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Partition Manager™ 2013 Free

User Manual

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Introduction

Paragon Partition Manager™ 2013 Free is designed to do drive partitioning on computers that host Windows and Mac OS X environments. The program supports the latest Windows 8 and enables to resize partitions of Apple Boot Camp. In this manual you will find the answers to many of the technical questions, which might arise while using the program.



Our company is constantly releasing new versions and updates to its software, that's why images shown in this manual may be different from what you see on your screen.

What's New in Partition Manager 2013

- **Support of Windows 8.**
- **New user-friendly interface.**
- **Support of GPT disks – create / format / delete / resize operations.**
- **Convert NTFS <> HFS file systems without reformatting.**

Features Overview

This chapter dwells upon key benefits and technical highlights of the product.

Features

Let us list some of the features:

User Friendly Fault Minimizing Interface

- **Graphical representation of the data** to gain a better understanding.
- **A handy Launcher** to easily find and run the required tasks.
- **Comprehensive wizards** to simplify even the most complex operations.
- **A context sensitive hint system** for all functions of the program.
- **Previewing the resulting layout of hard disks before actually executing operations** (so-called virtual operations).

Partition/Hard Disk Management Facilities

- **Basic functions for initializing, partitioning and formatting hard disks** (create, format, delete). Instead of the standard Windows disk tools, the program supports all popular file systems.
- **Express Create Partition Wizard** to create a new partition in the most appropriate place of a hard disk, format it to NTFS and then make it available in the system by assigning a drive letter.
- **Express Resize Partitions Wizard** to increase free space on one partition by up-taking the unused space of an adjacent partition of a hard disk (including partitions of Apple Boot Camp).
- **NTFS hot resize upward** to enlarge an NTFS partition (system, locked) without rebooting Windows and interrupting its work.

- **Convert a file system** (FAT16/32, NTFS, Apple HFS) without reformatting.
- **Mount a partition** (assign a drive letter) of any file system type to make it available for your operating system.
- **Modify file system parameters** (make active/inactive, hide/unhide, etc.).

Supported Technologies

Along with using innovative technologies from outside, Paragon has developed a number of its own original technologies that make its products unique and attractive for customers:

- **Paragon Power Shield™** technology to provide data consistency in case of a hardware malfunction, power outages or an operating system failure.
- **Paragon UFSD™** technology to browse partitions of any file system including hidden and unmounted, modify and copy files and folders, etc.
- **Paragon Hot Resize™** technology to enlarge NTFS partitions (system, locked) without rebooting Windows and interrupting its work.
- **Paragon Smart Partition™** technology to securely perform hard disk partitioning operations of any complexity.
- **Paragon BTE™** technology to set tasks for execution during the system restart, thus saving from the need to use a bootable media when modifying system partitions.
- **Microsoft Volume Shadow Copy Service (VSS)** to provide the copy/backup infrastructure for the Microsoft Windows XP/Vista/7/Server 2003/2008 operating systems. It offers a reliable mechanism to create consistent point-in-time copies of data known as shadow copies. Developed by Microsoft in close cooperation with the leading copy/backup solution vendors on the market, it is based on a snapshot technology concept.
- **GUID Partition Table (GPT)**. It is the next generation of a hard disk partitioning scheme developed to lift restrictions of the old MBR. GPT disks are now supported by Windows Vista/7, Server 2008, Mac OS X and Linux.

Supported File Systems

- Full read/write access to FAT16/FAT32 partitions.
- Full read/write access to NTFS (Basic Disks). Compressed NTFS files are also supported.
- Limited read/write access to Apple HFS+ partitions.



Unfortunately, support of non-Roman characters for the HFS+ file system is unavailable at the moment. The company is about to implement it in the nearest future.

Supported Media

- Support of both MBR and GPT hard disks (2.2TB+ disks included)
- IDE, SCSI and SATA hard disks
- SSD (Solid State Drive)
- AFD (Advanced Format Drive)
- Non-512B sector size drives
- CD-R, CD-RW, DVD-R, DVD+R, DVD-RW, DVD+RW, DVD-R, DVD+R double layer and also Blu-ray discs
- FireWire (i.e. IEEE1394), USB 1.0, USB 2.0, USB 3.0 hard disks

- PC card storage devices (MBR and GPT flash memory, etc.)

Getting Started

In this chapter you will find all the information necessary to get the product ready to use.

System Requirements

For the Windows installation package

- Operating systems:
 - Windows XP (32 and 64 bit)
 - Windows Vista (32 and 64 bit)
 - Windows 7 (32 and 64 bit)
 - Windows 8 (32 and 64 bit)
- Internet Explorer 5.0 or higher
- Intel Pentium CPU or its equivalent, with 300 MHz processor clock speed
- 128 MB of RAM (256+ recommended)
- Hard disk drive with 250 MB of available space
- SVGA video adapter and monitor
- Keyboard
- Mouse



During the installation additional free space (up to 1GB) will be required.

Installation

To install Paragon Partition Manager 2013, please do the following:

1. **Run Setup Application.** Click on the *.MSI file. This application will guide you through the process of the program installation. The setup utility is compiled with the InstallShield SDK, hence it contains the standard user interface and set of installation steps.



In case there is some previous version of the program installed on the computer, the program will offer the user to uninstall it first.

2. **Starting Setup.** The Welcome page informs that the application is being installed. Click the Next button to continue.
3. **Confirm License Agreement.** The License Agreement page displays the Paragon License Agreement. Read the agreement and then select the appropriate option to accept. If you do not agree with any conditions stated

there, the installation process will be interrupted. By clicking the Print button, the License Agreement may also be printed out.

4. **Select an Installation Folder.** The Destination Folder page allows you to choose a folder where the program will be installed. By default, the installation folder will be created as:

C:\Program Files\Paragon\Paragon Partition Manager 2013. To select another folder, click the Change... button.

