

## Benefits of Defragmentation



*By placing files that are referenced together near each other on the disk, and towards the more dense outer edge of the disk, seek distances are reduced which results in shorter seek times and improved performance.*

### Windows XP Performance

<http://www.microsoft.com/technet/prodtechnol/winxpro/evaluate/xpperf.msp>

"I/O performance is strongly influenced by the layout of files on disk. Files and directories that are heavily fragmented or dispersed across the disk will hurt performance."

### Benchmarking on Windows XP

<http://www.microsoft.com/whdc/system/sysperf/benchmark.msp>

"By placing files that are referenced together near each other on the disk, and towards the more dense outer edge of the disk, seek distances are reduced which results in shorter seek times and improved performance. The performance benefit of placing files becomes increasing important as the size of the disk increases."

### Reasons why the data throughput rate can be slower than the theoretical maximum when backing up to tape media.

<http://seer.support.veritas.com/docs/231488.htm>

"Disk/File Fragmentation - Fragmented disks take longer to back up. Heavily fragmented hard disks not only affect the rate at which data is written to tape, but also affects the overall system performance. Fragmented files take longer to back up because each segment of data is located at a different location on disk so instead of simply reading block after block of data, the heads on the disk must travel to a number of places to access the data. Performance can usually be improved by performing regular disk de-

## **Optimization and Tuning of Windows NT**

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“If you choose a FAT file system, with time it tends to become fragmented. As the file system becomes full, pieces of files tend to be scattered over the disk; the system cannot find enough contiguous blocks to store a new file in one place, so it must fit the file in empty spaces between other files. As files are added, deleted, truncated, and expanded, the file system becomes increasingly disorderly. Performance suffers because the disk drive cannot read a file with a sequential group of operations. Instead, it must constantly seek for different pieces of the file. To avoid fragmentation, use a Defrag utility to adjust files in a sequence.”

### **How NTFS Reserves Space for its Master File Table (MFT)**

Because utilities that defragment NTFS volumes cannot move MFT entries, and because excessive fragmentation of the MFT can impact performance, NTFS reserves space for the MFT in an effort to keep the MFT as contiguous as possible as it grows.”

“Because of the importance of the MFT to NTFS and the possible impact on performance if this file becomes highly fragmented, NTFS makes a special effort to keep this file contiguous. NTFS reserves a percentage of the volume for exclusive use of the MFT until and unless the remainder of the volume is completely used up. Thus, space for files and directories will not be allocated from this MFT zone until all other space is allocated first.”

### **Best Performance: Windows 2000 Professional**

<http://www.microsoft.com/technet/prodtechnol/windows2000pro/evaluate/featfunc/bestperf.mspx>

“Each file contains one or more clusters—sometimes thousands. Ideally, the operating system would always store these clusters on the same area of the disk, making it quick to access the file. Over time, however, the operating system must store a file’s clusters in different places. This usually occurs because the next free space in the file

*To avoid fragmentation, use a Defrag utility to adjust files in a sequence.”*

system isn't big enough to hold all of the file's clusters. The operating system stores a portion of the file's clusters in that location, and then moves on to the next free space. Loading a fragmented file takes longer than loading an unfragmented file."

### **The Art and Science of Web Server Tuning with Internet Information Services 5.0**

<https://www.microsoft.com/technet/prodtechnol/acs/reskit/acrkappc.mspx>

"Access times grow longer as disks become more fragmented."

"Perform disk defragmentation from time to time on your servers. The files and directories on your server become fragmented over time. When this occurs, it takes Windows longer to gain access to files and directories because several additional disk reads are required to collect the various pieces."

### **Assess and enhance the performance of your NTFS volumes**

**Sean Daily**

Article from Windows NT Magazine

<http://www.microsoft.com/technet/archive/winntas/tips/winntmag/optntfs.mspx?mfr=true>

"Be aware that the NTFS system partitions you create during the NT setup process are FAT volumes: When you choose to format your boot volume as NTFS during Setup, NT initially creates the volume as FAT, and only later in the Setup process converts it to an NTFS volume. As a result, your boot volume is subject to the problems of a converted NTFS volume. Unfortunately, the best option you have for optimizing the MFT of these system partitions is to religiously run disk-defragmentation software to maintain the volume's other portions. To determine the location and construction of an NTFS volume's MFT, you can use a commercial disk-defragmentation or analysis utility."

*...the best option you have for optimizing the MFT of these system partitions is to religiously run disk-defragmentation software...*

"The MFT is not the only component of an NTFS volume subject to fragmentation. The system requires additional head and platter movements to access a file stored in multiple noncontiguous locations on a disk. Fragmentation can result and adversely affect performance. However, when a file is contiguous, the system can read it sequentially without additional drive repositioning. Diligently maintaining a low level of file fragmentation on an NTFS volume is the most important way to improve volume performance. You can accomplish this maintenance by

regularly running a disk-defragmentation utility, which makes every file on the volume contiguous. In addition, these utilities can defragment the free disk space on a volume, which is also beneficial to the volume's performance."

