PARAGON Software GmbH

Heinrich-von-Stephan-Str. 5c ● 79100 Freiburg, Germany

Tel. +49 (0) 761 59018201 ● Fax +49 (0) 761 59018130

Internet www.paragon-software.com ● E-mail sales@paragon-software.com

Paragon NTFS for Mac OS X™

User Manual

Contents

Introduction

Paragon NTFS for Mac OS X™ is a low-level file system driver specially developed to bridge incompatibility of Windows and Mac OS X by providing full read/write access to any version of the NTFS file system (Windows NT 4.0, 2000, XP, 2003, Vista, 7, 8, 10) under Mac OS X.

Based on the Paragon UFSD™ (Universal File System Driver) technology our driver enables to provide fast and transparent access to NTFS partitions as Mac OS X-native, thus achieving an unprecedented high level of performance (the same as for HFS Plus and in some cases even better). Mac OS X programs can process such partitions without any restrictions – browse contents, read and modify files, copy and create new files and folders, etc.

Paragon NTFS for Mac OS X comes in one universal binary edition including a standard DMG disk image with an installation package to automatically substitute the Mac OS X default driver (read only) for Paragon NTFS for Mac OS X.

In this manual you will find the answers to many of the technical questions, which might arise while using our driver.

> **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.**

Features Overview

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

Key Features

Let us list some of the key features:

- **Extremely easy to use** as it requires no additional configuration after installation

- **Fast and transparent access to any NTFS partition under Mac OS X**

- **Advanced driver engine** to guarantee reliable operation and stability even under heavy workload

- **Unprecedented high level of performance** thanks to the Paragon UFSD™ technology

- **Complete support of Mac OS X 10.8 Mountain Lion**, **10.9 Mavericks, 10.10 Yosemite, 10.11 El Capitan**

- **Advanced support of the HFS Plus file system features** to guarantee data consistency (POSIX file attributes, Hardlinks, Symlinks, Data Fork and Resource Fork, etc.)

- **Advanced support of the NTFS file system features** to guarantee data consistency (sparse, compressed files/partitions, the Last Access Time stamp update, etc.)

- **Flexible notification system**

- **Support of Mac OS X extended attributes**

- **Support of non-Roman characters**

Supported Media

- Ultra high capacity disks (up to 10 TB tested)

- IDE, SCSI and SATA/eSATA disks

- SSD (Solid State Drive)

- Thunderbolt, FireWire (i.e. IEEE1394), USB 1.0, USB 2.0 , USB 3.0, ZIP® and Jazz® disks

- PC card storage devices (all types of flash memory, etc.)

Getting Started

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

System Requirements

To use Paragon NTFS for Mac OS X, you should install it first. But before that, make sure your computer meets the following minimum system requirements:

- Operating systems: Mac OS X 10.8 Mountain Lion, 10.9 Mavericks, 10.10 Yosemite, 10.11 El Capitan

Installing the Driver

To install Paragon NTFS for Mac OS X, please do the following:

1. Click on the supplied DMG disk image.

2. After the installation package has been extracted you can choose whether to install/de-install the driver or read the product manual. Click **Install NTFS for Mac® OS X** to initiate installation of the driver.


3. Click **Continue** on the Welcome page.

4. Next you will be notified that the version of the driver you're attempting to install is limited to work with Seagate, Samsung and Maxtor storage devices only. To access NTFS partitions on other devices, you should buy a full version. Click **Continue** to proceed.
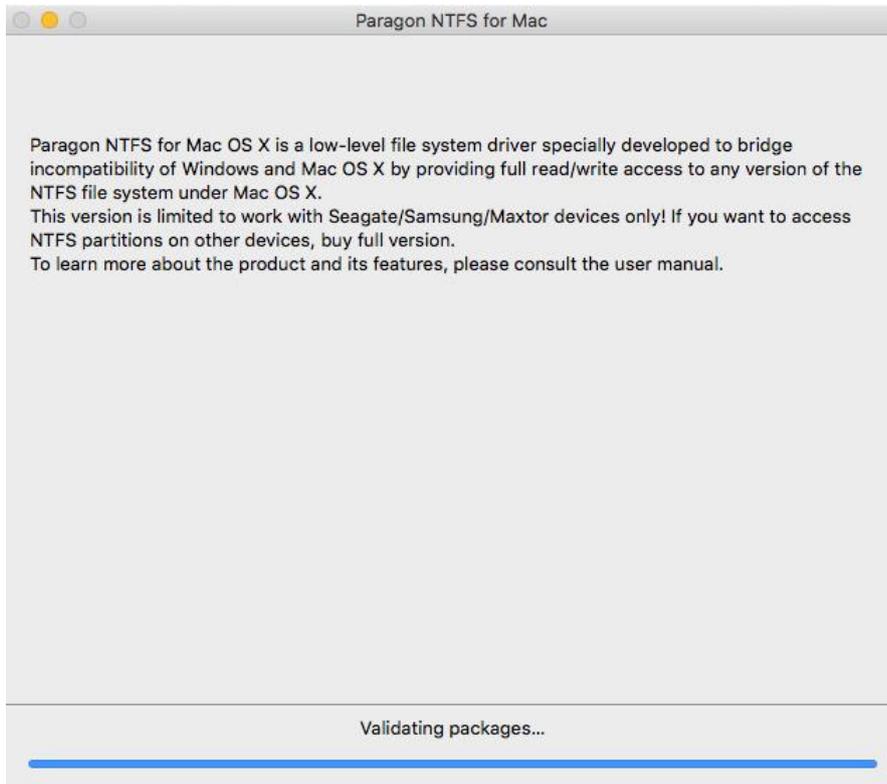

