Paragon Ext2/3FS for Mac OS X™

User Manual

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Introduction

Paragon Ext2/3FS for Mac OS X™ is a low-level file system driver specially developed to bridge file system incompatibility of Linux and Mac OS X by providing full read/write access to the Ext2 and Ext3 file systems under Mac OS X.

Based on the Paragon UFSD™ (Universal File System Driver) technology our driver enables to provide fast and transparent access to Ext2/3FS partitions as Mac OS X-native, thus achieving an unprecedented high level of performance (similar to HFS Plus). 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 Ext2/3FS for Mac OS X comes in one universal edition in the form of a standard DMG disk image that includes user manual, license agreement and installation/uninstallation files to automatically install/uninstall and configure the Ext2/3 FS driver. During installation of the driver two powerful utilities to create/format and check/repair Ext2 and Ext3 file systems will be integrated into the Disk Utility.

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

Features Overview

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

Key Features

Well let us list some of the product key features:

- Extremely easy to use as it requires no any additional configuration after installation.
- Fast and transparent access to any Ex2/3FS 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 Tiger 10.4.11 and Leopard (10.5.x) under Intel-based architectures.
- Advanced support of the Ext2/3FS file system features to guarantee data consistency (Hardlinks, Symlinks).
- Support of non-Roman characters.

Supported Media

- Large hard disks (up to 1,5 TB tested)
- IDE, SCSI and SATA hard disks
- FireWire (i.e. IEEE1394), USB 1.0, USB 2.0 hard disks, 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.

Distribution

Paragon Ext2/3FS for Mac OS X™ is distributed in two ways:

- Boxed package from Paragon Technology GmbH and resellers
- Downloadable package over the Internet at the company's web-site

The two contain a standard DMG disk image with an installation package to automatically install and configure the Ext2/3FS driver.

Thus in order to get the product ready for use, you need to install it first (see Installing the Program).

If you want to download an update/upgrade of the product, it will be in form of the downloadable installation package.

Registration

Paragon Technology GmbH provides a wide range of online services through its web-service - KB (Knowledge Base):

- Registration of new users;
- Registration of purchased products for registered users;
- Available around-the-clock downloading center, where registered users can get product updates/upgrades as well as all the necessary documentation;
- Downloadable free 10-day trial version and open documentation for all users.

To enter the Knowledge Base, please visit the web-site: http://kb.paragon-software.com/.

It is recommended to use Safari, Mozilla Firefox, Internet Explorer 5+ or any compatible browser.

To Register as a New User

To register as a new user, simply do the following:

1. **Run the Internet browser and visit the page**: http://kb.paragon-software.com/;
2. Click the **New User** button;
3. On the renewed page, **select your country and language**;
4. **Fill out the registration form**.

The most important field in the form is an E-mail address, as it serves as a login to enter the system. Besides your access password will be sent to this address as well.

To Register a New Product

If you are a registered user and would like to register Paragon Ext2/3FS for Mac OS X, simply do the following:

1. Click **Login** in the menu;
2. On the *Login* page, in the *User Name* field, **enter an E-mail**, which you have used for registration;
3. In the *Password* field **enter the password** you received with registration confirmation. Click the *Submit* button;
4. If the user name and password are valid, you will enter the system;
5. In the opened menu click the **Product Registration** item to see a list of all registered products with a new registration form;
6. Select **Paragon Ext2/3FS for Mac OS X** from the list of products;
7. **Type in your product serial number** in the *Serial Number* field. Click the *Submit* button.

That is all. You will receive a confirmation by E-mail.

Downloading Updates/Upgrades

Downloading of updates/upgrades can be fulfilled in the following way:

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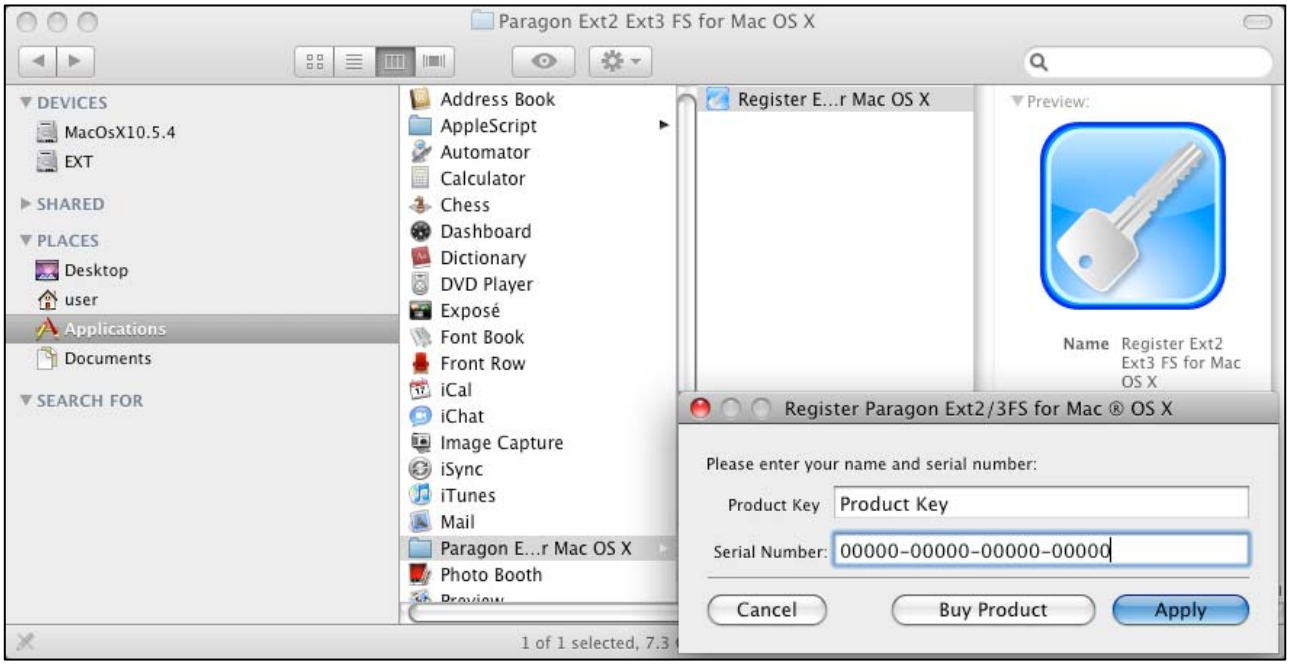
1. **Enter the Paragon Software web-service**;
2. In the menu click the **Download Update** to see what updates are available for you;
3. **Select the desired update** and click the *Download* button.

