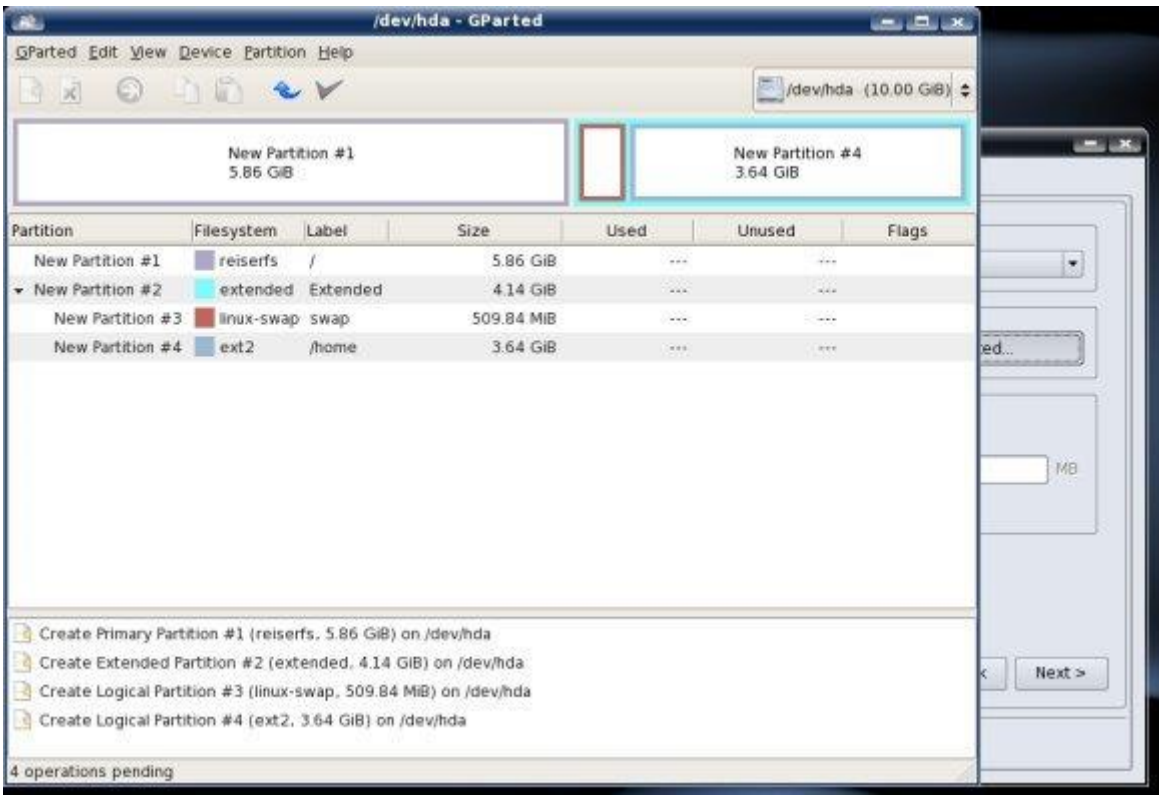
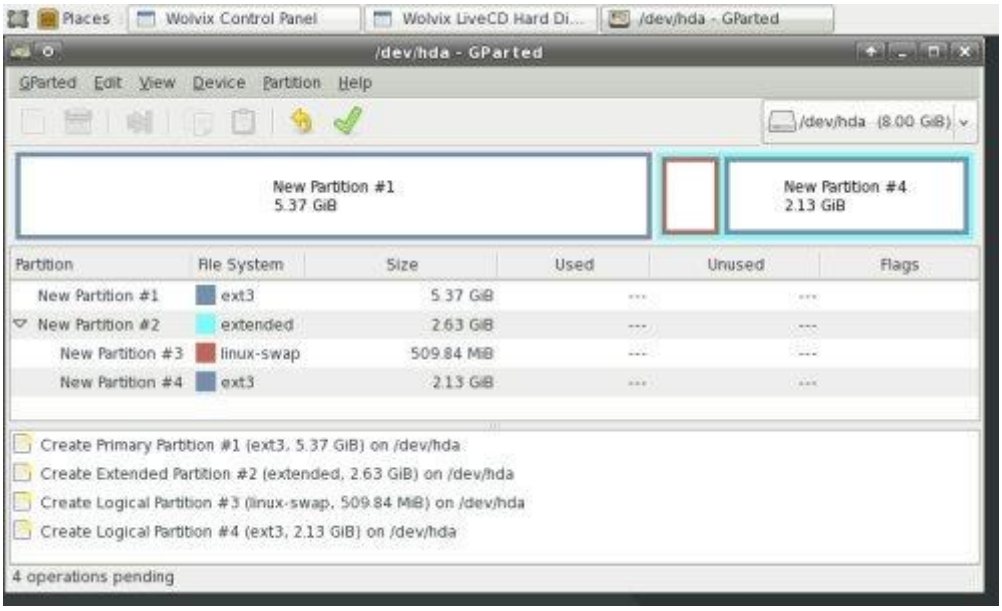
GParted - Introduction

GParted is one of the most popular partitioning software. It comes included with most modern Linux distributions. It also ships in a large number of dedicated rescue & recovery distributions. To name a few distributions that come with GParted: Ubuntu, Linux Mint, PCLinuxOS, Wolvix, and others. You can read tutorials and reviews for these in my Software section. GParted is a graphical software, so it is well suited for modern use, including less knowledgeable users. Here's what GParted looks like:



Or like this:



Basically, the decorations may vary, but it will be same software underneath. Do not worry about what you see, either. We will soon learn in great detail how to interpret GParted results.

