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Paragon® Hard Disk Manager™ for Mac OS X

User Guide

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Table of Contents

Product Overview 4

Getting Started 4

System Requirements 4

Installation 4

First Start 6

Activating the Product 6

Installing Auxiliary Components 7

Working with the Product 8

Preparing Bootable Recovery Media 12

Configuring the Program 14

Manage Partitions and Disks 15

Partition a Disk 15

Create a Partition 15

Format a Existing Partition 16

Delete a Partition 17

Change a Volume Label 18

Move/Resize a Partition 18

Redistribute Free Space 19

Change a GPT Type 21

Convert a Partition Table 22

Get Disk/Partition Properties 22

Wipe Data 23

Wipe a Disk or Partition 23

Clear Free Space 24

Copy Data 25

Copy a Disk 25

Copy a Partition 26

Check a Partition for Problems 28

Edit/View Sectors 28

Fix BootCamp Boot Problems 29

Correct BootCamp Boot Record 29

Correct BootCamp BCD Files 30

Correct BootCamp 'boot.ini' Files 30

Update BootCamp MBR 31

Adjust BootCamp to Dissimilar Hardware 31

Set Active/Inactive 32

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Mount/Unmount a Partition 32
Change Partition ID 33
Protect System and Data 34
Create a Full Backup Image 34
Create an Incremental Update 37
Mount a Backup Image 38
Restore a Backup Image 39
Merge an Incremental Image with Its Parent 42
Auxiliary 42
HDM for Mac and Snapshot 42
HDM for Mac and SIP 42
Managing SIP 43
HDM for Mac and Apple Core Storage 44

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Product Overview

Hard Disk Manager for Mac (HDM for Mac) is a port of the best-selling Paragon's storage management solution for Windows. It covers all aspects of a Mac computer life cycle: drive partitioning, file system optimization and repair functions, data backup capabilities, and irreversible data wiping. Unlike Disk Utility or similar Mac tools, the program supports all file systems of OS X, Windows, and Linux. Besides, it can back up system and data volumes through a patent-pending snapshot technology, which is several times more effective and user-friendly than the popular Time Capsule.

Among other strong benefits the following features are worth mentioning: redistribution of free space between volumes without the system restart, conversion of a file system that contains data, conversion from MBR to GPT and vice versa, recovery of an accidentally deleted volume, and irreversible destruction of not only all on-disk information, but remnants of deleted files without affecting the used data.

Getting Started

System Requirements

- An Intel-based Mac computer
- OS X 10.9 and later
- 2 GB of RAM

Installation

1. Double click the supplied .dmg image.

2. First you are to accept all conditions stated in Paragon's license agreement by clicking the **Agree** button. You can also save or print out the agreement by using the appropriate buttons.

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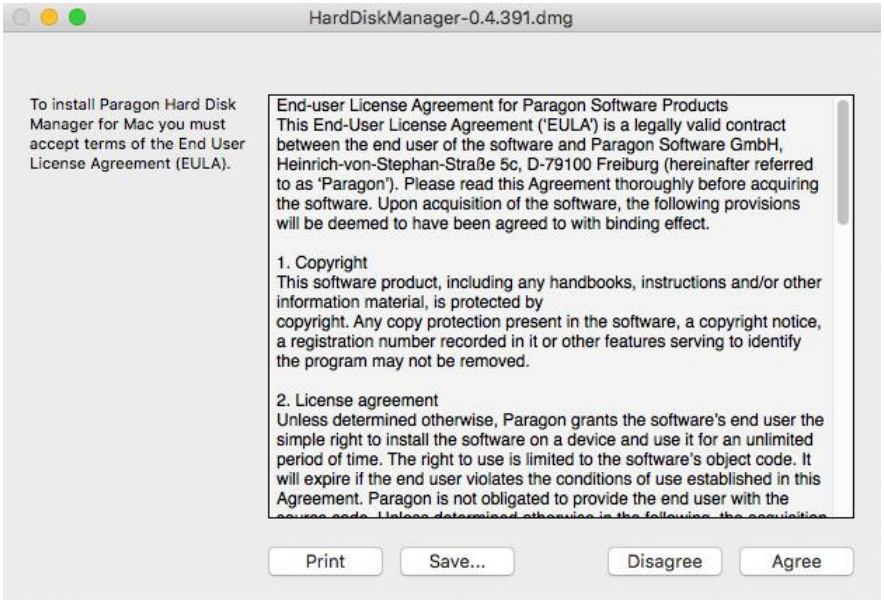
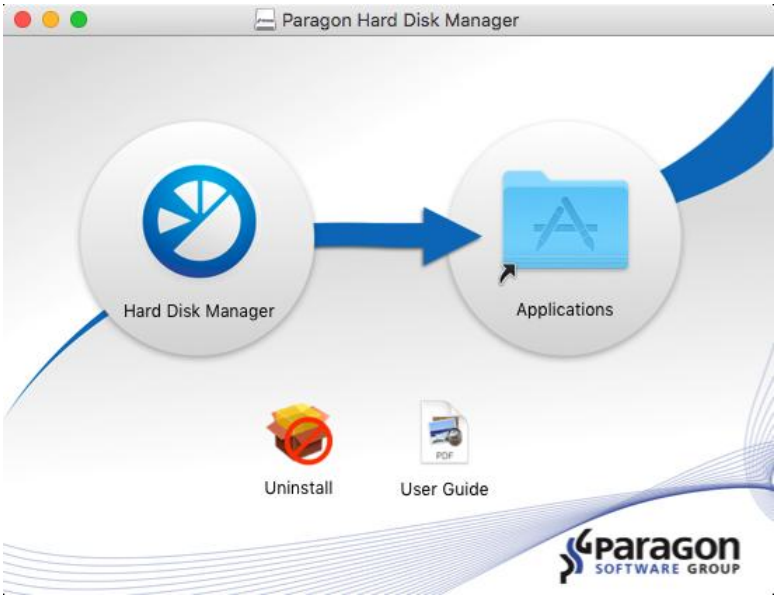


3. Drag the program's icon to the Applications folder.



4. After the installation you can see an icon of Paragon's Hard Disk Manager in the Applications folder. Double click the icon to launch the utility.

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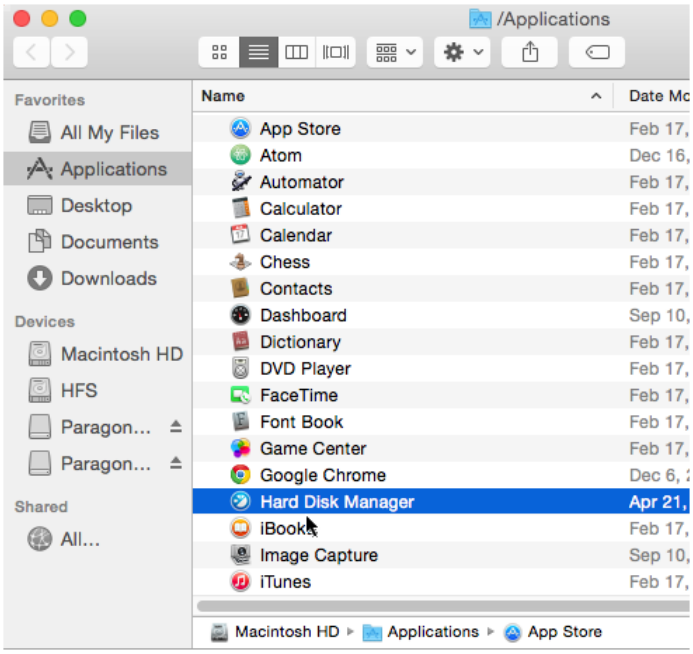
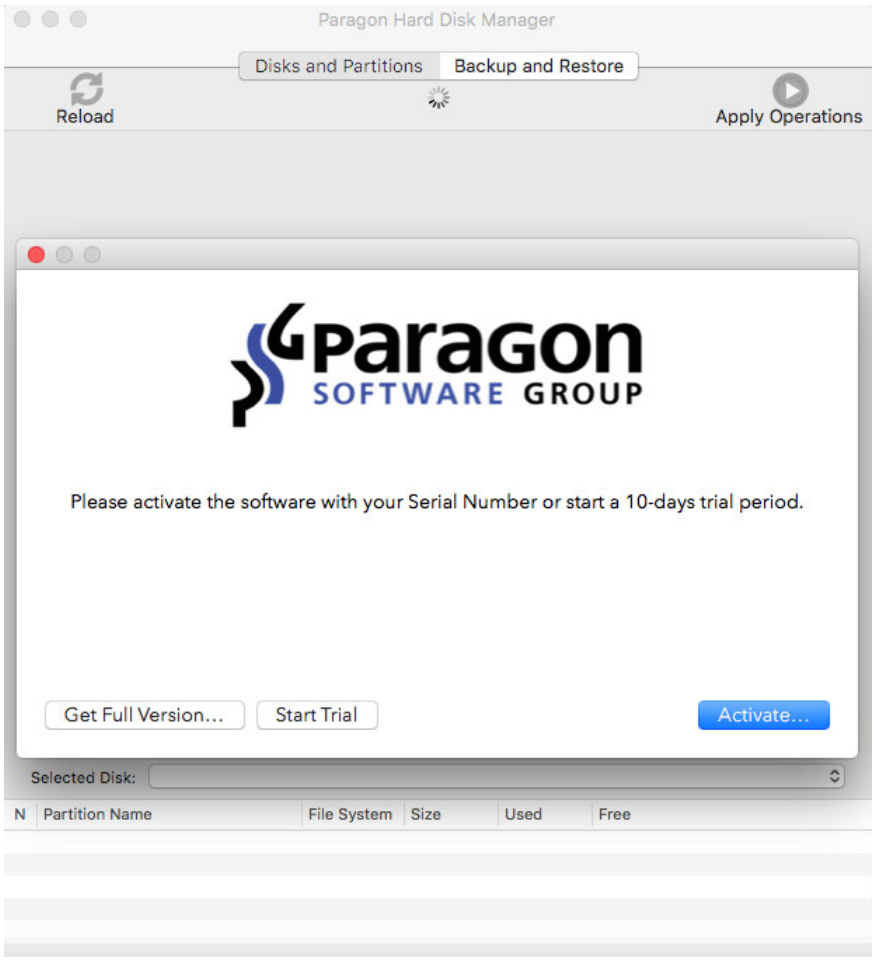


First Start

Activating the Product

Once started, you will see an activation dialog. HDM for Mac is a commercially distributed product, which is however can be used with no limitations completely for free during a 10-day trial period. After that you won't be able to use the product until activated over the Internet.



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There are two ways of activating the product: with login to MyParagon Customer Portal or Facebook and without it. We highly recommend you to use the first option to let us offer you personal discounts in the future. Besides, you will be able to issue support tickets directly from the product.

1. First purchase the product by clicking **Get Full Version…** As a result you should have your own serial number.
2. Click **Activate…**, enter an email and password of your Paragon's account, then click **Sign in**. If you don't have an account yet, please create it by clicking the corresponding option. Alternatively, you can sign in with your Facebook account.

If you don't want to activate the product with login to MyParagon Customer Portal, click **Skip**.

3. If you have purchased the product online as described in the first step, then your serial number will be pasted automatically. If having to do with a box version of the product, enter your serial number, then click **Activate**. This info will be sent to our activation server to complete the procedure.

4. Next you are to provide a password of a user with the administrator privilege.
5. If a success, you'll get a corresponding notification.

Installing Auxiliary Components

After you're done with the activation dialog, the program will notify you about installing several auxiliary components. These include the **Snapshot** to get instant copies of a disk or several disks at a specific point in time and the **VMDK Mounter** to mount existing backup images in read-only mode.

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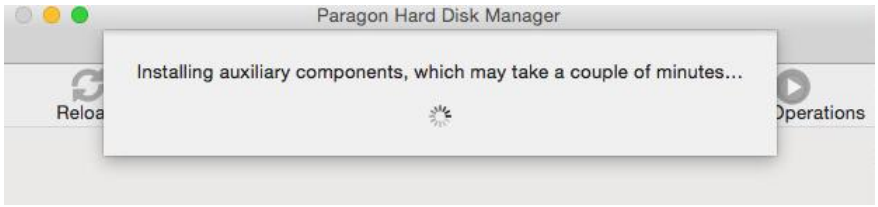
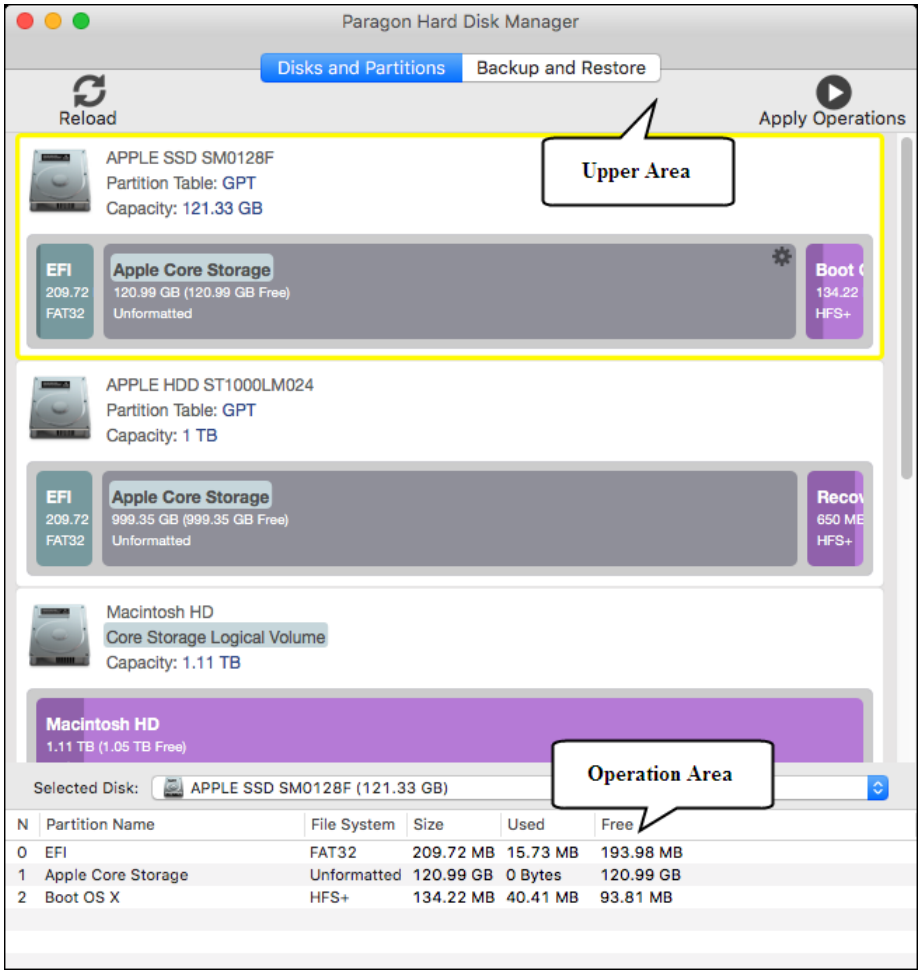


Working with the Product

The program provides wide opportunities in the field of hard disk structure modification, so it's highly recommended to back up your data before carrying out any operation.

The main window can be conditionally subdivided into several sections:



Upper Area

In the upper area of the main window you can switch between two operation modes available in the operation area:

- Click the **Disks and Partitions** tab (active by default) to do drive partitioning, file system optimization and repair, or data wiping;
- Click the **Backup and Restore** tab to protect your system and data against a system or hardware failure or accidental data loss.

Besides you can see here two buttons:

- Use the **Reload** button to bring the displayed information up-to-date after connecting an external disk or mounting a virtual image;

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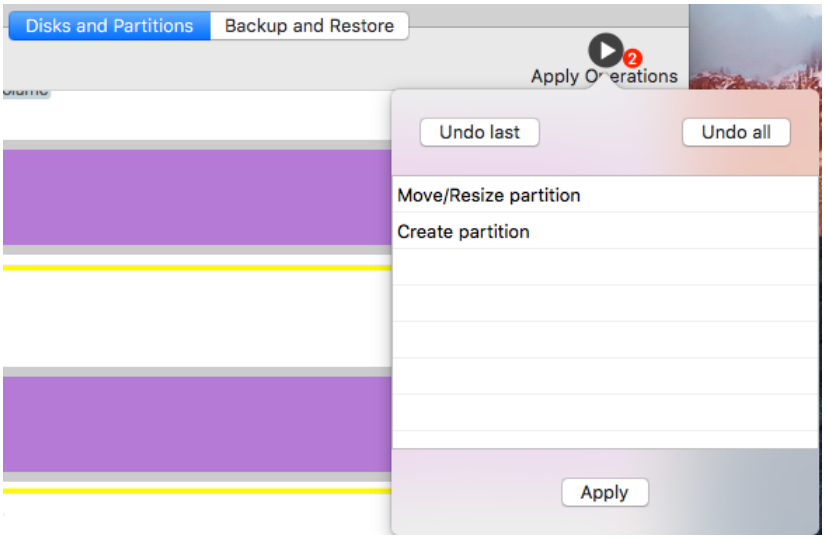
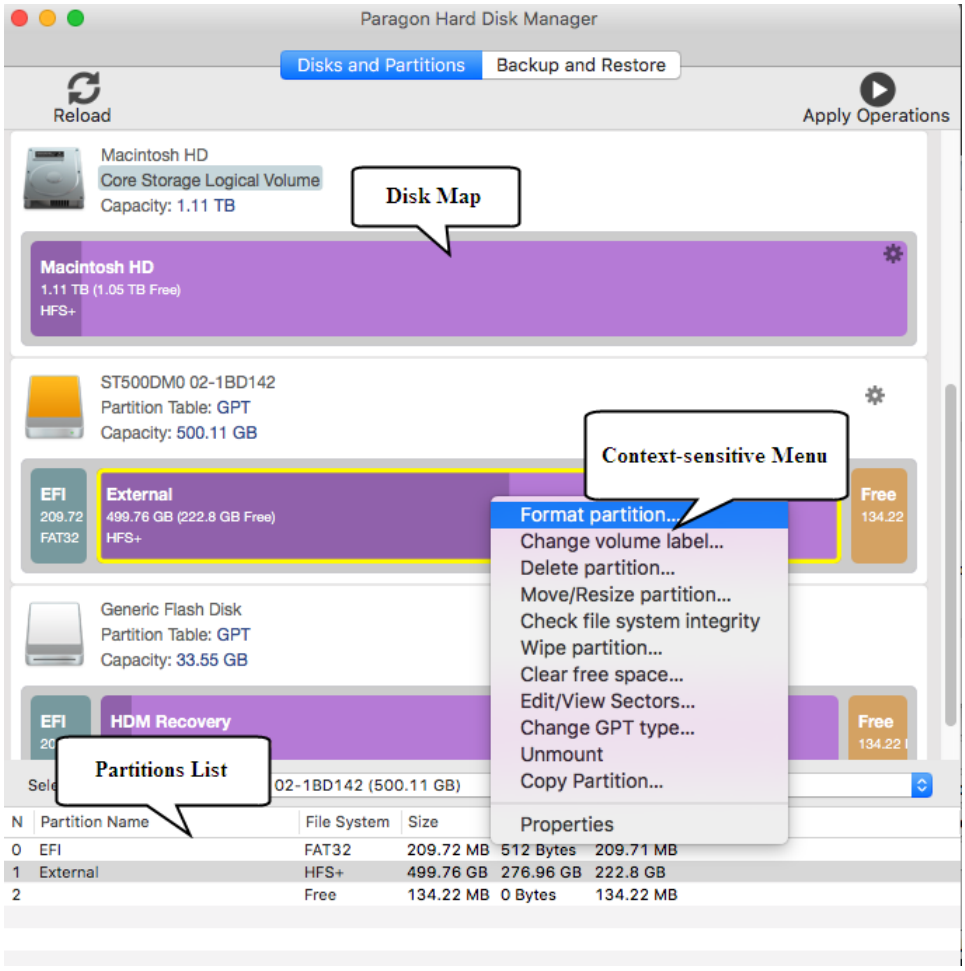
- Use the **Apply Operations** button to physically execute pending changes. In fact the program does not accomplish operations immediately, but places them on a special list (the so-called virtual mode). First it helps to avoid possible mistakes as you should confirm all provided changes. Second it saves your time and effort when executing several operations, as you don't need to wait for each operation to physically complete before proceeding to the next operation.