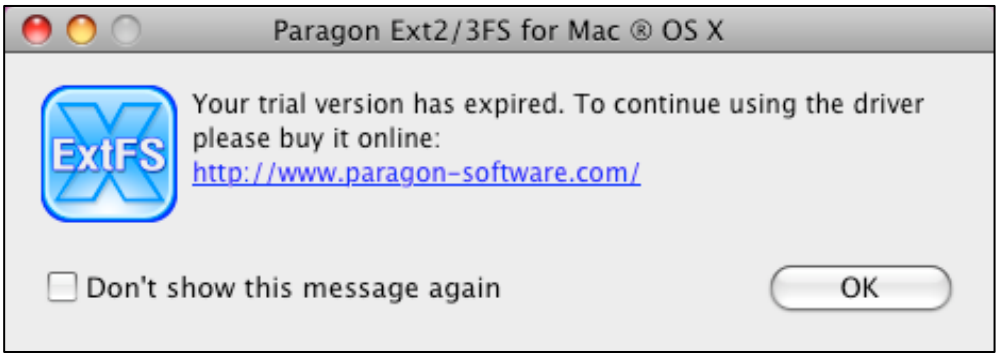
Trial Version Registration

In case you've got a 10-day trial version of Paragon Ext2/3FS for Mac OS X still installed and already made up your mind and purchased a full-fledged product online at the company's web-site (user name and serial number at your disposal), you can save yourself from downloading the driver once again by making your trial version work without any limitation:

1. **Launch the Register Application** (*Application > Paragon Ext2/3FS for Mac OS X > Register Ext2/3FS for Mac OS X*);
2. **Provide your registration info**, i.e. user name and serial number.



Once a 10-day trial version of the driver has expired, you will get a warning message the moment you log on to the system. Click *Don't show this message again* to suppress it.



Contacting Paragon Technology GmbH

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

Service	Contact
Visit Paragon GmbH web site	www.paragon-software.com
Registration & updates web-service	kb.paragon-software.com
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 and Russian. We are really sorry for possible inconvenience.

System Requirements

To use Paragon Ext2/3FS 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 10.4.11 Tiger** or higher;
- **Intel-based** architecture;
- 128 MB of RAM.

Installing the Driver

To install Paragon Ext2/3FS for Mac OS X, simply do the following:

1. Launch the installation process by clicking on the *supplied DMG disk image* (in our case it is *Paragon Ex3 Ext3 FS for Mac OS X.dmg*).

2. After the installation package is extracted you can choose whether to install/deinstall the driver or read the manual or license agreement. Click *Paragon Ex3 Ext3 FS for Mac OS X.pkg* to install the driver.

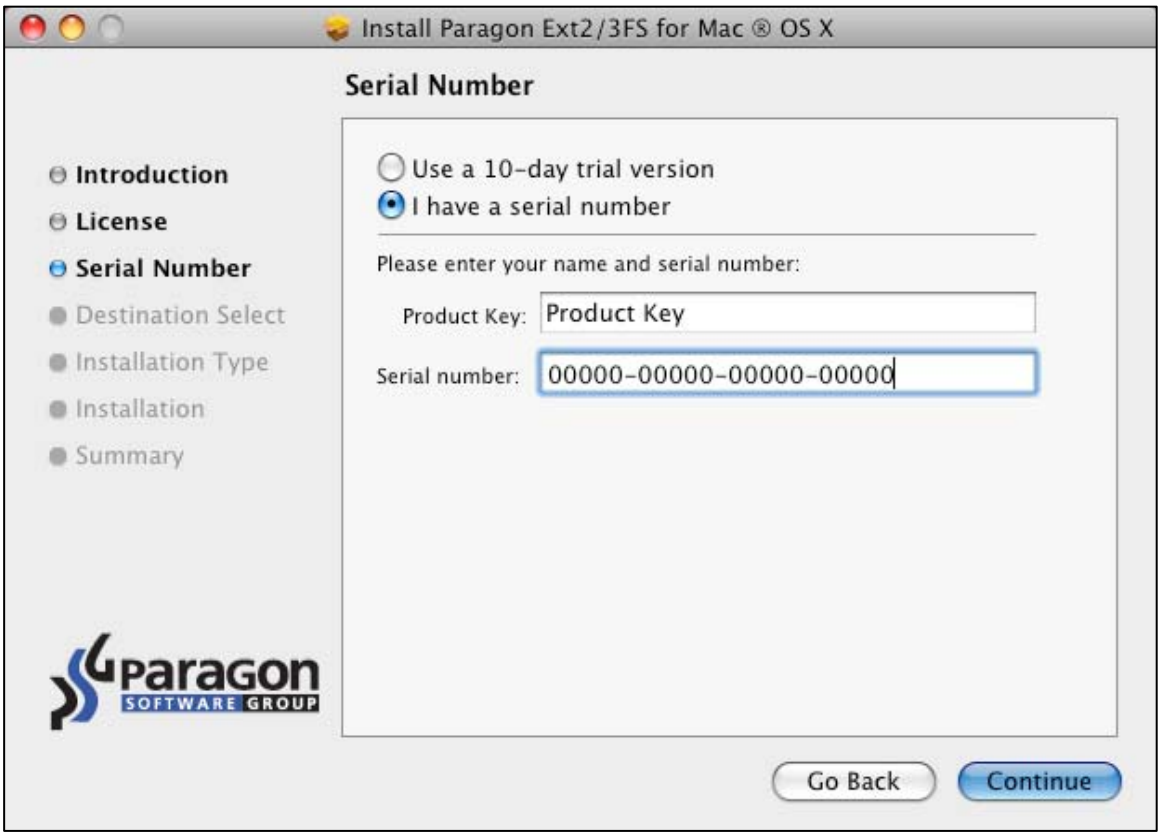
3. In order to actually start up installation of the driver, you need to confirm your intention by clicking the *Continue* button.

4. The setup wizard contains a standard user interface and set of installation steps to easily go through the process of installation. The **Welcome** page informs that the application is being installed. Click *Continue*.

5. On the next page you can see the Paragon license agreement. Please read it carefully and then click *Continue*. You can also save or print the agreement by using the appropriate buttons.

