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Sizing Microsoft BackOffice 1.5 on Compaq Servers

Compaq TechNote

Includes information on:

- Configuring the optimum platform to support Microsoft BackOffice 1.5

- Optimizing your memory configuration

- Exploring important considerations regarding your disk subsystem

- Compaq server recommendations

- System utilization and monitoring

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Sizing Microsoft BackOffice 1.5 on Compaq Servers

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Chapter 1
About This TechNote

This TechNote provides the knowledge acquired by Compaq Systems Engineers in the area of sizing the appropriate Compaq Server for Microsoft BackOffice 1.5. The information presented here provides a starting point for configuring the optimum platform to support Microsoft BackOffice 1.5. Compaq strives to provide the best technical information possible on a specific topic in a timely manner and in a highly usable format. Any comments, suggestions, and feedback are always appreciated. Feel free to use the User Survey found at the end of this TechNote. Wherever possible, references are made to other useful tuning documentation.

This TechNote also provides:

■ Details on the comprehensive testing methodology used to achieve our recommendations for the optimum platform to support Microsoft BackOffice 1.5.

■ Guidelines for planning the initial requirements necessary for memory and the disk subsystem.

■ Recommendations on user load variances, stress testing, and other server-specific results such as the monitoring and utilization of the system, processor, memory, and disk subsystem.

Chapter Organization

This chapter is intended to help you use this TechNote; therefore, each chapter is summarized as follows:

■ *Chapter 1* -- Introduces the TechNote with a brief summary of each chapter, general information about conventions used, additional resources you can use to find more information on the various components of Microsoft BackOffice, and the testing methodology used to produce the TechNote.

■ *Chapter 2* -- Provides recommendations on initial memory requirements for Microsoft BackOffice 1.5.

■ *Chapter 3* -- Provides recommendations on initial disk requirements for Microsoft BackOffice 1.5, disk subsystem considerations, and considerations for using the Compaq System Configuration Utility.

■ *Chapter 4* -- Provides recommendations for minimum and optimum hardware configurations based on user loads and user profiles.

■ *Chapter 5* -- Provides information on techniques and tools you can use to monitor and influence the performance of Microsoft BackOffice 1.5.

■ *Appendix A* -- Provides information on how to order printed Compaq TechNotes, including pricing information, 1 (800) telephone numbers, and a list of the latest TechNotes available. This information also includes the TechNotes available on the Internet.

Notational Conventions

Table 1-1 defines the text conventions used within this TechNote.

Table 1-1
Notational Conventions

Convention	Use
Enter	When instructed to enter information, type the information in using your keyboard, then press the Enter key.
FILENAMES	Names of files appear in uppercase italic in the DOS and other environments.
items of importance	Important terms or specific points of information may appear in italics for emphasis.

continued

Notational Conventions *continued*

Convention	Use
Key + **Key**	When you see a plus sign between two keys, hold down the first key while you simultaneously press the second key. For example, "Press the **Ctrl** + **Z** keys" means to press the **Ctrl** key while you simultaneously press and release the **Z** key.
Keys	Keys on your keyboard appear in boldface.
"new terms" and "prompts"	The first occurrence of a technical term, prompt, or reference to a word other than a command appears in quotes.
PROGRAMS, COMMANDS, UTILITIES, DIRECTORY NAMES, and DRIVE NAMES	These items appear in uppercase in the DOS and other environments.
Select *item* → *item*	Items separated by arrows indicate items you select in a sequence.
Set, Get	Screen button labels appear in bold initial caps.
screen selections and *variables*	These items appear in italics in all chapters of this TechNote.
user input and screen display	Information you type exactly as it appears on the screen.
USER INPUT	Information you type exactly as it appears is shown in uppercase.
CAUTION	Indicates that failure to follow directions could result in damage to equipment or loss of information.
! IMPORTANT	Presents clarifying or specific points of information.
NOTE:	Presents commentary, sidelines, or interesting points of information.

Additional Resources to Use

Use the following list of resources, which are used throughout this TechNote, for more information on the various components of Microsoft BackOffice:

■   Compaq TechNote, *Configuring Compaq RAID Technology for Database Servers*, P/N: 184206-001.

■   Compaq TechNote, *Configuration and Tuning Microsoft SQL Server for Windows NT on Compaq Servers*, P/N: 184207-002.

■   Compaq TechNote, *Compaq Backup and Recovery for Microsoft SQL Server*, P/N: 184489-001.

■   Compaq White Paper, *Installing Microsoft Windows NT Server 3.5 with Custom Setup*, D/N: 314A/0595.

■   Microsoft Documentation, *Microsoft SQL Server for Windows NT Configuration Guide*, P/N: Unknown.

■   Internet

    This service is available to interact with other users and support engineers or to get product information.

    ❏   To access the Compaq home page on the Internet:
        http:// www.compaq.com

    ❏   To access the Microsoft home page on the Internet:
        http:// www.microsoft.com

Testing Methodology

Microsoft BackOffice 1.5 encompasses five different products. Compaq testing focused on four of those five products. They are as follows:

■   Microsoft Windows NT Server 3.51

■   Microsoft SQL Server 6.0

■   Microsoft Mail 3.5 with the Multitasking Mail Transfer Agent (MTA)

■   Microsoft Systems Management Server 1.1

For testing purposes, our integration lab installed the components on multiple Compaq servers to comprehend and measure the unique requirements of each component. The Compaq integration test team exercised and stressed each component with various user loads. The user loads tested consisted of:

■   5-10 Users

■   11-30 Users

■   31-100 Users

■   Maximum User Load (Stress Testing)

In addition to introducing various user loads, different data requirements were applied across these user loads. The data requirements were placed into categories such as Light, Medium, and Heavy. Tables 1-2, 1-3, and 1-4 display these categories which are also sometimes called "user profiles."