How to use GParted?

GParted can be used in two ways: while booted in an operating system or from a live CD. The recommended way of using GParted is from the live environment. Why, you ask? This is because partitioning operations need to be done on hard disks when they are not in use, to avoid data corruption. Partitions that are in use cannot be modified. They are locked by the operating system that uses them.

In technical terms, partitioning can be done only when the hard disk partitions are unmounted. If disks are empty and contain no operating system whatsoever, it does not matter anyway, because the only way you can access the system is from a live environment.

As a rule of thumb, it is always the best idea to handle partitioning from live CD environment. Not surprisingly, almost every single modern Linux distro ships as a bootable live CD. Not only does this allow you to get a first impression of the operating system and check hardware compatibility before deciding whether to commit the distro to hard disk, it also allows you to perform maintenance operations from the live environment.

Nevertheless, you can still use partitioning software against NON-system partition, that is partitions that the operating system is not

installed on, and which, on demand can be unmounted. This is true for Windows and Linux alike. And just about any operating system in the world. I may have confused you, so let's recap the uses of partitioning software:

- Partitioning software cannot be used on partitions that are used (mounted) by an operating system.
- Partitioning software can be used on system partitions only when booted in a live CD environment.
- Partitioning software can be used on data partitions or empty, non-system disks while booted in either local, installed operating systems or from a live CD environment.

Practical examples

Example 1: Let's say you have Windows installed on drive C: and you have data (movies) on drive D:. Drive D: is formatted with FAT32 and you would like to convert it to NTFS. You can do this without booting into a live CD session. Since the system uses C: drive, there is no problem unmounting drive D: and changing it as necessary.

Example 2: Let's say you want to resize the same drive C: as above. You cannot do that while booted in Windows, because the system uses the drive. You will have to boot into a live CD environment, Linux or Windows-based and perform the partitioning changes from there.

Example 3: You are dual booting Windows and Linux. Currently, you are booted into your Linux. You wish to change your Windows drive C:. Even though drive C: is the Windows system partition, when you're booted in Linux, it is not active. Therefore, it is just like the data partition we worked on in example 1. This is very similar to working from live environment. However, in a live environment, you could also choose to work on the Linux root (/) partition as well, whereas when booted in the Linux operating system residing on the disk, you can only work on other, non-system partitions.

Example 4: The same dual-boot system, only this time you're in Windows. In general, Windows cannot see Linux partitions, although there is software that can overcome this limitation. Assuming that you can see the Linux partitions, you can change their partitioning layout, including the Linux root partition, because it is currently not in use.

I hope these examples help clarify the situation somewhat. The things are quite simple. Partitions used by the system cannot be edited as long as they are used. Data partitions can be edited in vivo. Whatever you do, it is prudent to think twice and backup any critical data before making changes. Now, let's talk about the notation.

Partitioning dictionary

Let's now try to understand how GParted sees hard disks and marks them. If you're a Windows user or have just started with Linux, the notation may be unfamiliar to you. Not to worry, we will have it explained to the latest detail:

Windows uses drive letters

In Windows, users are accustomed to referring to their partitions as drives, like C:, D: etc. This is somewhat misleading, because these letters in fact refer to partitions rather than actual drives. If you have a single drive (only C:), then the term partition and drive are synonymous in this case, because a single partition spans the entire size of the hard disk.

However, if you have more than a single drive letter in your My Computer, this means you have several partitions (and maybe even several physical hard disk drives). It is important to remember this.