6. In order to continue installation you are to accept all the conditions stated in the agreement by clicking the *Agree* button.

7. Since Ext2/3FS for Mac OS X is a commercially distributed product, you need to purchase it to get registration info. Still there is the possibility to try the driver for free during a 10-day period.



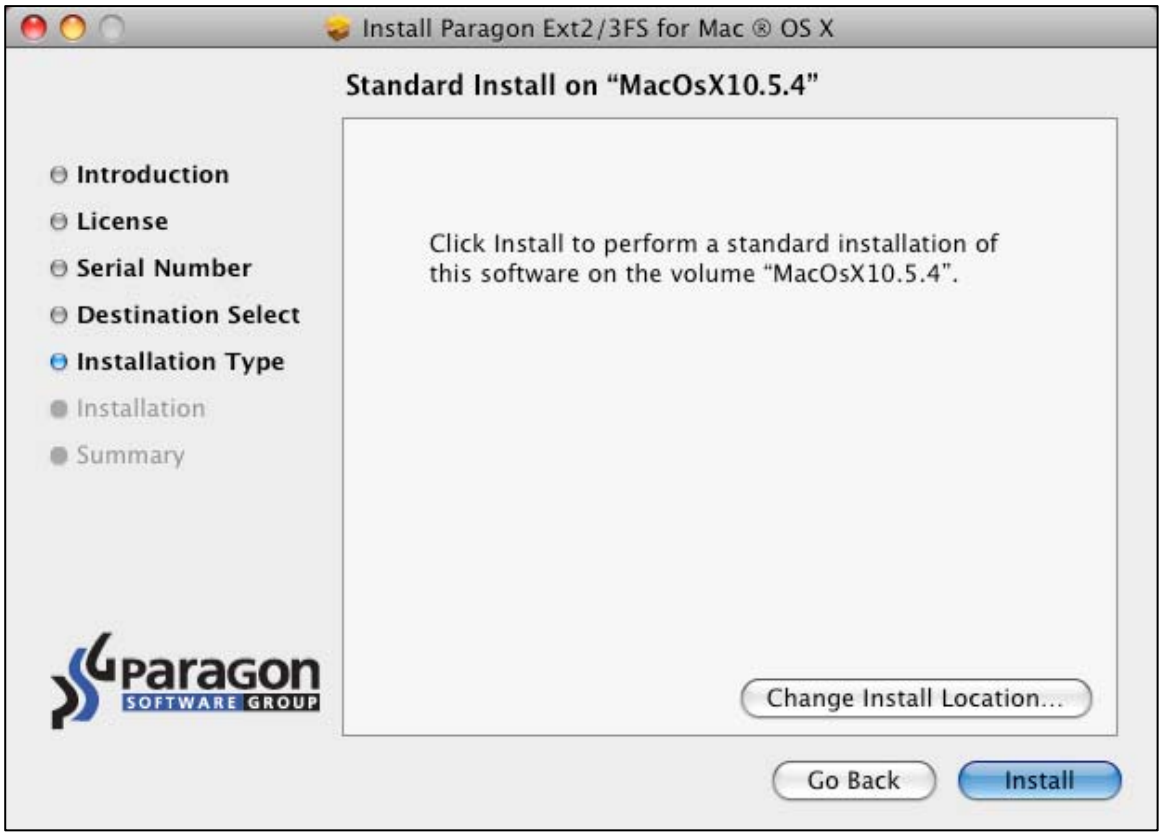
8. As the next step of the installation you are to provide a password of a user with the administrator privilege.

9. The **Select a Destination** page allows the user to select where it is required to install the driver.

After you have selected the required destination, click *Continue*.

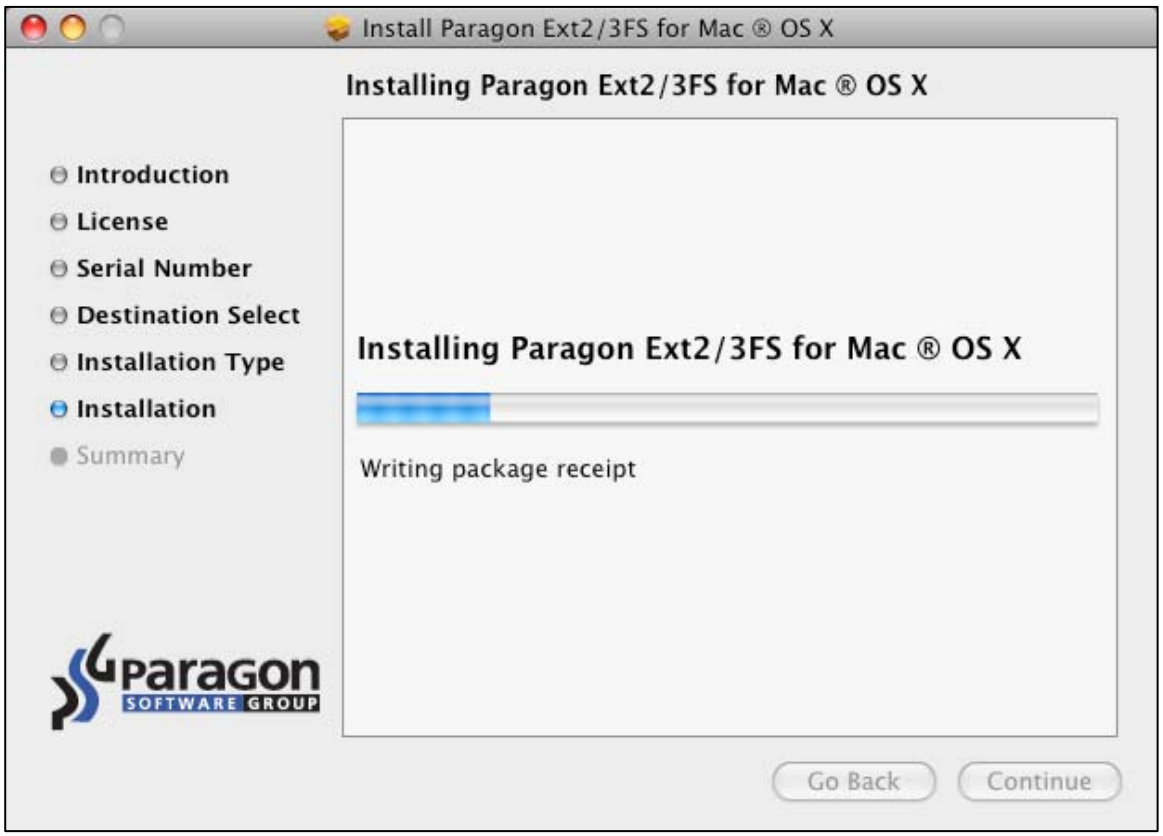
The driver can only be installed on an active Mas OS X volume, i.e. MacOsX10.5.4 in our case.