Table 1-2   **Data Requirements for Light User Loads**
Light User Profile
Windows NT Server 3.51 File and Print Services   — Operating system resident on user workstation   — Application binaries resident on user workstation   — User data resident on server   — 100 bytes printed/hour/user
SQL Server 6.0   — Users producing approximately 20 transactions per second (tps)
Mail 3.5 and the Multitasking MTA   — Users send new mail three times/day   — 90% of mail is 1 Kbyte or less of text   — 10% of mail is 1 Kbyte of text with a 10-Kbyte attachment   — Users read new mail twelve times/day   — Users Reply to 13% of new mail received   — Users Forward 5% of new mail received   — Users Delete 40% of new mail received   — Users average 6-9 messages sent/day   — Users average 15-20 messages received/day
Systems Management Server 1.1   — Static user workstation software   — Poll workstation inventory changes every 24 hours

**Table 1-3
Data Requirements for Medium User Loads**

Medium User Profile

Windows NT Server 3.51 File and Print Services
    — Operating system resident on user workstation
    — Application binaries resident on server
    — User data resident on server
    — Three to five applications shared from server
    — 100 bytes printed/hour/user

SQL Server 6.0   — Users producing approximately 100 transactions per second (tps)

Mail 3.5 and the Multitasking MTA
    — Users send new mail six times/day
    — 70% of mail is 1 Kbyte or less of text
    — 20% of mail is 1 Kbyte to 2 Kbyte of text
    — 10% of mail is 1 Kbyte of text with a 10-Kbyte attachment
    — Users read new mail twelve times/day
    — Users Reply to 20% of new mail received
    — Users Forward 7% of new mail received
    — Users Delete 40% of new mail received
    — Users average 17-20 messages sent/day
    — Users average 50-60 messages received/day

Systems Management Server 1.1
    — One to three new/updated applications/Operating Systems (packages)/month
    — Poll workstation inventory changes every 24 hours

Table 1-4
Data Requirements for Heavy User Loads

Heavy User Profile

Windows NT Server 3.51 File and Print Services
— Operating system resident on server
— Application binaries resident on server
— User data resident on server
— Six to ten applications shared from server
— 200 bytes printed/hour/user

SQL Server 6.0
— Users producing approximately 250 transactions per second (tps)

Mail 3.5 and the Multitasking MTA
— Users send new mail eight times/day
— 60% of mail is 1 Kbyte or less of text
— 20% of mail is 1 Kbyte to 2 Kbyte of text
— 20% of mail is 2 Kbyte to 4 Kbyte of text
— 10% of mail is 1K of text with a 10-Kbyte attachment
— Users read new mail twelve times/day
— Users Reply to 27% of new mail received
— Users Forward 7% of new mail received
— Users Delete 40% of new mail received
— Users average 35-40 messages sent/day
— Users average 100-110 messages received/day

Systems Management Server 1.1
— Three to five new/updated applications/Operating Systems (packages)/month
— Poll workstation inventory changes every 24 hours

Chapter 2
Memory Planning

This chapter provides the initial memory requirements necessary to produce an adequate base memory configuration for your system. It includes the requirements for Windows NT 3.51 Server, SQL Server 6.0, Systems Management Server 1.1, and Microsoft Mail 3.5 with the Multitasking MTA. In addition, we discuss important considerations regarding the system memory on Compaq servers.

Windows NT Server 3.51 Initial Memory Requirements

Memory is the most valuable resource in a Windows NT system. Memory is used for disk cache as well as program execution. If you have a shortage of memory you will negatively impact the disk subsystem, due to an increase in system paging from memory to disk. The ideal memory configuration is one that minimizes the amount of system paging. You cannot entirely eliminate paging, but by ensuring that enough memory is available you can minimize it.

The minimum amount of memory to allocate to Windows NT Server 3.51 is 16 Megabytes. This provides adequate storage for the server to handle File and Print requests. As the user load and application load increases, you must increase the amount of memory available. Table 2-1 provides some general guidelines for Windows NT Server 3.51.

Table 2-1
Initial Memory Requirements for Windows NT Server 3.51

Number of Users	Memory Requirement (MB)
1 - 10	16 (minimum required)
11 - 30	24
31 - 100	32
100 - 200	48
201 + Up	64

Memory requirements are very environment specific. Refer to the "Memory Utilization" section in Chapter 4 for information on detecting low memory situations.

SQL Server 6.0 for Windows NT Initial Memory Requirements

The *Microsoft SQL Server for Windows NT Configuration Guide* states that the minimum system memory requirement for running Microsoft SQL Server for Windows NT is 16 megabytes, which already includes the memory requirements for Windows NT. For satisfactory performance, Compaq recommends a minimum of 32 megabytes of memory to run SQL Server for Windows NT on a system.

Use the following formula as a general guideline to calculate the starting memory values to run SQL Server for Windows NT successfully:

SQL Server memory = [(5MB) + (2% * X) + (50KB * Y)]

Where:

X = Total Data and Index Space

Y = Number of Users

NOTE: Five Megabytes are allotted for database kernel and data structures. The 50 Kbytes for each user includes 10 Kbytes for procedures. Make the appropriate calculations to determine the percentage value of procedure cache to total memory using the result for the "procedure cache" variable of *sp_configure*.

Again, the memory requirements are very environment specific. Refer to the "Memory Utilization" section in Chapter 4 for some suggestions on how to detect and correct low memory situations. For more detailed information on initial memory requirements for SQL Server 6.0 for Windows NT, refer to the Microsoft SQL Server for Windows NT documentation.

Systems Management Server 1.1 Initial Memory Requirements

Systems Management Server 1.1 memory requirements may vary greatly based on the actual installation environment. The Systems Management Server impacts the overall system memory as well as the SQL Server memory defined through *sp_configure*. The base memory required for Systems Management Server is 8 megabytes. As you increase the number of systems being managed by for Systems Management Server, you must increase the memory accordingly. Table 2-2 provides some general guidelines for the initial memory requirements for Systems Management Server 1.1.