After you have selected the required folder, click the Next button to continue.



Do not install the program on network drives. Do not use Terminal Server sessions to install and run the program. In both cases, the program functionality will be limited.

5. **Confirm Installation.** On the Ready to Install the Program page click the Install button to start the installation or the Back button to return to any of the previous pages and modify the installation settings.
6. **Copying Files.** The Copying Files page shows the overall progress of the installation. Click the Cancel button to abort the setup.
7. **Finishing the Installation.** The Final page reports the end of the setup process. Click the Finish button to complete the wizard.

First Start

To start Paragon Partition Manager 2013 under Windows, please click the Windows Start button and then select **Programs > Paragon Partition Manager™ 2013 > Paragon Partition Manager™.**



The program provides wide opportunities in the field of hard disk structure modification, so just to be on the safe side, please make a backup of your data before carrying out any operation.

The first component that will be displayed is called the Express Launcher. Thanks to a well thought-out categorization and hint system, it provides quick and easy access to wizards and utilities that we consider worth using on a regular basis. With its help you can also start up the traditional launcher, the help system or go to the program's home page.



Basic Concepts

This chapter explains terms and ideas that show how the program works. To understand these helps to obtain a general notion of the operation performance and makes it easier for the user to operate the program.

Apple Boot Camp

Boot Camp is a special utility to help you set up a dual boot system (Mac OS X and 32-bit Windows XP/Vista) on Intel-based Macs. It enables to securely re-partition your hard disk (resize an existing HFS+ partition to create a separate partition for Windows) and then launch the installation process. With Boot Camp all the necessary drivers will be at your disposal. Moreover after Windows has been installed it will serve as a boot manager to choose what operating system to start up.



It is strongly recommended not to modify the hard disk configuration with Windows Disk Manager. Otherwise it may lead to unexpected consequences, right up to BSOD and inability to boot in Windows XP/Vista. Please use our program to correctly update both MBR and GPT.

64-bit Support

The bulk of software today is written for a 32-bit processor. It can meet the requirements of almost any end user. However that is not the case when dealing with servers processing large amounts of data with complex calculations of very large numbers. That is where 64-bit architecture comes into play.

It can boast improved scalability for business applications that enables to support more customer databases and more simultaneous users on each server. Besides a 64-bit kernel can access more system resources, such as memory allocation per user. A 64-bit processor can handle over 4 billion times more memory addresses than a 32-bit processor. With these resources, even a very large database can be cached in memory.

Although many business applications run without problems on 32-bit systems, others have grown so complex that they use up the 4 GB memory limitation of a 32-bit address space. With this large amount of data, fewer memory resources are available to meet memory needs. On a 64-bit server, most queries are able to perform in the buffers available to the database.

Some 32-bit applications make the transition to the 64-bit environment seamlessly others do not. For instance, system-level utilities and programs that provide direct hardware access are likely to fail. Our program offers a full-fledged support of the 64-bit architecture providing fault-tolerant work for such system dependent modules as Hot Processing.

Drive Partitioning

As you probably know a hard drive is to be split into one or more partitions, since it cannot hold data until it is carved up and space is set aside for an operating system. Until recently most PCs used to have just one partition, which filled the entire hard disk and contained an OS. The situation has changed however, thanks to new cost-effective high capacity hard drives, thus opening up numerous possibilities for PC users, such as editing video, archiving music, backing up CD images, etc. Huge increase in space is great, but it poses a number of problems, most important of which are effective data organization and speed.

Large drives are always going to take longer to search than smaller volumes, and an operating system is going to have its work cut out both finding and organizing files. It is for this reason that many people decide to invest in multiple hard drives, but there is an easy solution – drive partitioning. Partitioning lets you divide a single physical drive into a number of logical drives, each of which serves as a container with its own drive letter and volume label, thus enabling the operating system to process data more efficiently. Besides partitioning makes it possible to organize data so that it is easy to find and manage. You can set aside, for instance, 40 GB of a 160 GB hard drive for the OS, 70 GB for storing video and another 50 GB for your favorite music collections to provide transparent data storage.

It is also worth mentioning to that with a hard drive properly partitioned, such routine operations as files defragmentation or consistency check will not be that annoying and time-consuming any more.

By detaching the OS from the rest of the data you can tackle one more crucial issue – in case of a system malfunction, you can get the system back on track in minutes by recovering it from a backup image located on the other partition of the hard drive.

But that is not all drive partitioning may be used for. If you are willing to play games in Windows while browsing the Internet in Linux, 100-percent sure that no virus will attack your PC, drive partitioning is a necessity. In order to run several OSs on a single hard drive you are to create a corresponding number of partitions to effectively delineate the boundaries of each OS.

Typical Scenarios

This chapter lists a number of the most frequently used scenarios that may be accomplished with the program. You can find here useful recommendations and descriptions of operations.

Resize Scenarios

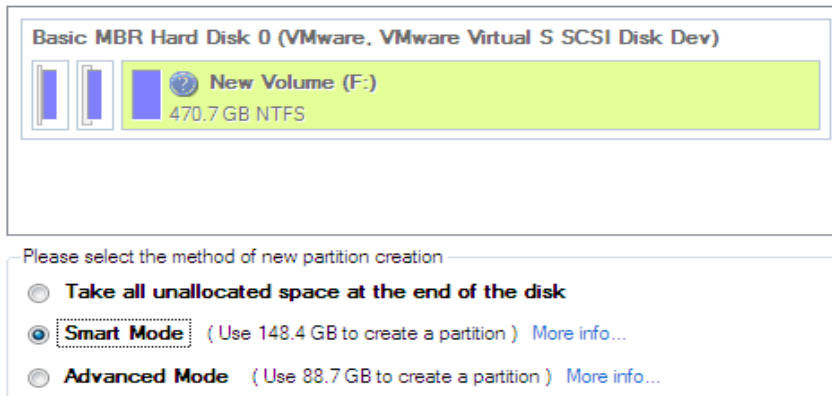
Creating a new partition to detach operating system from the rest of data

Let's assume that you're a rank and file user who is most likely to have only one hard disk with only one partition (the only partition is always system). To secure yourself against a system malfunction or a virus attack you've got nothing to do, but make a backup of the whole partition, which besides the operating system itself contains all your family photos, favorite films and music, program distributives, whatever. As a result you'll get a very huge backup image. You can easily tackle this issue however by detaching your operating system from the rest of data.