10. On the **Installation Type** page click *Install* to continue.

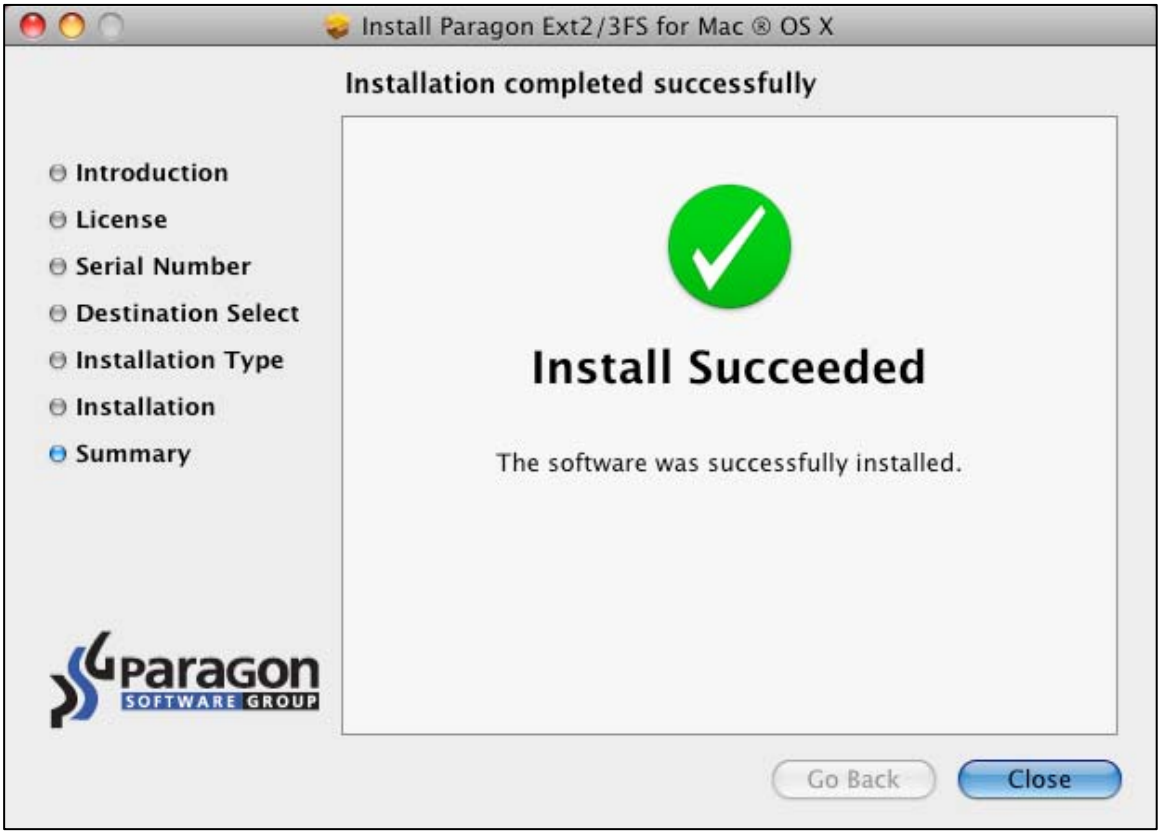


In case it is not the first time the driver is being installed the wizard will offer you to update it by clicking the *Upgrade* button.

11. The next page shows the overall progress of the installation.

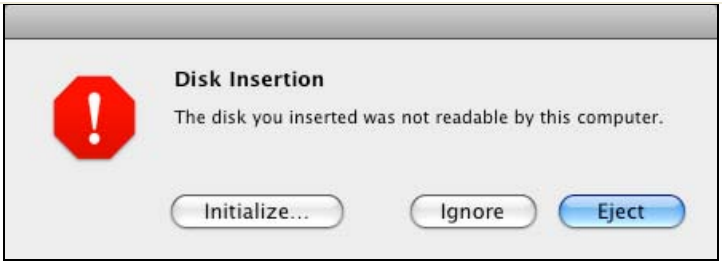
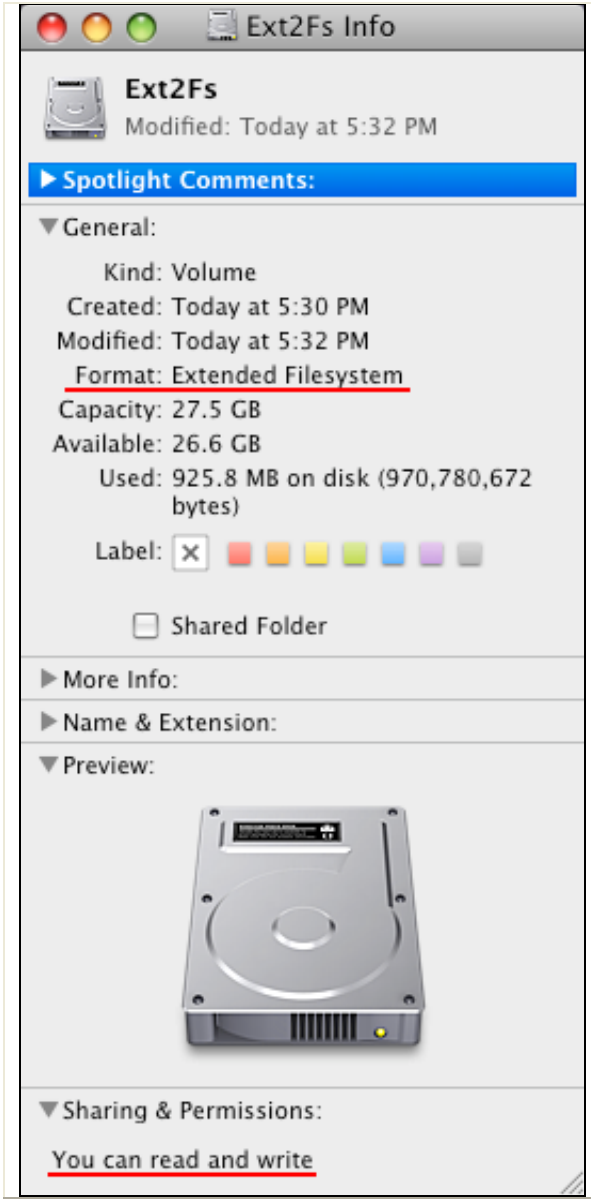


12. On the **Finish Up** page click *Close* to accomplish the installation process. Restart the computer to enable the driver.