Table 2-2
Initial Memory Requirements for Systems Management Server 1.1

Number of Users	Memory Requirement (MB)
1 - 10	8 (minimum required)
11 - 30	Add 8 MB
31 - 100	Add 8 MB
100 - 200	Add 8 MB
201 + Up	Add 16 MB

In addition to normal system memory requirements, Systems Management Server also requires the appropriate configuration changes to memory allocated to SQL Server. Systems Management Server maintains its databases through the services of SQL Server. You must have a minimum of 8 megabytes of memory allocated to SQL Server through *sp_configure*. Use the formula outlined in the "Windows NT Server 3.51 Initial Disk Requirements" section and the information in the "SQL Server 6.0 Initial Disk Requirements" section found in Chapter 3 of this TechNote. When using the formula, be sure to include those database tables created by Systems Management Server along with your traditional database tables.

Microsoft Mail 3.5 and Multitasking MTA
Initial Memory Requirements

The Mail components, Microsoft Mail 3.5 and the Multitasking MTA, requires a minimum of 16 Megabytes of system memory. This includes the memory requirement for Windows NT Server.

Memory requirements grow very slowly as additional mail users are added to the system. The initial memory requirements will handle 200 users or less. When going beyond 200 users, an additional 16 Megabytes is recommended.

Chapter 3
Disk Planning

This chapter discusses all of the initial disk requirements for Windows NT
3.51 Server, SQL Server 6.0, Systems Management Server 1.1, and
Microsoft Mail 3.5 with the Multitasking MTA. Along with this information,
we provide starting point guidelines for disk storage and important
considerations regarding the disk subsystems on Compaq servers.

Windows NT Server 3.51
Initial Disk Requirements

The minimum disk space required for Windows NT Server 3.51 is 90 megabytes.
This allows enough space for the Windows NT Server executables as well as the
pagefile. As you add applications to support the File and Print Services, disk
requirements increase. Use the following formula for estimating the required disk
space for your system.

  required_disk_space = system_minimum + application_space + user_data_space

In the formula, the system_minimum is equal to the greater of 250 megabytes or
the sum of 162 megabytes and the amount of system memory. The value of
application_space is the total size of all applications being shared by the Windows
NT Server. The user_data_space value is the total amount of disk space allocated
for users to store their files, plus an additional 10 percent margin for error.

SQL Server 6.0
Initial Disk Requirements

SQL Server 6.0 requires a minimum of 60 megabytes of available hard disk
space for the executables and the Master database. Add another 1.5 megabytes
if you choose to install the SQL Server Books on-line which runs from the
hard disk.

Actual SQL Server data space requirements vary widely from environment to
environment. A guideline for additional disk space is approximately 120 percent
of the estimated dataset size.

For more information regarding SQL Server tuning and disk requirements, refer to the Compaq TechNote, *Configuration and Tuning of Microsoft SQL Server for Windows NT on Compaq Servers*. This TechNote is available from the Compaq Computer Corporation World Wide Web server at which is located at:

http://www.compaq.com

Systems Management Server 1.1 Initial Disk Requirements

Systems Management Server 1.1 has very specific disk requirements for installation. Systems Management Server requires a hard disk formatted for the NT File System (NTFS) with at least 100 megabytes of free space. Start with 500 megabytes of free space. This allows adequate space for the executables as well as the Systems Management Server database files.

It is also advisable to install Systems Management Server on a separate hard disk. This ensures adequate space for the Systems Management Server database files without impacting the space needed for other BackOffice components.

Microsoft Mail 3.5 and Multitasking MTA Initial Disk Requirements

Microsoft Mail 3.5 requires 4.5 megabytes of free disk space to install and set up the initial Post office. The Multitasking MTA requires an additional 1.8 megabytes of disk space.

Additional disk space requirements are environment specific due to the different needs of the mail system users. The Microsoft Mail system is a shared file system. Most user information, such as the mailboxes and distribution lists, is maintained on the server rather than on the user workstation.

Disk Subsystem Considerations

When planning for your disk subsystem, you must consider two factors: disk performance and data protection. To discuss these considerations, we have dedicated this section of the TechNote to describe how to optimize your write operation performance to the disk and how to protect your data from data loss by implementing fault tolerance.

Optimizing Performance by Using the Array Accelerator

The main function of the Array Accelerator is to store data in cache memory on the controller, thus boosting the write operation performance. Once this has taken place, the drive controller informs the host that the write operation is complete, then writes the data to the hard drive at a more convenient time.

Without the Array Accelerator, the application must wait until each write request is written out to the disk. Writing to a disk device is much slower than posting the write request in the Array Accelerator, thus resulting in very different performance characteristics.

NOTE: The onboard rechargeable battery pack and mirrored memory banks found in the Array Accelerator guarantee data integrity at all times.

Protecting Your Data With Fault Tolerance

When planning or implementing a comprehensive data-protection system, fault tolerance often comes to mind. Fault tolerance protects against data loss due to a hardware failure. For mission-critical systems, where data availability is crucial and any downtime due to a hardware failure is very costly, fault tolerance is a necessity. Even if your disk subsystem does not contain mission-critical data, be aware that the drive subsystem has the highest chance of failure out of all components in the system.

NOTE: Most environments that install Microsoft BackOffice can benefit from some type of disk fault tolerance.

The choices of protecting your data are:

■ A RAID-based disk controller such as the Compaq SMART SCSI Array Controller.

■ Windows NT-based RAID.

NOTE: Windows NT-based RAID requires you to have Windows NT Advanced Server installed.

Various levels of fault tolerance are available, ranging from no fault tolerance to fault tolerance for the entire drive subsystem. However, as the level of fault tolerance increases, so does the implementation cost. Many times a high level of fault tolerance can be an expensive solution. Therefore, you must weigh the cost of implementing a good fault tolerant system against the cost attributed to any significant down-time.