5. In order to continue the installation you are to accept all conditions stated in Paragon's license agreement by clicking the **Agree** button. You can also save the agreement by using the appropriate button.
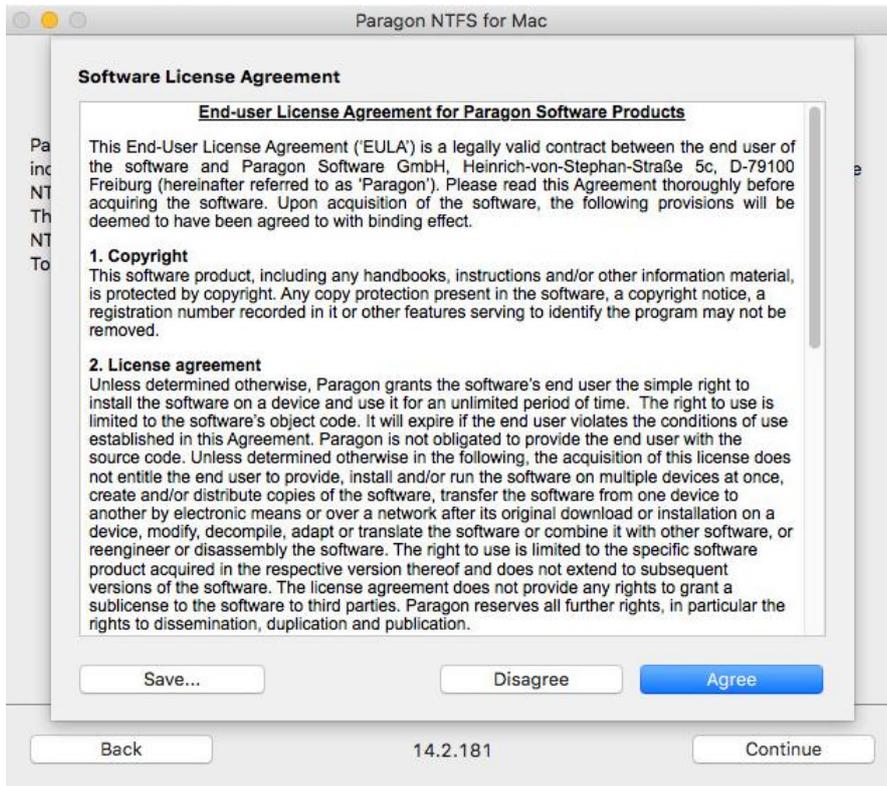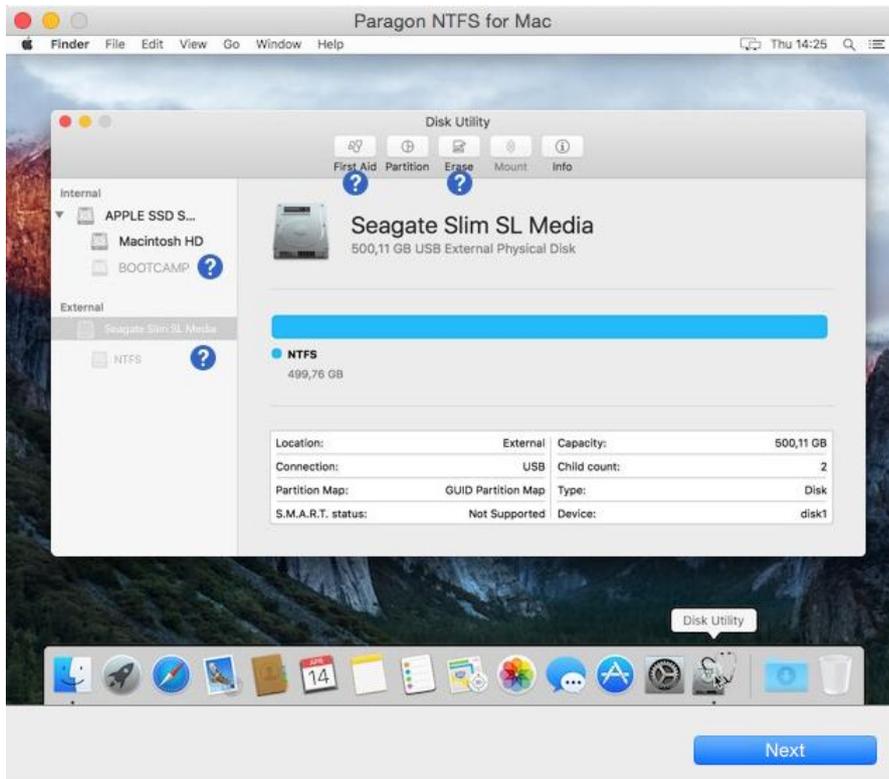
6. Next you are to provide a password of a user with the administrator privilege.
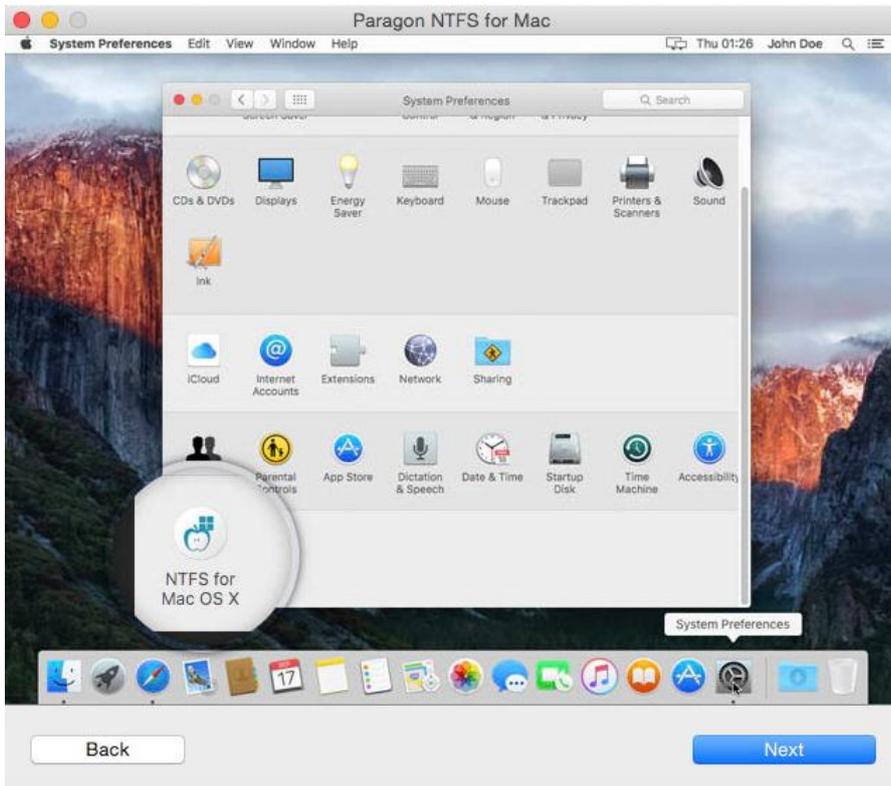

