
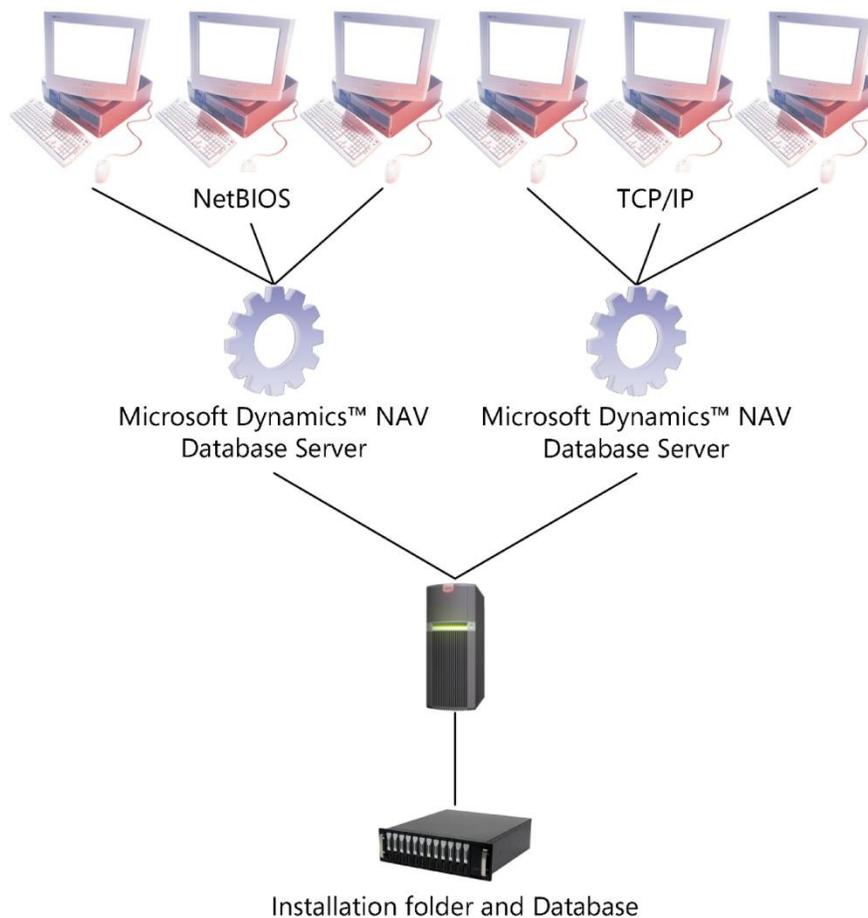
Microsoft Dynamics™ NAV option for Microsoft SQL Server

Microsoft Dynamics™ NAV can run on Microsoft SQL Server. Microsoft SQL Server is integrated with C/SIDE and provides additional features such as Online Analytical Processing (OLAP) and data warehousing.

Microsoft SQL Server Option for Microsoft Dynamics™ NAV gives you the support to securely grow your business.
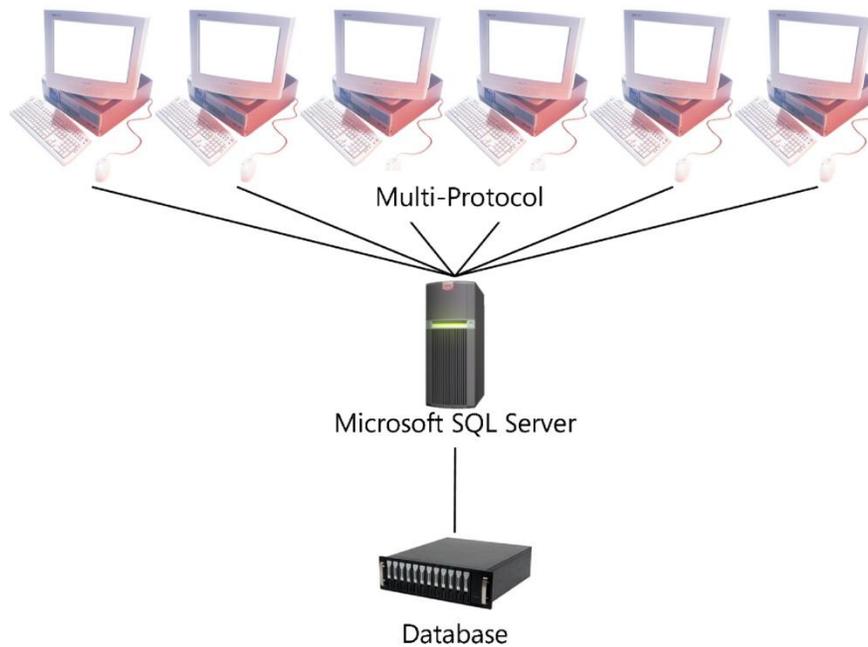
Microsoft Dynamics™ NAV Application Server