Sites requiring access to data with minimal down-time must implement hardware fault tolerance for the entire drive subsystem. Sites that are not mission-critical can implement a lower level of fault tolerance. We recommend that you evaluate the various fault tolerance methods using your own applications, then decide which level to implement.

Comparison of Fault Tolerance Options

Here are some key points to consider when choosing the appropriate fault tolerant method. The performance differences between fault tolerance implementations can vary significantly, depending on your configuration and environment. Therefore, we omitted the performance differences to avoid misleading our readers.

RAID-Based Disk Controllers

Fault tolerance at the disk controller level offers:

■ Configurable RAID on a logical volume basis

Having configurable hardware fault tolerance on a logical volume basis allows you to protect the whole logical volume. The capacity reduction depends on the size of the logical volume and the type of fault tolerance configured. You may configure RAID-0 (striping), RAID-1 (drive mirroring), RAID-4 (data guarding), or RAID-5 (distributed data guarding). For more information on RAID, see the Compaq TechNote, *Configuring Compaq RAID Technology for Database Servers,* part number 184206-001.

NOTE: Logical volumes are defined by using the Compaq System Configuration Utility.

■ Complete reliability as well as automatic recovery

If you have configured RAID-1, RAID-4 or RAID-5 and a drive failure occurs, the system continues operating and does not suffer any data loss. Once the failed drive is replaced, the controller automatically rebuilds the new drive and restores the system to its full fault-tolerant capabilities. This does not apply to RAID-0 configurations.

■ No overhead on the system processor

Since the data protection occurs at the controller level, there is no overhead on the system processor. This type of fault tolerance is totally transparent to the applications and operating system. With a processor-intensive application/environment such as SQL Server, hardware-based fault tolerance can provide the best performance.

Windows NT-Based RAID

To take advantage of Windows NT-based fault tolerance, you must have Windows NT Advanced Server installed. The current versions of Windows NT Workstation do not provide software-based RAID. Windows NT-based fault tolerance offers:

■ Controller duplexing

This type of fault tolerance adds redundancy at the controller level, but you must make sure that your mirrored partitions are on physically different drive controllers.

■ Configurable RAID on a logical partition basis

Windows NT fault tolerance is based on logical drives (partitions). The capacity reduction depends on the size of the logical drive and the type of fault tolerance installed. You may configure RAID-1 (drive mirroring) or RAID-5 (distributed data guarding).

■ Reliability and recovery

If you experience a drive failure, your system continues to run and you are protected against losing any data, but the Windows NT fault tolerance recovery procedure is not automatic. You do have to bring your system down.

■ Additional overhead on the system processor

When data protection occurs at the operating system level, there is additional overhead on the system processor. Consequently, in a system processor-intensive environment, Windows NT fault tolerance can impact performance. Similar to hardware-based fault tolerance, mirroring is preferred to striping with parity.

If you are running the SQL Server component of BackOffice 1.5, there is an additional fault tolerance choice for your data. In SQL Server 6.0 you have the option of enabling mirroring/duplexing. Refer to the next section for information on enabling these features.

SQL Server 6.0 for Windows NT Mirroring/Duplexing

Listed below are some of the characteristics of mirroring and/or duplexing:

■ SQL Server mirroring is based on SQL Server devices.

This offers you the finest granularity and lowest capacity reduction due to duplicated data. Refer to the *Microsoft SQL Server for Windows NT Systems Administrator's Guide* for guidelines on choosing which devices to mirror.

■ Controller duplexing

This fault tolerance adds redundancy at the controller level. However, you must make sure that your mirrored devices are on physically different drive controllers.

■ Serial mirroring

SQL Server for Windows NT supports only serial mirroring, meaning writes to the first device must finish before writes to the second device can begin.

■ Reliability and recovery

These procedures are very similar to those of the Windows NT fault tolerance. Your system remains running, but you must take the system off-line and, after you replace the failed drive, you must manually re-mirror the devices.

■ Additional overhead on the system processor

Again, mirroring through SQL Server induces additional processing overhead on the system, resulting in lower performance often in the range of 5 to 10 percent.

For further information on Compaq RAID technology and backup and recovery with SQL Server, refer to the "Additional Resources to Use" section found in Chapter 1 of this TechNote.

File Allocation Tables (FAT) and
NT File System (NTFS) Differences

Compaq testing showed only a slight difference in performance between the file systems FAT and NTFS in the BackOffice 1.5 environment. NTFS is generally faster than FAT in read environments. Because NTFS performs transaction logging for recoverability purposes, File Allocation Tables are generally faster than NTFS in write environments. We typically choose File Allocation Tables for the boot partition and NTFS for the remaining application partitions.

NOTE: Systems Management Server requires an NTFS partition.

The Windows NT C2-level security features are only available on NTFS volumes. A complete list of advantages and disadvantages of FAT and NTFS is available in the *Microsoft Windows NT, Concepts and Planning Guide*.

Compaq System Configuration
Utility Considerations

The Compaq System Configuration Utility allows you to select the operating system for each SMART Controller. The Configuration Utility chooses the best physical characteristics for a specified environment such as striping block size and number of sectors per track.

NOTE: Be sure you obtain the latest available version of the Compaq System Configuration Utility from Compaq.

Once you choose the *MS Windows NT* option as your selection for the operating system, the configuration utility displays the following options:

❏ MS Windows NT 3.1
❏ MS Windows NT 3.5x
❏ MS Windows NT 3.5x - Maximum Boot Size

■ Choose the *MS Windows NT 3.1* option only if you are running Microsoft Windows NT version 3.1.

■ Choose the *MS Windows NT 3.5x* option for the best performance under Microsoft Windows NT version 3.5x.

■ Choose the *MS Windows NT 3.5x - Maximum Boot Size* if you want the maximum boot partition size available under Microsoft Windows NT version 3.5x. The current partition limitations outlined are as follows:

❑ Windows NT 3.5x limit the boot partition to four gigabytes, regardless of the file system.