7. Monitor the installation progress.

8. Finally the installation wizard will display a couple of screenshots that help to get started with the product. When ready, click **Restart** to complete the installation.
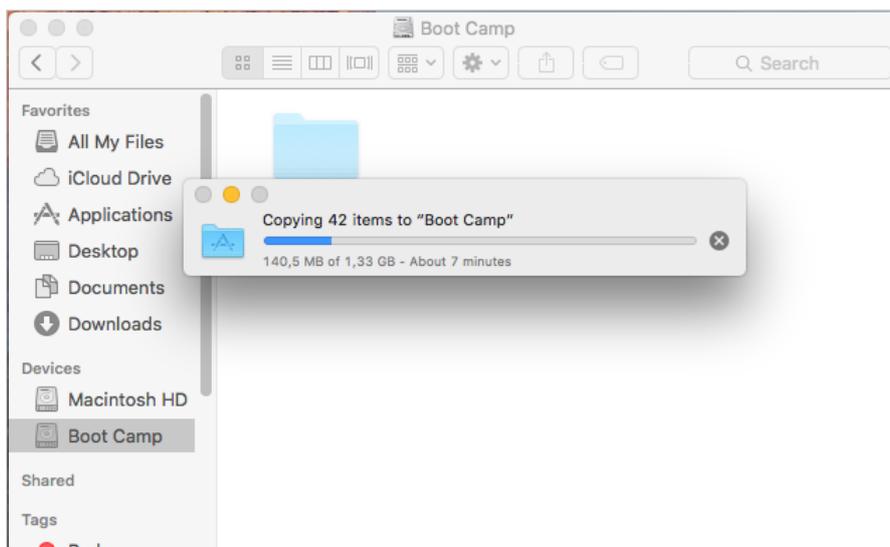
Using the Driver

Once the driver has been installed you obtain full read/write access to any type of NTFS as if it's Mac OS X-native.
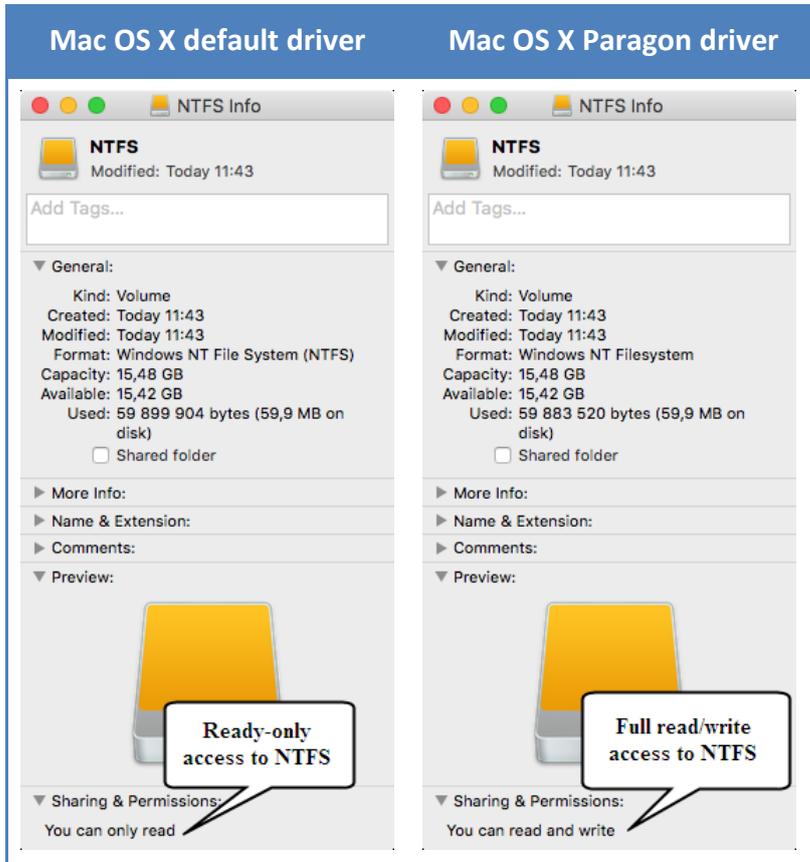
Unlike Mac OS X default driver you can now carry out any operation on an NTFS volume, like:

- Transfer data;

- Modify data;
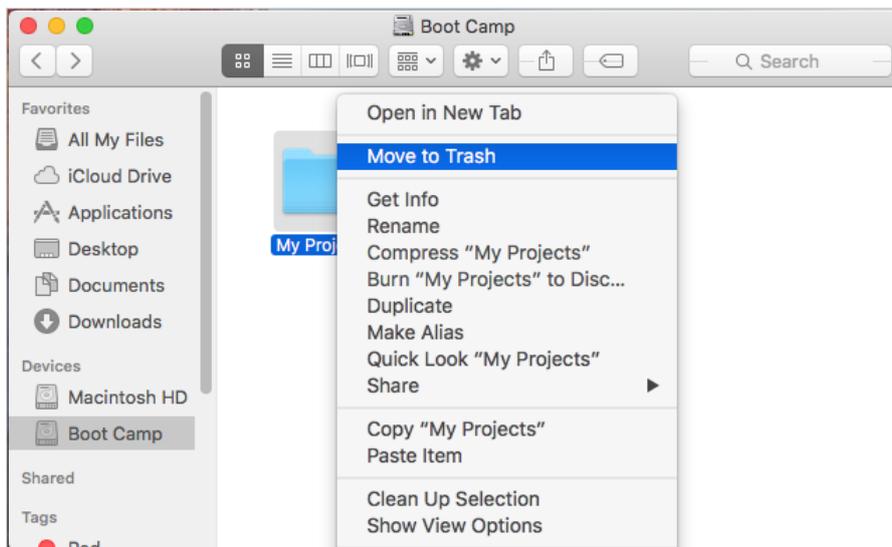
- Delete data;
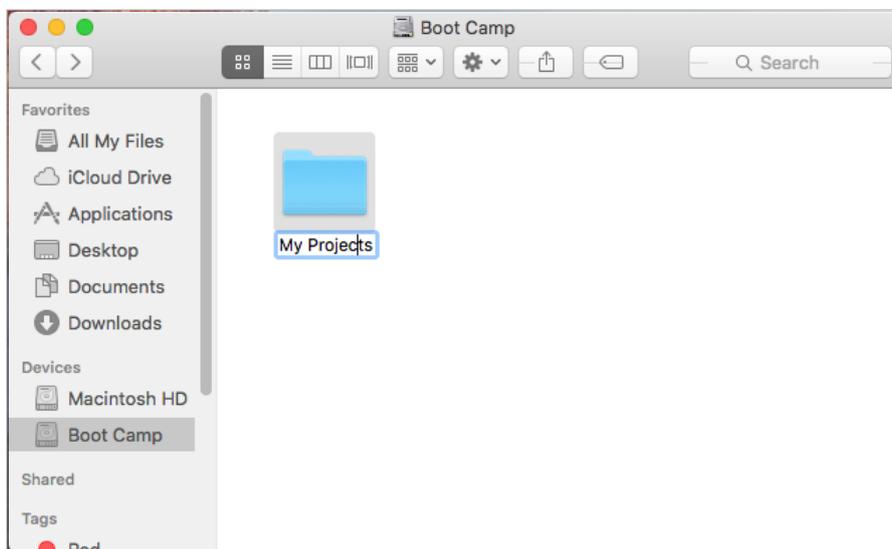
Just whatever you feel like doing.

Configuring the Driver

Paragon NTFS for Mac OS X is very flexible and can be easily set up either with the help of a graphical interface or from the command line.