Linux notation is different

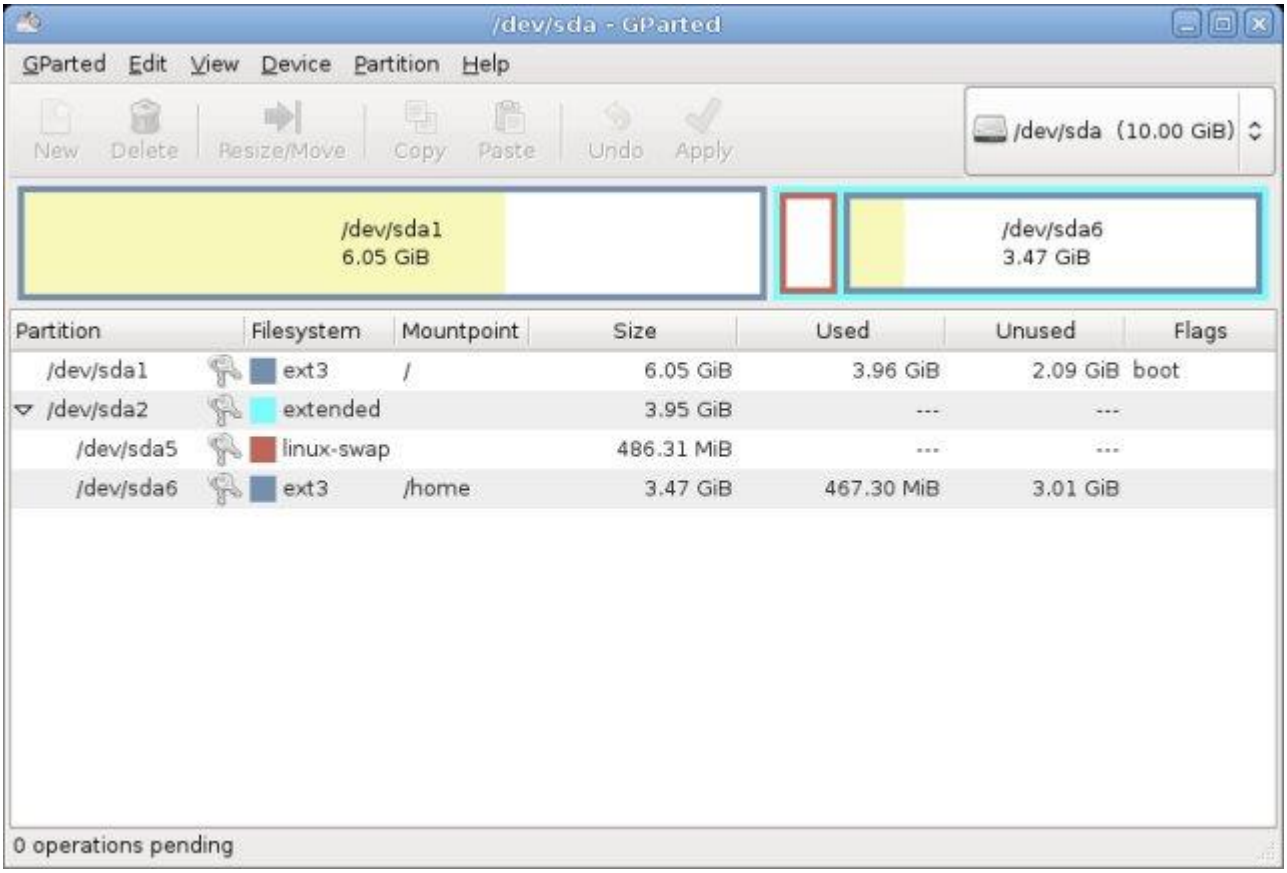
I have explaining the Linux disk notation in many other articles, but for the completeness' sake, I will do it one more time.

Hard drives in Linux are marked by three letters:

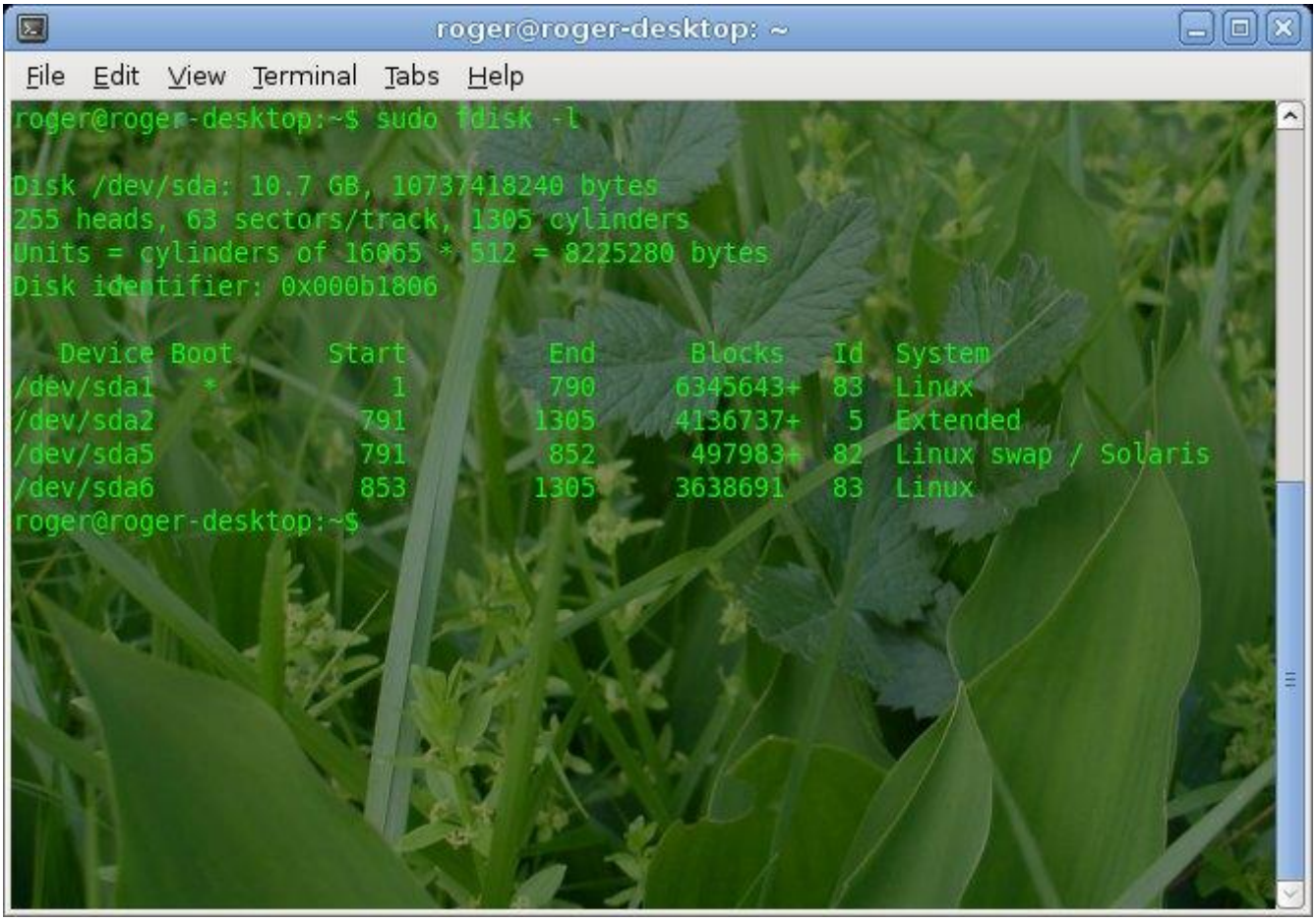
- IDE drives are marked hdX, where X is one of the four letters a-d. hda is the primary master, hdb is the primary slave, hdc is the secondary master, and hdd is the secondary slave.
- SCSI / SATA drives are marked by sdX, where X is any which letter.