Microsoft Dynamics™ NAV Application Server is a connection point to the Microsoft Dynamics™ NAV application that runs as a Microsoft Windows NT service. It makes Microsoft Dynamics™ NAV data and business logic available to external applications.

It is a key component in the architecture of e-commerce and web-based solutions for Microsoft Dynamics™ NAV.

It is possible to run two or more Microsoft Dynamics™ NAV Application Servers with the same database to scale-up your architecture if more than 10 XML documents from Microsoft BizTalk Server need to be processed per minute for example.
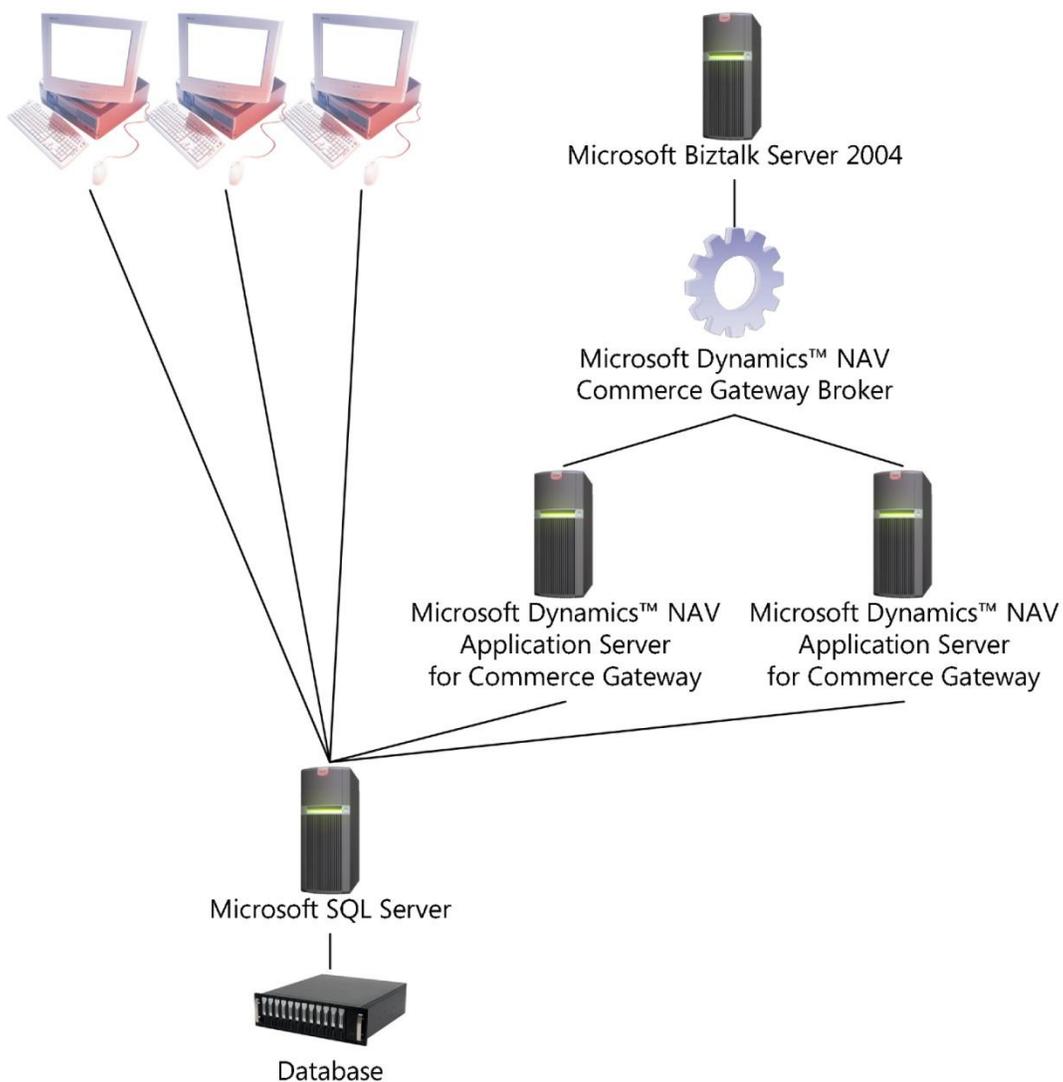
It is also possible to run two or more Microsoft Dynamics™ NAV Application Servers with the same database to exchange data with different external applications: one Microsoft Dynamics™ NAV Application Server to exchange data with Microsoft SharePoint Portal Server and another one to exchange data with hand-held devices for example.