Operation Area

Contents of the operation area vary according to the selected operation mode in the upper area.

Disks and Partitions



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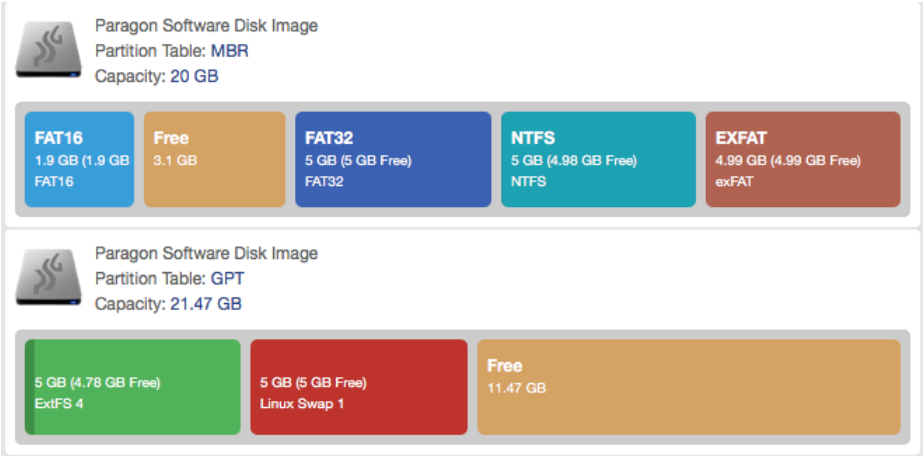
In this mode you can see all physical and virtual storage devices available in the system, including mounted .dmg images. The information is displayed graphically to help you accomplish the required task with the minimal effort.

Disk Map

The Disk Map displays the layout of storage devices. Each device is represented with a white rectangle bar that contains coloured bars, which represent partitions or logical disks. Their color depends on the file system of the appropriate partition (purple for HFS, teal for ExtFS, blue for NTFS, etc.). By looking at the size of the bar's shaded area it is possible to estimate the used disk space. For the selected at the moment object you can call a context-sensitive popup menu with available operations.



White bars display the following information about storage devices:

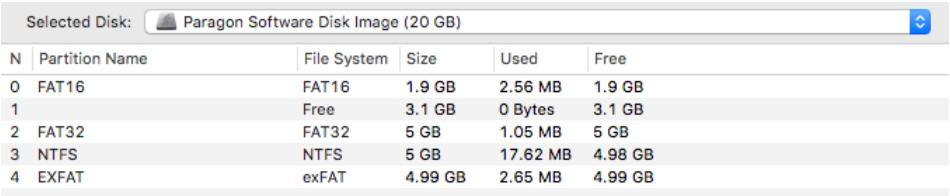
- Type (physical, virtual, apple disk image),
- Used partitioning scheme (MBR or GPT),
- Total capacity.

Coloured bars display the following information about logical disks and blocks of free space:

- Volume label (if exists),
- Total size,
- File system.

Partitions List

The Partitions List is another tool that helps to get a clear-cut picture on the current state of the system storage devices. All objects (disks, partitions, blocks of free space, or disk images) on the list are sorted according to their starting position. For every item you can call a context-sensitive popup menu with available operations.



N	Partition Name	File System	Size	Used	Free
0	FAT16	FAT16	1.9 GB	2.56 MB	1.9 GB
1		Free	3.1 GB	0 Bytes	3.1 GB
2	FAT32	FAT32	5 GB	1.05 MB	5 GB
3	NTFS	NTFS	5 GB	17.62 MB	4.98 GB
4	EXFAT	exFAT	4.99 GB	2.65 MB	4.99 GB

Context-sensitive Menu

Right click a disk, partition, or block of free space on the Disk Map or Partitions List or left click the gear icon for the currently-selected object on the disk map to call a context-sensitive menu with available operations. Select a desired operation to call the corresponding dialog.

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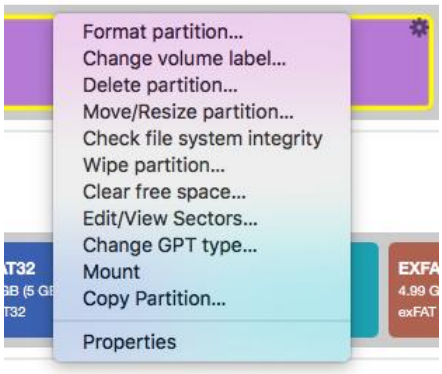
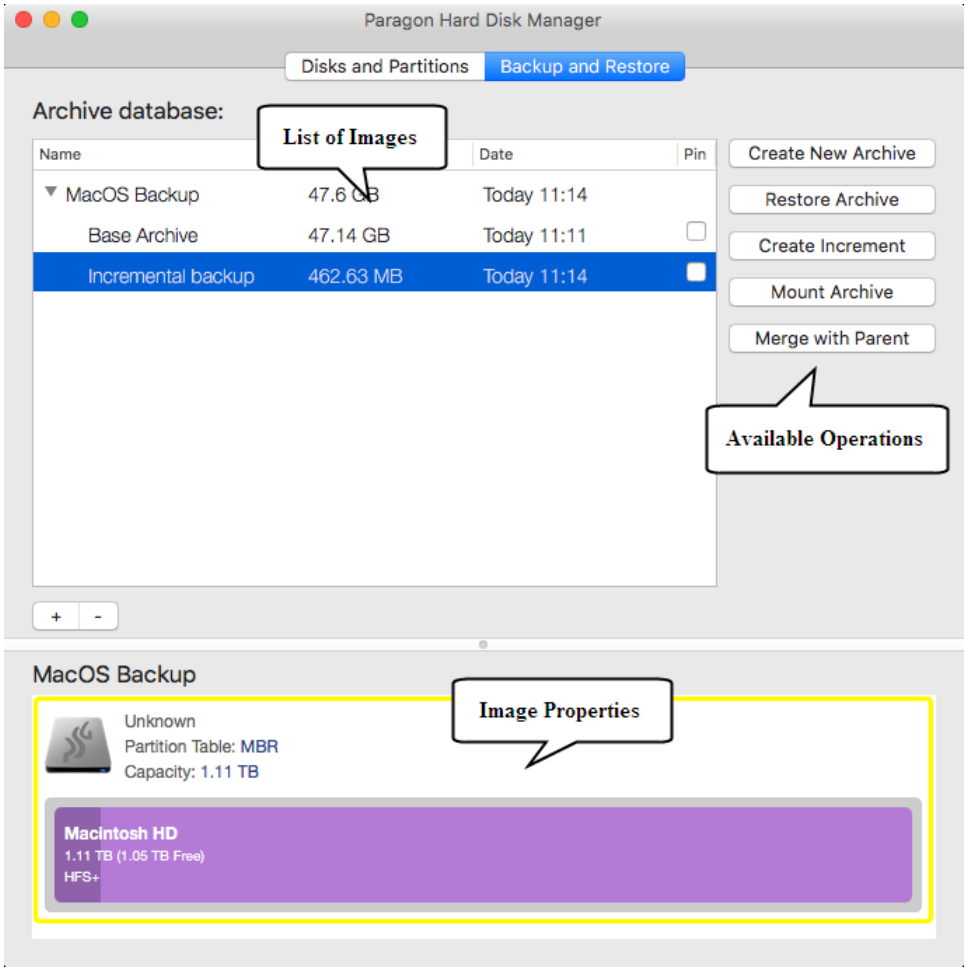


To learn more about drive partitioning, file system optimization and other storage management operations, please consult the Manage Partitions and Disks chapter.

Backup and Restore



In this mode you can see a list of created backup images. Left click an image to get detailed information on its properties in the lower panel. Depending on the selected object you're allowed to initiate one of the available operations.

To learn more about backup and restore operations, please consult the Protect System and Data chapter.

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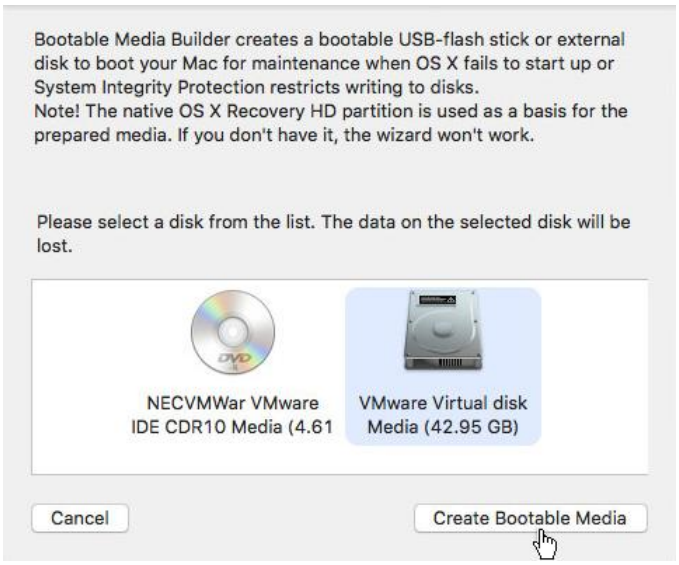
Preparing Bootable Recovery Media

Recovery media can help you boot your Mac into Recovery Environment to get access to your disk(s) for maintenance or recovery purposes when OS X fails to start up. It includes a standard set of utilities (terminal, reinstall os x tool, etc.) and the Hard Disk Manager application. HDM for Mac includes a user-friendly wizard that will guide you through the process of creating this media on a flash stick or external disk. The only prerequisite is to have the native OS X Recovery HD partition in the system, which is used as the basis.

1. Select from the main menu: **Wizards > Create Bootable Recovery Media**.

If running HDM for Mac on Mac OS X El Capitan where the System Integrity Protection (SIP) is enabled, which is on by default, you'll be prompted to either create the recovery media and accomplish otherwise prohibited operations from it or switch off SIP at the first program start. For more details, please consult HDM for Mac and SIP.

2. Choose a flash stick or external disk from the list of available storage devices, then click **Create Bootable Media**.



3. If the selected disk has got enough free space, the wizard will offer you the choice of either creating the recovery media on a separate partition in the end of the disk after resize to keep the on-disk data intact or

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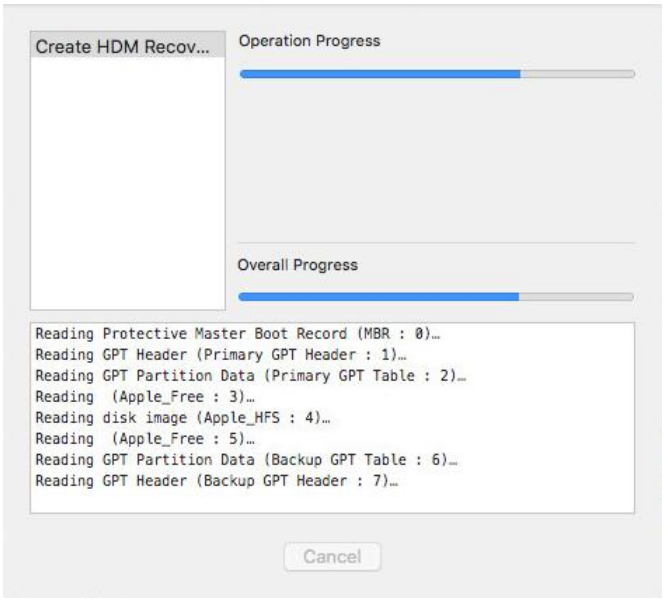
erasing the entire disk contents. Click on the required option to initiate the operation, which takes a couple of minutes.

If the selected storage device is a GPT disk, where the last partition can be downsized by 700MB, the wizard will offer you the choice of either creating the recovery media on a separate partition ("HDM Recovery") in the end of the disk after resize to keep the on-disk data intact or erasing the entire disk contents. If the disk is MBR, then it will prompt you to erase it, creating a GPT disk with three partitions: EFI, “User Data” (takes the bulk of the available free space), and “HDM Recovery” (700MB). Click on the required option to initiate the operation, which takes a couple of minutes.



4. Once completed, you will be prompted to restart your Mac from the just created media. If you decide not to do it right now, click **Don’t restart**.

5. To start up the computer from the recovery media later you will need to hold the **Option** (alt) key during the system restart until the Startup Manager appears, then select **Hard Disk Manager** as boot source. Alternatively, you can use the Startup Disk System Preferences.

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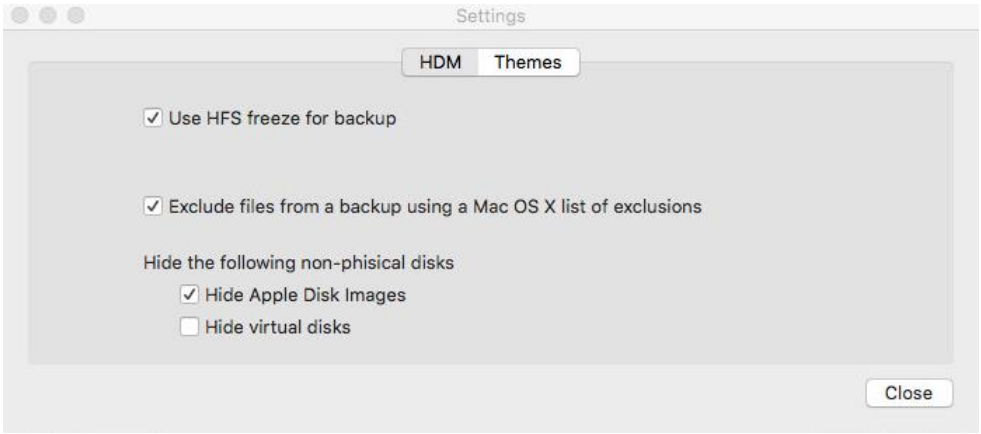
Configuring the Program

HDM for Mac is very flexible and can be easily set up with the help of a graphical interface.

1. Select from the main menu: **Paragon Hard Disk Manager > Preferences…**

2. Click on the **HDM** tab to see the main program settings (opened by default).



- **Use HFS freeze for backup**. By default, if Paragon's snapshot technology fails to back up one of your Mac OS X volumes, the problem HFS volume will be automatically "frozen for backup" (read-only access), which may take quite a while when processing a system volume. Unmark the checkbox, if you don't need this alternative.
- **Exclude files from a backup…** By default, OS X temporary files are not backed up, which helps to reduce the operation time and the resulted size of backup images. Unmark the checkbox, if you need them inside backup images.
- **Hide Apple Disk Images**. By default, mounted Apple disk images (.dmg files) are not displayed on the disk map. Unmark the checkbox, if you need them displayed.
- **Hide virtual disks**. Use this option to allow the program to display physical devices only on the disk map.

3. Click on the **Themes** tab to customize the working environment. The program includes three predefined themes to choose from. Additionally, you can modify every single view.