Partitions are marked by a number after any three letter combination:

For example, sdb1 is the first partition on the second SCSI / SATA drive. s - SCSI/SATA, d - drive, b - second drive, 1 - first partition. hdc3 is the third partition on on the IDE secondary master. Here's a screenshot of the partitioning layout on one of my machines:



And here's what it looks like in text form:



What do we see here?

Let's take a look at the first picture. Don't worry about using GParted, we'll get to it. What I want you to focus on are the color ribbon and the partition notations. As you can see, all partitions are marked with sdaX. This means we have a SCSI/SATA disk at hand. The numbers indicate the partition order. The second image shows the same information in text form.

There's more information to be had from this example, but we will talk about it later on. One thing I want to focus on is the sequence of numbers. You may have noticed we have sda1, sda2 and then sda5, but no sda3 or sda4 in between. For those unversed in the rules of partitioning, this can be confusing. This is why it is important to understand partition types.

Partition types

Partitions also have another important element: they can be primary or logical. Primary partitions are just that, a total of four of which can exist on any one hard disk. To reiterate, there can be

only up to four primary partitions on a hard disk. If you have three hard disks on your machine, each one can still hold up to four primary partitions.

Logical partitions have been created to overcome the inherent numerical limitation of primary partitions. One of the primary partitions can be created as the Extended partition. This partition acts as a container for logical partitions. The total number of logical partitions you can create (and use) depends on the disk type and the operating system you're using. For all practical purposes, the number is beyond the needs of any user.

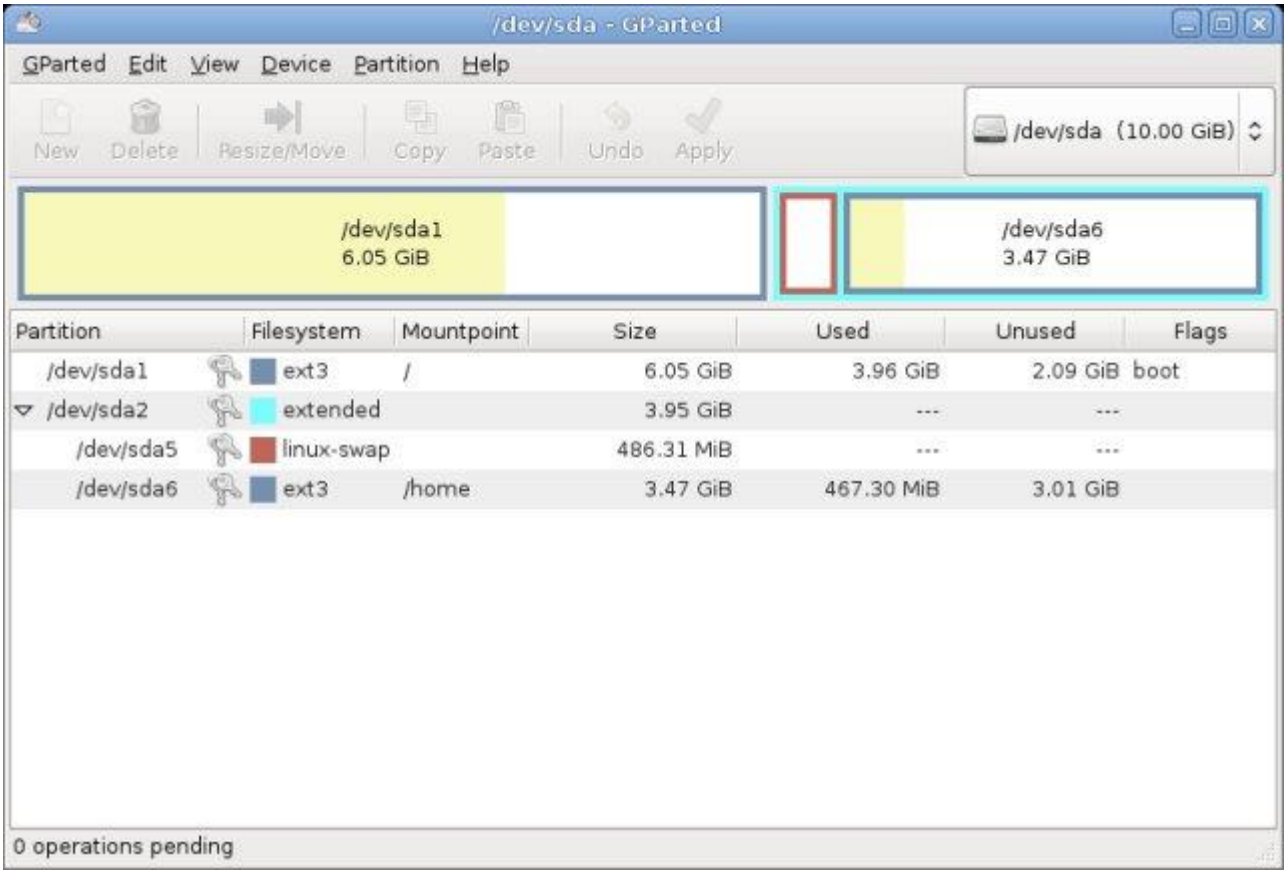
As you can see, we have up to four primary partitions and a de-facto unlimited number of logical ones. Notation-wise, the primary partitions will always be the first four, logical partitions will start with number 5.