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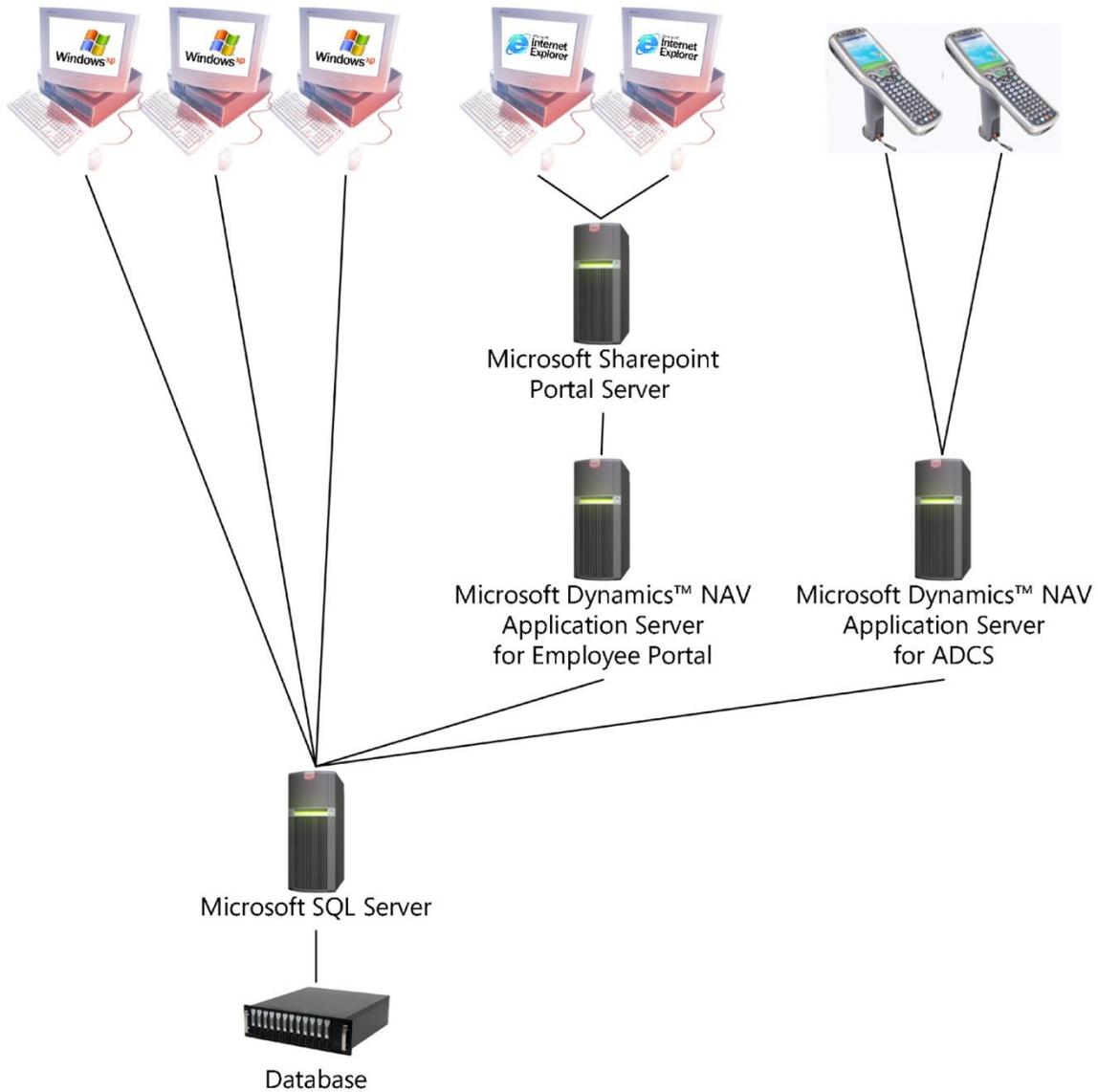
Microsoft Dynamics™ NAV Client