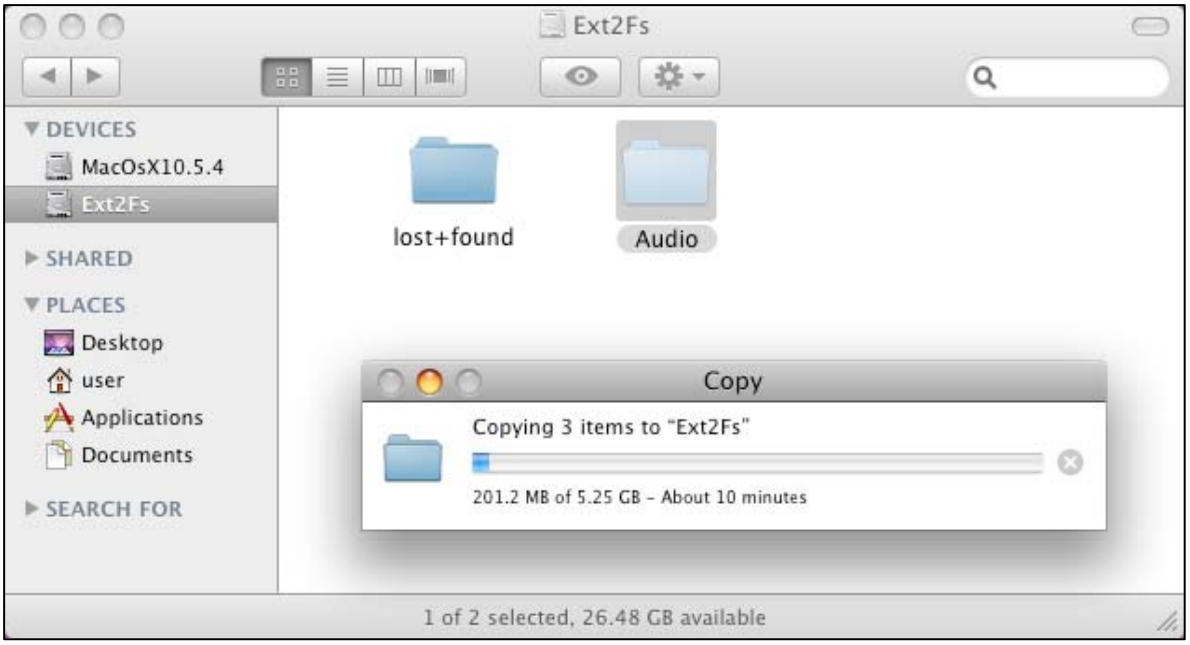
Using the Driver

Once the driver has been installed you obtain full read/write access to any type of Ext2/3 file systems as if it is Mac OS X-native.

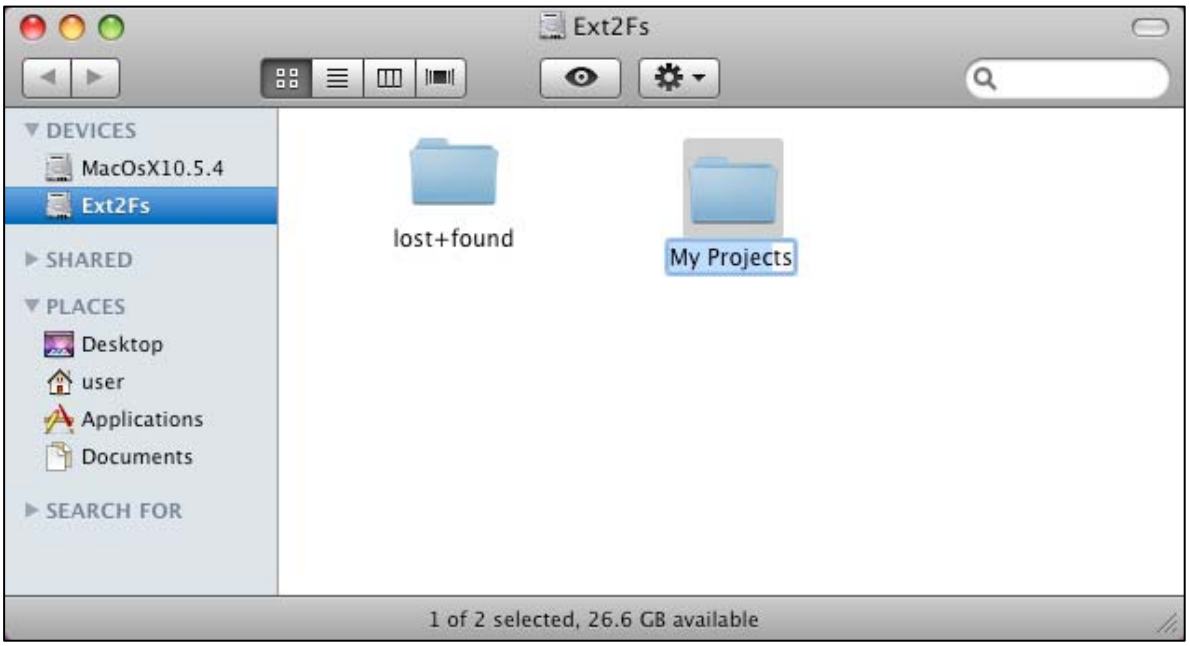
Before installing the Paragon driver	After installing the Paragon driver
 In case you connect any Ext2 or Ext3 formatted disk you can see the message above.	