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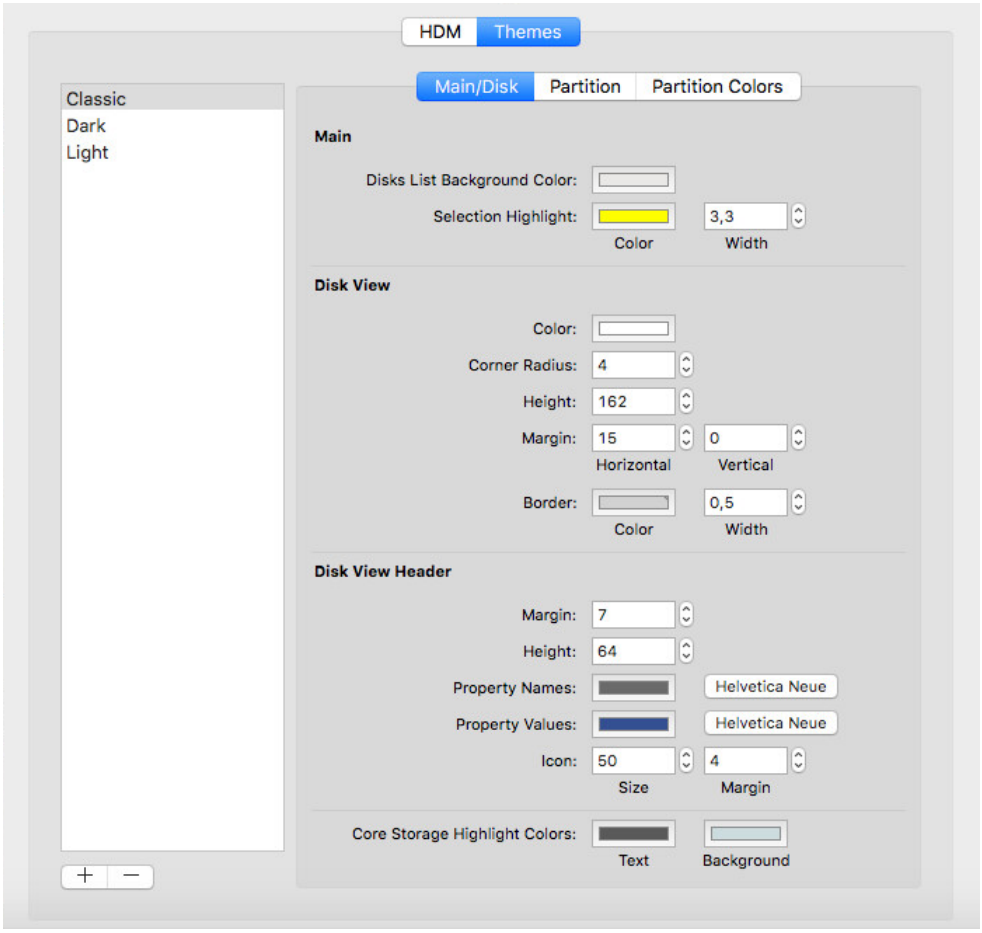


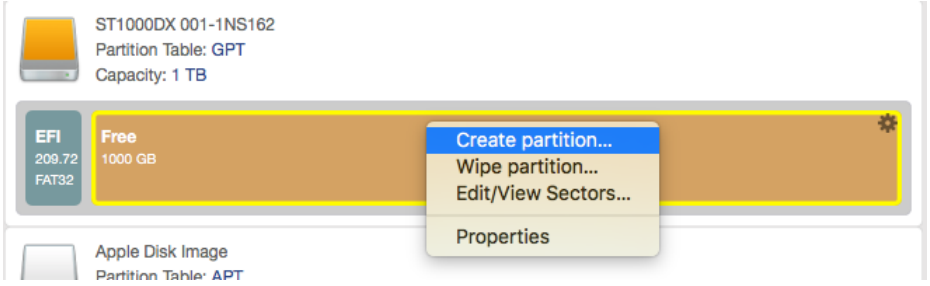
Manage Partitions and Disks

Partition a Disk

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. Partitioning also makes it possible to organize data so that it is easy to find and manage. 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. Finally partitioning is a necessity if you're planning to run several OSs on a single hard drive to effectively delineate the boundaries of each OS.

Create a Partition

1. Select **Disk and Partitions** in the upper area.
2. Right click a block of free space, then select **Create partition…**



3. Define a partition size and its position relative to the beginning and the end of the selected block of free space by manually entering desired values or through dragging the corresponding sliders.

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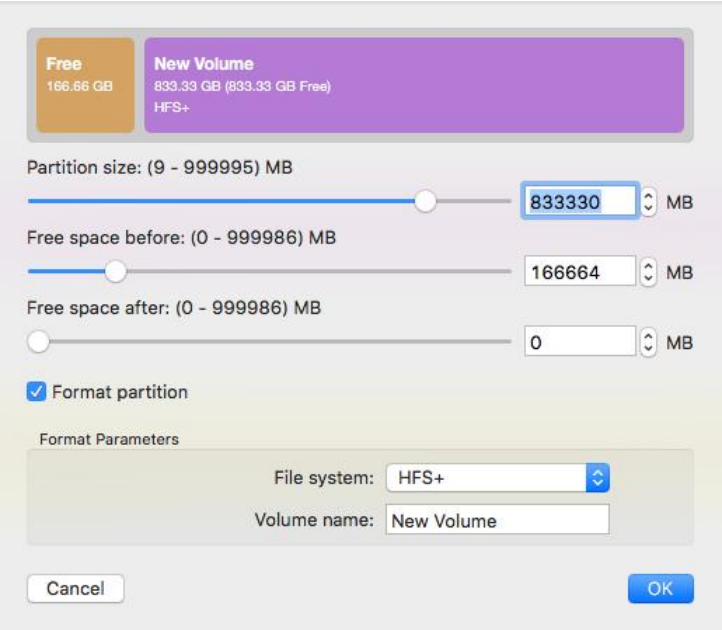
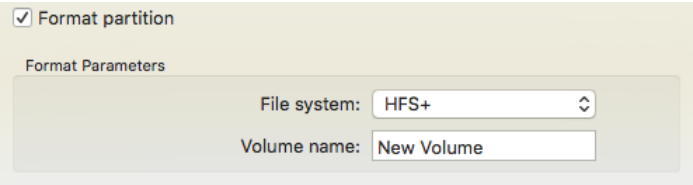


4. To store data on the created partition you need to format it to one of the supported file systems. Mark the corresponding check box, then select the desired file system from the pull-down list and enter a volume label to easily identify the partition later (optional parameter).



- **HFS+** – the primary file system for Mac OS X
- **NTFS** – the primary file system for Windows OS
- **FAT32** – Use for data disks that are 32GB or less
- **ExtFS 2/3/4** – the primary file system for Linux OS
- **exFAT** - Use for external storage devices that are over 32GB

5. Click **OK** when ready. All introduced changes to the disk layout will be pended until confirmed.

Format a Existing Partition

When you create a new partition you will be prompted to choose the desired file system format as described above. This section explains how to format an existing partition.

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing partition, then select **Format partition…**

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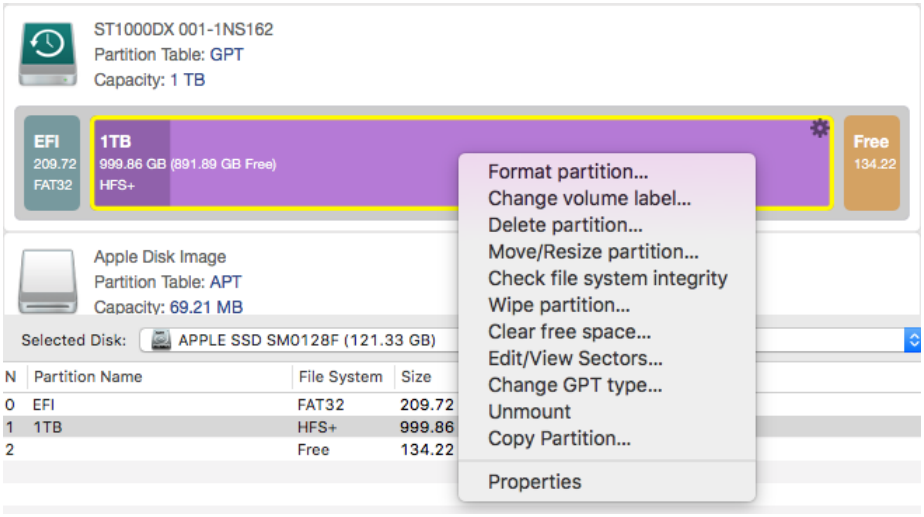
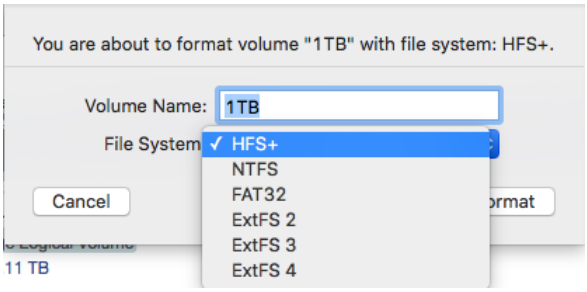


3. Select the desired file system from the pull-down list and enter a volume label to easily identify the partition later (optional parameter).

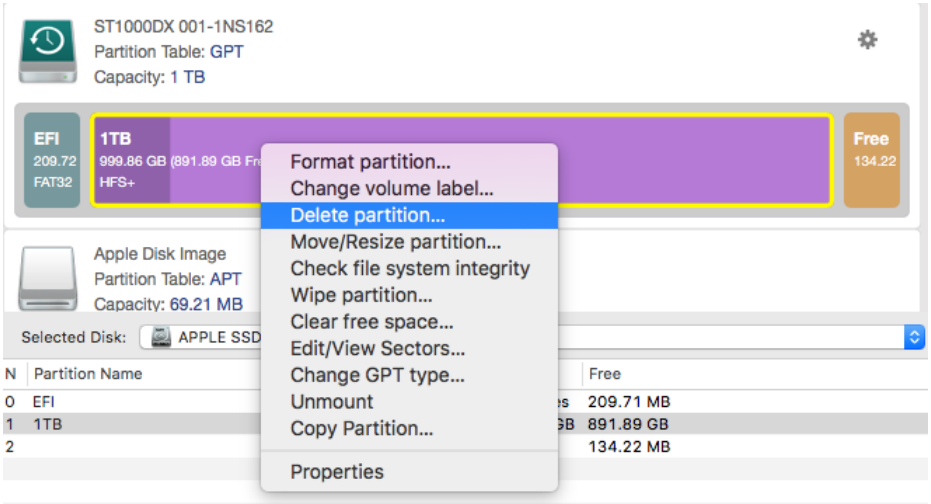


- **HFS+** – the primary file system for Mac OS X
- **NTFS** – the primary file system for Windows OS
- **FAT32** – Use for data disks that are 32GB or less
- **ExtFS 2/3/4** – the primary file system for Linux OS
- **exFAT** - Use for external storage devices that are over 32GB

4. Click **Format** when ready. All introduced changes to the disk layout will be pended until confirmed.

Delete a Partition

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing partition, then select **Delete partition…**



3. Confirm the operation.

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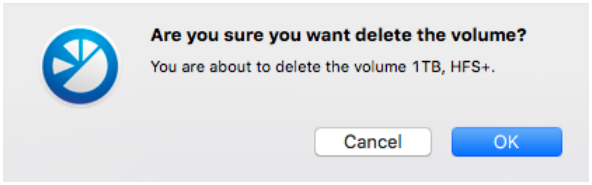
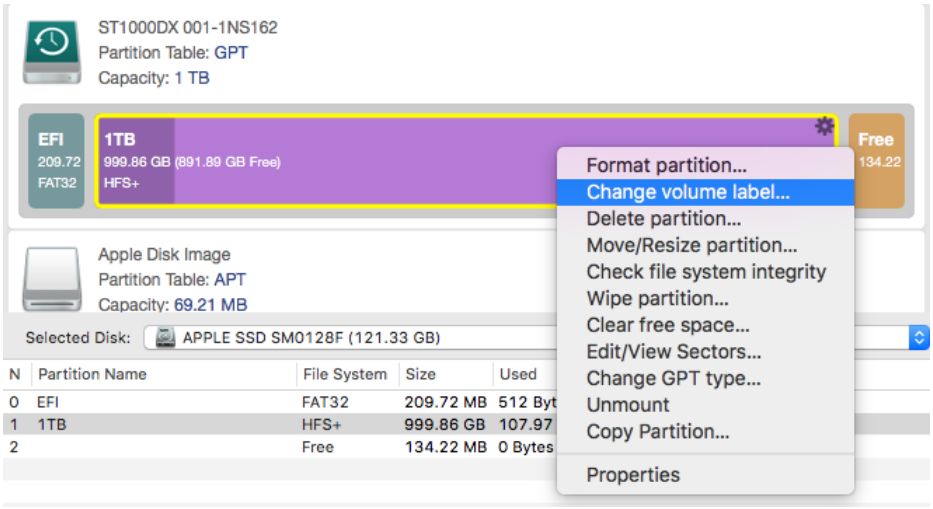


As a result of this operation contents of the selected partition will be lost. You can recover the deleted partition however through the undelete operation.

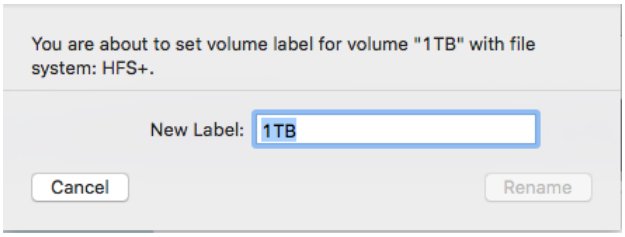
4. Click **OK** when ready. All introduced changes to the disk layout will be pended until confirmed.

Change a Volume Label

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing partition, then select **Change Volume label…**



3. Enter a new catchy volume label.



4. Click **Rename** when ready. All introduced changes to the disk layout will be pended until confirmed.

Move/Resize a Partition

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing partition, then select **Move/Resize partition…**

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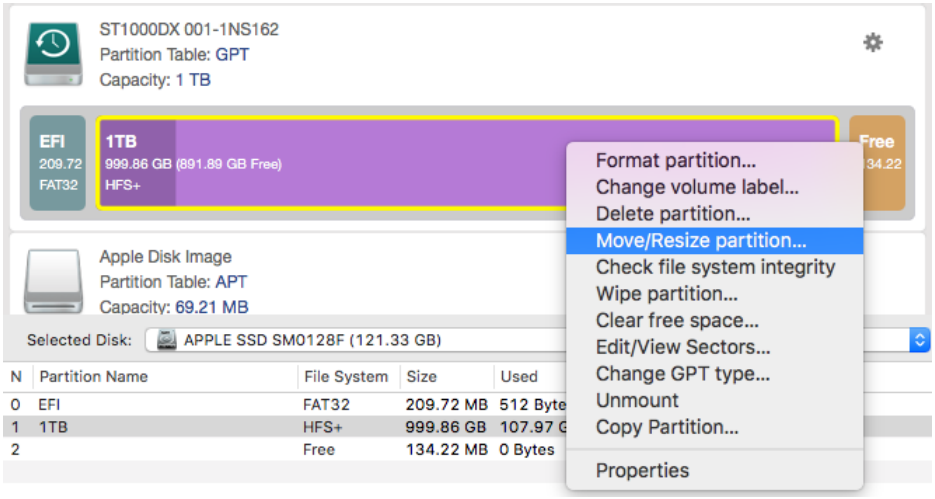
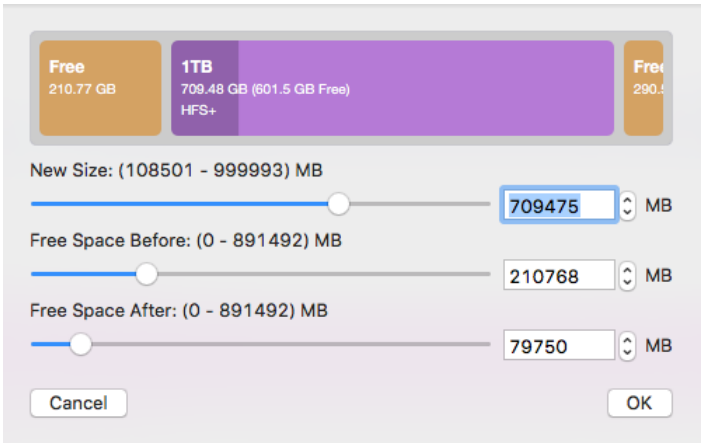


3. Define a partition size and its position relative to the beginning and the end of the selected block of free space by manually entering desired values or through dragging the corresponding sliders.



4. Click **OK** when ready. All introduced changes to the disk layout will be pended until confirmed.

Redistribute Free Space

Until now redistribution of free space between partitions of a BootCamp configuration has been a long, time-consuming and tedious procedure. It meant spending hours waiting for backup operations to finish, watching for volumes to move their borders and images to be written back. With HDM for Mac this operation can be done in minutes without restarting your Mac.

The Redistribute Free Space Wizard helps to easily increase free space on one partition by up-taking the unused space of an adjacent partition of your disk.

1. Select from the main menu: **Wizards > Redistribute Free Space**.

2. Once opened, the wizard detects all system storage devices.

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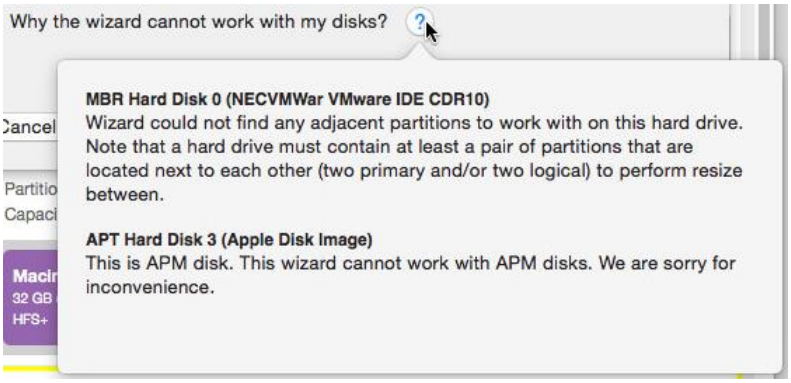
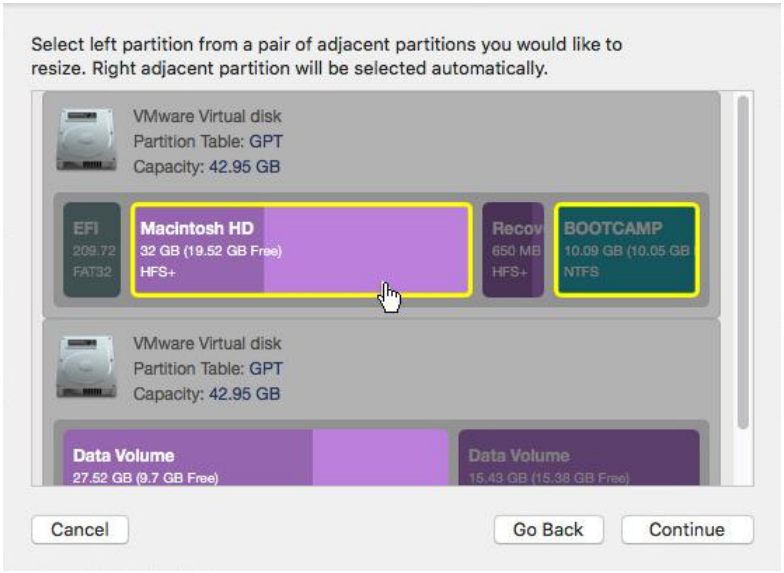
If a found disk(s) doesn't have two adjacent data partitions to work with or it's of an unsupported type, the wizard prompts you to see it by clicking the query button.