Therefore, when someone says sda5, it necessarily means we're talking about a logical partition. Similarly, any partition with a number equal or higher than 5 will always be a logical partition.

Important thing to pay attention to!

It is also important to understand that although sda5 is the fifth partition per se, there do not have to be four primary partitions on the system. There will be either one, the extended partition itself, which is the bare minimum, or more (up to four). Therefore, notation-wise, logical partitions begin with number 5. Physically, sda5 is the FIRST logical partition. Physically, it can be fifth, but it can also be anywhere between first or fifth.

Please remember this. This is very important! Why, you ask? Because if you use a visual tool for partitioning, like GParted, do NOT count the partitions visually!



We have seen this layout before; it was the sample layout we reviewed earlier.

It's a very good example, as the matter of fact. This is because, in this case, sda5 is the second partition on the system! sda1 is the primary partition that holds the root filesystem of the specific Linux operating system installed on the machine. sda2 is the extended partition, which contains sda5. So if we count from left to right, sda1 is our first partition, sda2 is the extended partition, but it is a container for all logical partitions, so we cannot include it in our visual count! Therefore, sda5 is the second rectangle on the color ribbon!

I implore you to pay attention to this subtle fact! Never, ever blindly count partitions just based on their numbers. Always triple check that you're working on the right hard disk, on the right partition. And always backup data before making changes. Never edit partitions without a proven, tested recovery plan in place!

Exceptions

All of the examples mentioned above relate to single disk configurations. They do not take into account Redundant Arrays of

Inexpensive Disks (RAID) or Logical Volume Manager (LVM). In this tutorial, we will not go into the management of these solutions too deeply, because they are inherently more complex.

However, I won't leave you without a solution - we will talk about RAID and LVM in a separate tutorial. For now, please accept my apologies and try to get by with just a brief introduction on "cross-disk" solutions.

RAID

RAID stands for Redundant Array of Inexpensive Disks. This is a solution where several physical hard disks (two or more) are governed by a unit called RAID controller, which turns them into a single, cohesive data storage block.

An example of a RAID configuration would be to take two hard disks, each 80GB in size, and RAID them into a single unit 160GB in size. Another example of RAID would be to take these two disks and write data to each, creating two identical copies of everything.

RAID controllers can be implemented in hardware, which makes the RAID completely transparent to the operating systems running on top of these disks, or it can be implemented in software, which is the case we are interested in.