You can now carry out any operation on an Ext2/3FS volume, like:

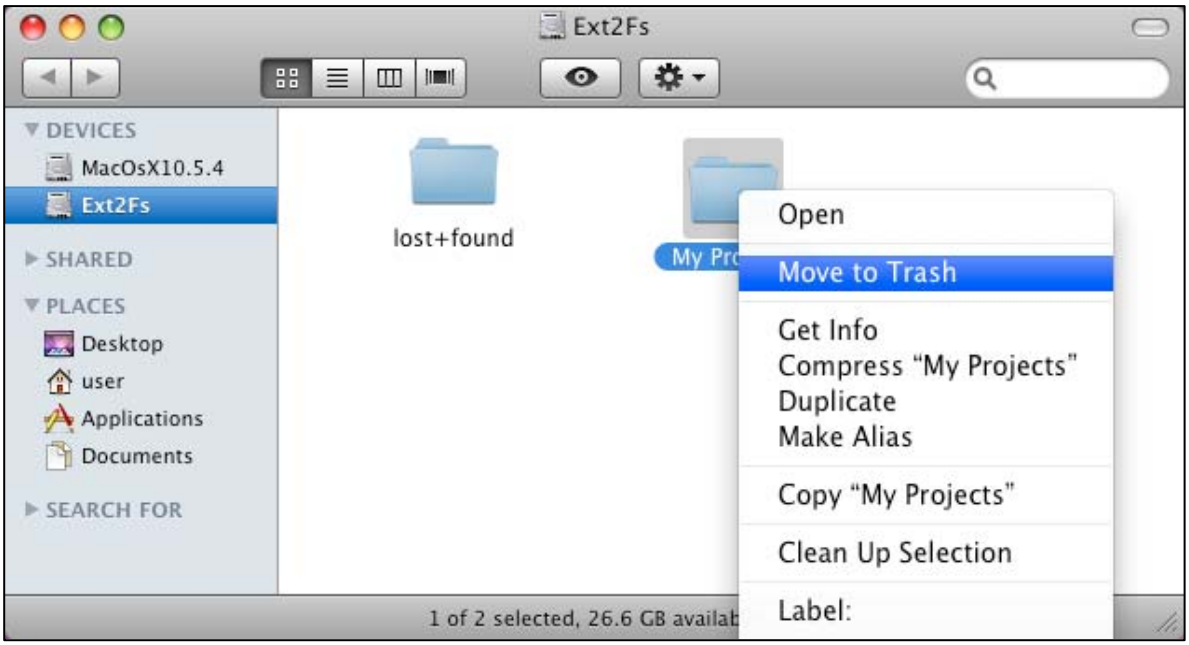
- Transfer data;



- Modify data;



- Delete data;



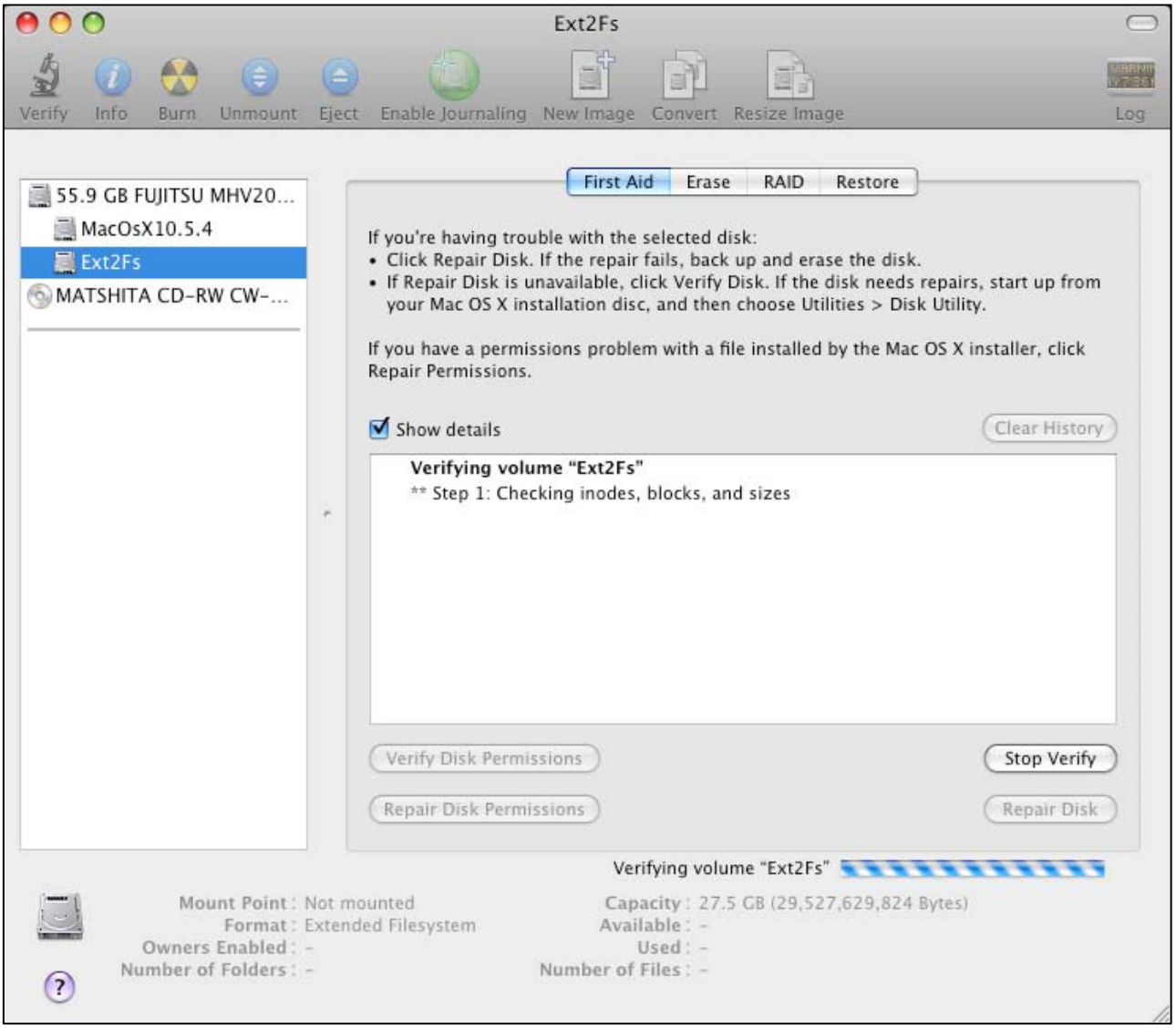
Just whatever you feel like doing.