To create a new partition on your hard disk, please do the following:

1. Click the **Express Create Partition** item of the Wizards menu.
2. On the Wizard's Welcome page, click the Next button.
3. Choose a method you find the most suitable to create the partition. The wizard is especially designed to minimize your participation in finding an appropriate place for it and its resulted size. The only thing you're to do is to choose between several modes. The most relevant thing here is the amount of space that will be allocated for that partition. For easy perception, you can see the resulted disk layout on the disk map by selecting this or that mode.

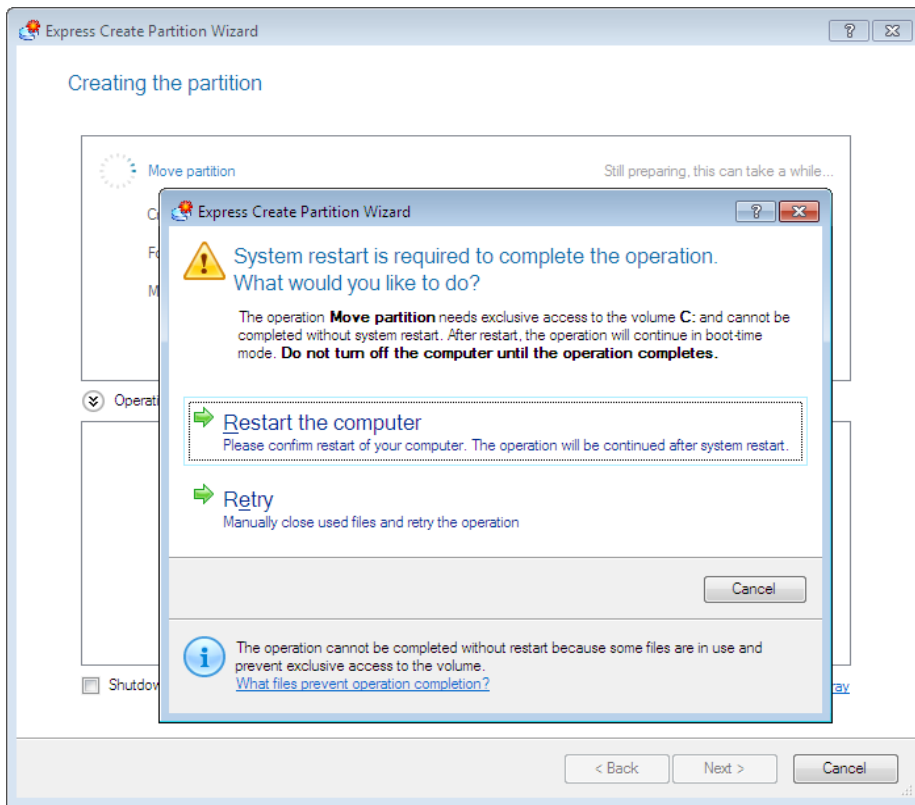
The result you will get after applying the changes:



The number of available methods depends on your disk layout.

To learn more on the way the wizard works, please click the corresponding link on the first page of the wizard.

4. That's basically it. By clicking the Next button the wizard will start modifying your disk layout. If you've got to do with the system partition resize, like we do in our case, you will be asked to restart your computer in a special boot-up mode to accomplish the operation. So click the appropriate button to agree.



5. In the Progress window you can see in real-time a detailed report on all actions carried out at the moment. After completing the operation your computer will be automatically restarted back to Windows where you can see the newly created NTFS partition. Now you've got a place to keep your stuff apart from Windows.

Increasing size of a system partition by taking unused space of an adjacent partition

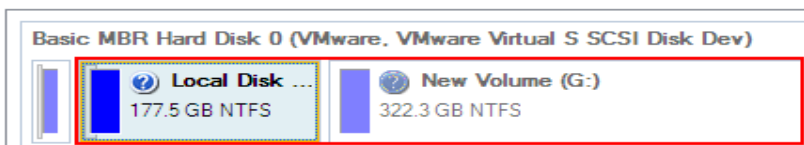
Let's assume you've got several partitions on your hard disk. After installing a number of resource-consuming applications and system updates your system partition has started to suffer from the lack of free space. But an adjacent partition has a plenty of redundant space. That's just enough to make your system partition suffer no more.

To increase size of a system partition by taking unused space from an adjacent partition, please do the following:

1. Click the **Express Resize Partitions** item of the Wizards menu.
2. On the Wizard's Welcome page, click the Next button.
3. Click on your system partition. By doing that, the wizard will automatically select an adjacent partition as well. This partition will later act as a space donor.

The wizard will resize space between **Local Disk (C:)** and **New Volume (G:)** on **Basic MBR Hard Disk 0 (VMware, VMware Virtual S SCSI Disk Dev)**.

Select left partition from a pair of adjacent partitions you would like to resize. Right adjacent partition will be selected automatically.





If you've got more than two partitions on your hard disk and a partition you need to increase is surrounded by other partitions, you've got the choice to choose which partition will act as a space donor. Just click on the left partition of the pair, as the right one will be selected automatically.