❑ Non-bootable partitions to be formatted with FAT file system are limited to four gigabytes. Non-bootable partitions to be formatted with NTFS are typically limited by physical space.

> ⚠ **WARNING:** Changing the controller characteristics, such as the operating system, through the Compaq System Configuration Utility causes the controller to apply different physical characteristics to the drive array. As a result, you might lose data on such a drive array. If you have existing data on such a drive array and need to change these controller characteristics, back up your data completely before changing the controller characteristics.

Chapter 4
Compaq Server Recommendations

Based on the information gained during testing, the following recommendations can be made. By applying the User Loads and User Profiles (found in Tables 1-2 to 1-4) in Chapter 1 to your environment, you can determine which Compaq server meets the needs of your Microsoft BackOffice installation.

NOTE: Be sure to include any environment-specific functions that are beyond the scope of this TechNote, and adjust the configuration accordingly.

Stress Testing

During testing we applied maximum user loads to a fully configured Compaq ProLiant 4500. The system configuration included four 133-MHz Pentium processors and 1 Gigabyte of memory. The same User Profiles were used as defined in Tables 1-2, 1-3, and 1-4 in Chapter 1 of this TechNote.

These user counts are based on using four components of the Microsoft BackOffice product. If the Compaq ProLiant 4500 is dedicated to a single component of BackOffice, many more users can be supported. For example, when running only SQL Server 6.0, the Compaq ProLiant can support over 2500 simultaneous users.

Table 4-1 lists the maximum user counts supported by the Compaq ProLiant 4500 with Microsoft BackOffice.

Table 4-1
Maximum User Counts Supported by the Compaq ProLiant 4500

User Profile	Maximum Number of Users Supported
Light	500
Medium	450
Heavy	400

NOTE: The maximum user loads listed in Table 4-1 are environment dependent, but they can be used as a guideline for determining the growth potential for your BackOffice system.

User Load Recommendations

The recommendations include both minimum and optimum hardware
configurations. The minimum configurations provide adequate response time
and throughput, but might not provide enough options for growth. The
optimum configurations provide better response time and throughput while
providing some excess capacity for growth.

Configuration Recommendations
for Five to Ten Users

The recommended minimum and optimum configuration for 5 to 10 users
with a Light User Load is as follows:

Table 4-2	
5-10 Users With a Light User Load	
Minimum Configuration	**Optimum Configuration**
Compaq ProSignia 300	Compaq ProSignia 300
— 75-MHz Pentium	— 75-MHz Pentium
— 32 MB of RAM	— 48 MB of RAM
Disk Configuration:	Disk Configuration:
535 MB — Windows NT Server	1.05 GB — Windows NT Server
— SQL Server Binaries	— SQL Server Binaries
— Mail Binaries	— Mail Binaries
— MTA Binaries	— MTA Binaries
— Mail Data	— Mail Data
535 MB — SMS Binaries	1.05 GB — SMS Binaries
— SMS Database Files	— SMS Database Files
Other — SQL Server Database File(s)	Other — SQL Server Database File(s)
— SQL Server Log(s)	— SQL Server Log(s)

The recommended minimum and optimum configuration for 5 to 10 users
with a Medium User Load is as follows:

Table 4-3
5-10 Users With a Medium User Load

Minimum Configuration	Optimum Configuration
Compaq ProSignia 300	Compaq ProSignia 500
— 75-MHz Pentium	— 90-MHz Pentium
— 48 MB of RAM	— 64 MB of RAM
Disk Configuration:	Disk Configuration:
535 MB — Windows NT Server	1.05 GB — Windows NT Server
— SQL Server Binaries	— SQL Server Binaries
— Mail Binaries	— Mail Binaries
— MTA Binaries	— MTA Binaries
— Mail Data	— Mail Data
535 MB — SMS Binaries	1.05 GB — SMS Binaries
— SMS Database Files	— SMS Database Files
Other — SQL Server Database File(s)	Other — SQL Server Database File(s)
— SQL Server Log(s)	— SQL Server Log(s)

The recommended minimum and optimum configuration for 5 to 10 users
with a Heavy User Load is as follows:

Table 4-4
5-10 Users With a Heavy User Load

Minimum Configuration	Optimum Configuration
Compaq ProSignia 500	Compaq ProSignia 500
— 90-MHz Pentium	— 90-MHz Pentium
— 64 MB of RAM	— 96 MB of RAM
Disk Configuration:	Disk Configuration:
535 MB — Windows NT Server	1.05 GB — Windows NT Server
— SQL Server Binaries	— SQL Server Binaries
— Mail Binaries	— Mail Binaries
— MTA Binaries	— MTA Binaries
— Mail Data	— Mail Data
535 MB — SMS Binaries	1.05 GB — SMS Binaries
— SMS Database Files	— SMS Database Files
Other — SQL Server Database File(s)	Other — SQL Server Database File(s)
— SQL Server Log(s)	— SQL Server Log(s)

Configuration Recommendations
for Eleven to Thirty Users

The recommended minimum and optimum configuration for 11 to 30 users with a Light User Load is as follows:

Table 4-5
11-30 Users With a Light User Load

Minimum Configuration	Optimum Configuration
Compaq ProSignia 500	Compaq ProLiant 1500
— 90-MHz Pentium	— 120-MHz Pentium
— 64 MB of RAM	— 64 MB of RAM
Disk Configuration:	Disk Configuration:
1.05 GB — Windows NT Server	1.05 GB — Windows NT Server
— SQL Server Binaries	— SQL Server Binaries
— Mail Binaries	— Mail Binaries
— MTA Binaries	— MTA Binaries
— Mail Data	— Mail Data
1.05 GB — SMS Binaries	1.05 GB — SMS Binaries
— SMS Database Files	— SMS Database Files
Other — SQL Server Database File(s)	Other — SQL Server Database File(s)
— SQL Server Log(s)	— SQL Server Log(s)

The recommended minimum and optimum configuration for 11 to 30 users
with a Medium User Load is as follows:

Table 4-6
11-30 Users With a Medium User Load

Minimum Configuration	Optimum Configuration
Compaq ProSignia 500	Compaq ProLiant 1500
— 90-MHz Pentium	— 120-MHz Pentium
— 64 MB of RAM	— 96 MB of RAM
Disk Configuration:	Disk Configuration:
1.05 GB — Windows NT Server	1.05 GB — Windows NT Server
— SQL Server Binaries	— SQL Server Binaries
— Mail Binaries	— Mail Binaries
— MTA Binaries	— MTA Binaries
— Mail Data	— Mail Data
1.05 GB — SMS Binaries	2.1 GB — SMS Binaries
— SMS Database Files	— SMS Database Files
Other — SQL Server Database File(s)	Other — SQL Server Database File(s)
— SQL Server Log(s)	— SQL Server Log(s)

The recommended minimum and optimum configuration for 11 to 30 users
with a Heavy User Load is as follows:

Table 4-7
11-30 Users With a Heavy User Load

Minimum Configuration	Optimum Configuration
Compaq ProLiant 1500	Compaq ProLiant 1500
— 100-MHz Pentium	— 120-MHz Pentium
— 96 MB of RAM	— 128 MB of RAM
Disk Configuration:	Disk Configuration:
1.05 GB — Windows NT Server	1.05 GB — Windows NT Server
— SQL Server Binaries	— SQL Server Binaries
— Mail Binaries	— Mail Binaries
— MTA Binaries	— MTA Binaries
— Mail Data	— Mail Data
2.1 GB — SMS Binaries	2.1 GB — SMS Binaries
— SMS Database Files	— SMS Database Files
Other — SQL Server Database File(s)	Other — SQL Server Database File(s)
— SQL Server Log(s)	— SQL Server Log(s)

Configuration Recommendations
for Thirty-One to One Hundred Users

The recommended minimum and optimum configuration for 31 to 100 users with a Light User Load is as follows:

Table 4-8 31-100 Users With a Light User Load	
Minimum Configuration	**Optimum Configuration**
Compaq ProLiant 1500	Compaq ProLiant 4500
— 100-MHz Pentium	— 133-MHz Pentium
— 128 MB of RAM	— 192 MB of RAM
Disk Configuration:	Disk Configuration:
1.05 GB — Windows NT Server	1.05 GB — Windows NT Server
— SQL Server Binaries	— SQL Server Binaries
— Mail Binaries	1.05 GB — Mail Binaries
— MTA Binaries	— MTA Binaries
— Mail Data	— Mail Data
2.1 GB — SMS Binaries	2.1 GB — SMS Binaries
— SMS Database Files	— SMS Database Files
Other — SQL Server Database File(s)	Other — SQL Server Database File(s)
— SQL Server Log(s)	— SQL Server Log(s)

The recommended minimum and optimum configuration for 31 to 100 users with a Medium User Load is as follows:

Table 4-9
31-100 Users With a Medium User Load

Minimum Configuration	Optimum Configuration
Compaq ProLiant 4500	Compaq ProLiant 4500
— 133-MHz Pentium	— Dual 133-MHz Pentiums
— 192 MB of RAM	— 256 MB of RAM
Disk Configuration:	Disk Configuration:
1.05 GB — Windows NT Server	1.05 GB — Windows NT Server
— SQL Server Binaries	— SQL Server Binaries
2.1 GB — Mail Binaries	2.1 GB — Mail Binaries
— MTA Binaries	— MTA Binaries
— Mail Data	— Mail Data
2.1 GB — SMS Binaries	2.1 GB — SMS Binaries
— SMS Database Files	— SMS Database Files
Other — SQL Server Database File(s)	Other — SQL Server Database File(s)
— SQL Server Log(s)	— SQL Server Log(s)

The recommended minimum and optimum configuration for 31 to 100 users with a Heavy User Load is as follows:

Table 4-10
31-100 Users With a Heavy User Load

Minimum Configuration	Optimum Configuration
Compaq ProLiant 4500	Compaq ProLiant 4500
— 133-MHz Pentium	— Dual 133-MHz Pentiums
— 192 MB of RAM	— 384 MB of RAM
Disk Configuration:	Disk Configuration:
1.05 GB — Windows NT Server	1.05 GB — Windows NT Server
— SQL Server Binaries	— SQL Server Binaries
2.1 GB — Mail Binaries	2.1 GB — Mail Binaries
— MTA Binaries	— MTA Binaries
— Mail Data	— Mail Data
2.1 GB — SMS Binaries	2.1 GB — SMS Binaries
— SMS Database Files	— SMS Database Files
Other — SQL Server Database File(s)	Other — SQL Server Database File(s)
— SQL Server Log(s)	— SQL Server Log(s)

Chapter 5

Monitoring the Performance of Your BackOffice 1.5 System

This chapter provides information on techniques and tools you can use to monitor and influence the performance of your Microsoft BackOffice 1.5 system. The Performance Monitor provided by Microsoft Windows NT Server is a tool to help capture and analyze system performance information. The following sections concentrate on the Performance Monitor objects which help provide insight into the performance of your Microsoft BackOffice 1.5 system. These objects include:

■   System Processor Performance

■   Memory Utilization

■   Disk Subsystem Performance

System Processor Performance

The Windows NT Server Performance Monitor objects allow you to monitor and gain insight into the system processor utilization. Normal system processor utilization displays short term spikes on the processor. Potential system problems can occur when the processor utilization is sustained above 80 percent capacity. Table 5-1 lists the types of Performance Monitor counters for the system processor. Use this table to gain an understanding of what the counter type monitors and how it can be used in your environment.

Table 5-1
System Processor Counters

Object Type	Counter Type	Counter Meaning
Processor	% Processor Time	The percent of system processor utilization of all threads (both Privileged Mode and User Mode threads) running on the system.
Processor and Process	% Privileged Time	The percentage of time the system processor spends while executing Windows NT kernel commands. Much of this time is associated with processing I/O requests.
Processor and Process	% User Time	The percentage of time the system processor spends while executing user applications.
Processor	Interrupts/Sec	The number of processor interrupts per second.