3. Click on the left partition of the pair of partitions you need to redistribute the unused space between, as the right one will be selected automatically. It's allowed to have a service partition in between them.



4. Redistribute unused space between the specified partitions with the slider or manually by entering the required size for the left partition. Click **Resize** when ready.

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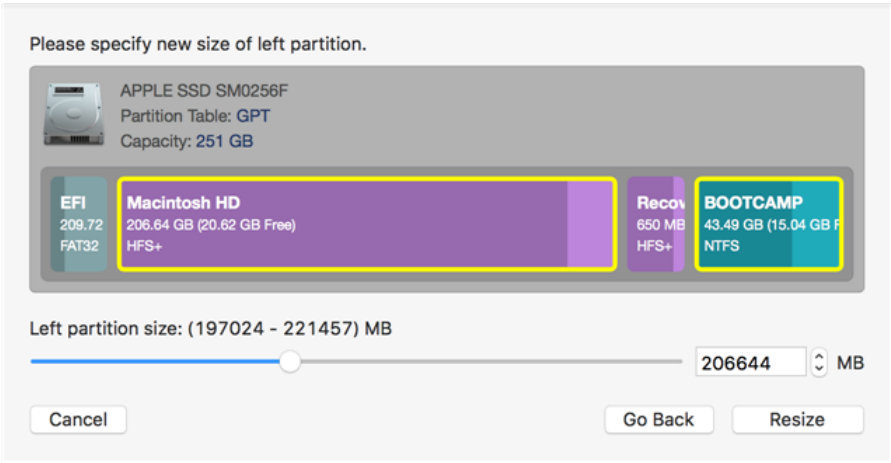
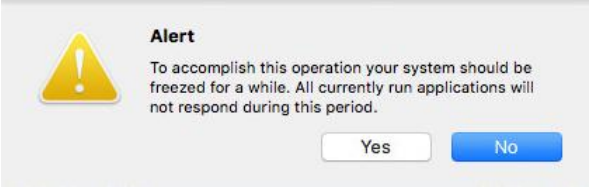


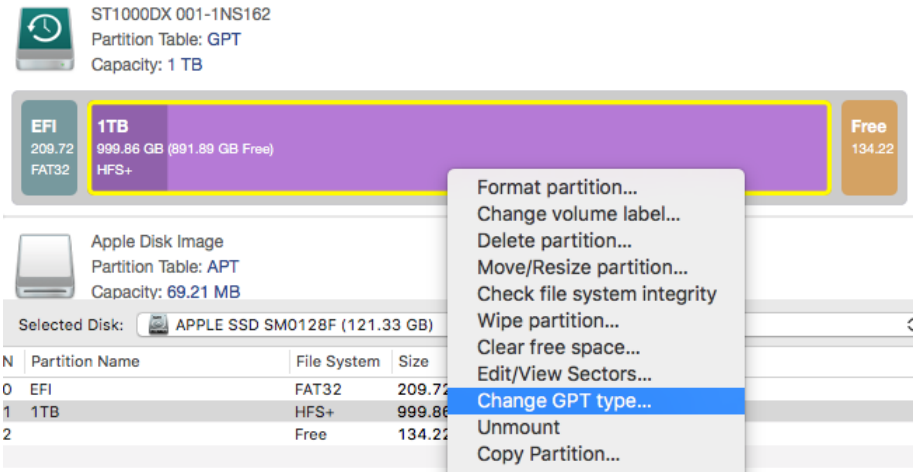
5. If one of the partitions you're trying to resize hosts Mac OS X, you will be warned about a system freeze (from a couple of seconds up to several minutes) during the upcoming operation. Confirm the operation to proceed.



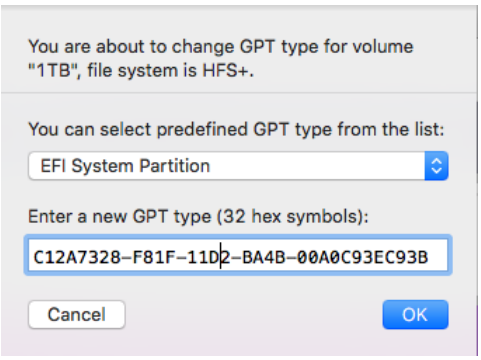
6. All introduced changes to the disk layout will be pended until confirmed.

Change a GPT Type

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing partition, then select **Change GPT type…**



3. Manually enter a new GPT type or select the required type from the pull-down list.



- **Apple Boot Partition –**
- **Apple Core Storage Physical Volume –**

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- **Apple Offline RAID –**
- **Apple RAID** –
- **EFI System Partition** – ESP includes boot loader programs for installed operating systems contained in other partitions on the same or other storage devices, drivers for computer devices used by the firmware at boot time, system utility programs to run before OS is booted, and error logs
- **HFS Data Partition** – the primary partition type for Mac volumes
- **Microsoft Basic Data Partition** – the primary partition type for Windows volumes
- **Microsoft Reserved Partition** – MSR reserves space on each disk drive for subsequent use by OS. Though MSR doesn't store user data, its chunks may be taken for creation of new partitions. Its standard size is 128MB (32MB for partitions under 16GB)
- **Microsoft Recovery Partition** – stores OS system files to refresh Windows installation when necessary

4. Click **OK** when ready. All introduced changes to the disk layout will be pended until confirmed.

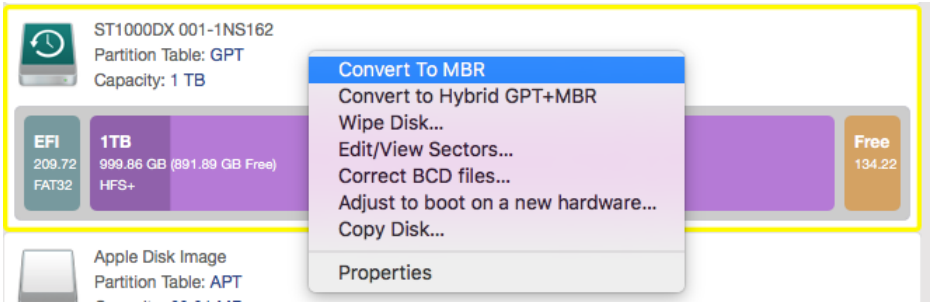
Convert a Partition Table

Your storage device may have GPT (GUID Partition Table), MBR (Master Boot Record), or a hybrid GPT+MBR partition table:

- GPT is now used on Windows and Mac computers as the primary partition scheme.
- MBR used to be the main and only partition scheme for Windows computers up to Vista.
- A hybrid GPT+MBR partition scheme is a necessity for BootCamp users.

HDM allows easy non-destructive conversion between these three partition schemes.

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing disk, then select **Convert to MBR** or **Convert to Hybrid GPT+MBR** or **Convert to GPT** (available options depend on the selected storage device).



3. If selecting MBR as the destination partition table, you will need to additionally define a desired number of primary partitions.

4. Click **OK** when ready. All introduced changes to the disk layout will be pended until confirmed.

Get Disk/Partition Properties

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing partition or entire disk, then select **Properties** or just double click the required object.

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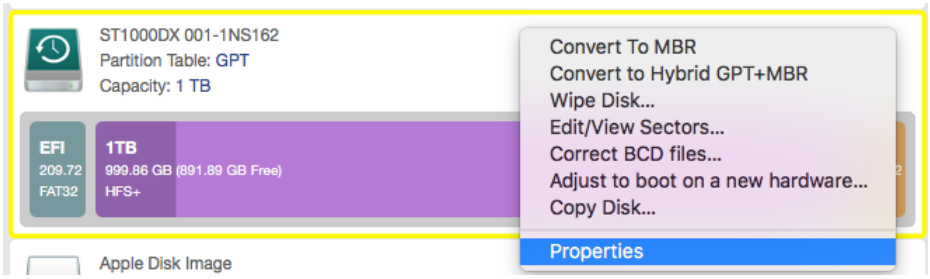
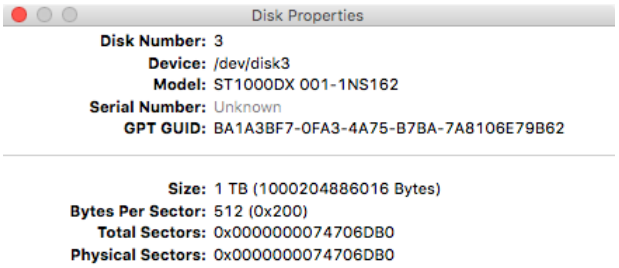
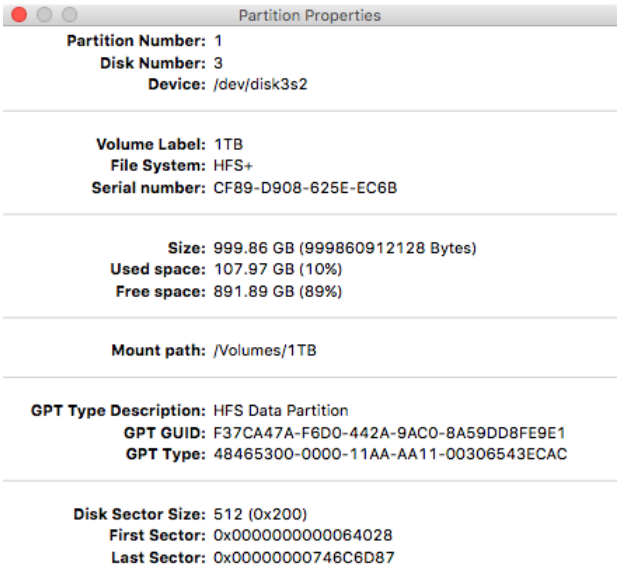


3. The program displays detailed information on the properties of an entire storage device or individual partition. Besides the general information, such as capacity, used space or file system type it provides the possibility to get info on hard disk geometry, cluster size, exact partition location, etc.

Disk Properties:



Partition Properties:



Wipe Data

Providing confidentiality requires not only information to be stored properly, but also to be destroyed according to certain rules. So how can you make sure confidential data doesn't fall into wrong hands together with your old hard drive (HDD) or solid state drive (SSD)? Of course, you can physically shred your disk into pieces – an ultimate data destruction method, but not productive, as you won't be able to benefit from it. The best method is to use a specialized data erasure tool.

Wipe a Disk or Partition

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing disk, then select **Wipe Disk…** or right click an existing partition, then select **Wipe Partition…**

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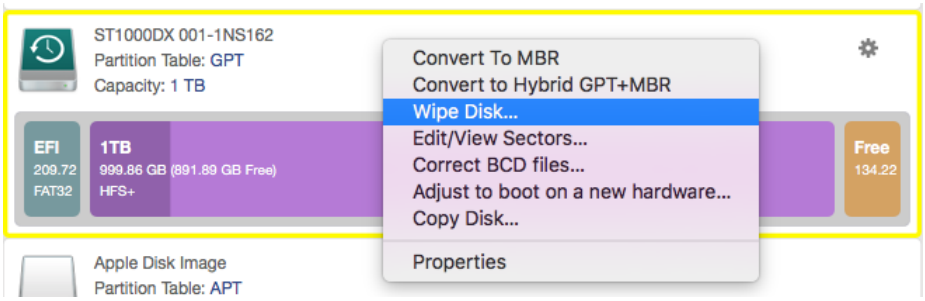
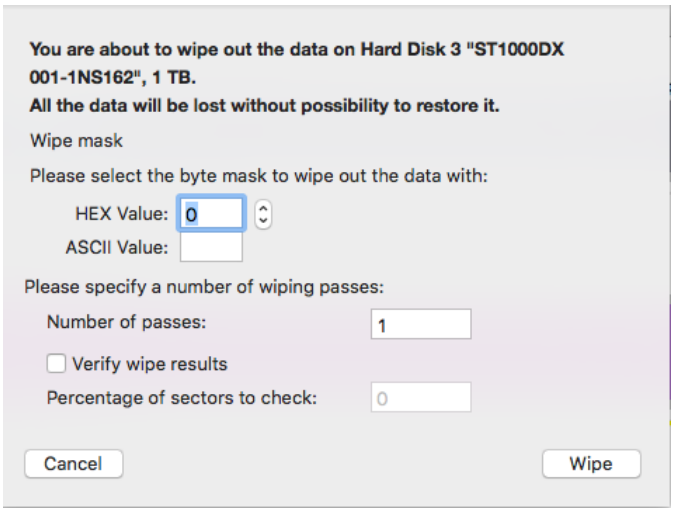


3. Define a wipe mask as a HEX or ASCII value and the required number of passes. Mark the **Verify wipe results** checkbox to initiate residual data verification specifying the percentage of sectors to check. If you attempt to wipe a solid state drive, the program will automatically enable the SSD TRIM command to completely remove all traces of your personal data without shortening the storage lifespan.

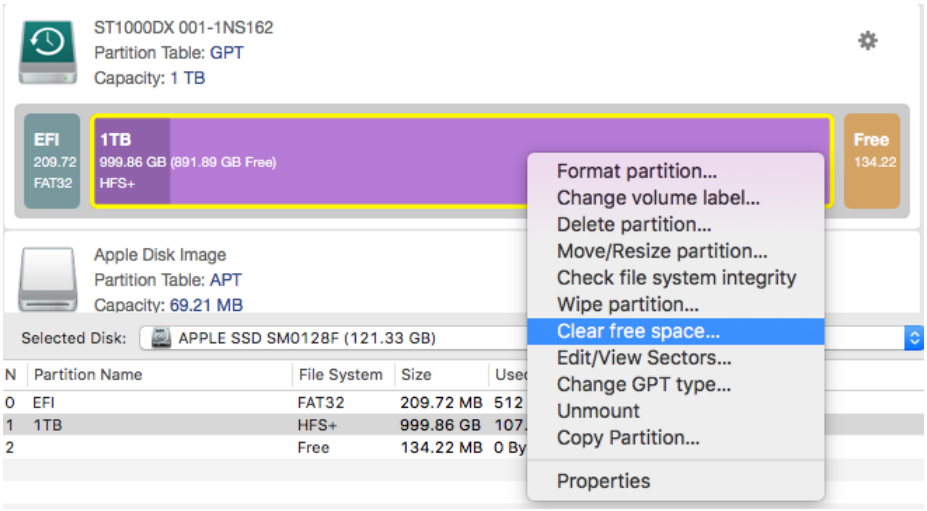


As a result of this operation contents of the selected partition will be irreversibly deleted.

4. Click **Wipe** when ready. All introduced changes to the disk layout will be pended until confirmed.

Clear Free Space

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing partition, then select **Clear free space…**



3. Define a wipe mask as a HEX or ASCII value and the required number of passes. Mark the **Verify wipe results** checkbox to initiate residual data verification specifying the percentage of sectors to check. If you attempt to

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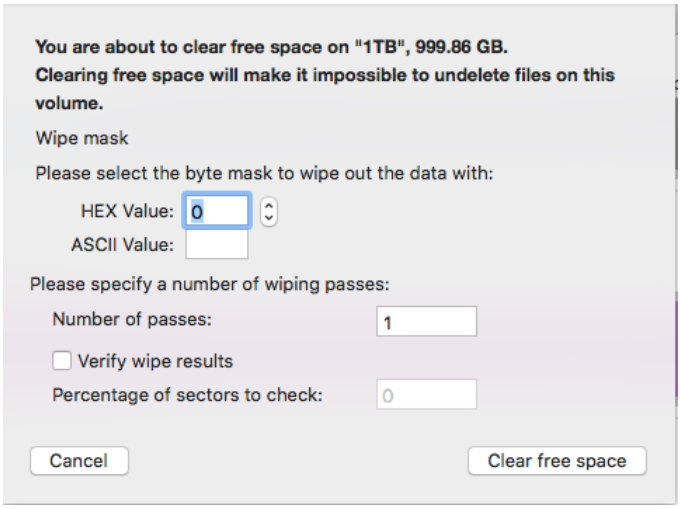
clear free space on a solid state drive, the program will automatically enable the SSD TRIM command to completely remove all traces of your personal data without shortening the storage lifespan.



As a result of this operation contents of the selected partition will remain intact, while any remnants of previously deleted files will be irreversibly deleted.

4. Click **Clear free space** when ready. All introduced changes to the disk layout will be pended until confirmed.

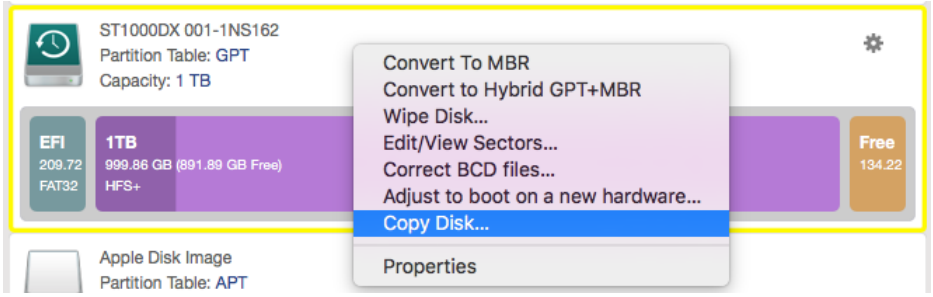
Copy Data

Sooner or later each of us faces the problem of having not enough space on the internal disk to install a new game or application, or to store a favorite music album or family pictures. Worse still, is a situation when a system HDD or a trendy SSD starts to deteriorate, threatening to die any moment. When this is happening to us, the only thought we've got is how to transfer OS X, applications and all data to a newer and larger storage device with minimal time and effort.