Memory (RAM)

Windows XP Professional 128 MB recommended

Windows Vista† Business Edition 1 GB recommended (128 MB video memory also recommended)

Windows Vista† Enterprise Edition 1 GB recommended (128 MB video memory also recommended)

In addition, Microsoft Dynamics™ NAV objects such as code, descriptions and windows that will be used on the client computer are stored in the object cache. This means that the client computer only needs to retrieve these objects once from the server, and then they will be stored in memory. In Microsoft Dynamics™ NAV 5.0 the total size of objects is about 67MB. The W1 version of Microsoft Dynamics™ NAV 5.0 includes the English (United States) language layer (objects translation). Additional language layers such as Danish require up to 2MB of additional memory. On top of this, the client application will also consume memory depending on the functionality it is executing. As an example, the client application may consume about 95MB of memory when a user is creating and posting sales orders.

CPU

Windows XP Professional - Intel Pentium/Celeron family, or AMD K6/Athlon/Duron family, or compatible processor recommended

Windows Vista† Business Edition - 1 GHz 32-bit (x86) or 64-bit (x64) †† Intel or AMD processor recommended

Windows Vista† Enterprise Edition - 1 GHz 32-bit (x86) or 64-bit (x64) †† Intel or AMD processor recommended

Hard disk

Windows XP Professional requires up to 1.5 GB

Windows Vista† Business Edition requires up to 40 GB

Windows Vista† Enterprise Edition requires up to 40 GB

In addition, Microsoft Dynamics™ NAV 5.0 requires about 70MB if the following options are not installed: Demo Database, Backup of Demo Database, and SQL Express. The W1 version of Microsoft Dynamics™ NAV 5.0 includes the English (United States) language files (UI and online help). Additional language files require up to 30MB.

Furthermore, the Windows XP and Windows Vista paging file requires 1.5 to 2.5 times the amount of RAM on the computer.

† Microsoft Vista is a supported platform with the release of Microsoft Dynamics – NAV 5.0. Hard disk recommendations are based on OS system requirements (http://support.microsoft.com/kb/919183/)

†† The Microsoft Dynamics™ NAV Client will run on (x64) platforms. The executable will run in the WOW (Windows on Windows) (x86) subsystem.

Networking

The Microsoft Dynamics™ NAV Client requires a 100MB switched (no hubs) connection to the server. Therefore, 56K modem or broadband connections are not supported with the standard Microsoft Dynamics™ NAV Client. Alternative solutions are available (Windows Terminal Services†, Microsoft Dynamics™ NAV Employee Portal or ADCS for example).

†Please refer to page 19 of this document for hardware guidelines for the Dynamics™ NAV Client on Windows Terminal Services
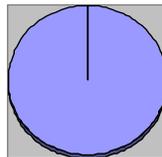
Microsoft Dynamics™ NAV Database Server

Windows Edition	Concurrent Number of Users	C/SIDE Database Size	Processor Cores	RAM (GB)	Network Interface Card
Microsoft Windows 2003 Server Standard Edition R2 x86	≤50	Small (≤40GB)	1	1GB †	Gigabit Ethernet LAN
Microsoft Windows 2003 Server Standard Edition R2 x86	51-100	Large (>40GB)	2	2GB ††	Gigabit Ethernet LAN

Microsoft Windows Server 2003 Enterprise Edition differs from Microsoft Windows Server 2003 Standard Edition primarily in its support for high-performance servers and its ability to cluster servers for failover security. These capabilities provide reliability that helps ensure systems remain available even if problems arise. Microsoft Dynamics™ NAV Database Server does not support load balancing with cluster servers.

† Microsoft Dynamics™ NAV Database Server can only use one processor. However, there can be other services requiring CPU process time running on the machine (such as anti-viruses, backup software, task schedulers, etc). The machine "as a whole" can benefit from having two processors.