### **Scenarios and Procedures for Microsoft Systems Management Server 2003: Maintenance, Backup and Recovery**

<http://www.microsoft.com/technet/prodtechnol/sms/sms2003/maintain/spmbrsms03/spmbr16.mspx#EECAC>

"Over time, disk volumes on SMS site systems become fragmented. Site operations such as distributing large software packages might significantly increase fragmentation on site servers and distribution points. As fragmentation increases, disk operations take longer, thus, the overall site performance decreases.

Run disk defragmentation tools on the SMS site server and all other site systems to maintain the performance level of disk operations."

### **PSS ID Number: Q209769**

Defragment and Compact Database to Improve Performance [Q209769]

<http://support.microsoft.com/support/kb/articles/Q92/6/81.ASP>

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### **MS Backoffice Performance Tuning Checklist**

Published: November 1999

<http://www.microsoft.com/technet/prodtechnol/bosi/maintain/optimize/bostune.mspx>

"Run a defragmentation utility on your machine regularly. Disk fragmentation decreases performance."

### **Internet Information Server 5.0 Resource Guide**

#### ***Monitoring and Tuning Your Server***

#### **"Defragment Your Disks**

If your cache performance declines over time, defragment the disk(s). Your files may have become fragmented over time."

### **“Improve Data Organization**

Keep related Web files on the same logical partitions of a disk. Keeping files together improves the performance of the File System Cache. Also, defragment your disks. Even well-organized files take more time to retrieve if they are fragmented.”

### **SQL Server Magazine**

[http://www.microsoft.com/technet/abouttn/flash/tips/tips\\_083104.mspx](http://www.microsoft.com/technet/abouttn/flash/tips/tips_083104.mspx)

“An OS-level defragmentation will improve performance if the files become fragmented and you’re performing table-scan operations within SQL Server that look at ranges of data.”

“The best practice for highly available SQL Servers is to create your files on contiguous space that’s already been defragmented”

### **Upgrade or Wipe-and-Load Choosing the Best Scenario for Deploying Windows XP Professional**

<http://www.microsoft.com/technet/prodtechnol/winxppro/deploy/upwpload.mspx>

“After erasing and writing many files to disk, fragmentation occurs. Fragmentation also occurs when users edit files, such as word documents, as they add and remove content and save updated versions. Fragmentation is normal and happens when pieces of single files are inefficiently distributed across many locations on a disk. The result is an increase in the time it takes to access a file. Running a disk-defragmentation program repairs this problem by rearranging the files so that their entire contents are stored on the disk contiguously.”

*Fragmentation adversely affects performance because head and platter movements are required to access a file which is stored in multiple, noncontiguous locations on a disk.*

### **Maintaining Windows 2000 Peak Performance Through Defragmentation**

<http://www.microsoft.com/technet/prodtechnol/windows2000serv/maintain/optimize/w2kexec.mspx>

“File fragmentation has a negative effect on disk performance because the disk head requires more time to move around to different points on the disk to read scattered file parts. This is a primary reason for the gradual degradation of system performance—and the specific cause of longer reads and extended reboots.”

“Free space fragmentation refers to file space that’s broken into small pieces, rather than joined together. This type of fragmentation results in slowed performance because of the time it takes for the disk head to move to different points on the disk to find free space and then write the file. Fragmented free space also increases the possibility of file fragmentation; when a file is larger than the space it’s being written to, the file fragments.”

### **Virtual Server Administrator’s Guide**

[http://www.microsoft.com/technet/prodtechnol/virtualserver/2005/proddocs/vs\\_operate\\_using\\_perfTune\\_tune.mspx?mfr=true](http://www.microsoft.com/technet/prodtechnol/virtualserver/2005/proddocs/vs_operate_using_perfTune_tune.mspx?mfr=true)

“Reduce disk fragmentation. Defragment the physical disk on a regular basis, especially if you are using a dynamically expanding virtual hard disk. The data stored on a dynamically expanding virtual hard disk will grow increasingly fragmented as the size of the disk grows, because storage space is used only as it is needed. As the size grows it is less likely that the space will be contiguous. By contrast, a fixed-size virtual hard disk uses a reserved block of storage space, which means that data is less likely to be fragmented as it is stored.”

### **Windows 2000 Professional Resource Kit Chapter 30 - Examining and Tuning Disk Performance**

<http://www.microsoft.com/technet/prodtechnol/Windows2000Pro/reskit/part6/proch30.mspx?mfr=true>

“disk fragmentation slows the transfer rate and seek times of your disk system and you need to monitor for increasing disk fragmentation. On single-disk systems, you can use the Split IO/sec counter to determine the degree of fragmentation of your disks. Defragment the disk if this counter rate is consistently high and run Disk Defragmenter periodically to keep stored data organized for best performance.”