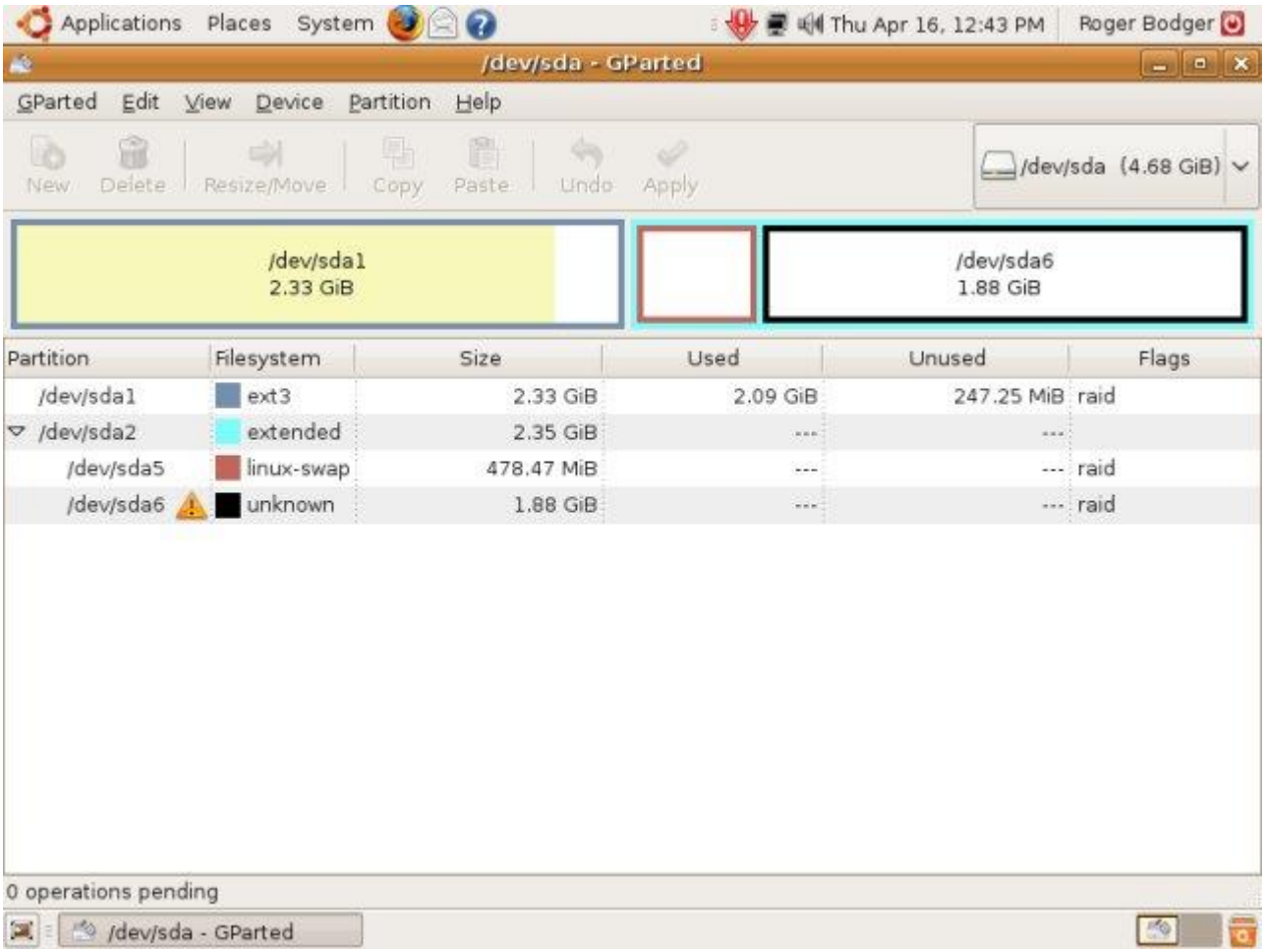
There are quite a few RAID schemes, known by numbers and names, such as RAID 0, RAID 1, RAID 5, and others. You may also have heard of RAID striping and mirroring, which are names for RAID 0 and RAID 1, respectively. If you're interested, Wikipedia has a very nice article on the subject.

RAID is interesting, because we can no longer use physical disks and partitions as units of measure. Instead, we have a higher level of hierarchy instead, defining how the devices should be called. If you remember this important fact when setting up RAID, it will be much easier for you to understand the concept.

RAID devices in Linux are denoted by letters md followed by a single letter. For instance, md0, md1, md6, these are valid examples for RAID devices. There is no strict relation whatsoever between md devices and physical hard disks and their partitions.

For example, md0 could be a RAID 0 device, spanning physical sda1 and sdb1 partitions. It could also be a RAID 1 device, spanning physical sda1 and sdb2 partitions. In both cases, the device name

would remain the same, while the physical topography underneath would be different. Here's an example:

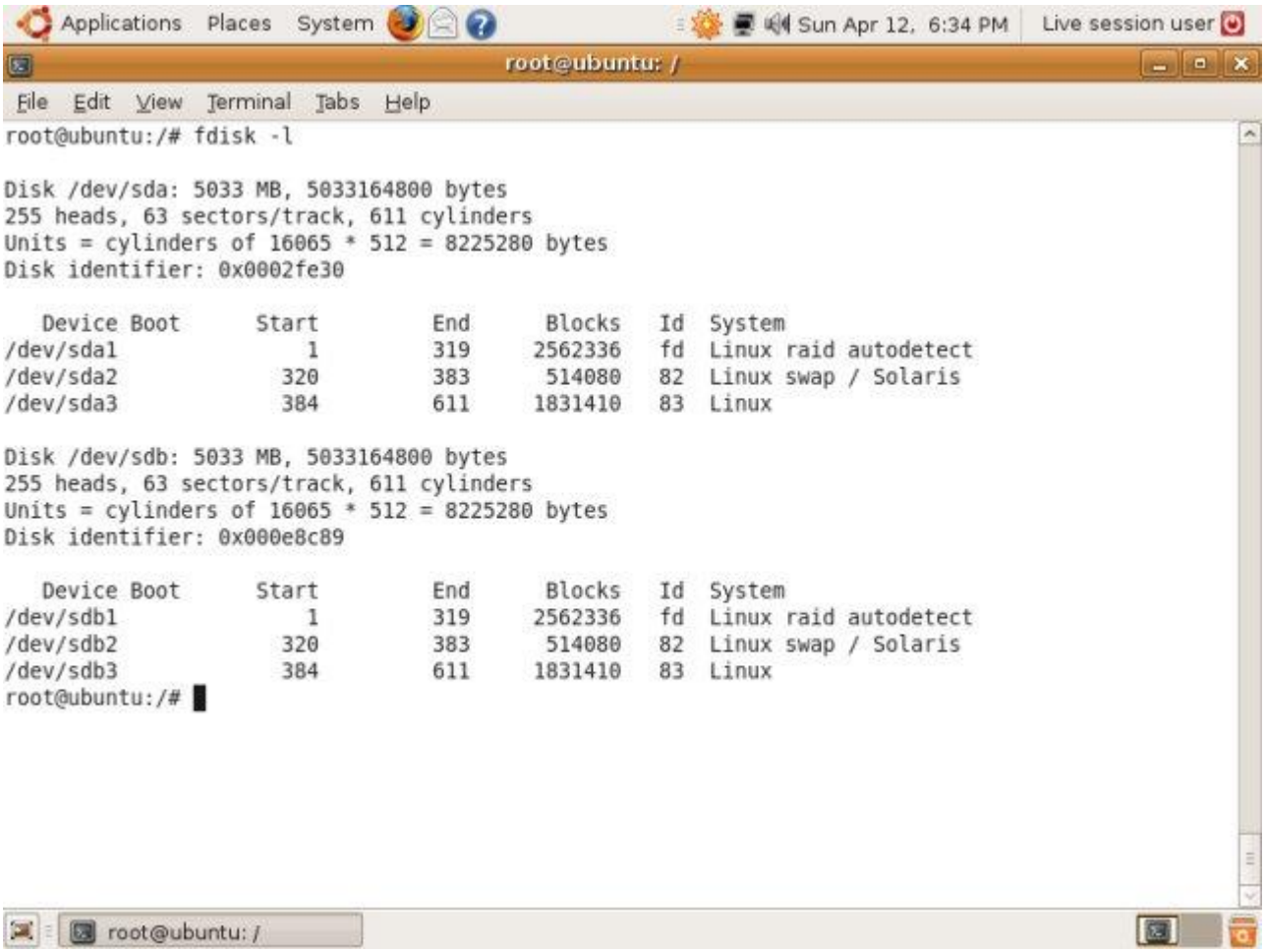


We can see that GParted does not display RAID (md) devices, but it does identify them. The RAID partitions are marked with the raid flag (more about those later).

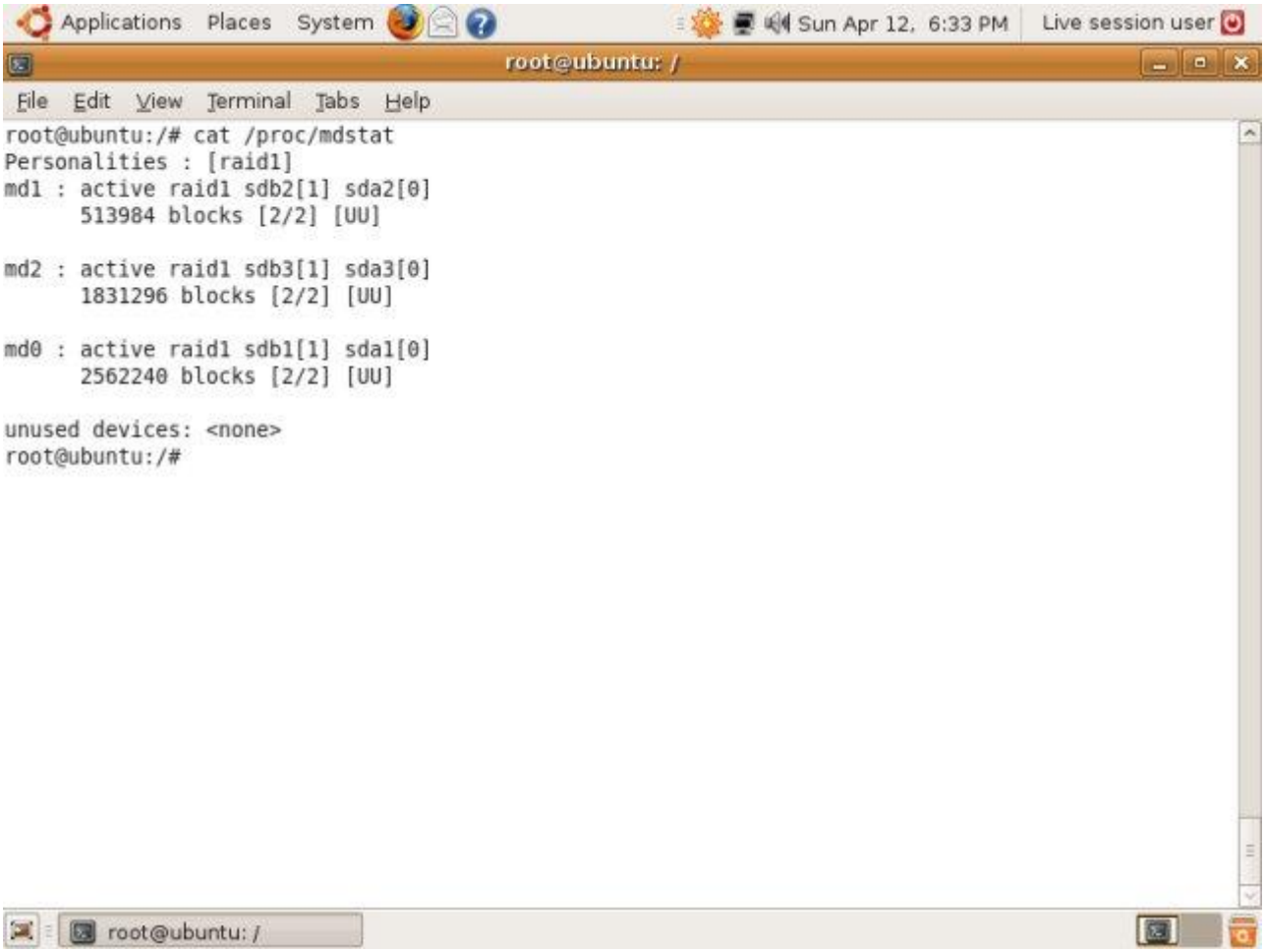
One thing worth noting is that on sda6, GParted is unable to recognize the filesystem. This is because the RAID configured on that partition is such that sda6 does not provide all the information on the filesystem used, preventing GParted from properly classifying the partition. We're using RAID 0, known as striping on sda6 (and sdb6), which converts these two partitions into a single device. Therefore, each partition contains only half the information, hence deciding on what data is contained cannot be deducted from just looking at a single partition in the pair.