Driver Setup with Graphical Interface

1. Open the NTFS Preferences Pane: **Applications > System Preferences > NTFS for Mac**.

2. Click on the **Volumes** tab to see a list of available partitions on the left.

Changing NTFS Parameters

As we have already mentioned our driver provides advanced support of the NTFS file system features. Select an NTFS partition on the left to see what options are currently enabled:

- **Access Permissions**. Mark this feature if you'd like to specify a user (a group of users) who is allowed to access each newly created file (folder), and his or her privileges (read/write/execute);

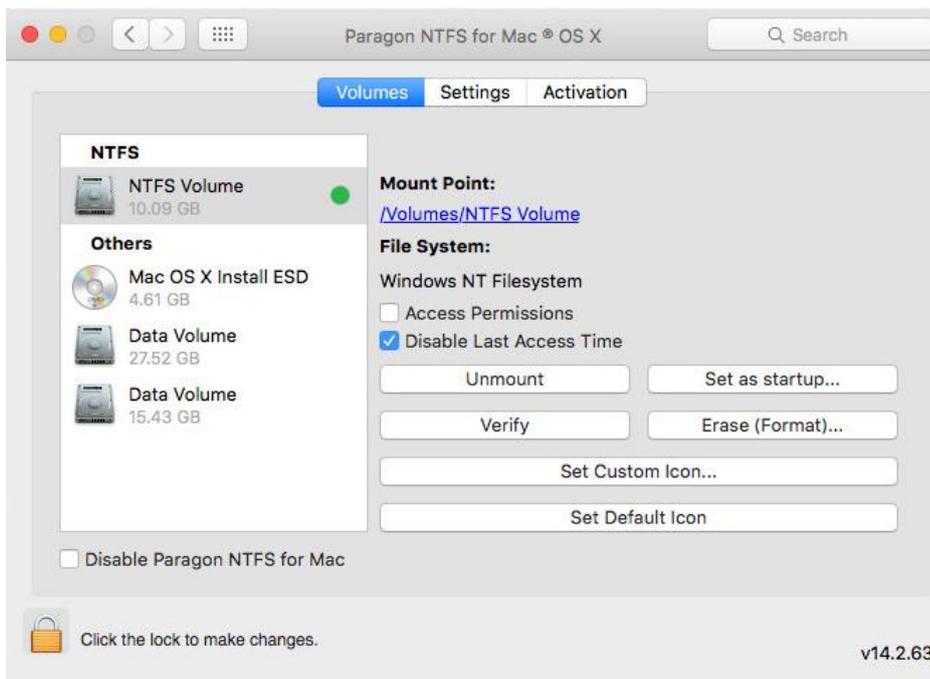- **Last Access Time**. By default, this feature is disabled for all mounted NTFS partitions to get the maximum performance out of system storage devices.

Setting NTFS Volume as Startup Disk

After installing the driver, Mac OS X Startup Disk (a utility responsible for setting an active operating system) stops recognizing Windows installed with Boot Camp, thus you can't set a Windows volume as a startup disk. It's an internal problem of Mac OS X and we can do nothing with it.

As a way out, choose your Windows volume on the left side of our pane, then click on the **Set as startup…** button. In the opened dialog either choose to restart your Mac from the selected partition immediately or postpone this operation until the next time you switch on the computer.
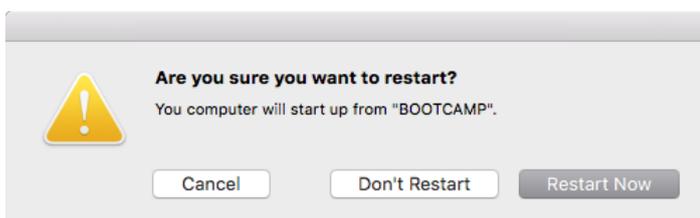
To make your Mac OS X an active operating system again please do the following:

- Click on a corresponding icon in the Windows system tray to restart your computer to Mac OS X. Alternatively, you can press and hold the **Option** key during the system restart until the Startup Manager appears, then select the required bootable partition;

- Launch the Mac OS X Startup Disk utility to make your Mac OS X an active operating system or use the NTFS Preferences Pane.

Formatting Volumes

You can format any unused partition (a partition that doesn't accommodate your Mac OS X) available in your system to NTFS or format an existing NTFS partition to HFS+, exFAT or any other file system supported by Mac OS X. If having Paragon ExtFS for Mac installed in the system, the following Linux-native file systems become available to select as well: Ext2/Ext3/Ext4.

Select a partition you'd like to format on the left side of the pane, then click on the **Erase (Format)**… button.
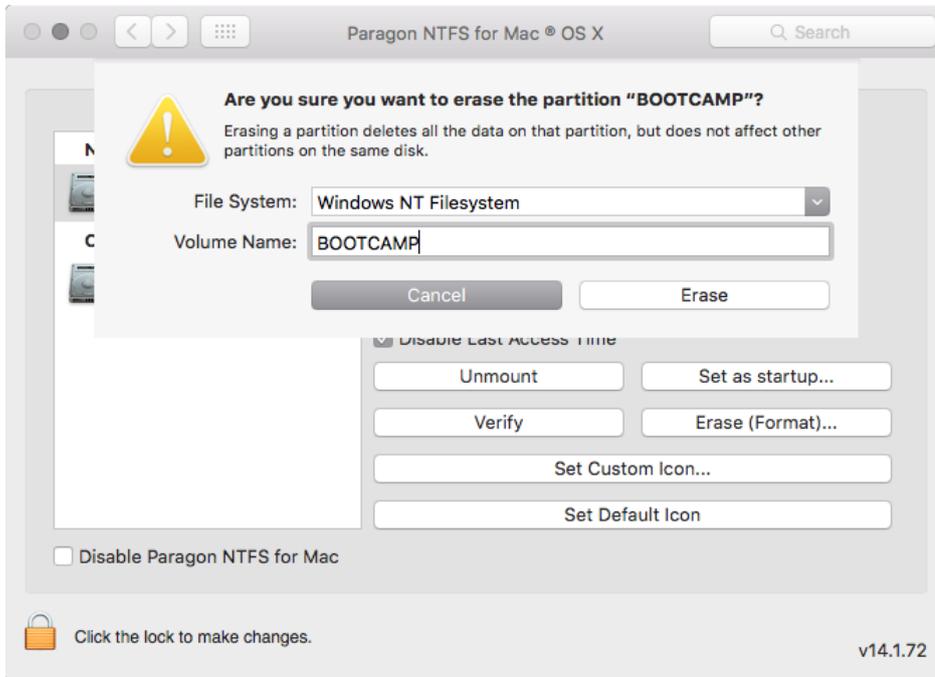
- Select the required file system type from the popup list;
- Type in a new volume label (irrelevant parameter used for notification purposes);
- Click on the **Erase** button to format the partition.