- Increase size of the system partition with the slider or manually by entering the required value. Please note, when you change size of one partition the size of the other will be changed as well, thus redistributing the unused space between the partitions.

Please specify new sizes of selected partitions.

Selected part of Basic MBR Hard Disk 2 (VMware, VMware Virtual S SCSI Disk Dev)

3... 265.2 GB NTFS

Left volume size: 35563 MB MB Right volume size: 271636 MB MB

- On the next page of the wizard you need to confirm the operation by selecting the appropriate option.



The Wizard has not applied your changes yet. On this page, you can either accept or reconsider the changes.

Please note that if you accept the changes, the Wizard will **physically** perform all the necessary operations and it will not be possible to **undo the changes**.

It may take some time to apply the changes. You may also be asked to restart your computer during this process.

Would you like to apply your changes?

- Yes, apply the changes physically.
- No, let me reconsider.

- That's basically it. By clicking the Next button the wizard will start modifying your disk layout. If you've got to do with the system partition resize, like we do in our case, you will be asked to restart your computer in a special boot-up mode to accomplish the operation. So click the appropriate button to agree.



System restart is required to complete the operation.

What would you like to do?

The operation **Redistribute partitions** needs exclusive access to the volume C: and cannot be completed without system restart. After restart, the operation will continue in boot-time mode. **Do not turn off the computer until the operation completes.**



Restart the computer

Please confirm restart of your computer. The operation will be continued after system restart.



Retry

Manually close used files and retry the operation

Cancel

- In the Progress window you can see in real-time a detailed report on all actions carried out at the moment.

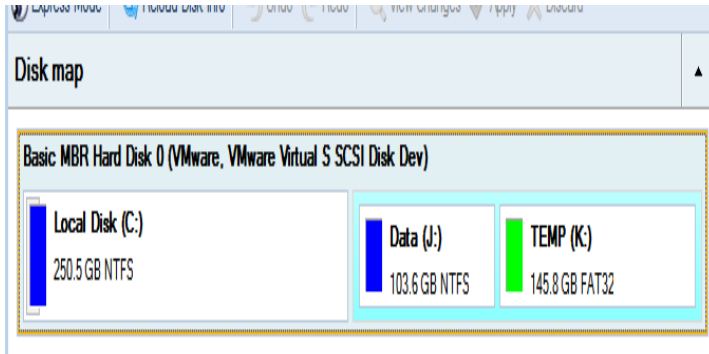
After completing the operation your computer will be automatically restarted back to Windows where you can see that your system partition is bigger now.

Increasing size of a system partition by taking unused space from any other

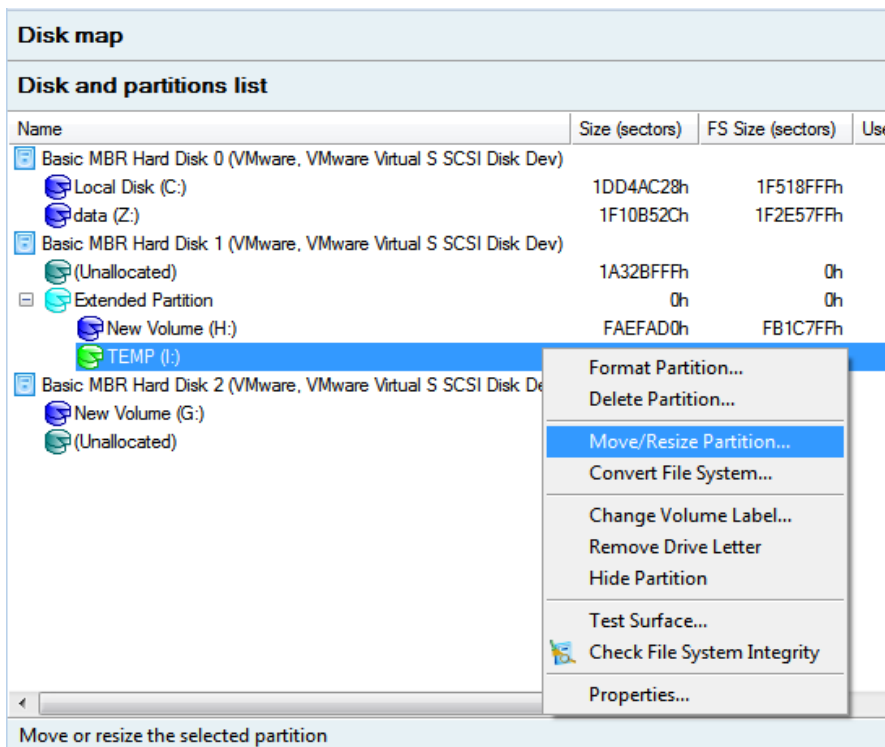
Let's assume you've got several partitions on your hard disk. After installing a number of resource-consuming applications and system updates your system partition has started to suffer from the lack of free space. But one of your partitions has a plenty of redundant space. That's just enough to make your system partition suffer no more.

To increase size of a system partition by taking unused space from any other on-disk partition, please do the following:


1. In the main window select the required hard disk (if several) on the Disk Map.

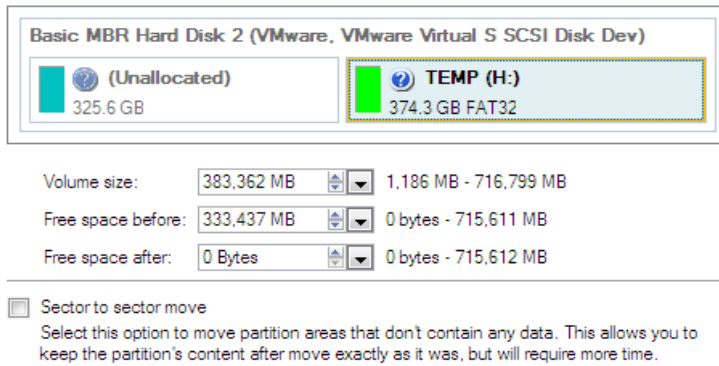


2. Choose a space donor partition and then call the context menu for it (right click of the mouse button) to launch the Move/Resize dialog.