†† Microsoft Dynamics™ NAV Database Server can only use 1GB of RAM. But the server has to share its resources with other programs and with the Operating System. The upper limit of the database cache is 1GB. The extra memory allows the Operating System to allocate more resources for handling other important operations like concurrent connections.

Dedicated 1 Processor / 1 GB RAM   **Extra Processor / RAM**
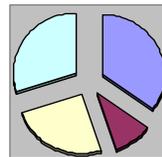
□ Database Server

□ Concurrent Connections
■ Antivirus
□ Backup Software
□ Background Process

Microsoft Dynamics™ NAV option for Microsoft SQL Server 2000

Windows Edition	SQL Server Edition	Concurrent Number of Users	SQL Database Size	Processor Cores	RAM (GB)	Network Interface Card
Microsoft Windows 2003 Server Standard Edition R2	Microsoft SQL Server 2000 Standard Edition	≤50	Small (≤40GB)	2	4GB†	Gigabit Ethernet LAN
Microsoft Windows 2003 Server Enterprise Edition R2	Microsoft SQL Server 2000 Enterprise Edition	51-100	Large (>40GB)	4	8GB††	Gigabit Ethernet LAN

Note that Microsoft Windows 2003, both Standard and Enterprise Editions, requires Microsoft SQL Server 2000 Service Pack 3 or later to be applied.

† Microsoft SQL Server 2000 Standard Edition is capable of utilizing a maximum of 2GB RAM by default. Having 4GB of RAM would provide SQL Server with maximum exclusive memory space, with the operating system having enough memory to use for other applications and services running in the server. The use of the /3GB switch in the BOOT.INI file will allow SQL Server 2000 Standard edition to use 3 GB of virtual address space

†† In order for Microsoft SQL Server 2000 Enterprise Edition to use over 4 GB of RAM AWE must be enabled. AWE is a set of application programming interfaces (APIs) to the memory manager functions that enables programs to address more memory than the 4 GB that is available through standard 32-bit addressing. SQL AWE memory is static not dynamic so when the SQL Server service starts it will reserve the memory specified as the "max server memory". If there is 8 GB of memory on the server, you will want to set the "max server memory" to 7 GB to allow 1 GB for the OS. The /PAE switch must also be included in the BOOT.INI file on the OS without /PAE AWE cannot reserve memory in excess of 4 GB. The /3GB switch should not be used in conjunction with AWE, but /3GB can be used in conjunction with /PAE on servers with more than 4 GB of memory but only running SQL Server Standard edition. The OS will need to be rebooted for any BOOT.INI changes to take effect. AWE is turned on in SQL Server please consult SQL Books on Line for more information on enabling AWE.

Reminder:
Mainstream support for SQL 2000 (all editions) will expire on 2008. Please refer to the following link for further information: http://support.microsoft.com/lifecycle/?p1=2852

Dual Core and Quad Core processors and Microsoft Dynamics – NAV SQL Server Option

For the purposes of this document, we will equate a processor core to be the same a single core processor. This is not exactly the case but with Dynamics – NAV's interaction with Microsoft SQL Server being a relatively small consumer of CPU cycles compared to other Microsoft SQL Server applications, we can safely make this assumption for the purposes of this document.

Intel and AMD processors

Due to the difference in CPU architecture between Intel and AMD this document will not make recommendations for CPU clock speeds or L2 and L3 caches. This document will also not recommend any specific CPU due to the rapid advancement of CPU designs. Please consult the manufacturer's latest specifications when deciding which server class CPU to choose.

Hyper-threaded processors have the ability to utilize unused processor cycles as a virtual processor. The OS and SQL Server will see this virtual processor as separate processor if Hyper-Threading is enabled. For example, two Dual Core hyper-threaded processors will show up as eight separate CPU's. The issue with this and SQL Server is that the actual processor and the virtual processor will share the same L2 and L3 caches so hyper-threading increases CPU throughput but decrease the cache available to the actual and virtual processors which can cause performance issues certain situations. Whether or not to disable Hyper-Threading on SQL Server will depend on the implementation and workload so we recommend testing with it enabled and disabled to determine the correct configuration for an individual implementation.