> **During installation of our driver, the setup wizard automatically adds the possibility to format partitions to NTFS into Mac OS X Disk Utility. Click here for more information.**

Verifying Volumes

You can check integrity and fix errors on any type of NTFS. To do that, please select an NTFS partition on the left, then click on the **Verify** button.
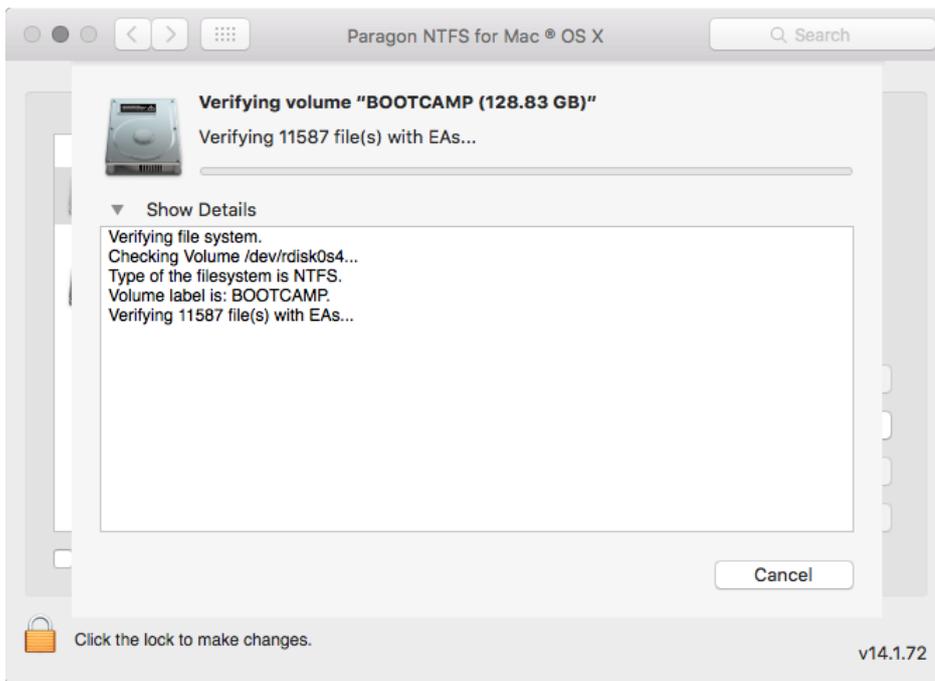
> **i** During installation of our driver, the setup wizard automatically adds the possibility to check and repair NTFS partitions into Mac OS X Disk Utility. Click here for more information.

Mounting Volumes

You can mount or unmount any unused (Mac non-system) partition available in your system. To do that, please select a non-system partition on the left, then click on the **Mount/Unmount** button.

Setting Custom/Default Icon

You can find and set your own icon for the selected NTFS partition or get back to the default icon at any moment by using the corresponding buttons.

Deactivating the Driver

You can deactivate the driver by marking the appropriate checkbox at the bottom of the window. If you do that, the Mac OS X default driver (read only) will be used to mount NTFS partitions.

> **i** Only users who can provide an administrator's password are allowed to modify preferences of the driver.
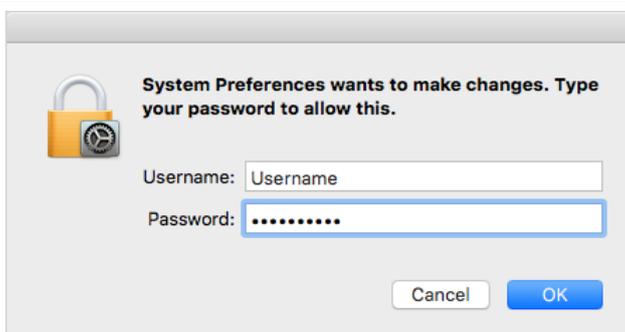
3. Click on the **Settings** tab to see a number of additional options.
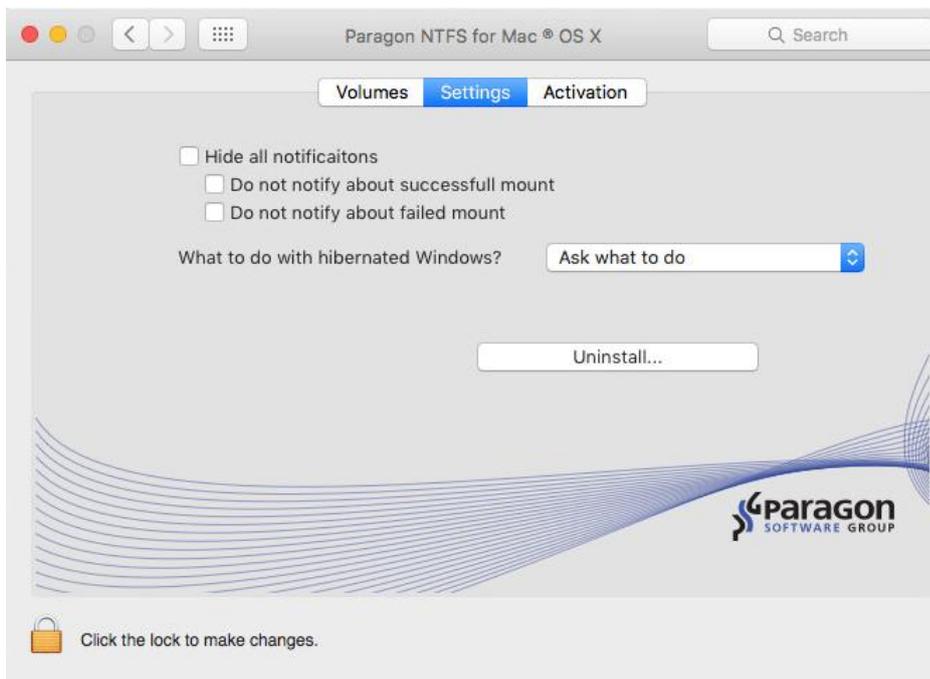
Configuring Notifications

By default, you will be notified through popup windows on the main product events. If necessary, you can disable all or any type of notifications.

Successful mount:
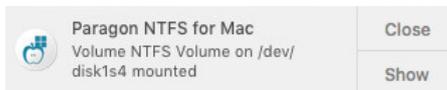
Uninstalling the Driver

By clicking **Uninstall…** you can remove Paragon NTFS for Mac from the system. For more details, please consult the De-installing the Driver chapter.