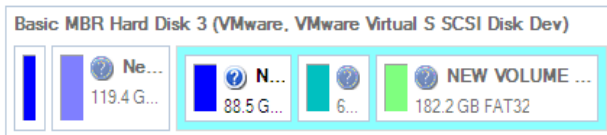


3. In the opened dialog shift the edge of the partition to the right by the drag-and-drop technique. While doing this, free space from the partition will be released (displayed in aqua-green). You can also do it manually by entering the exact size of free space. Click the Yes button to continue.

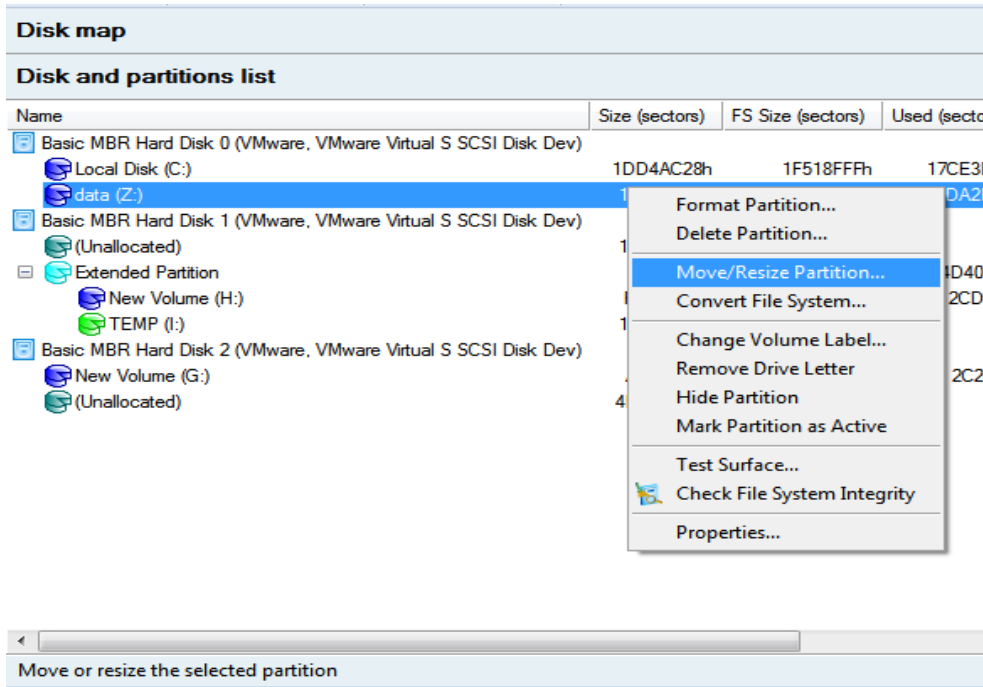
 Are you sure you want to move/resize volume (H:)?
You are about to move/resize FAT32 volume TEMP. (H:).



- Now you've got a block of free space to add to the system partition. You cannot do it directly however, but by carrying out a number of extra move/resize operations.

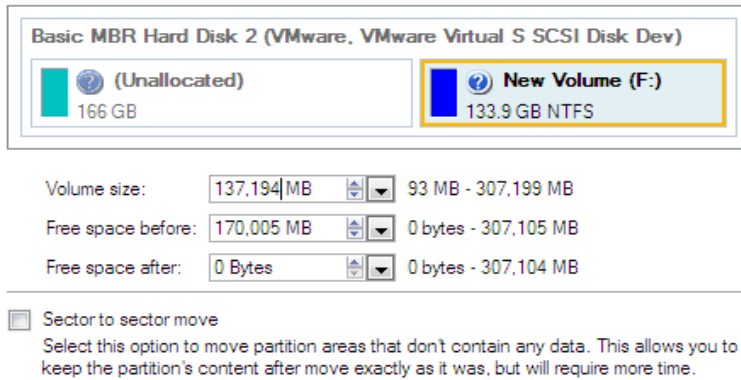
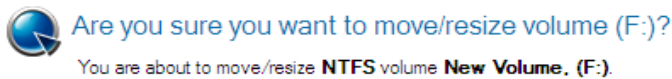


- Since the block of free space is within the extended partition, you need to take it out first. The program enables to resize the extended partition only when there's a block of free space adjoining its borders. In our case it's between two logical disks. So we need to move it. To do that, please select the first logical partition and then call the context menu for it (right click of the mouse button) to launch the Move/Resize dialog.



Name	Size (sectors)	FS Size (sectors)	Used (sectors)
Basic MBR Hard Disk 0 (VMware, VMware Virtual S SCSI Disk Dev)			
Local Disk (C:)	1DD4AC28h	1F518FFFh	17CE31
data (Z:)	1		DA2
Basic MBR Hard Disk 1 (VMware, VMware Virtual S SCSI Disk Dev)			
(Unallocated)	1		
Extended Partition			D40
New Volume (H:)	1		2CD
TEMP (I:)	1		
Basic MBR Hard Disk 2 (VMware, VMware Virtual S SCSI Disk Dev)			
New Volume (G:)	4		2C2
(Unallocated)			

- At first shift the right edge of the partition to the right, then do the same with the left edge. Make sure the partition size has been left unchanged.