Microsoft Dynamics™ NAV option for Microsoft SQL Server 2005

Windows Edition	SQL Server Edition	Concurrent Number of Users	SQL Database Size	Processors or Processor Cores	RAM (GB)	Network Interface Card
Microsoft Windows SBS 2003 R2 Standard Edition	Microsoft SQL Server 2005 Workgroup Edition	≤5	Very Small (≤20GB)	2	2 GB	Gigabit Ethernet LAN
Microsoft Windows 2003 Server Standard Edition R2 x64 or x86	Microsoft SQL Server 2005 Standard Edition x64 or x86	6-50	Small (21-40GB)	2	4 GB	Gigabit Ethernet LAN
Microsoft Windows 2003 Server Standard Edition R2 x64	Microsoft SQL Server 2005 Standard Edition x64	51-150	Medium (41-80GB)	4	8 GB	Gigabit Ethernet LAN
Microsoft Windows 2003 Server Standard Edition R2 x64	Microsoft SQL Server 2005 Standard Edition x64	151-250	Large (>80GB)	8	16 GB	Gigabit Ethernet LAN

Microsoft Windows SBS 2003 R2 Standard Edition is an affordable and integrated solution which provides small businesses with many of the features used by large companies – e-mail, Internet connection, internal Web sites, remote access, support for mobile devices, file and printer sharing, backup and restore.

Microsoft Windows Server 2003 Standard Edition R2 (x64) in combination with Microsoft SQL Server 2005 Standard Edition (x64) will support up to 32 GB of RAM and 4 processor sockets (single, dual or quad core so it can support up to 16 cores). This configuration will meet the needs of the vast majority of the Microsoft Dynamics – NAV customers. Microsoft SQL Server 2005 Standard Edition (x64) can also run in a 2-node cluster configuration if paired with Microsoft Windows Server 2003 Enterprise Edition R2.

Microsoft Windows Server 2003 Enterprise Edition R2 and Microsoft SQL Server 2005 Enterprise Edition would only be necessary if more than 32 GB of RAM, more than 4 processor sockets, or more than a 2 node cluster is required for the implementation.

There are difference in functionality between Microsoft SQL Server 2005 Enterprise Edition and SQL Server 2005 Standard edition such a Database Mirroring and Partitioning for more information on the difference please reference the following URL.

http://www.microsoft.com/sql/prodinfo/features/compare-features.mspx

We strongly recommend the use of Microsoft SQL Server 2005 with the latest version of Dynamics – NAV executables available. Due to issues with the cursor engine changes in SQL Server 2005 and the query hints issue, it is best that customers stay on the latest executables to help mitigate these issues.

Microsoft SQL Server 2005 (x64) and (x86)

An x86 server system can manage a maximum of 4 GB of memory. This limits the addressable memory space for Windows server 2003 systems to 4 GB. (This is true for all 32-bit operating systems). With 2 GB reserved for the operating system by default on 32-bit Windows, only 2 GB of memory remains for SQL 2000 or SQL Server 2005 x86. You can increase this amount to 3 GB by setting a /3GB switch in a Windows BOOT.INI. In order to use more than 4 GB of memory AWE must be enabled. AWE is a set of memory management extensions to the Microsoft Win32 API that allows SQL Server x86 to address memory beyond 4 GB. Using AWE, applications can acquire physical memory as nonpaged memory, and then dynamically map views of the nonpaged memory to the 32-bit address space. AWE enables SQL Server 2000 and 2005 x86 to address larger amounts of data. Although AWE makes execution of memory-intensive applications possible when otherwise impossible, AWE imposes overhead, adds initialization time, and can face performance challenges under various processing conditions. The use of AWE in a x86 environment is only for data caching so plan caching, sort space, and lock memory are still limited to 2 GB of memory in x86

These issues are eliminated on the x64 platform when directly addressing memory as AWE is no longer necessary. In x64 environments you are no longer limited to 2 GB for memory for plan caching, sort space, and lock memory†. For any Dynamics – NAV implementation that will use more than 4 GB of memory for SQL Server we recommend x64.