Extra Functionality

Besides providing full read/write access to Ext2/3FS partitions under Mac OS X, our driver offers a number of additional features:

1. **Check/Repair Ext2/3FS Volumes**. During installation of our driver, the setup wizard automatically adds to Mac OS X Disk Utility the possibility to check integrity and fix errors on any type of Ext2/3 FS. To do that, please follow the steps below:

   - Launch Disk Utility: *Applications* > *Utilities* > *Disk Utility*;
   - Select an Ext2/3FS 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:

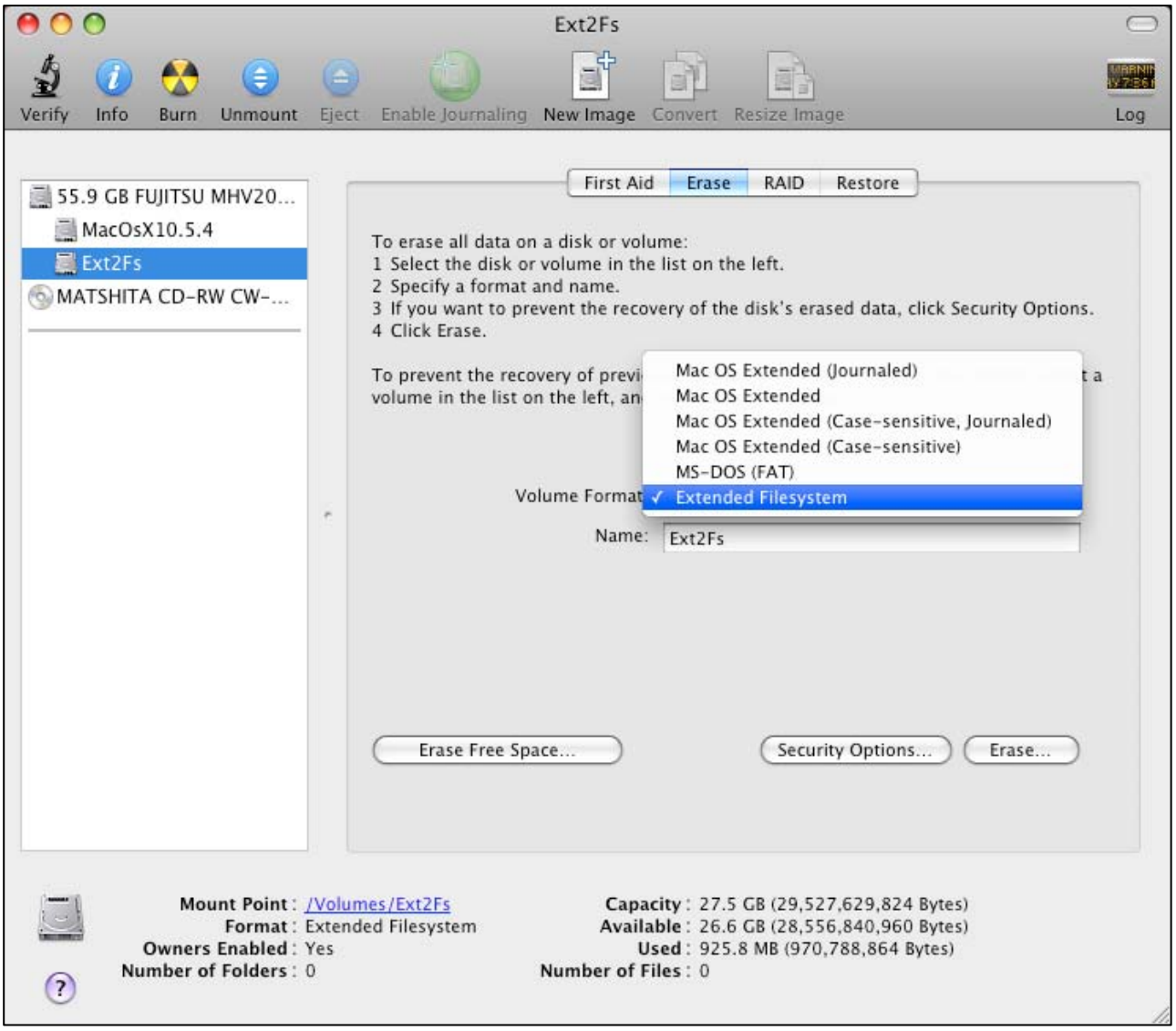
- Launch the command line: *Applications* > *Utilities* > *Terminal*;
- Type in **fsck_ufsd_ExtFS** to get help.

```
MacOsX10-5-4-Intel:~ user$ fsck_ufsd_ExtFS
fsck_ufsd_ExtFS (Compiled on Oct  2 2008 17:14:26)
Usage: fsck_ufsd_ExtFS (-n | -y) ...
       fsck_ufsd_ExtFS -n device - verify disk, but don't repair
       fsck_ufsd_ExtFS -y device - repair disk
```

Use **fsck_ufsd_ExtFS –n device** to check disk integrity;
Use **fsck_ufsd_ExtFS –y device** to fix disk errors

2. **Format Ext2/3FS Volumes**. During installation of our driver, the setup wizard automatically adds to Mac OS X Disk Utility (under Leopard only) the possibility to format Ext2/3FS volumes as well:

   - Launch Disk Utility: *Applications* > *Utilities* > *Disk Utility*;
   - Select a partition you need to format to Ext2/3FS from the list of available partitions on the left;
   - Click on the **Erase** tab at the top of the window;
   - Select **Extended 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 format Ext2/3FS volumes from the command line. To do that, please follow the steps below:

- Launch the command line: *Applications* > *Utilities* > *Terminal*;
- Type in **diskutil** to get help.

```
MacOsX10-5-4-Intel:~ user$ diskutil
Disk Utility Tool
Utility to manage local disks and volumes.
Most options require root access to the device

Usage:  diskutil <verb> <options>
     <verb> is one of the following:
     list                   (List the partitions of a disk)
     info[rmation]          (Get information on a specific disk or partition)
     listRAID               (List RAID-sets and members)

     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)

     rename[Volume]         (Rename a volume)

     verifyVolume           (Verify the file system data structure of a volume)
     repairVolume           (Repair the file system data structure of a volume)
     verifyDisk             (Synonym for verifyVolume)
     repairDisk             (Synonym for repairVolume)

     verifyPermissions      (Verify the permissions of a volume)
     repairPermissions      (Repair the permissions of a volume)
     repairOS9Permissions   (Repair the permissions for the currently-selected
                                 Classic boot volume)

     eraseDisk              (Erase an existing disk, removing all volumes)
     eraseVolume            (Erase an existing volume)
```

Use **diskutil eraseVolume UFSD_EXTFS "Disk Label" device** to format the required partition to Ext2FS.