4. This version of the driver is limited to work with Seagate, Samsung and Maxtor storage devices only. If you'd like to access NTFS partitions on other devices, please click on the **Activation** tab, then **Buy Full Version**.
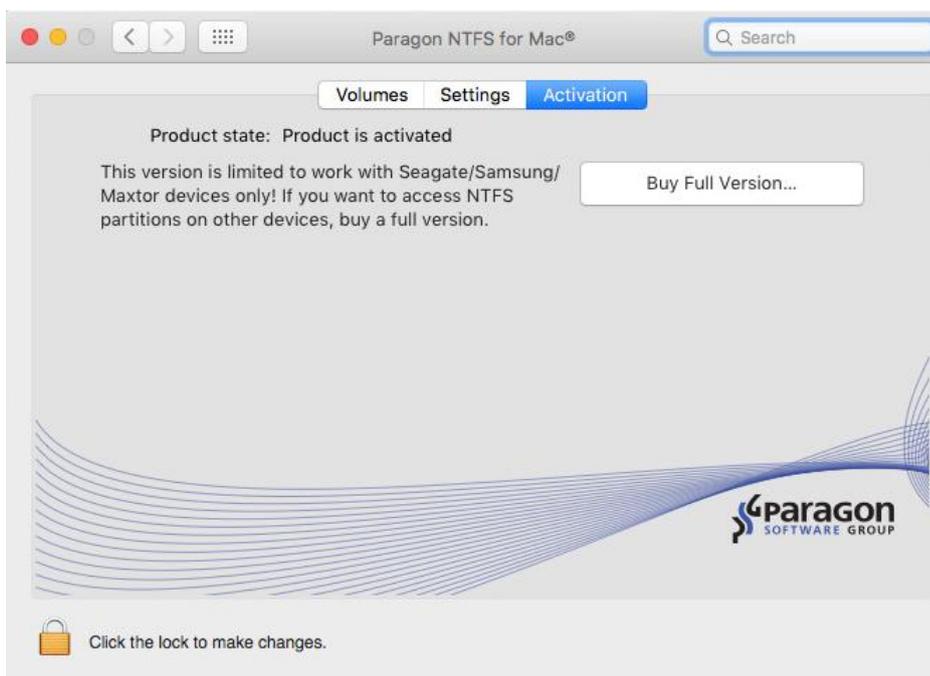
Driver Setup from the Command Line

You can set up the driver from the command line as well:

1. Launch the command line: **Applications > Utilities > Terminal**;

2. Type in **/usr/local/sbin/fsctl_ufsd** to get help.

```
Apples-Mac:sbin apple$ /usr/local/sbin/fsctl_ufsd
[fsctl_ufsd (Compiled on Sep 22 2015 18:39:04)
Usage: fsctl_ufsd (-p | -c | -a | -d) [on | off] ...
        fsctl_ufsd -p [on | off] <mount point> - display/control access permissions on a specified mount point
        fsctl_ufsd -c [on | off] <mount point> - display/control compression on a specified mount point
        fsctl_ufsd -a [on | off] <mount point> - display/control last access time on a specified mount point
        fsctl_ufsd -d [on | off]               - enable/disable Paragon NTFS for Mac OS X driver
Note: you must be the admin user to change these settings.
```

Since NTFS for Mac 14, the fsctl_ufsd utility has been moved from /sbin/ to /usr/local/sbin/. The new location is not default, thus you need to provide a full path to it.

Only users who can provide an administrator's password are allowed to modify preferences of the driver.

Extra Functionality

Apple doesn't allow the use of third-party drivers in the GUI version of Disk Utility of El Capitan. Please either use the NTFS Preferences Pane (recommended) or command line tools described in this section to manage NTFS partitions under El Capitan.

1. **Check/Repair NTFS Volumes**. During installation of our driver, the setup wizard automatically adds the possibility to check integrity and fix errors on any type of NTFS into Mac OS X Disk Utility. To do that, please follow the steps below:

   - Launch Disk Utility: **Applications > Utilities > Disk Utility**;

   - Select an NTFS volume from the list of available partitions on the left;

   - Click on the **First Aid** tab at the top of the window;

   - Click on the **Verify Disk** button to check it for integrity or the **Repair Disk** button to fix errors (if any).
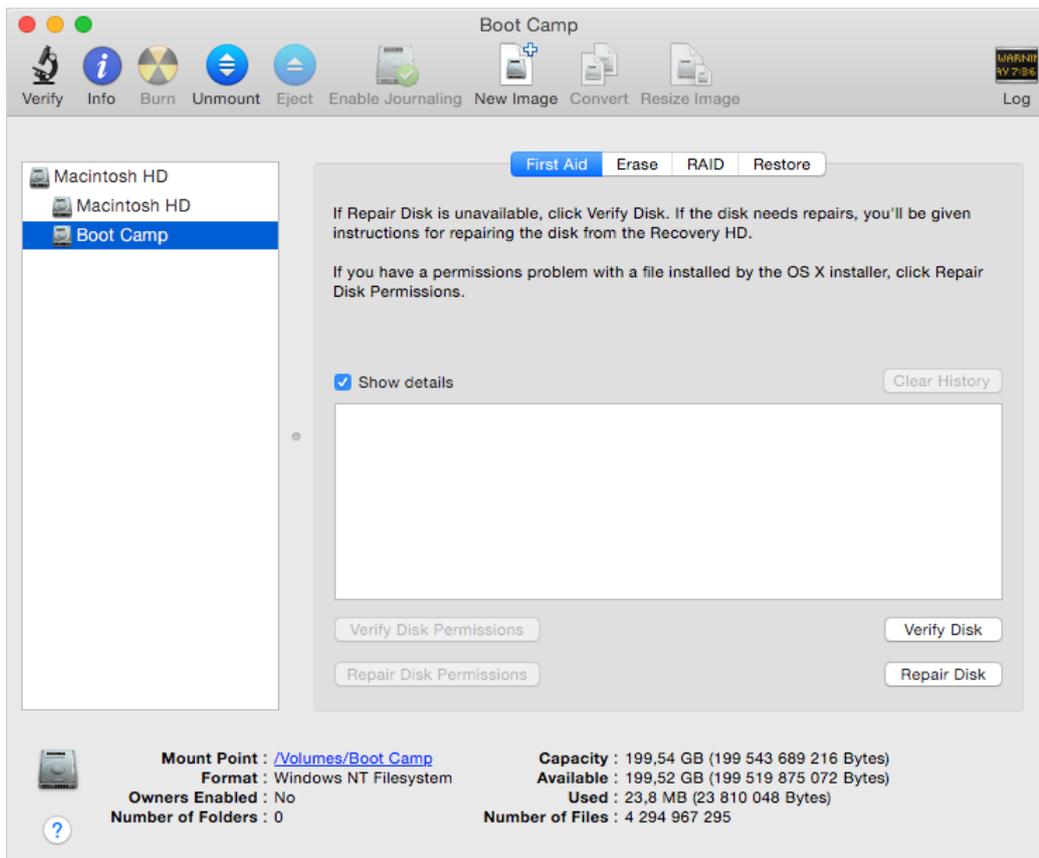
You can also carry out these operations from the command line:

- Launch the command line: **Applications > Utilities > Terminal**;

- Type in **fsck_ufsd** to get help.

```
[Apples-Mac:sbin apple$ fsck_ufsd_NTFS
fsck_ufsd_NTFS (Compiled on Sep 22 2015 18:39:56)
Usage: fsck_ufsd_NTFS (-n | -y | -q) ...
       fsck_ufsd_NTFS -n device - verify disk, but don't repair
       fsck_ufsd_NTFS -y device - repair disk
       fsck_ufsd_NTFS -q device - quick check returns clean, dirty or failure
           -m - optional modifier to show minors
```

Use **fsck_ufsd –n device** to check disk integrity;

Use **fsck_ufsd –y device** to fix disk errors

2. **Format NTFS Volumes**. During installation of our driver, the setup wizard automatically adds the possibility to format NTFS volumes into Mac OS X Disk Utility. To do that, please follow the steps below:

- Launch Disk Utility: **Applications > Utilities > Disk Utility**;

- Select a partition you need to format to NTFS from the list of available partitions on the left;

- Click on the **Erase** tab at the top of the window;

- Select **Windows NT Filesystem** from the popup list;

- Type in a new volume label (irrelevant parameter used for notification purposes);

- Click on the **Erase** button to format the partition.
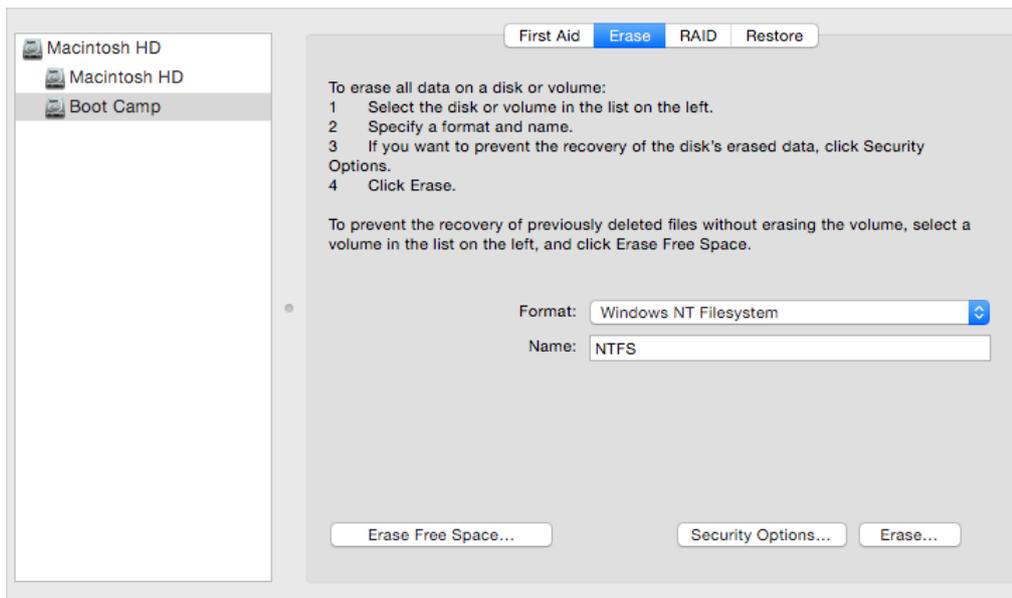
You can also carry out this operation from the command line:

- Launch the command line: **Applications > Utilities > Terminal**;

- Type in **diskutil** to get help.

```
[Apples-Mac:~ apple$ diskutil
Disk Utility Tool
Utility to manage local disks and volumes
Most options require root access to the device

Usage:  diskutil [quiet] <verb> <options>, where <verb> is as follows:

        list                    (List the partitions of a disk)
        info[rmation]           (Get information on a specific disk or partition)
        listFilesystems         (List file systems available for formatting)
        activity                (Continuous log of system-wide disk arbitration)

        u[n]mount               (Unmount a single volume)
        unmountDisk             (Unmount an entire disk (all volumes))
        eject                   (Eject a disk)
        mount                   (Mount a single volume)
        mountDisk               (Mount an entire disk (all mountable volumes))

        enableJournal           (Enable HFS+ journaling on a mounted HFS+ volume)
        disableJournal          (Disable HFS+ journaling on a mounted HFS+ volume)
        moveJournal             (Move the HFS+ journal onto another volume)
        enableOwnership         (Treat as exact User/Group IDs for a mounted volume)
        disableOwnership        (Ignore on-disk User/Group IDs for a mounted volume)

        rename[Volume]          (Rename a volume)

        verifyVolume            (Verify the file system data structures of a volume)
        repairVolume            (Repair the file system data structures of a volume)

        verifyDisk              (Verify the components of a partition map of a disk)
        repairDisk              (Repair the components of a partition map of a disk)

        eraseDisk               (Erase an existing disk, removing all volumes)
        eraseVolume             (Erase an existing volume)
        reformat                (Erase an existing volume with same name and type)
        eraseOptical            (Erase optical media (CD/RW, DVD/RW, etc.))
        zeroDisk                (Erase a disk, writing zeros to the media)
        randomDisk              (Erase a disk, writing random data to the media)
        secureErase             (Securely erase a disk or freespace on a volume)

        partitionDisk           ((re)Partition a disk, removing all volumes)
        resizeVolume            (Resize a volume, increasing or decreasing its size)
        splitPartition          (Split an existing partition into two or more)
        mergePartitions         (Combine two or more existing partitions into one)

        appleRAID <verb>        (Perform additional verbs related to AppleRAID)
        coreStorage <verb>      (Perform additional verbs related to CoreStorage)

diskutil <verb> with no options will provide help on that verb
```

Use **diskutil eraseVolume "UFSD_NTFS" "Volume Label" /dev/diskID** to format the required partition to NTFS.

> ℹ **There is no need to use inverted commas if label of your NTFS disk contains just one word.**

Another way to format a volume to NTFS from the command line is to use a Paragon's utility:

- Launch the command line: **Applications > Utilities > Terminal**;

- Type in **newfs_ufsd_NTFS** to get help.

```
[Apples-Mac:~ apple$ newfs_ufsd_NTFS
newfs_ufsd_NTFS (Compiled on Sep 22 2015 18:39:54)
Create an NTFS volume on a user specified block device.
Usage: newfs_ufsd_NTFS [-v label] [-c] [-a size] device
  -v label          Specifies the volume label.
  -c                Files created on the new volume will be compressed by default.
  -a size           Overrides the default allocation unit size. Default settings
                    are strongly recommended for general use.
                    NTFS supports 512, 1024, 2048, 4096, 8192, 16K, 32K, 64K.
           NTFS compression is not supported for allocation unit sizes above 4096.


E.g.: newfs_ufsd_NTFS -v "X-Files" /dev/disk0s3
```

Typical Application Cases

You might face various situations where Paragon NTFS for Mac OS X will be the most preferable way out. Let's just consider a little closer two of them.