† The expanded lock memory available when utilizing SQL Server 2005 x64 would be very beneficial if you plan on using the "Always Rowlock" database option in Dynamics - NAV

Microsoft Dynamics™ NAV Application Server (stand alone computer)

Microsoft Dynamics™ NAV Application Server for Employee Portal

Windows Edition	Concurrent Number of Web-Users	Processors or Processor Cores	RAM (GB)	Network Interface Card
Microsoft Windows 2003 Server Standard Edition R2	≤100	1	2 GB	Gigabit Ethernet LAN
Microsoft Windows 2003 Server Standard Edition R2	≥101	2	4 GB	Gigabit Ethernet LAN

Microsoft Dynamics™ NAV Application Server for ADCS

Windows Edition	Concurrent Number of Web-Users	Processors or Processor Cores	RAM (GB)	Network Interface Card
Microsoft Windows 2003 Server Standard Edition R2	≤25	1	2 GB	Gigabit Ethernet LAN
Microsoft Windows 2003 Server Standard Edition R2	≥26	2	4 GB	Gigabit Ethernet LAN

Microsoft Dynamics™ NAV Application Server for Commerce Gateway

Windows Edition	Number of Documents per Minutes	Processors or Processor Cores	RAM (GB)	Network Interface Card
Microsoft Windows 2003 Server Standard Edition R2	≤2	1	2 GB	Gigabit Ethernet LAN
Microsoft Windows 2003 Server Standard Edition R2	≥3	2	4 GB	Gigabit Ethernet LAN

Microsoft Dynamics™ NAV Remote Clients

Windows Terminal Services or Windows Terminal Service with Citrix is the only supported solutions for Microsoft Dynamics – NAV client running over a WAN connection. There is no difference in the hardware recommendation between Windows Terminal Services and Windows Terminal Services with Citrix. For this section of the document I will refer to both configurations as just Windows Terminal Services.

Dual Core and Quad Core processors and Windows Terminal Services

For the purposed of this section of the document, I will equate a processor core to be the same a single core processor.

Intel and AMD processors

Due to the difference in CPU architecture between Intel and AMD this document will not make recommendations for CPU clock speeds or L2 and L3 caches. This document will also not recommend any specific CPU due to the rapid advancement of CPU designs. Please consult the manufacturer's latest specifications when deciding which server class CPU to choose.

Hyper-threaded processors have the ability to utilize unused processor cycles as a virtual processor. The OS and SQL Server will see this virtual processor as separate processor if Hyper-Threading is enabled. For example, two Dual Core hyper-threaded processors will show up as separate CPU's. The issue with this and SQL Server is that the actual processor and the virtual processor will share the same L2 and L3 caches so hyper-threading increases CPU throughput but decrease the cache available to the actual and virtual processors which can cause performance issues certain situations. Whether or not to disable Hyper-Threading on SQL Server will depend on the implementation and workload so we recommend testing with it enabled and disabled to determine the correct configuration for an individual implementation.

Sizing Formula for Dynamics – NAV clients and Windows Terminal Services†

10-15 Dynamics – NAV users per processor core depending on work load

64 MB of Memory per Dynamics – NAV user (assumes an object cache of 32 MB)

1 GB of Memory for the Operating System

Internal SCSI or SAS RAID 1 10 – 15K RPM with 500 MB of disk space available for each user

1 Gigabit Ethernet connection

† These recommendations assume that Microsoft Dynamics – NAV will be the only application running on under Windows Terminal Services. If Microsoft Office or other application will be deployed on Windows Terminal Services in addition to the Dynamics – NAV client the hardware recommendations will need to be taken into account in addition to those the Microsoft Dynamics – NAV client.

Example 100 Dynamics – NAV users;

CPU

100 users / 10 users per processor core = 10 cores††

or

100 users / 15 users per core = 6.67 cores which really equates to 8 cores††

For this example, a 4-way dual core or 2-way quad core server would be the recommended choice. Because Dynamics – NAV is utilizing client side cursors you may consider more smaller Terminal Servers for better network bandwidth such as 2 2-way dual core or 2 1-way quad core servers.

RAM

(100 users X 64 MB per user) + 1 GB for the OS = 7400 MB which equates to 8 GB of RAM

For this example if you deployed a 4 way dual core server all 8 GB of RAM would installed on the that server and the same holds true the 2 way quad core machines. If you deploy multiple Terminal Servers the RAM calculation is a little different as we must figure in the 1 GB or RAM for the OS on each server.

(50 users X 64 MB per user) + 1 GB for the OS = 4200 (4 or 6 GB of RAM)

In this example, you will need to take into account workload and activity to decide whether the 4 GB will be sufficient or you will need to scale up to 6 GB

DISK

100 users X 500 MB per user = 50000 MB or 50 GB

For this example we would recommend two internal 146 GB 15K RPM SCSI or SAS drives in a RAID 1 configuration to hold the Dynamics – NAV temp files, OS and program files, page file, and anything else installed on the Terminal Server.