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

The command-line utility, as well as the plug-in for the Disk Utility can create a partition with Ext2 file system only.

Mac OS X Tiger 10.4.11 supports the command-line utility only.

Typical Application Cases

You might face various situations where Paragon Ext2/3FS for Mac OS X will be the most preferable way out. Let’s just consider a little closer five of them.

1. You’ve got at the disposal a dual-boot system of Mac OS X and Linux and it will be really convenient to get a full-fledged access (read/write) to Linux Ext2/3FS partitions under Mac OS X. To tackle the issue, please follow the steps below:

   - Start up your Mac OS X;
   - Install Paragon Ext2/3FS for Mac OS X;
   - Reboot you computer into Mac OS X once again;
   - Enjoy Ext2/3FS under Mac OS X.

2. You need to transfer data (files over 4GB in size) from your Linux-based computer to Mac 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 Linux PC;
   - Copy the data to any external hard driver with ext2 or ext3 partition;
   - Start up your Mac OS X;
   - Install Paragon Ext2/3FS for Mac OS X;
   - Reboot you computer into Mac OS X once again;
   - Connect the external drive to Mac;
   - Copy files you need from the external hard driver to your Mac.

3. You need to read or modify files stored on an external or internal (local) hard drive with Linux extended file system from your Mac PC. To tackle the issue, please follow the steps below:

   - Start up your Mac OS X;
   - Install Paragon Ext2/3FS for Mac OS X;
   - Connect an external drive with Ext2 or Ext3 FS partitions to Mac PC (if any);
   - Reboot you computer into Mac OS X once again;
   - Read or modify files stored on the hard disk from your Mac PC.

4. You need to extend the set of used file systems to store your data on the most popular file systems of the most popular operating systems and don't worry where to save your data:

   - Start up your Mac OS X;
   - Install Paragon Ext2/3FS for Mac OS X;
   - Reboot you computer into Mac OS X once again;
   - Enjoy Ext2/3FS under Mac OS X.

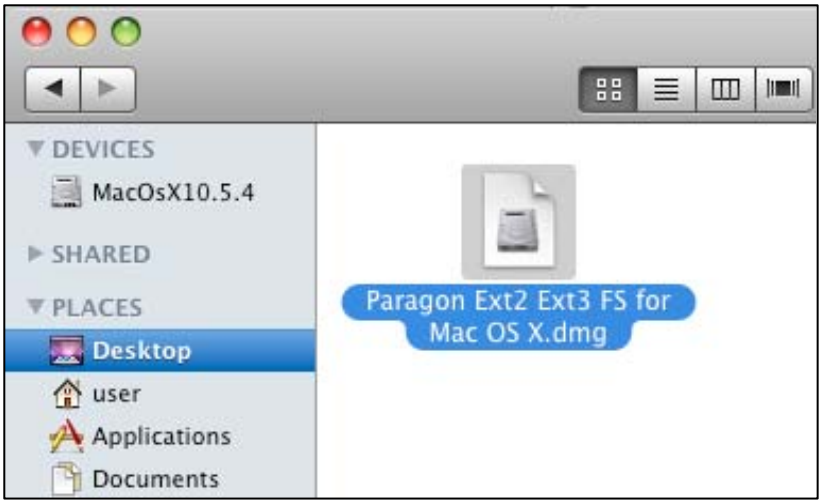
5. As a professional using Apple to produce video you need to use the cheapest methods to distribute Digital Cinema Package (DCP) materials. Just install the driver that enables the ability to read from and write to (and even format) Ext2/3 formatted drive. Ext2/3FS is the file system format used on USB 2.0 DCP distribution hard drives preferred by the Digital Cinema distribution facilities:

   - Start up your Mac OS X;
   - Install Paragon Ext2/3FS for Mac OS X;
   - Connect an external drive with Ext2 or Ext3 FS partitions to Mac PC;
   - Reboot you computer into Mac OS X once again;
   - Write to or read DCP materials stored on the hard disk from your Mac PC.

Deinstalling the Driver

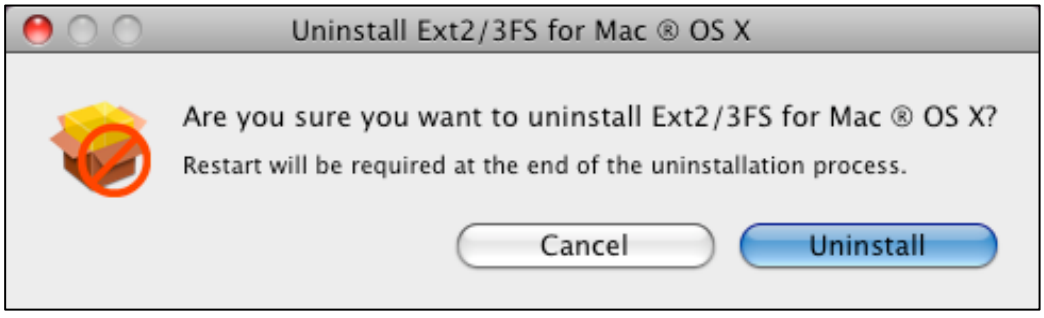
To deinstall Paragon Ext2/3FS for Mac OS X™, simply do the following:

1. Open the installation package by clicking on the *supplied DMG disk image* (in our case it is *Paragon Ext2 Ext3 FS for Mac OS X.dmg*).



2. After the installation package is extracted click *Uninstall Ext2FS for Mac® OS X* to deinstall the driver.

3. The setup wizard will ask confirmation before removing the driver from the system, so please click the *Uninstall* button.



4. On the next page enter the root user password (if any) to accomplish the operation.

5. Click *OK* to finish the deinstallation process.

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.

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.

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, 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).

Ext2 File System is a file system for the Linux OS. It was initially designed as a replacement for the extended file system (ext). Although ext2 is not a journaling file system, its successor, **Ext3 FS**, provides journaling and is almost completely compatible with ext2.

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 Mac, 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.