Percent Processor Time Counter

The *% Processor Time* counter is very useful in determining if you have a system processor bottleneck. Consistent processor utilization of over 95 percent on all processors is a safe indicator of a processor bottleneck. In such a case, add another system processor or upgrade the existing processor(s) to the next generation of processor(s).

Percent Privileged Time and Percent User Time Counter

Both of these counters, *% Privileged Time* and *% User Time*, are very useful in determining how different types of operations utilize the system processor(s). If your system is spending too much time computing I/O, investigate the disk subsystem and how you can relieve the processor. In addition, check the system processor memory; you might have to add more to your system.

Both the *% Privileged Time* and *% User Time* breaks information out by each process. As stated earlier, the *% Privileged Time* is typically the percentage of time the process is spending executing internal process commands and % *User Time* is the percentage of time the process is spending executing user requests. Each of these counters provide insight into the overall system utilization by process. If the *% Privileged Time* is consistently higher than the *% User Time*, you should investigate adding additional processors or possibly install a faster processor(s). This condition might also point to an inadequate disk subsystem.

NOTE: Refer to the Disk Subsystem Performance section of this chapter for more information on monitoring your disk subsystem.

Interrupts/Second Counter

The *Interrupts/Sec* counter indicates if the processor(s) is too busy due to an application load or hardware interrupt processing. In a small network, values of 500 or below are acceptable. In large networks, values of 1000 or less are not unusual. However, values exceeding 1000 could be pointing to a deficiency with some hardware device(s) such as the Disk Controller(s) or the Network Interface Controller(s).

Memory Utilization

The Windows NT Server Performance Monitor also provides several objects and counters to monitor memory utilization. Low memory conditions can dramatically impact server performance due to the overhead required to swap out memory pages to the disk. Windows NT Server uses the *PAGEFILE.SYS* file as a holder for the swapped out memory pages. Table 5-2 lists the objects and counters that are helpful in examining system memory usage:

Table 5-2
Memory Counters

Object Type	Counter Type	Counter Meaning
Memory	Page Faults/Sec	The total page faults by all running processes.
Memory	Pages/Sec	The percentage of time the system processor is spending executing Windows NT kernel commands. A lot of this time is associated with processing I/O requests.
Memory	Available Bytes	The percentage of time the system processor is spending executing user applications.
Paging File	% Usage	The number of processor interrupts per second.

Page Faults/Second Counter

The *Page Faults/Sec* counter monitors the total page faults by all running processes. A page fault occurs when a process makes reference to a virtual memory page that is not currently in its working set in memory. The page fault causes Windows NT Server to temporarily stop processing and retrieve the desired page from the *PAGEFILE.SYS* file and place it into memory. If memory is over-committed, other pages are paged from memory and placed into *PAGEFILE.SYS* file.

NOTE: You can also monitor *Page Faults/Sec* per individual process. For example, you can monitor just the page faults that occur for the SQLSERVER process.

A system with adequate memory has very little paging once the system reaches a steady state. There will be occasional paging prior to the steady state condition as the server optimizes its memory configuration. In conditions of high amounts of paging, the system can not handle the user requests in a timely manner and response times degrade. Adding memory to the system helps alleviate the paging.

Page/Second Counter

The *Page/Second* counter monitors the total paging for the entire system. If the average value is consistently above 70 pages/sec, the system is doing too much paging and memory should be added to the system. Values over 100 pages/sec indicate a severe memory shortage.

Available Bytes Counter

The *Available Bytes* counter indicates the amount of physical memory that is not currently in use. If this counter consistently falls below four megabytes, add more memory to the system.

Percent Usage Counter

The maximum value for the *% Usage* counter allows you to determine how much additional memory should be added to the system with excessive paging. To do this, multiply the maximum *% Usage* by the actual size of *PAGEFILE.SYS*, the paging file, to determine the amount of physical memory you must add.

NOTE: Consider setting up a system alert to notify the System Administrator when the *% Usage* counter hits 80 to 90 percent.

Disk Subsystem Performance

Diskperf Option

The *diskperf* option allows you to monitor the disk subsystem activity and is very useful when monitoring the performance of the drive subsystem. If this option is disabled, the Performance Monitor can not monitor the low-level disk-related activity such as the *LogicalDisk* and *PhysicalDisk* counters. However, *diskperf* does slightly degrades performance when enabled; therefore, enable *diskperf* only when needed and disable it to get maximum performance.

You can enable or disable *diskperf* by using the Control Panel/Devices or by issuing the *diskperf -y/n* command from a system prompt. When using the Control Panel, set *diskperf* to automatically start at boot time to enable. You must restart your system for the *diskperf* option to become effective.

For more information on *diskperf*, refer to the *Microsoft Windows NT Resource Kit* for a detail discussion.

After you enable *diskperf*, you can use the following Performance Monitor objects and counters to monitor disk performance:

Table 5-3
Logical Disk Counters

Object Type	Counter Type	Counter Meaning
Logical Disk	Avg. Disk sec/Read	The average number of seconds for read operations from a logical disk to complete.
Logical Disk	Avg. Disk sec/Write	The average number of seconds for write operations to a logical disk to complete.
Logical Disk	Disk Transfers/sec	The rate of read and write operations to and from a logical disk.

Performance Monitor Object: Logical Disk

Performance Monitor Counter: Avg. Disk sec/Read

                                    Avg. Disk sec/Write

These counters monitor the average number of seconds for read and write
operations from or to a logical disk. If your *Avg. Disk sec/Read* values go
beyond 40 to 60 msec or your *Avg. Disk sec/Write* goes beyond 20 to 30 msec,
either increase the speed of your disk(s) or add more drives and spread the
applications across them.