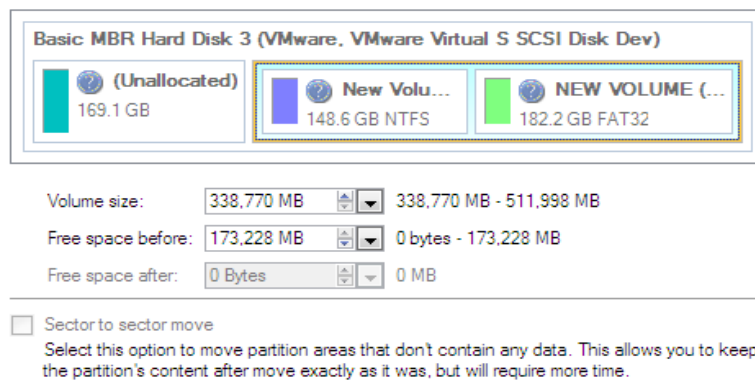
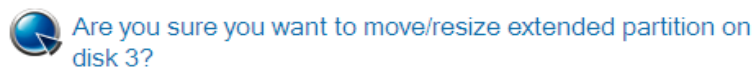


- Now you can resize the extended partition to take the block of free space out of it. Call the context menu for it (right click of the mouse button) to launch the Move/Resize dialog.

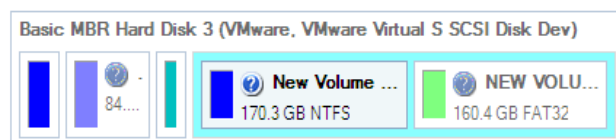


Call a context menu for the extended partition (with the blue border), not the logical one.

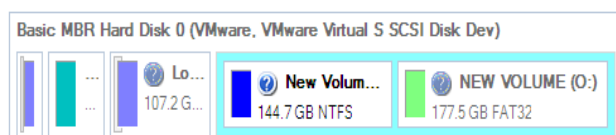
- In the opened dialog shift the edge of the extended partition to the right.



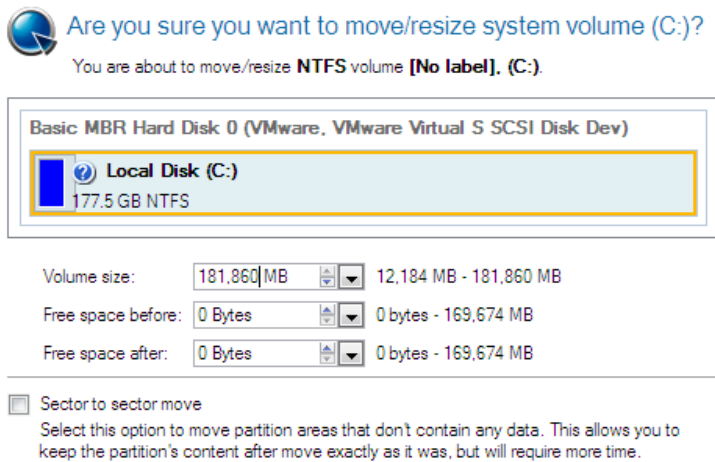
- The block of free space has been released.



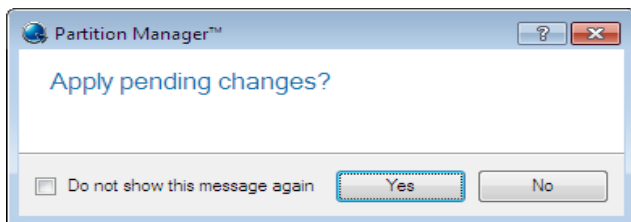
- Now you need to move the second primary partition just the way we did it with the logical partition to make the block of free space adjoin the system partition.



11. Finally increase size of the system partition. Call the context menu for it (right click of the mouse button) to launch the Move/Resize dialog.
12. In the opened dialog shift the edge of the partition to the right, thus increasing its size.



13. Apply all introduced changes. By default, our program works in the virtual mode of execution, so you have to confirm all operations to let the program accomplish them. To do that, just click the Apply button on the Virtual Operations Bar.



14. The program will require the system restart to accomplish the operation in a special boot-up mode. Click the appropriate button to agree.

Resizing partitions of Apple Boot Camp

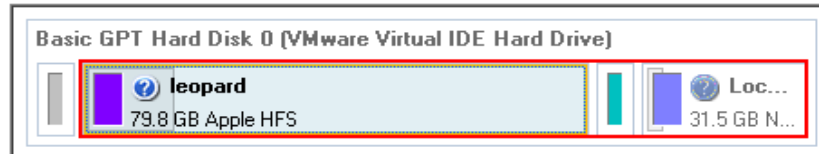
Let's assume you're a Boot Camp user who's got Windows XP as the second operating system. Initially allocated space for the Windows partition has turned out to be insufficient for your current needs. The only way out is to take some space from your Mac partition, thus redistributing the unused space between the partitions.

To increase size of the Windows partition by taking unused space from the Mac partition, please do the following:

1. Click the **Express Resize Partitions** item of the Wizards menu.
2. On the Wizard's Welcome page, click the Next button.
3. The wizard will automatically select Windows (the NTFS file system) and Mac (the Apple HFS file system) partitions of your Boot Camp configuration.

The wizard will resize space between **leopard** and **Local Disk (C:)** on **Basic GPT Hard Disk 0 (VMware Virtual IDE Hard Drive)**.

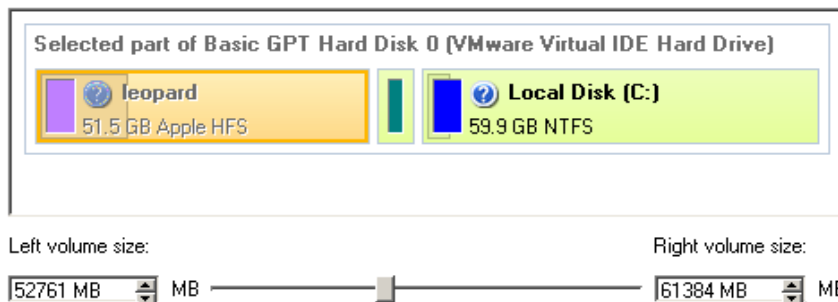
Select left partition from a pair of adjacent partitions you would like to resize. Right adjacent partition will be selected automatically.