†† It is recommended that you use both calculations to find a feasible recommendation that can be applied to currently available hardware.

Storage

Recommendation for hard disk size depicts minimum values only. Depending on availability, larger disks can be used. Factors such as RPM, Seek Time and Latency should always be taken into consideration when choosing the hard disk. The number of spindles used can greatly increase performance. The number of spindles should drive decision of how many disks to use not drive space.

Storage for Microsoft Dynamics™ NAV Database Server

Storage Solution	Technology	C/SIDE Database Size	Number of Disks for Data
Internal Storage Direct Attached Storage (DAS)	SCSI SAS SCSI SAS	Small (≤40GB)	4 HDD @ 15K RPM RAID 1
Direct Attached Storage (DAS) Storage Area Network (SAN)	SCSI SAS Fiber/SCSI	Large (>40GB)	8 HDD @ 15K RPM Multiple RAID 1† or RAID 10

†The Dynamics – NAV database server performs best with large database when the data is spread across multiple *.FDB files with each file being on its own RAID 1 partition (each with its own physical disks). For best performance you may want to limit the size of each *.FDB file to 10-15 GB. So for example if you have a 60 GB database you may want to split that into 4-6 *.FDB files with each file residing its own RAID 1 partition for best performance. RAID 10 is also an option.

Storage for Microsoft SQL Server

Storage Solution	Technology	SQL Database Size	Concurrent Number of Users	Number of Disks for Data	Number of Disks for Transaction Log
Internal Storage	SAS SCSI	Very Small (≤20GB)	≤5	1 HDD Mirrored @ 10 – 15K RPM RAID 1	1 HDD Mirrored @ 10 – 15K RPM RAID 1
Internal Storage or Direct Attached Storage (DAS)	SAS SCSI	Small (21-40GB)	6-50	2 – 3 HDD † Mirrored @ 15K RPM RAID 10	1 HDD Mirrored @ 15K RPM RAID 1
Direct Attached Storage (DAS) or Storage Area Network (SAN)	SAS SCSI Fiber/SCSI	Medium (41-80GB)	51-150	4 – 5 HDD † Mirrored @ 15K RPM RAID 10	1 HDD Mirrored @ 15K RPM RAID 1
Storage Area Network (SAN)	Fiber/SCSI Fiber/Fiber	Large (>80GB)	151-250	6 – 7 HDD † Mirrored @ 15K RPM RAID 10	2 HDD Mirrored @ 15K RPM RAID 10

Example:

C:\....   Operating System, Page File, and SQL Server program files

D:\....\data   SQL data files (*.mdf and *.ndf)

E:\....\NAVlog   SQL log file (*.ldf)

F:\....\back-up   SQL database and transaction log back-ups

† The two numbers specified for the recommend numbers of spindles (drives) it meant to cover both ends of the concurrent users count spectrum for that section. For example, with the concurrent user count of 6-50 the recommend number of spindles (drives) for the lower end of that range would be 2 and the recommended number of spindles (drives) for the upper end of the range would be 3. It is also recommend that you have a separate set of disks for the SQL database back-ups and transaction log back-ups.

We recommend that the log file drive for each SQL Server database be a separate set of physical and logical drives. For best performance, you always want the read/write head of the disk at the end of the log file and if multiple log files reside on the same set of disks, the read/write head will need to switch back and forth potentially causing performance issues. Microsoft Dynamics – NAV is not a heavy user of TempDB; the decision of whether or not to place TempDB on its own set of drives will depend on the volume and usage of each individual customer and must be evaluated individual basis. The same goes for the usage of extra SQL data files and file groups, these decisions must be evaluated on an individual basis.

Stripe Size and Disk Alignment

Disk alignment can have a significant impact on disk performance. Since proper configuration can vary greatly by manufacturer, please consult your hardware manufacturing to verify the proper disk alignment and offset settings. The allocation or stripe size should be >=8k to prevent torn pages we recommend 64k to match the size of the SQL Server Extent (8 – 8K pages).

Microsoft Dynamics is a line of integrated, adaptable business management solutions that enables you and your people to make business decisions with greater confidence. Microsoft Dynamics works like and with familiar Microsoft software, automating and streamlining financial, customer relationship and supply chain processes in a way that helps you drive business success.

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