1. You've got at the disposal a dual-boot system of Mac OS X and Windows and it will be really convenient to get a full-fledged access (read/write) to Windows NTFS partitions under Mac OS X. To tackle the issue, please follow the steps below:

   - Start up your Mac OS X;

   - Install Paragon NTFS for Mac OS X;

   - Reboot you computer into Mac OS X once again;

   - Enjoy NTFS under Mac OS X.

2. You need to transfer data (files over 4GB in size) from your Mac PC to a Windows-based computer using an external hard drive. FAT32 file system that is supported by both systems cannot be used as it doesn't support files over 4GB. To tackle the issue, please follow the steps below:

   - Start up your Mac OS X;

   - Install Paragon NTFS for Mac OS X;

   - Reboot you computer into Mac OS X once again;

   - Connect an external drive to Mac PC and format it to NTFS;

   - Copy files you need from your Mac PC to the external drive;

   - Connect the external drive to a Windows PC;

   - Copy files from the external drive to the Windows PC.

De-installing the Driver

To de-install Paragon NTFS for Mac, please do the following:

1. Open the installation package by clicking on the supplied DMG disk image.

2. After the installation package has been extracted click **Uninstall NTFS for Mac® OS X** to initiate the de-installation process.

3. The setup wizard will ask confirmation before removing the driver from the system, so please click the **Uninstall** button.
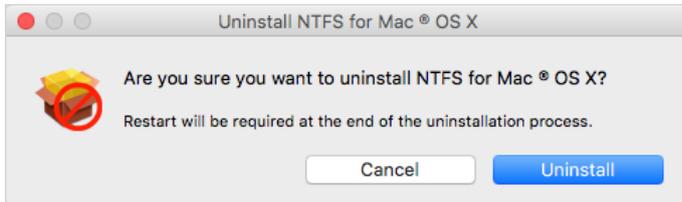
4. Next you are to provide a password of a user with the administrator privilege.
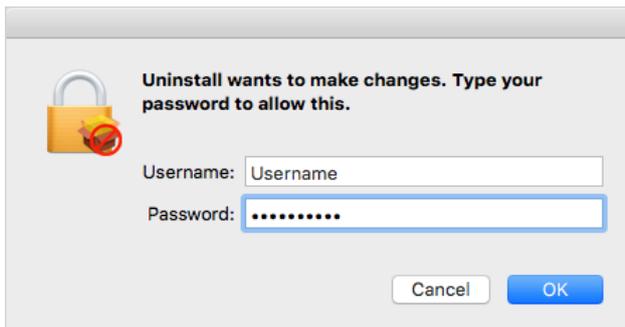
5. Click **OK** to finish the de-installation process.

> ℹ️ **You can also de-install the product through the [NTFS Preferences Pane](#).**

Known Issues

After installing our driver, the GUI version of Disk Utility in Mac OS X 10.11 El Capitan stops displaying mounted NTFS partitions. It's due to the fact that Apple doesn't allow the use of third-party drivers in the GUI version of Disk Utility. Please use command line tools to manage NTFS partitions:

- To format or create a new disk: **sudo diskutil eraseVolume "UFSD_NTFS" "LABEL" /dev/diskID**;

- To repair a disk: **sudo diskutil verifyVolume /dev/diskID**;

- To mount a disk manually: **diskutil mount /dev/diskID** or

  sudo mkdir /Volumes/mountPoint/ – creates a folder to mount a disk to,

  usr/local/sbin/mount_ufsd_NTFS /dev/diskID /Volumes/mountPoint – mounts a disk to the earlier created folder.

ⓘ   **All found NTFS partitions are automatically mounted by default.**

Contacting Paragon Software GmbH

If you have any questions about the company products, please do not hesitate to contact Paragon Software GmbH.

Service	Contact
Visit Paragon GmbH web site	www.paragon-software.com
Registration & updates web-service	www.paragon-software.com/support
Knowledge Base & Technical Support	kb.paragon-software.com
Pre-sale information	sales@paragon.software.com

> **Unfortunately, the company can only provide technical support in the following languages at the present time: English, German, French and Russian. We are really sorry for possible inconvenience.**

Glossary

Hard Link is a reference, or pointer, to physical data on a storage volume. On most file systems, all named files are hard links. The name associated with the file is simply a label that refers the operating system to the actual data. As such, more than one name can be associated with the same data. Though called by different names, any changes made will affect the actual data, regardless of how the file is called at a later time. Hard links can only refer to data that exists on the same file system.

HFS Plus File System (HFS or Mac OS Extended) is an updated version of HFS (Hierarchical File System) and is applied nowadays as the primary file system for Macintosh computers. Unlike HFS it supports much larger files (block addresses are 32-bit length instead of 16-bit) and uses Unicode (instead of Mac OS Roman) for naming the items (files, folders). Besides it permits filenames up to 255 UTF-16 characters in length, and n-forked files similar to NTFS, though almost no software takes advantage of forks other than the data fork and resource fork. One of the crucial improvements of this file system is of course the possibility to use a full 32-bit allocation mapping table that resulted in much less wasted space (and more files).

NTFS File System is an advanced file system that provides performance, security, reliability, and advanced features that are not found in any version of FAT. For example, NTFS guarantees volume consistency by using standard transaction logging and recovery techniques. If a system fails, NTFS uses its log file and checkpoint information to restore consistency of the file system. In its later versions, NTFS also provides advanced features such as file and folder permissions, encryption, disk quotas, and compression.

Resource Fork is a construct of the Mac OS operating system used to store structured data in a file, alongside unstructured data stored within the data fork. A resource fork stores information in a specific form, such as icons, the shapes of windows, definitions of menus and their contents, and application code (machine code).

Symbolic Link (Symlink or Soft Link) consists of a special type of file that serves as a reference to another file or directory. Unlike a hard link, which points directly to data and represents another name for the same file, a symbolic link contains a path which identifies the target of the symbolic link. Thus, when the user removes a symbolic link, the file to which it pointed remains unaffected. Symbolic links may refer to files even on other mounted file systems.

UFSD™ (Universal File System Driver) technology developed by Paragon Software provides full read/write access to the so-called popular file systems (NTFS, FAT16/32, Ext2/Ex3FS, etc.) under operating systems that cannot do it by default (e.g. NTFS for Linux, Ext2/Ex3FS for Windows, etc.).

This technology is based on the direct access to physical drives and buffered Input/Output access, that is why it makes it possible to process unsupported partitions (browse contents, read and modify files, copy and create new files and folders, etc.) while keeping an acceptable level of performance.