Fortunately, there are technologies that help to straightforward the process of moving all contents of your disk, including standard bootstrap code and other system service structures, to another storage device without having to re-install the operating system and applications. Unlike competitive solutions, HDM for Mac enables you to transfer not only OS X, but BootCamp Windows as well, resizing partitions while copying proportionally to the size of the target disk or how you need it.

Copy a Disk

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing disk, then select **Copy Disk…**



You need to have connected at least two storage devices to accomplish this operation.

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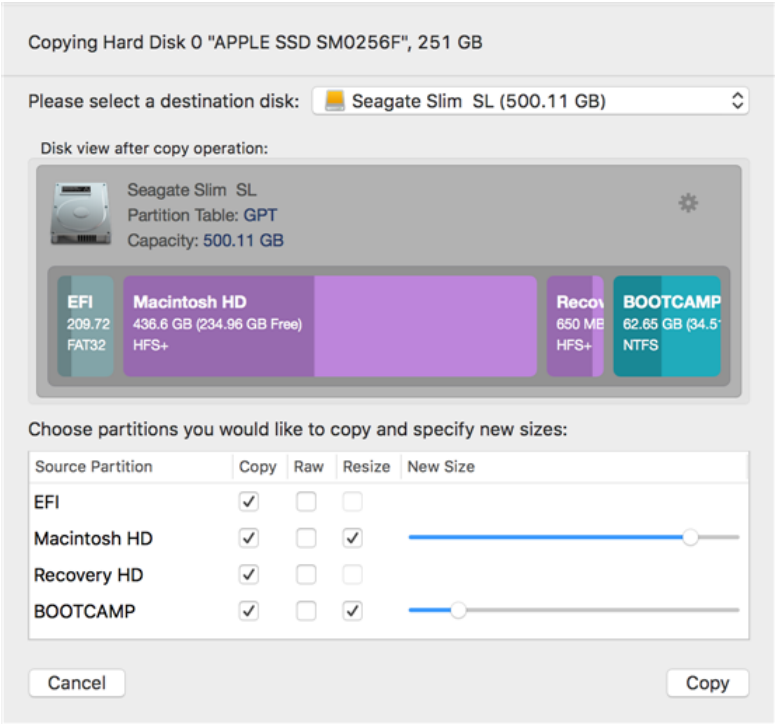
3. The program automatically selects the most suitable destination disk from available in the system where all data from the source will be copied to. You're free to choose another disk from the pull-down menu if necessary.



As you can see on the screenshot, the wizard detects all partitions of the source disk, prompting to use the most efficient copy modes. In addition, it proportionally enlarges all found data partitions (in our example these are Mac OS X and BootCamp Windows) to let them occupy all available space of the target disk. By dragging the sliders and marking or unmarking the checkboxes you can change any default parameter, for instance remove the BootCamp Windows partition from copying, leave a certain block of free space in the end of the disk or enable copying in the sector-by-sector mode, which helps to process unknown or corrupted file systems (not recommended to use for supported file systems as it takes more time to accomplish the operation).

As a result of this operation contents of the destination disk will be lost.

4. Click **Copy** when ready. All introduced changes to the disk layout will be pended until confirmed.

Copy a Partition

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing partition, then select **Copy Partition…**

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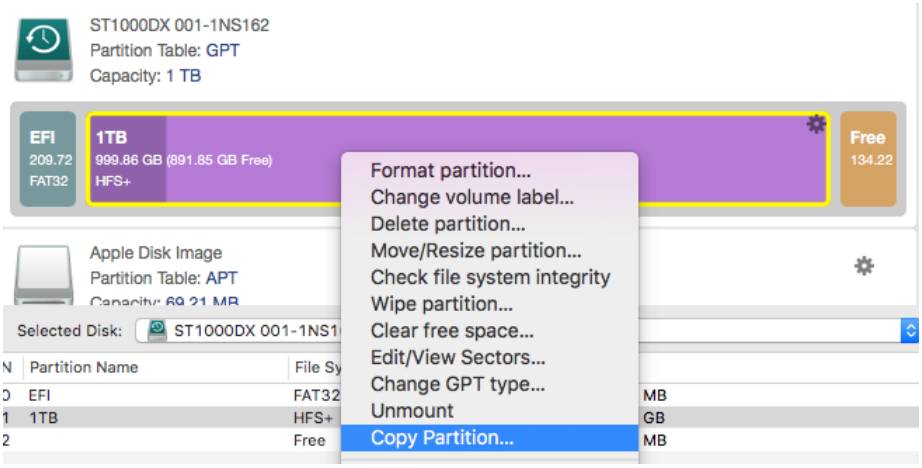
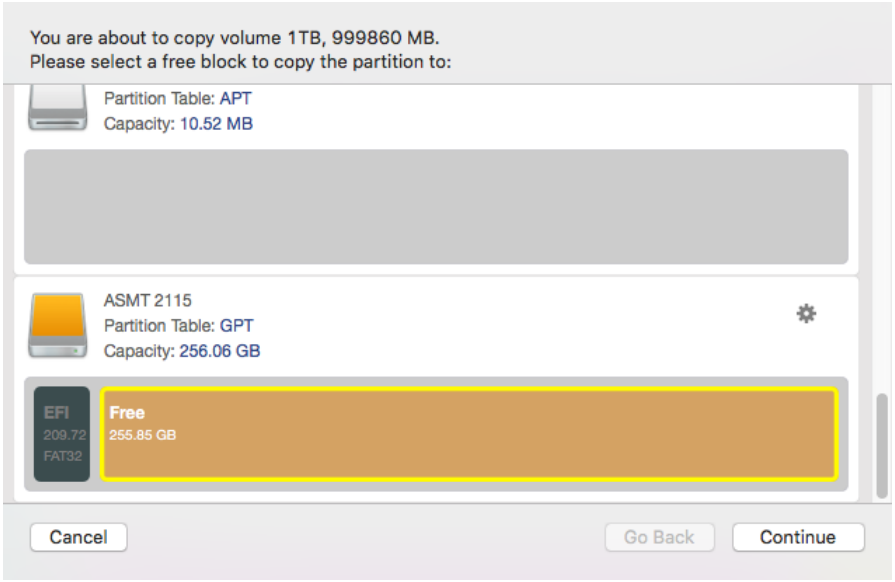
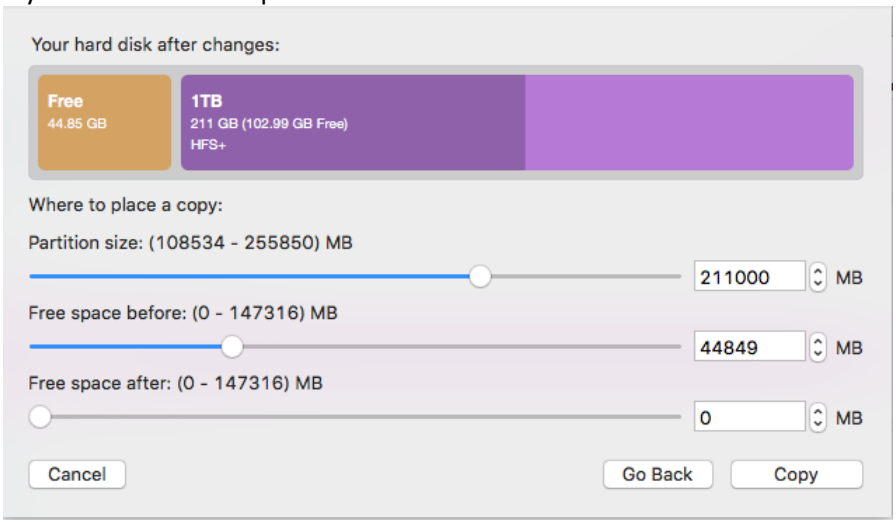


3. Select a block of free space enough in capacity to host the copied partition.



4. By default the program prompts you to occupy the entire free block. If necessary, define a partition size and its position relative to the beginning and the end of the selected block of free space by manually entering desired values or through dragging the corresponding sliders. You can observe all modifications to the disk layout on the disk map.



5. Click **Copy** when ready. All introduced changes to the disk layout will be pended until confirmed.

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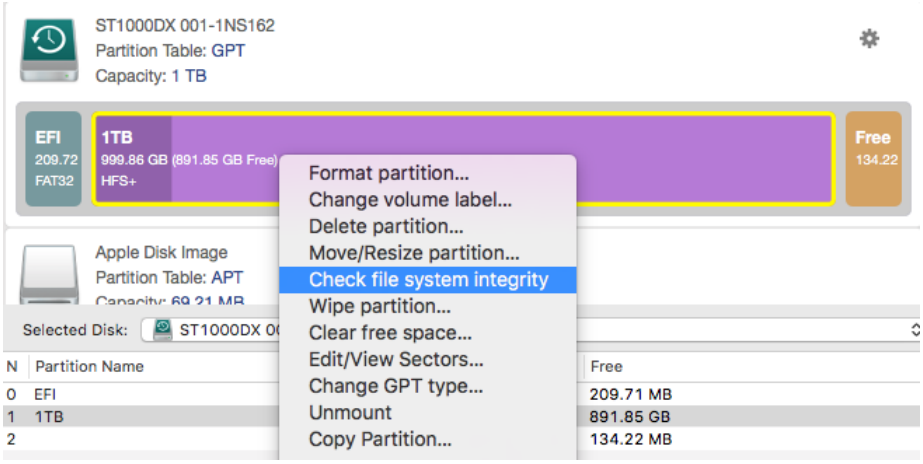
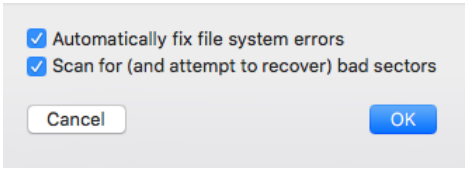
Check a Partition for Problems

You can check the integrity of a file system to detect and repair errors before copying data or performing drive partitioning.

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing partition, then select **Check file system integrity.**



3. If you'd like the program to automatically fix file system errors and/or find and attempt to repair bad sectors, just enable the corresponding options.

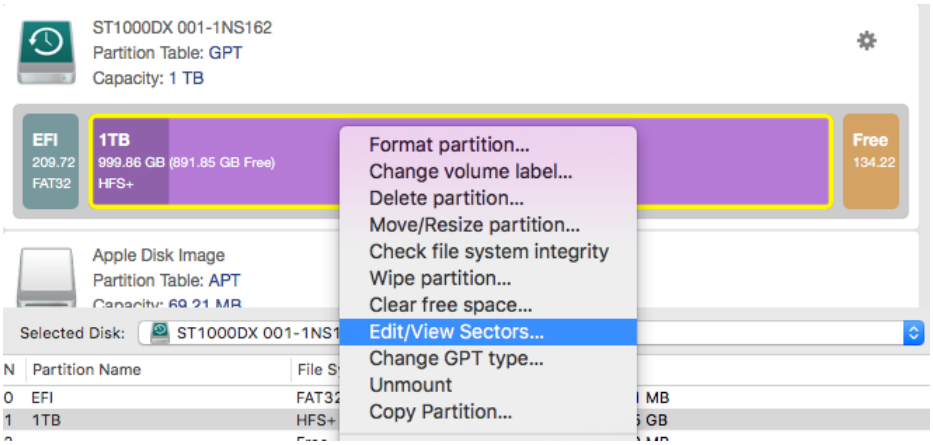


4. Click **OK** when ready. The operation will be performed immediately.

Edit/View Sectors

You can directly access and modify sectors of an entire disk drive or individual partition, save and restore sectors from specified files as well as navigate through the system metadata.

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing disk, then select **Edit/View Sectors…** or right click an existing partition, then select **Edit/View Sectors…**



3. Before you proceed with the operation you are required to provide password of a user with the administrator privileges.

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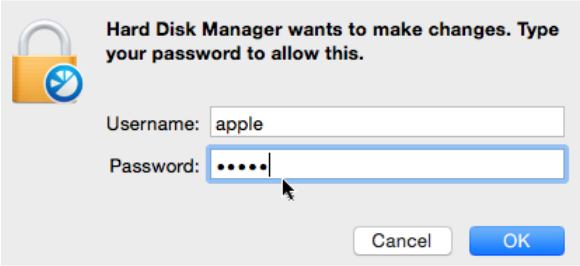
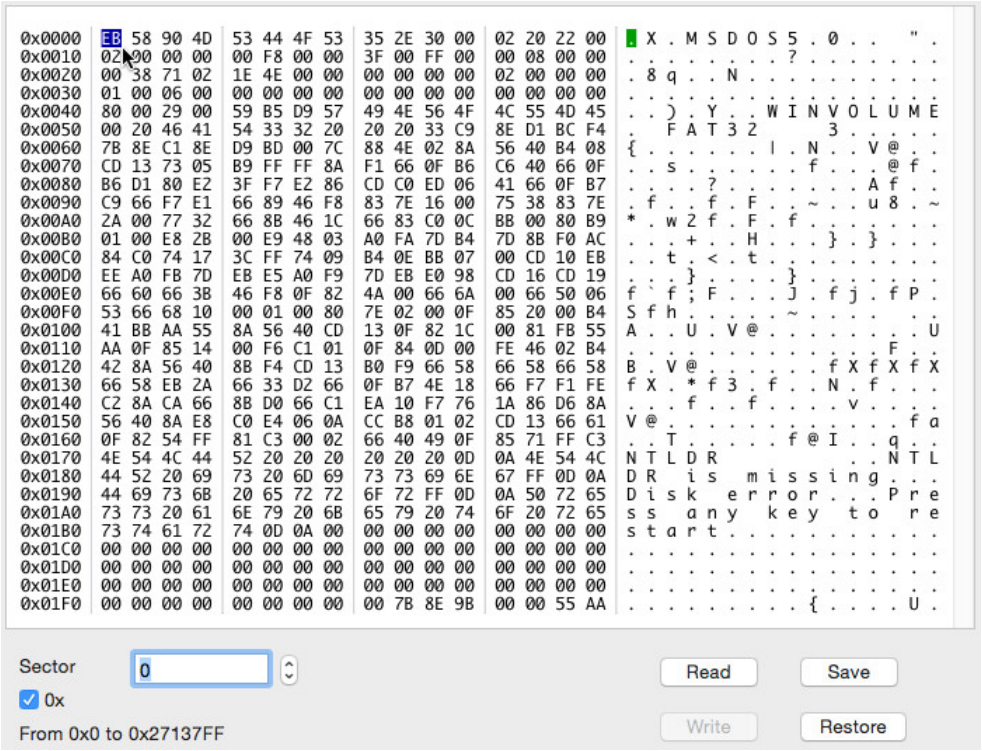


4. Navigate to the required sector to do mods.



Careless use of this function may result in irreversible data corruption.

5. Click **Write** when ready. All introduced changes to the disk layout will be pended until confirmed.

Fix BootCamp Boot Problems

If a Windows OS doesn't boot after replacing a failed hardware device or you have any other boot issue resulting from a human or program error, or a boot virus activity, first try our boot repair tools before taking more radical actions.

Correct BootCamp Boot Record

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing MBR-type active partition, then select **Correct BootCamp Boot Record…**

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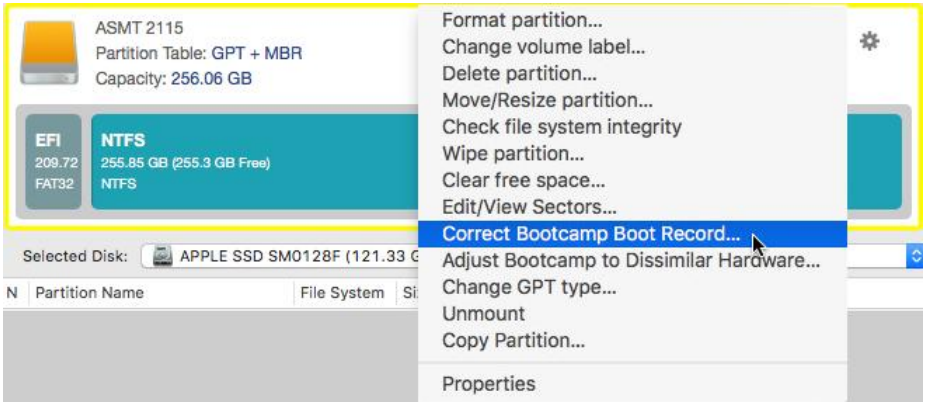
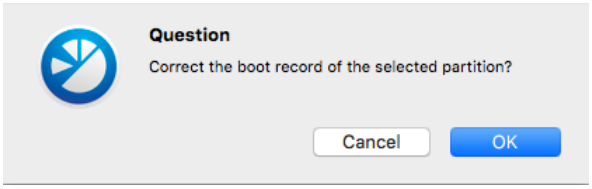


3. Confirm the operation.

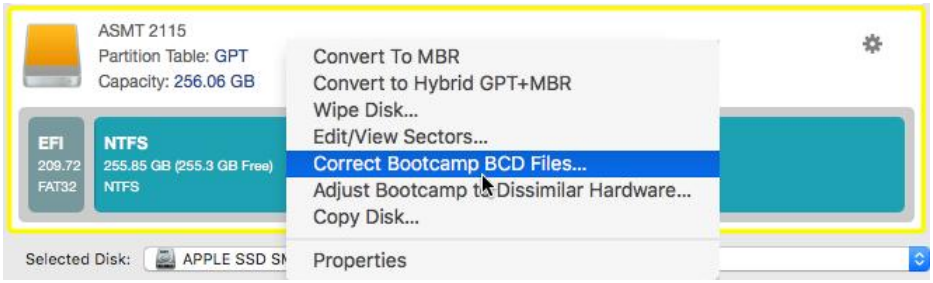


4. Click **OK** when ready. All introduced changes to the disk layout will be pended until confirmed.

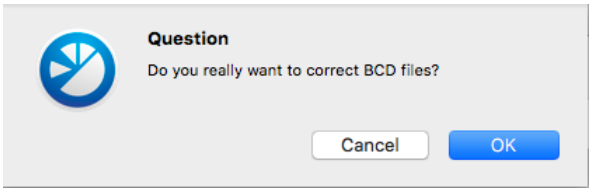
Correct BootCamp BCD Files

If you have several operating systems on your disk (Windows Vista and later) after copying a system partition for instance, update their BCD (Boot Configuration Data) files to be able to choose an OS to start up.