On the disk map you can also see the GPT service partition (called EFI) as well as a 128-megabyte free block between Mac and Windows partitions made with Boot Camp. It's just for your information.

- Increase size of your Windows partition with the slider or manually by entering the required value. Please note, when you change size of one partition the size of the other will be changed as well, thus redistributing the unused space between the partitions.

Please specify new sizes of selected partitions.



- On the next page of the wizard you need to confirm the operation by selecting the appropriate option.



The Wizard has not applied your changes yet. On this page, you can either accept or reconsider the changes.

Please note that if you accept the changes, the Wizard will **physically** perform all the necessary operations and it will not be possible to **undo the changes**.


It may take some time to apply the changes. You may also be asked to restart your computer during this process.

Would you like to apply your changes?

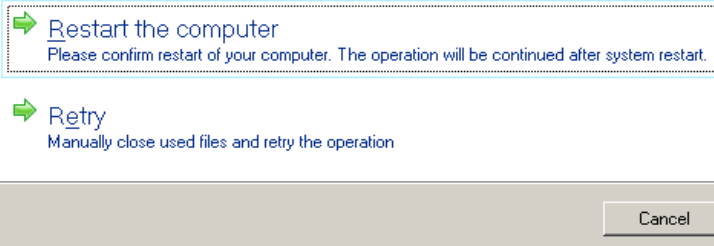
Yes, apply the changes physically.

No, let me reconsider.

- That's basically it. By clicking the Next button the wizard will start modifying your disk layout. If you've got to do with the system partition resize, like we do in our case, you will be asked to restart your computer in a special boot-up mode to accomplish the operation. So click the appropriate button to agree.

 System restart is required to complete the operation.
What would you like to do?

The operation **Redistribute partitions** needs exclusive access to the volume C: and cannot be completed without system restart. After restart, the operation will continue in boot-time mode. **Do not turn off the computer until the operation completes.**



7. In the Progress window you can see in real-time a detailed report on all actions carried out at the moment.

After completing the operation your computer will be automatically restarted back to Windows where you can see that your system partition is bigger now.

Troubleshooter

Here you can find answers to the most frequently asked questions that might arise while using the program.

1. I try to run an operation, but the program claims my partition is in use and suggests restarting the computer.

There are a number of operations that cannot be performed while your partition is in use (or locked in other words). Please agree to reboot your machine to make the program accomplish the operation in a special boot-up mode.

2. I run an operation and restart the machine as required, but it just boots back into Windows without accomplishing the operation.

Please run 'chkdsk /f' for the partition in question.

3. I cannot create a new partition on the disk.

There can be a number of reasons for that:

- The program cannot create a new partition on a dynamic disk.
- The program allows creating new partitions only within blocks of un-partitioned space. It cannot convert a free space on an existing partition to a new partition.

4. I cannot copy a partition.

There can be a number of reasons for that:

- The source or target disk you select is a dynamic disk;
- 4 primary partitions (or three primary partitions and an extended one) already exist on the target disk.

5. I need to copy a partition. But when selecting a place where to make a copy, I always get a crossed circle sign no matter which partition is selected.

The program enables to copy a partition only to a block of un-partitioned space. If you don't have a block of free space on your hard disk, please delete or reduce an existing partition to accomplish the operation.

6. I cannot do anything with my USB flash drive. I get a crossed circle sign when trying to select any area on it.

Some USB flash drives don't have the MBR (Master Boot Record), that's the cause of your problem. To fix the issue please use the Update MBR function of our program or 'fixmbr' of the Windows installation disc to write a standard code to your flash drive.

7. When trying to back up my system the program asks to restart the computer.

Most likely the Hot Processing mode is disabled. Please make it active in the program settings.

8. When backing up a partition with the VSS (Volume Shadow Copy Service) mode, the program throws "VSS could not be started for processed volume".

Most likely you try to back up a FAT32 partition, which is not supported by VSS. Please use the Paragon Hot Processing mode instead.

9. I cannot back up my hard disk to an external hard drive. Once started, the operation is aborted with the following error: Hard Disk management, Error Code 0x1100a. What is wrong here?

The problem is that the Microsoft VSS service is set as the default Hot Processing mode in the program. But this service has not been started in your WindowsXP/Windows2003/Vista. Please start this service (right click on My Computer > Manage > Services > find Microsoft Volume Shadow Copy Service and make it active. Set also to start it automatically).

10. When running a backup operation with the Paragon Hot Processing mode enabled, I get an error: error code 0x1200e "Internal error during Hot Backup"

Most likely your hard disk contains bad blocks. Please fix the issue with your HDD manufacturer's tool.

You can find a name of the tool you need here: <http://kb.paragon-software.com>

11. When running a backup operation with the Microsoft VSS mode enabled, I get the following error: error code 0x12016 "VSS: can't read volume data"

Most likely your hard disk contains bad blocks. Please fix the issue with your HDD manufacturer's tool.

You can find a name of the tool you need here: <http://kb.paragon-software.com>

12. When trying to back up to a network share, I get the following error: "i/o error" or "can't open/create file"

Please check whether you've got a permission to write to the selected destination or not.

13. When trying to restore a backup archive, I get the following error: "Can't restore to current selection" or "Archive does not fit"

Most likely you're trying to restore a backup of the whole hard disk to a partition or vice versa.