Performance Monitor Object: Logical Disk

Performance Monitor Counter: Disk Transfers/sec

The *Disk Transfers/sec* counter monitors the rate of read and write operations
on the disk(s). If you are using a SMART Controller and have several drives
allocated to a single logical volume, this counter monitors the total number of
disk transfers per logical volume. To calculate the number of disk transfers
per second per drive, divide the *Disk Transfers/sec* value by the numbers of
drives that make up the logical volume.

Use the following guidelines when optimizing the drive subsystem. You
should not have more I/O requests (disk transfers) per second per drive than
the values in the table below.

Table 5-4
I/O Transfer Rates

	1.0-GB drives (Max I/Os per Second)	2.0-GB drives (Max I/Os per Second)	4.0-GB drives (Max I/Os per Second)
Sequential Writes	≈150	≈160	≈200
Random Reads/Writes	≈30-40	≈50	≈60-65

If your values are much higher than those suggested in the above table, increase the
speed of your disk subsystem by adding more drives or using faster drives.

Conclusion

The intention of this document was to communicate relevant information on sizing Microsoft BackOffice 1.5 on Compaq server products. This information can be used for both the planning of new installations and for the tuning of an existing installation.

It was our goal not to simply provide you with sizing information, but also to explain how each hardware and software component can influence other components and how they all can impact system performance.

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Appendix A
Multivendor Integration
from Compaq

To help you successfully integrate and optimize your network or multivendor system, Compaq has developed a library of systems integration TechNotes for the NetWare, Microsoft Windows NT, SCO UNIX, and OS/2 operating system environments. TechNotes provide you with important information on topics such as network performance management, server management, and operating system interconnectivity.

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The current TechNotes available are listed in Table A-1.

Table A-1
Compaq TechNotes

TechNote Name	Part Number
Compaq Insight Management	
Integrating Compaq Insight Manager with Enterprise Management Platforms (8/95)	145806-003
Integrating Compaq Insight Manager with Microsoft Systems Management Server (8/95)	184720-001
Integrating Compaq Insight Manager with ManageWise (8/95)	182074-001
NetWare	
Performance Management in a NetWare v3.1x Environment (4/93)	133399-002
NetWare Tape Backup Management Using ARCserve from Compaq (4/93)	137535-001
NetWare 4 Performance Management (7/94)	137989-001
ORACLE Server Planning in a NetWare v3.11 Environment (5/93)	145143-001
NetWare Server Management (9/92)	145231-001
Compaq IDA-2 Configuration for NetWare (12/92)	145536-001
Compaq ProSignia Configuration Guidelines for NetWare v3.x (12/92)	145537-001
Compaq Answers to Technical Support Questions for NetWare Environments (2/95)	145710-002
NetWare SFT III v3.11 Installation (9/93)	145905-001
NetWare Migration from 2.x to 3.12 (6/94)	181069-001

continued

Compaq TechNotes   *continued*

TechNote Name	Part Number
NetWare (continued)	
NetWare Migration from 3.12 to 4 (11/94)	181152-001
SYBASE SQL Server 4.2.2 for NetWare: Tuning and Performance (2/95)	184429-001
Performance of Lotus Notes 3.1 on Compaq ProLiant Servers with NetWare 3.1x (2/95)	184430-001
Configuration and Tuning of Oracle7 for NetWare on Compaq Servers(11/94)	Not available in bound format
Microsoft	
Implementing Lotus Notes on Compaq Servers with Microsoft LAN Manager (9/92)	145201-001
Microsoft SQL Server and Novell NetWare Requester for OS/2 (9/92)	145376-001
Drive Subsystem Performance with Microsoft LAN Manager 2.1 (11/92)	145517-001
Configuration and Tuning of Microsoft SQL Server for Windows NT on Compaq Servers (7/94)	184207-001
Migrating from Microsoft Windows NT Advanced Server 3.1 to Microsoft Windows NT Server 3.5 (2/95)	184669-001
Compaq Backup and Recovery for Microsoft SQL Server (3/95)	184489-001
Configuration and Tuning of Oracle7 for Windows NT on Compaq Servers (7/95)	184853-001
Implementing Microsoft Windows NT Server RAS, DHCP, and WINS on Compaq Servers (9/95)	184488-001
Migrating to Microsoft Windows NT Server 3.51 on Compaq Servers (8/95)	185026-001
Sizing Microsoft BackOffice 1.5 on Compaq Servers (2/96)	185496-001

Compaq TechNotes *continued*

TechNote Name	Part Number
UNIX	
SCO UNIX in an SNA Environment Using CLEO DataTalker U/X (5/92)	145081-001
SCO UNIX in an SNA Environment Using Computone LYNX (7/92)	145116-001
SCO UNIX Database Servers in Novell Networks (10/92)	145402-001
Printing in SCO UNIX and NetWare Integrated Environments (3/93)	145538-001
SCO UNIX Connectivity to SNA Environments Over X.25 Networks (1/93)	145583-001
Disk Mirroring with VERITAS VxMirror (12/93)	145656-001
SCO UNIX IP Routing Over X.25 Networks (4/93)	145711-001
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Configuration and Tuning of Oracle7 for SCO UNIX on Compaq Servers (11/94)	184329-001
Configuration and Tuning of Sybase System 10 for Novell UnixWare 2.0 on Compaq Servers (7/95)	184943-001
The Compaq, SCO UNIX, and ORACLE7 Database Server (9/93)	195818-001
Configuration and Tuning of Sybase System 10 for SCO UNIX Open Server 3.0 on Compaq Servers (9/95)	185111-001

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Compaq TechNotes   *continued*

TechNote Name	Part Number
IBM	
Compaq Answers to Technical Support Questions for OS/2 Environments (11/94)	Not available in bound format
Performance of Lotus Notes 3.1.5 on Compaq ProLiant Servers with OS/2 2.11 (3/95)	184655-001
Technology Overview	
Configuring Compaq RAID Technology for Database Servers (7/94)	184206-001