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing disk, then select **Correct BootCamp BCD Files…**



3. Confirm the operation.



4. Click **OK** when ready. All introduced changes to the disk layout will be pended until confirmed.

Correct BootCamp 'boot.ini' Files

If you have several operating systems on your disk (up to Windows XP) after copying a system partition for instance, update their boot.ini files to be able to choose an OS to start up.

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing disk, then select **Correct 'boot.ini' files…**

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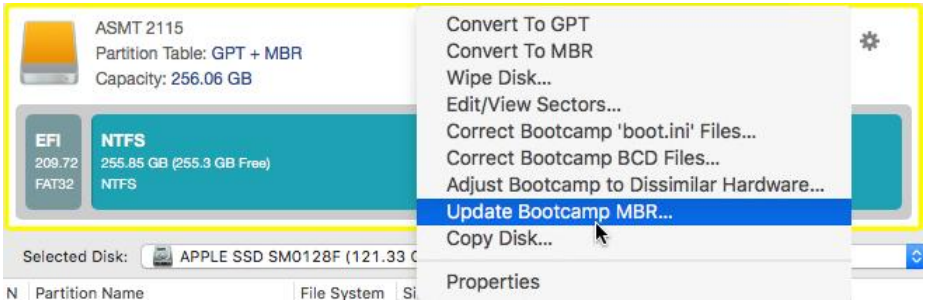
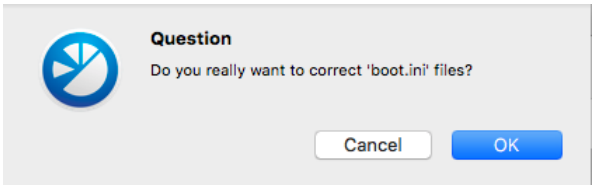


3. Confirm the operation.

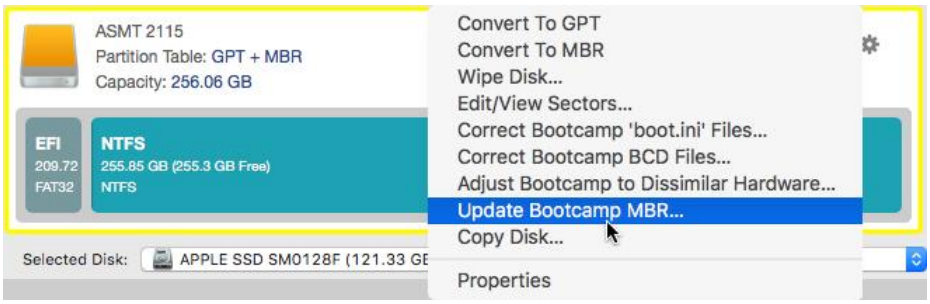


4. Click **OK** when ready. All introduced changes to the disk layout will be pended until confirmed.

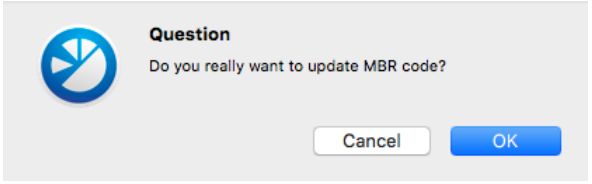
Update BootCamp MBR

The program enables you to overwrite the current bootable code in the MBR (Master Boot Record) by the standard bootstrap code. This can help to repair a corrupted bootable code of a hard disk resulting from a boot virus attack or a malfunction of boot management software.

1. Select **Disk and Partitions** in the upper area.
2. Right click an existing MBR-type disk, then select **Update BootCamp MBR…**



3. Confirm the operation.



4. Click **OK** when ready. All introduced changes to the disk layout will be pended until confirmed.

Adjust BootCamp to Dissimilar Hardware

Windows family operating systems are notorious for their excessive sensibility to hardware, especially when it turns to replacement of such a crucial device as HDD controller or motherboard – actually Windows will most likely fail to boot as a result of this operation. Thus if you need to replace a failed hardware device and cannot find an exact match for your original system specifications, use this option to successfully start up Windows OS on dissimilar hardware.

1. Select **Disk and Partitions** in the upper area.
2. Right click a disk containing Windows OS, then select **Adjust to boot on new hardware…**

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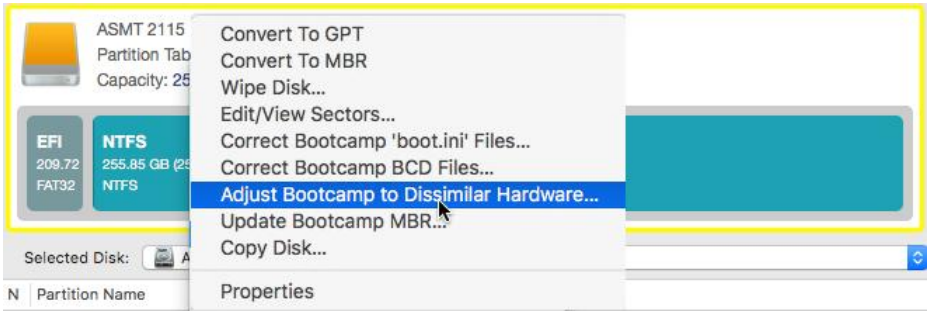
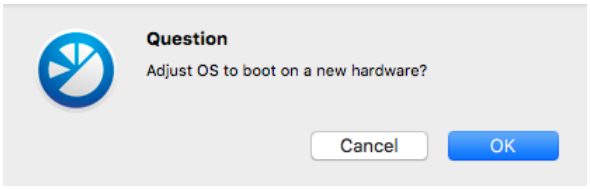


3. Confirm the operation.

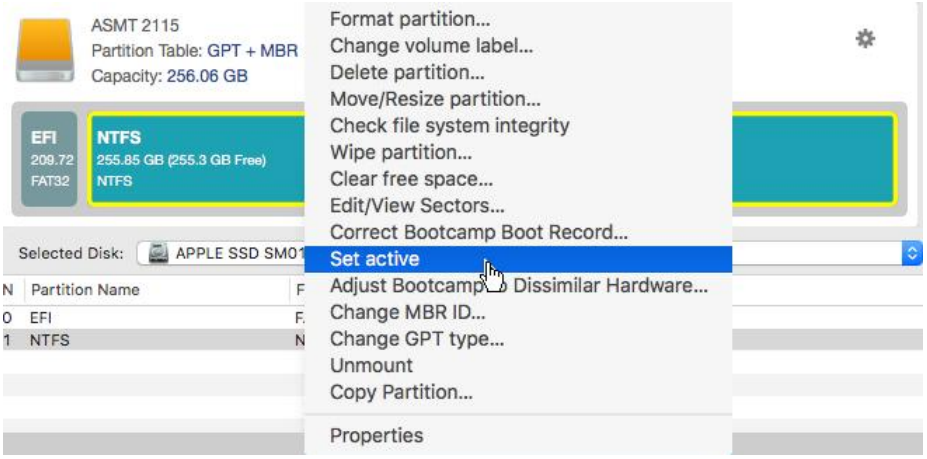


4. Click **OK** when ready. All introduced changes to the disk layout will be pended until confirmed.

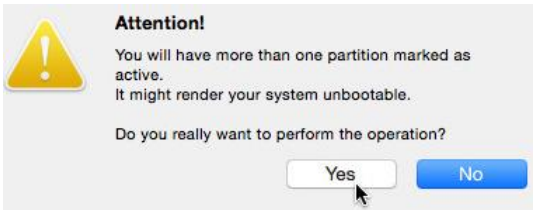
Set Active/Inactive

You can set an active/inactive flag for primary partitions on an MBR-type hard disk. By default, an operating system starts up only if its partition is active or bootable.

1. Select **Disk and Partitions** in the upper area.
2. Right click an MBR-type system partition, then select **Set Active/Inactive…**



3. Confirm the operation.



There can only be one active partition on a MBR hard disk, otherwise an operating system will fail to boot.

4. Click **OK** when ready. All introduced changes to the disk layout will be pended until confirmed.

Mount/Unmount a Partition

1. Select **Disk and Partitions** in the upper area.

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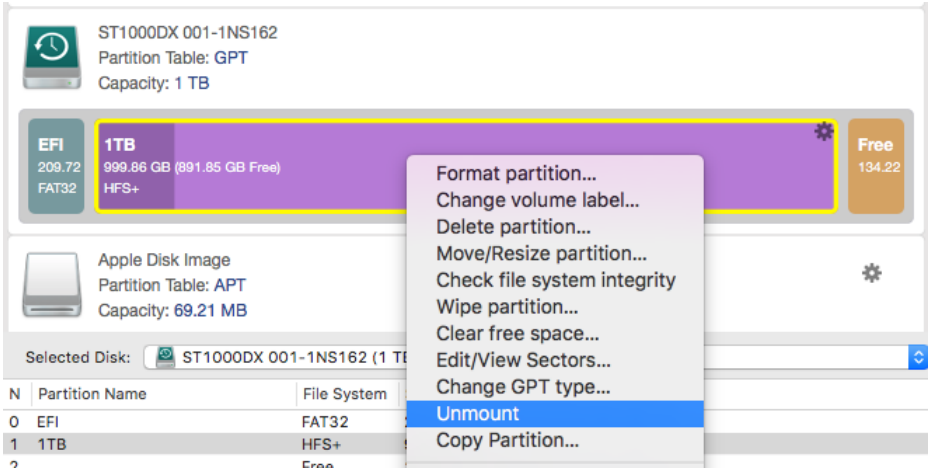
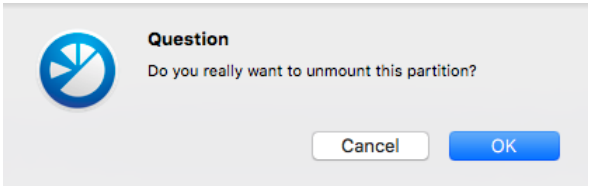
2. Right click a partition, then select **Mount/Unmount.**



3. Confirm the operation.

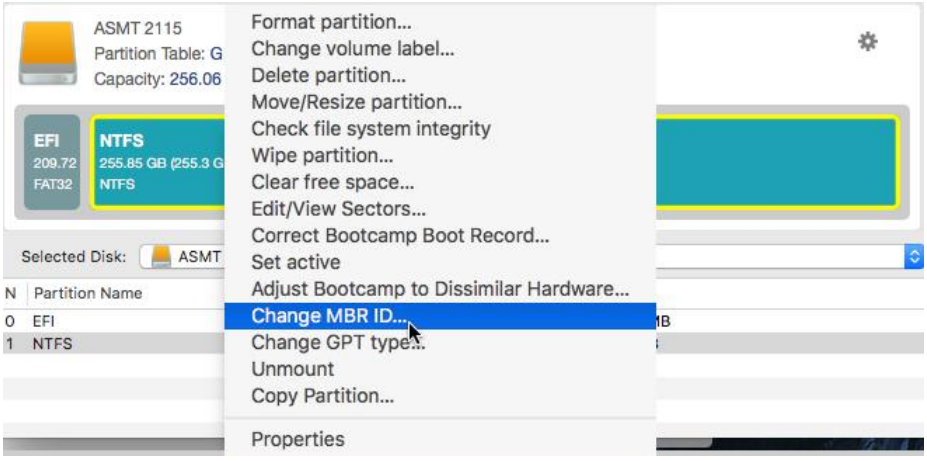


4. Click **OK** when ready. All introduced changes to the disk layout will be pended until confirmed.

Change Partition ID

Partition ID is a file system identifier. It is saved in the Partition Table and is used to quickly detect a partition of the supported type. By manually changing its value, you can manipulate accessibility of partitions.

1. Select **Disk and Partitions** in the upper area.
2. Right click an MBR-type partition, then select **Change MBR ID…**



3. Set the required ID value. It has to be a 1-2 digit hexadecimal number. Use the list of known ID values as an example.

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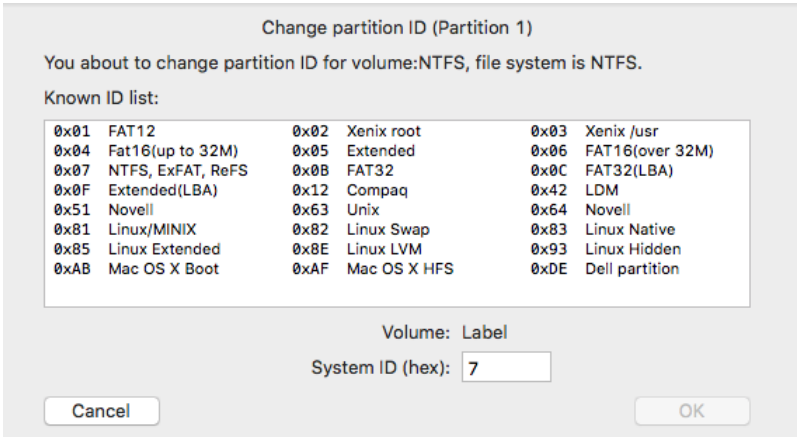


4. Click **OK** when ready. All introduced changes to the disk layout will be pended until confirmed.

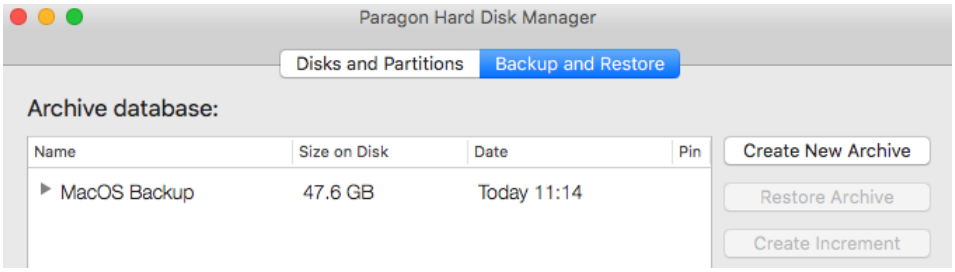
Protect System and Data

Unlike Mac-native backup apps, HDM for Mac operates at a sector-level, which achieves a much better backup and recovery times and general performance. In order to minimize backup storage footprint, the program supports incremental imaging. Regular backup routines can be automated through the embedded scheduler (coming soon). OS X system volumes can be restored from the bootable recovery media, while data or Windows system volumes directly under OS X. If required, you can mount a backup image to retrieve individual files without accomplishing a full restore operation.

Create a Full Backup Image

A full or base sector-level backup image may include contents of individual partitions or entire disks at the moment of its creation. This type of backup helps to secure your software environment, including the operating system, applications and data. Full copies of disks and partitions enable to recover your system to a working state within minutes.

1. Select **Backup and Restore** in the upper area.
2. Click **Create New Archive**.



3. The wizard detects operating systems residing on your disks (all editions of Windows and Mac OS X are currently supported), prompting to choose what you need to protect. It's important to note that when you make your choice, the program not only selects the main OS partition, but also one or several service partitions (Boot OS X, EFI, Recovery) that contain boot system files to ensure successful startup of the operating system after restore. You can observe it on the disk map. Alternatively, you may manually pick one or several partitions you'd like to back up. Click **Continue** to proceed.

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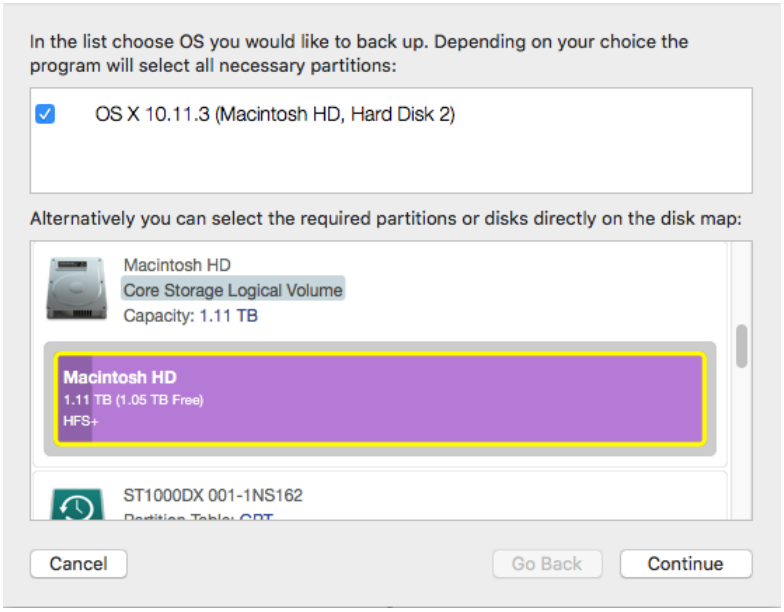
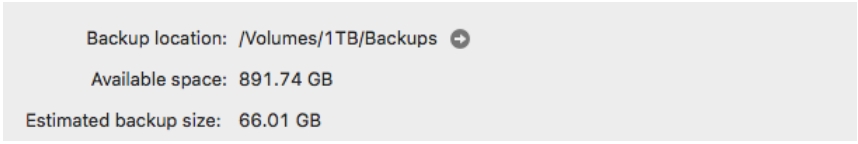


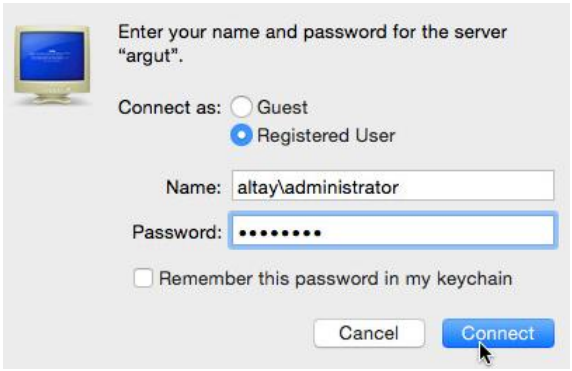
If you're planning to back up an OS X system volume the Snapshot component will be automatically invoked.