14. I set up a timetable for a task, but it fails to execute.

There can be a number of reasons for that:

- Windows Task Scheduler does not work properly. Check whether it is so or not by scheduling a simple task (call Notepad through scheduling);
- You don't have permission to write to the selected backup destination.

Glossary

Active Partition is a partition from which an x86-based computer starts up. The active partition must be a primary partition on a basic disk. If you use Windows exclusively, the active partition can be the same as the system volume. In the DOS partitioning scheme, only primary partitions can be active due to limitations of the standard bootstrap.

The term **backup** originates from the time when the best way to protect valuable information was to store it in form of archives on external media. It's become now a general notion to mean making duplications of data for protection purposes.

Bootable Archive is created by adding a special bootable section when backing up the data to CD/DVDs. Thus you will be able to restore the data from these archives without having to run the program, but by simply booting from these CD/DVDs.

Cluster is the smallest amount of disk space that can be allocated to hold a file. All file systems used by Windows organize hard disks based on clusters, which consist of one or more contiguous sectors. The smaller the cluster size, the more efficiently a disk stores information. If no cluster size is specified during formatting, Windows picks defaults based on the size of the volume. These defaults are selected to reduce the amount of space that is lost and the amount of fragmentation on the volume. A cluster is also called an allocation unit.

Extended Partition is a partition type you create only on a basic MBR (Master Boot Record) disk. Extended partition is used if you want to create more than four volumes on a disk, since it may contain multiple logical drives.

File System Metadata. The servicing structures of a file system, which contain information about allocating files and directories, security information etc, are named the file system metadata. It is invisible for users and regular applications because its accidental modification usually makes a partition unusable.

Hard Disk Geometry. Traditionally, the usable space of a hard disk is logically divided into cylinders, cylinders are divided into tracks (or heads), and tracks are divided into sectors.

The triad of values {[Sectors-per-Track], [Tracks-per-Cylinder], [Amount-of-Cylinders]} is usually named the Hard Disk Geometry or C/H/S geometry.

Tracks and cylinders are enumerated from "0", while sectors are enumerated from "1". These disk parameters play an essential role in the DOS Partitioning scheme.

Modern hardware uses an advanced scheme for the linear addressing of sectors, which assumes that all on-disk sectors are continuously enumerated from "0". To allow backward compatibility with older standards, modern hard disks can additionally emulate the C/H/S geometry.

Hidden Partition. The concept of a "hidden" partition was introduced in the IBM OS/2 Boot Manager. By default, an operating system does not mount a hidden partition, thus preventing access to its contents.

A method of hiding a partition consists in changing the partition ID value saved in the Partition Table. This is achieved by XOR-ing the partition ID with a 0x10 hexadecimal value.

Master File Table (MFT) is a relational database that consists of rows of file records and columns of file attributes. It contains at least one entry for every file on an NTFS volume, including the MFT itself. MFT is similar to a FAT table in a FAT file system.

MBR & 1st track of the hard disk is the 0th sector of the disk. MBR (Master Boot Record) contains important information about the disk layout:

- The used partitioning scheme;
- The starting records of the Partition Table;
- The standard bootstrap code (or the initial code of boot managers, disk overlay software or boot viruses).

Generally, the 0th sector is used for similar purposes in all existing partitioning schemes.

The MBR capacity is not sufficient to contain sophisticated boot programs. That's why the on-boot software is allowed to use the entire 0th track of the disk. For example, boot managing utilities such as LILO, GRUB and Paragon Boot Manager are located in the 0th track.

Partition ID (or File system ID) is a file system identifier that is placed in the partition. It is used to quickly detect partitions of supported types. A number of operating systems completely rely on it to distinguish supported partitions. Partition ID is saved in appropriate entries of the Partition Table and takes only 1 byte of space.

Partition Label (or Volume Label) is a small textual field (up to 11 characters) that is located in the partition's boot sector. This value is used for notification purposes only. It is detectable by any partitioning tool including the DOS FDISK utility.

Modern operating systems save it within a file system, e.g. as a special hidden file. Thus it is able to contain a relatively large amount of text in multiple languages.

Partitioning Scheme is a set of rules, constraints and format of the on-disk structures to keep information on partitions located on a hard disk.

There are known several partitioning schemes. The most popular of them is the so-called DOS partitioning scheme. It was introduced by IBM and Microsoft to use multiple partitions in the disk subsystems on IBM PC compatible computers.

Another popular partitioning scheme is the so-called Logical Disks Model (LDM) that originates from the UNIX mainframe systems. Veritas Executive accommodates a simplified version of LDM to the Windows 2000 operating system.

Windows 2000 and XP support two quite different partitioning schemes: the old DOS partitioning scheme and the new Dynamic Disk Management (DDM). The problem is that earlier versions of Windows do not support DDM. In addition, most hard disk utilities do not support it as well.

Recovery Media is a CD/DVD disc, a USB flash card or even a floppy disk from which you can boot for maintenance or recovery purposes.

Root Directory is the top-level directory of a formatted logical drive to include other files and directories. In modern file systems (Ext2/Ext3, NTFS and even FAT32) it does not differ from other directories. This is not the case for old FAT12 and FAT16 file systems.

Serial Number. In the DOS partitioning scheme, every hard disk and every partition has a 32-bit serial number represented by an 8-figure hexadecimal value. It is stored in the MBR and its value is assigned when the MBR sector is initialized by Microsoft standard disk managing tools, such as Windows Disk Administrator and the FDISK utility.

In fact, a hard disk's serial number is not important for most operating systems and software. It is known that Windows NT, 2000 and XP store its value in the database of assigned drive letters.

A partition's serial number is stored in its boot sector (in FAT16, FAT32 and NTFS file systems). Its value is assigned when the partition is formatted. It does not play an important role for most operating systems and software as well.