Apple Core Storage configurations require a specific backup approach. For more details, please read an article on this issue in our Knowledge Base at https://kb_wp.paragon-software.com/article/1144.

4. Click the arrow icon to set a backup location. Backup images can be placed to a local volume, external storage, or a network share. We highly recommend you to use either an externally connected disk (USB, ThunderBolt, FireWire) or a network share (our choice) to increase chances of success in an emergency situation. Please take into account values of the parameters "Available space" and "Estimated backup size" – if the backup size exceeds the available storage space, the operation won't proceed.



Providing credentials for a remote machine:



Browsing the remote machine:

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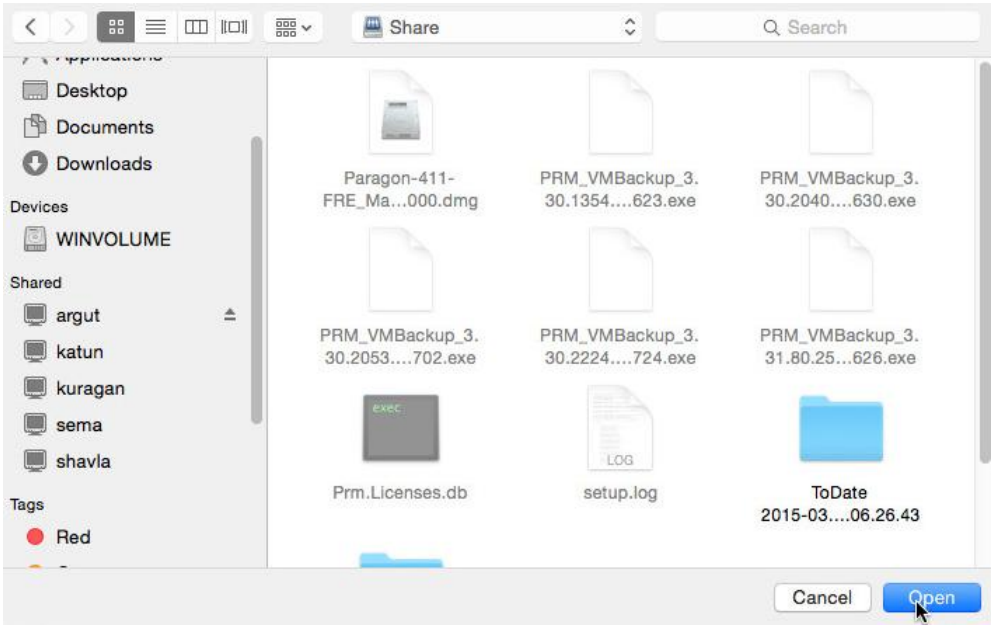
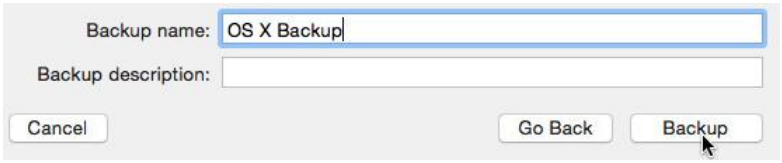


You're not allowed to place backup images to volumes these images are made out of. It's done for safety reasons.

5. By providing a catchy file name and description for the backup image, you can later easily differentiate it from the others.



6. By default, HDM for Mac stores backup data in pVHD (Paragon Virtual Hard Drive) – a special VHD image, optimized for backups of virtual and physical machines. pVHD does away with all limitations of a standard virtual drive format, such as a poor compression ratio, integrity control, and encryption capabilities. As a result, it creates backups that are up to four times smaller than original backup objects! Anyway, the program supports all popular containers, such VMDK, VDI, VHD or HDD.

7. Click **Backup** to initiate the operation, which may take quite a while (depends on the amount of data to process).

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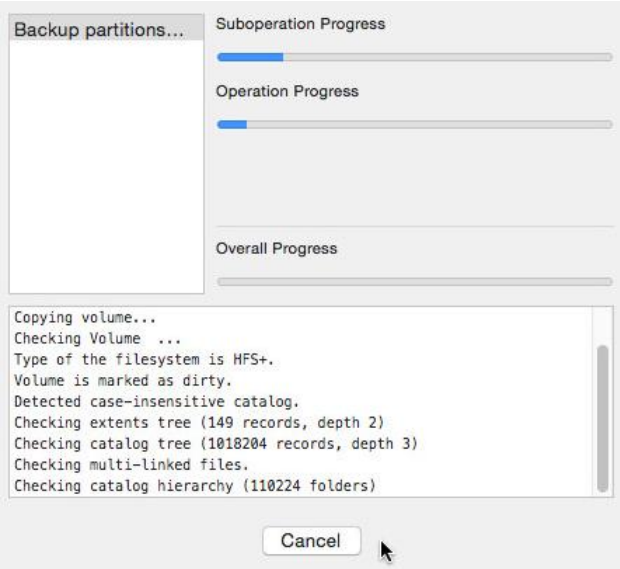
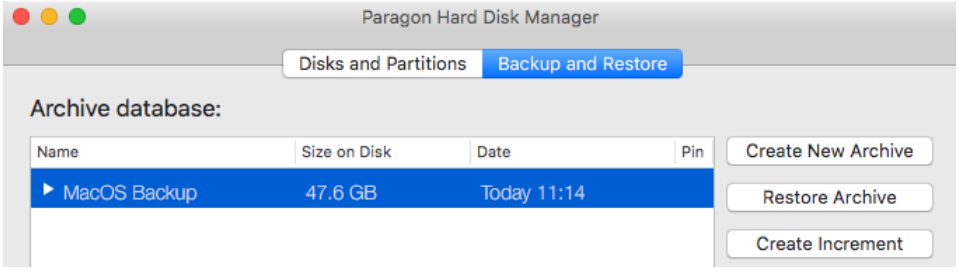


Create an Incremental Update

After you get the first full backup image, we recommend you to do incremental updates regularly to keep the backup data up-to-date. An incremental backup only includes data changed since the time of creating the latest image in a chain, so it doesn't include data duplicates, which minimizes the backup storage footprint. Besides, incremental imaging allows having different time stamps of one and the same data.

1. Select **Backup and Restore** in the upper area.
2. Choose a backup image you'd like to be updated. Since all earlier created images get to the "Archive Database", you won't have problems finding it. If you don't have the required image in the database, please use the plus button to find it. Click **Create Increment**.



If you have a backup image(s) located on a network share, please make sure this share is mapped in the system. Otherwise the image won't be available to work with.

3. If the specified backup image contains several objects, you can choose whether to update the entire image or only individual partitions that contain valuable information that keeps changing constantly, for example some project or document, or a financial report you're working on every day. Click **Backup** to give a name for the future increment and initiate the backup operation, which may take quite a while (depends on the amount of data to process).

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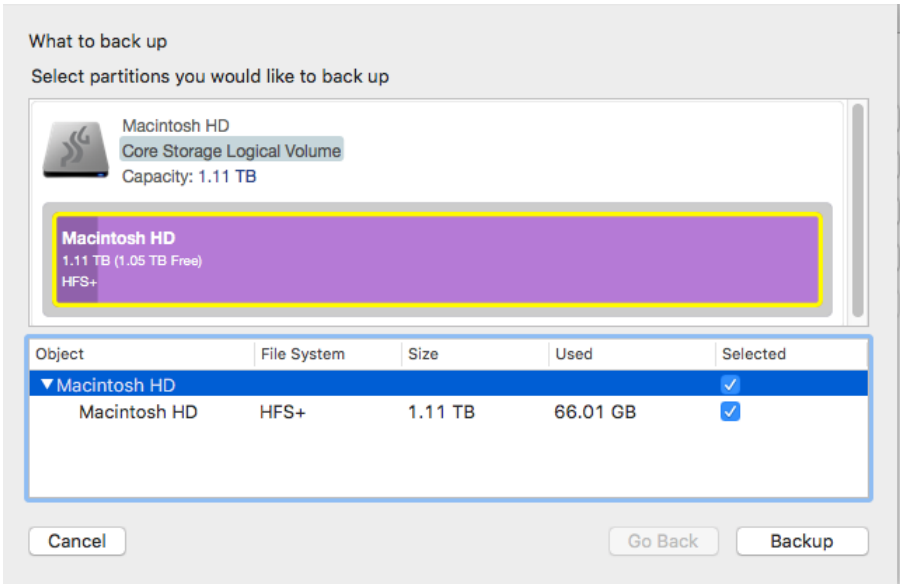
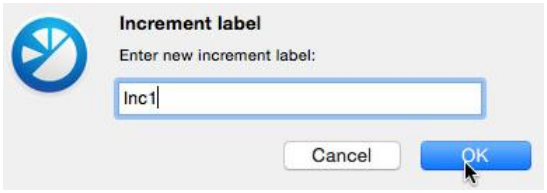
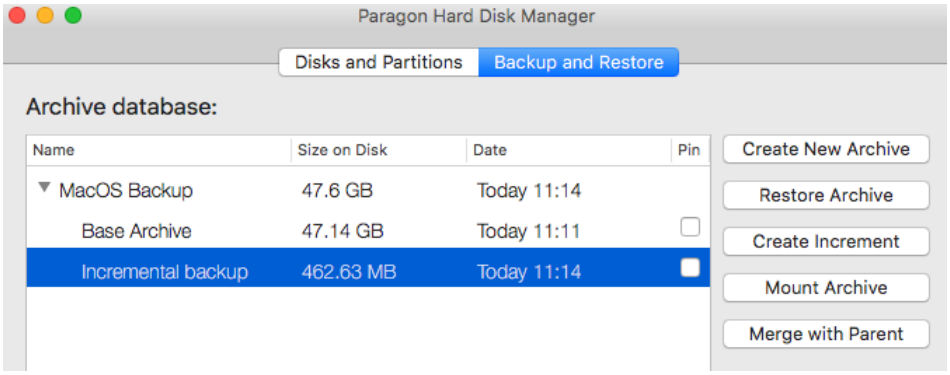




Mount a Backup Image

You can mount an existing backup image in read-only mode, thus getting access to its contents through the Finder. This option can help to quickly retrieve individual files without accomplishing a full restore operation.

1. Select **Backup and Restore** in the upper area.
2. Choose a full or incremental image you'd like to mount. Since all earlier created images get to the "Archive Database", you won't have problems finding it. If you don't have the required image in the database, please use the plus button to find it. Click **Mount Archive**.



If you have a backup image(s) located on a network share, please make sure this share is mapped in the system. Otherwise the image won't be available to work with.

3. Mark a checkbox next to the desired backup object, then click **Mount**.

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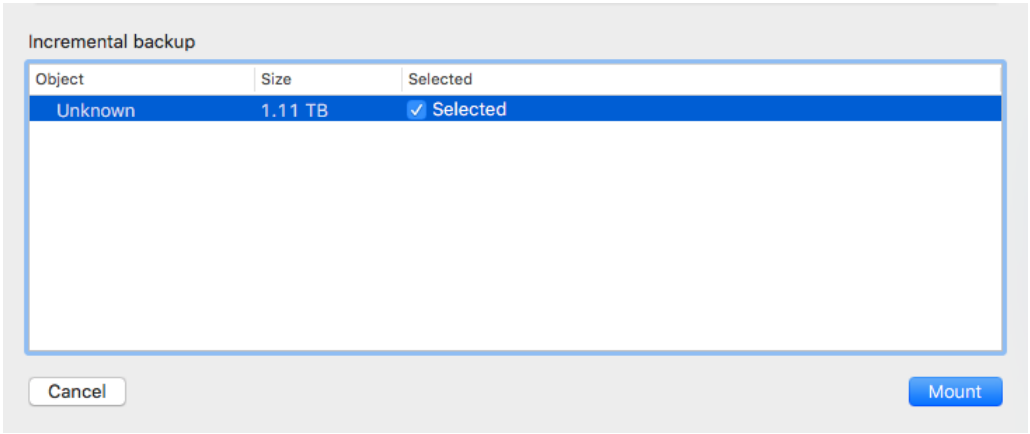
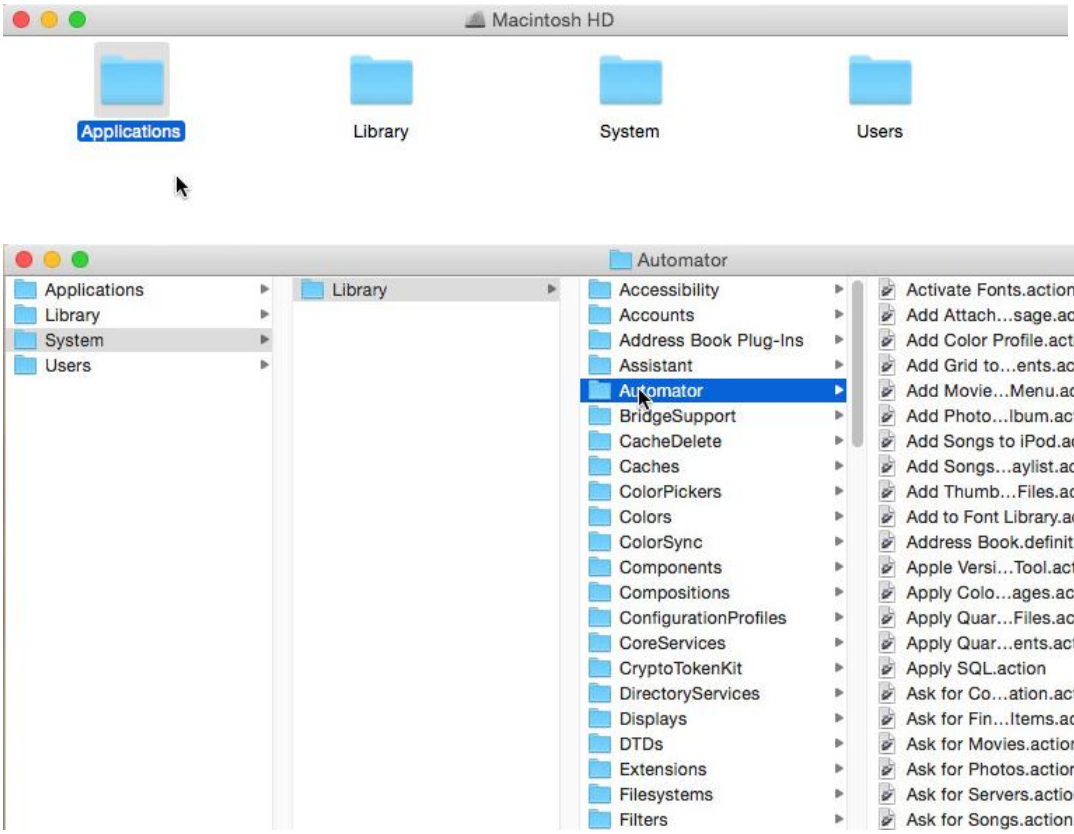


4. Browse the mounted backup image to retrieve files you need.



Restore a Backup Image

If your Mac fails to start up because of a software glitch or after you accidentally deleted the entire OS X partition or some system files, you can get it back on track by utilizing the previously prepared recovery media and one of available backup images. When it's a data volume or BootCamp Windows that fails, you can initiate restore directly under OS X.

Apple Core Storage configurations require a specific backup approach. For more details, please read an article on this issue in our Knowledge Base at https://kb_wp.paragon-software.com/article/1144.

1. Select **Backup and Restore** in the upper area.
2. Choose a backup image you'd like to restore. Click **Restore Archive**.

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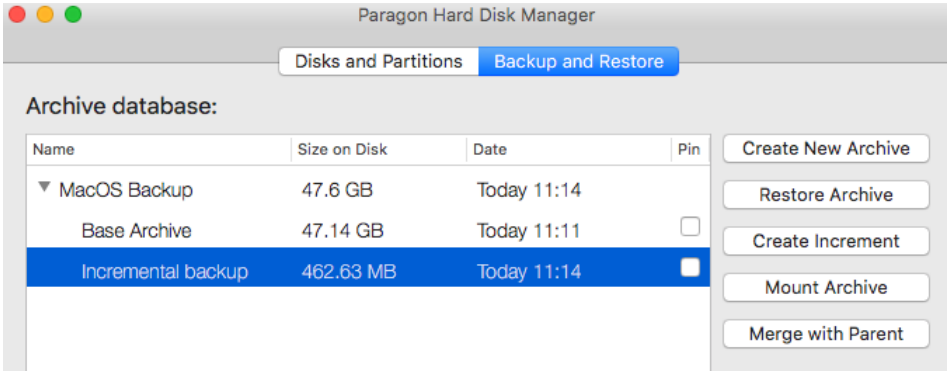
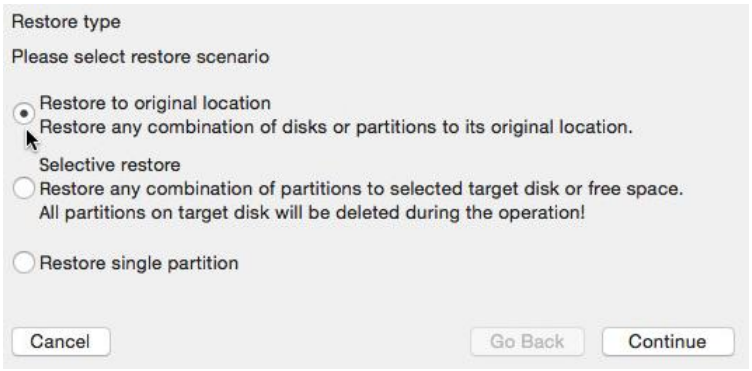
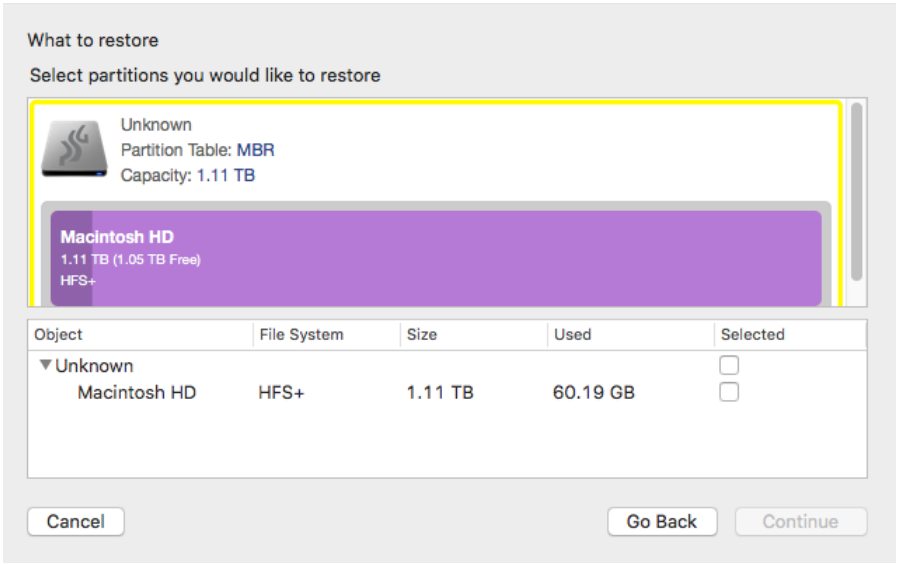


If you have a backup image(s) located on a network share, please make sure this share is mapped in the system. Otherwise the image won't be available to work with.

3. If the partition structure on the source disk hasn't been changed much, you can restore to the original location. If it has changed, e.g. you're attempting to restore to another Mac computer having a Fusion Drive configuration, then you can use one of the two remained options. Choose the appropriate restore mode, then click **Continue** to proceed.



4. The program displays contents the selected backup image. If you have several partitions in the backup, select those you need to restore.



5. Check the resulting disk layout. Click **Restore** to initiate the operation, which may take quite a while (depends on the amount of data to process).

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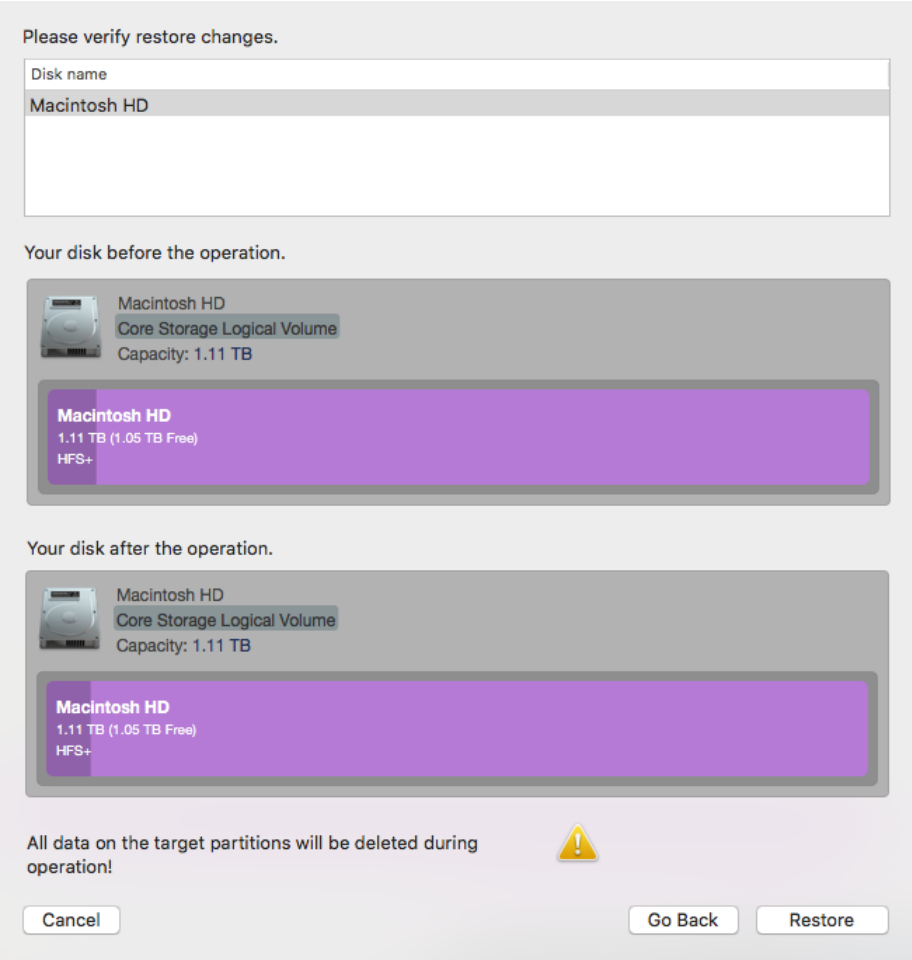
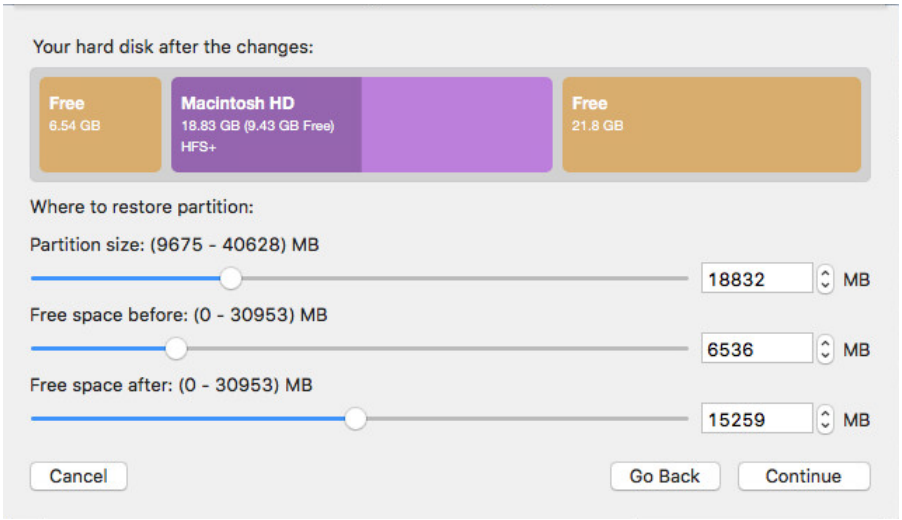


Depending on the backup object(s) you're dealing with, you may have the options to enlarge the restored volume to occupy the entire target disk, remove existing free blocks, or restore as is. Any change to the disk layout will be displayed on the disk map.



All contents on the partition selected for restoring purposes will be deleted during the operation.

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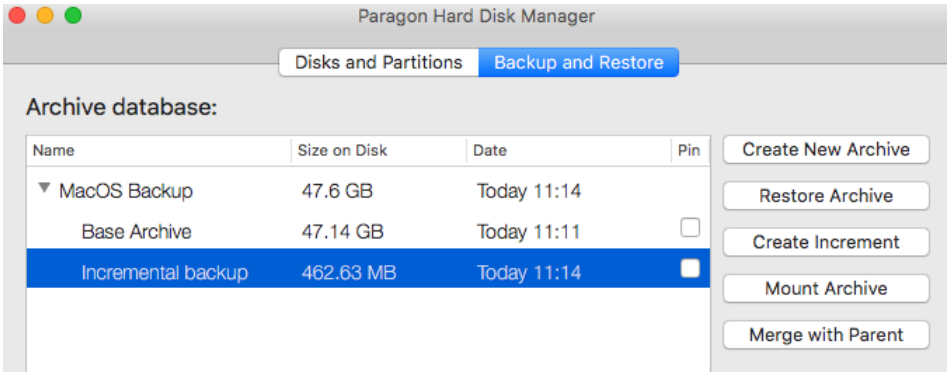
Merge an Incremental Image with Its Parent

By merging contents of an increment with its parental image you can optimize existing backup chains, as processing many increments in a chain during restoration takes extra time. This option can also help to save the backup storage space by getting rid of obsolete time stamps.

1. Select **Backup and Restore** in the upper area.
2. Choose an incremental image you'd like to merge with the parent. Click **Merge with Parent**.



3. The operation will take a while (depends on the amount of data to process).

Auxiliary

HDM for Mac and Snapshot

Hard Disk Manager for Mac utilizes a Paragon's patent-pending snapshot technology that enables you to take consistent snapshots of both inactive and in-use partitions, e.g. those that host Mac OS X, providing a coherent state of all open files involved in the process and taking into account that applications may still keep writing to disks. The Time Machine, for instance, waits until user applications are closed and locked files become available to process, while ignoring system files at all, that's why Mac OS X has a two-step restore procedure: first the user re-installs the operating system and then rolls in-app and user files from a backup image.

During the installation of HDM for Mac a special filter driver is embedded into input-output (I/O) stack between a block device and a file system. It is aimed at saving initial (at the moment of taking a snapshot) state of data blocks on a disk to provide backup data consistency, while OS or applications keep modifying data on this disk. So, when attempting to write something to a block device, which snapshot has been taken, the filter driver first copies existing data from the targeted blocks to a special temporary file called the backstore and only then the writing operation is allowed. This way HDM for Mac doesn't prohibit re-writing data on the "snapshotted" block device, but only postpone it until the old data is copied to the backstore. The above trick enables to ensure consistency of backup data at a specific point-in-time, while allowing standard read/write operations for target storage devices during a backup process.

With the snapshot technology HDM for Mac is able to do live imaging or migration of the entire Mac including OS, applications and files in such a way that the user doesn't even feel any discomfort. Beside OS X, it can help to protect BootCamp Windows or any data volume of OS X, Windows or Linux. For more details about technology specifics, please visit our website at http://www.paragon-software.com/technologies/components/snapshot-mac/.

HDM for Mac and SIP

OS X 10.11 El Capitan includes a serious hurdle against malware called the System Integrity Protection or just SIP. SIP literally kills root for **/usr**, **/bin**, **/sbin**, and **/System**, preventing ANY user or application, except for Mac-native installer software, from writing to these locations or debugging protected processes. This way for the first time Apple has decided to reject one of the principals of Unix that lies in the almighty access privileges of a superuser or root. It's no surprise that SIP has been instantly labeled "rootless" among Mac users.

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SIP is enabled by default, preventing 3rd party processes from modifying of certain system processes, files and folders regardless if they are launched by the root user or not. Layout of the system disk is not allowed to modify either, that's why HDM for Mac is not able, for instance, to redistribute free space between your OS X and BootCamp partitions until SIP is deactivated. The same restriction goes for the Paragon Snapshot component that is used to make consistent backup images of in-use files, running applications and OS.

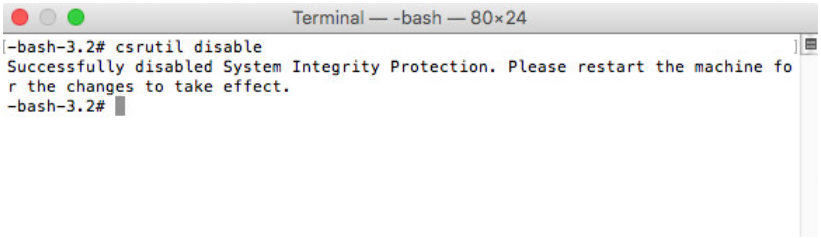
We offer you the choice of either accomplishing otherwise prohibited operations from the recovery media or switching off SIP to do all operations directly in Mac OS X. For more details, please consult Preparing Bootable Recovery Media and Managing SIP.

Managing SIP

You can manage (disable or enable) System Integrity Protection with the **csrutil** command line utility or through a Paragon's dialog embedded to the Startup Manager of the prepared recovery media.

1. Hold the **Option** (alt) key during the system restart until the Startup Manager appears, then launch the terminal utility.

2. Use the **csrutil disable** command to switch off or **csrutil enable** to switch on SIP.



3. That's it. Restart the computer into regular mode.

Alternatively, you can do the same actions by selecting **System Integrity Protection Management** in the Startup Manager of the recovery media.

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HDM for Mac and Apple Core Storage

Core Storage is a logical volume format introduced by Apple that serves the basis for FileVault (Full Disk Encryption) and Fusion Drive technologies. In short, the Core Storage is a layer between the disk partition scheme and the file system. It works by including one or several physical volumes into a logical volume group, where can be resided one or more logical volumes.

It is important to note that data from physical volumes that join a logical volume group cannot be retrieved directly, because they don't have a standard file system. It’s a logical volume standard file system (such as HFS+), where all data is organized in a traditional way, so it can be easily accessed and read.

In order not to confuse regular users, Disk Utility only displays Core Storage logical volumes. For a typical Fusion Drive configuration, for instance, it’s one mounted drive in the system, which capacity is a total of the SSD and HDD.

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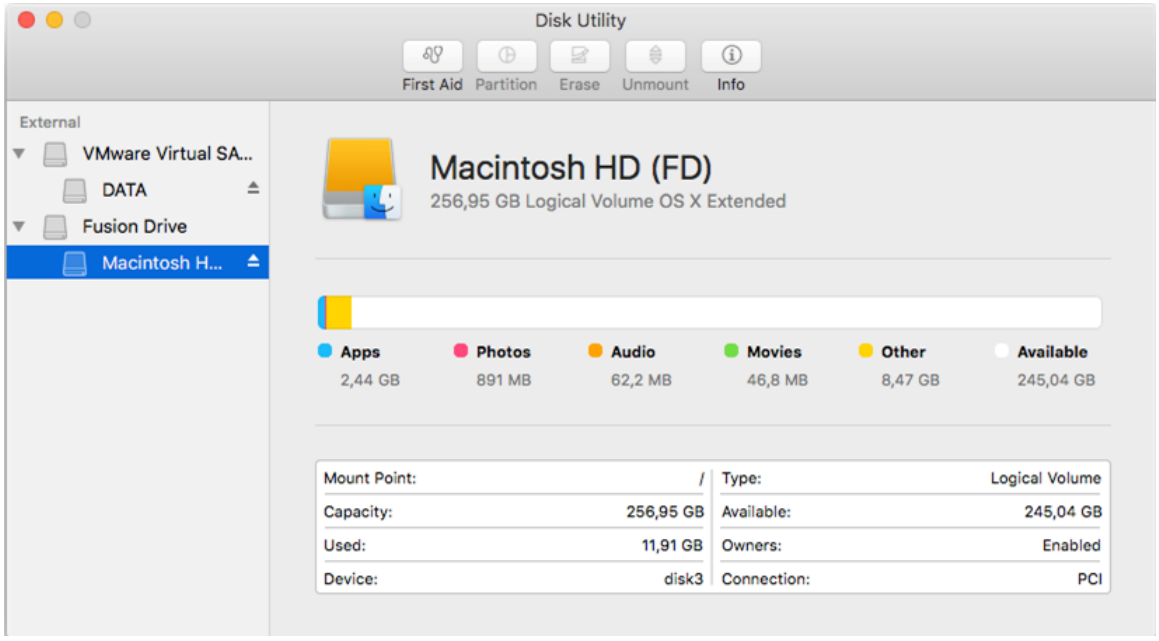
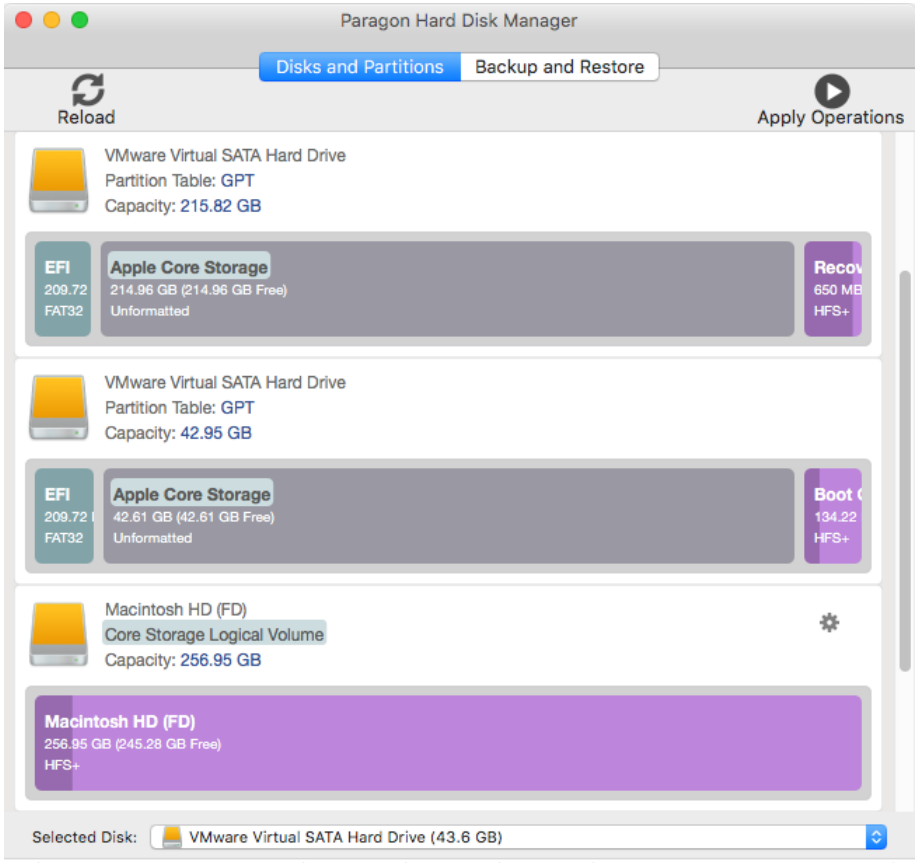


Hard Disk Manager for Mac doesn't hide anything, providing detailed information on all physical and logical volumes mounted in the system.



As you may guess already, unlike traditional configurations, Apple Core Storage requires a different backup approach. For more details, please read an article on this issue in our Knowledge Base at https://kb_wp.paragon-software.com/article/1144.

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