This should not bother you, as it's perfectly all right. However, you should remember that this can happen - and know what it means. We will talk about this in great detail in a dedicated tutorial. Another

example, this time using the command-line utility fdisk, here's what a RAID layout might look like:



Notice the Linux raid autodetect filesystem. This means that partitions sda1 and sdb1 might be used in a RAID configuration. What and how exactly, we will focus on that in a separate article. Another useful command for checking the status/presence of RAID devices on the system is the /proc/mdstat command:



For example, on the system above, we have three RAID devices, md0-2, each containing a pair of devices in a Mirror configuration, also known as RAID 1. Again, do not get flustered if you find this short sub-section too technical. A separate tutorial will explain RAID in detail.

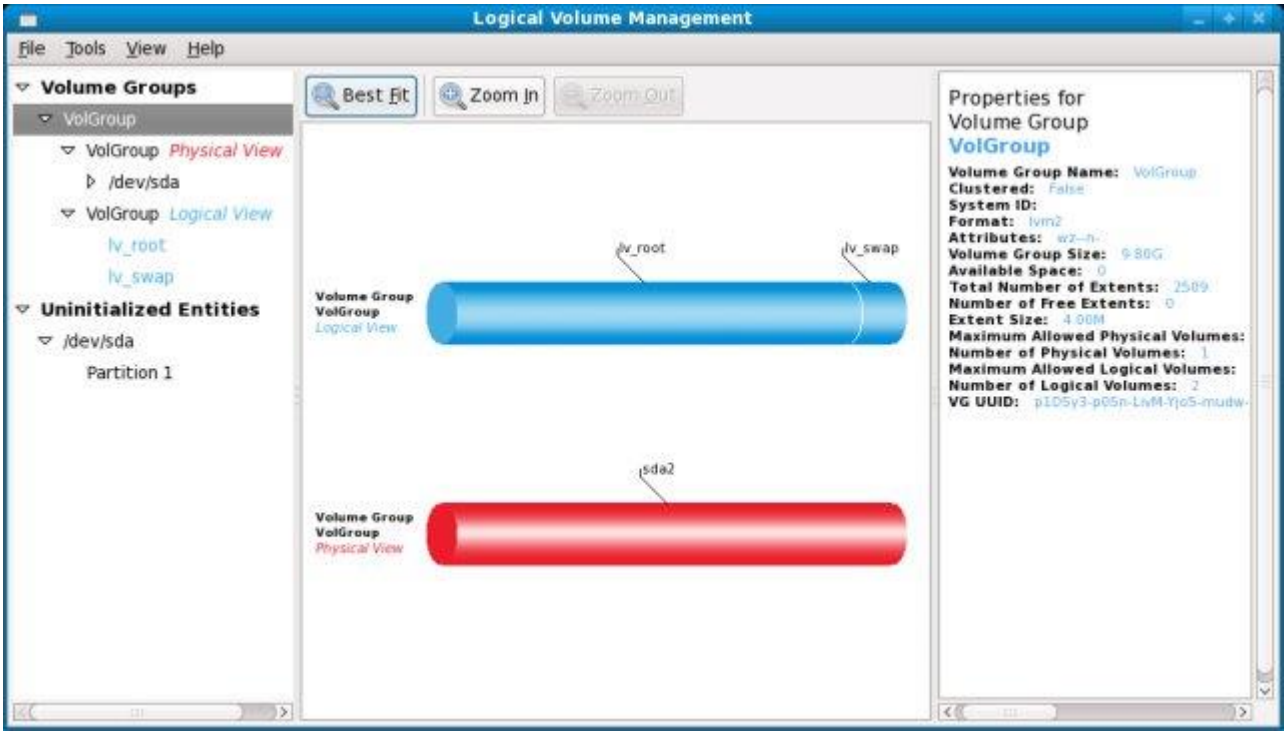
While GParted can identify RAID devices, it cannot create or fail them. To this end, you will have to use other utilities. For now, though, it is important that you understand what RAID is what it looks like, so you can properly identify the layout and change it accordingly if needed.

LVM

LVM is somewhat similar to RAID. However, it is different in being able to allocate any which bit of hard disk space into logical sub-groups, known as Volume Groups, each containing one or more Logical Volumes.

The easiest way to visualize LVM is as a space-restriction-free partitioning on top of an existing physical disk layout. In order

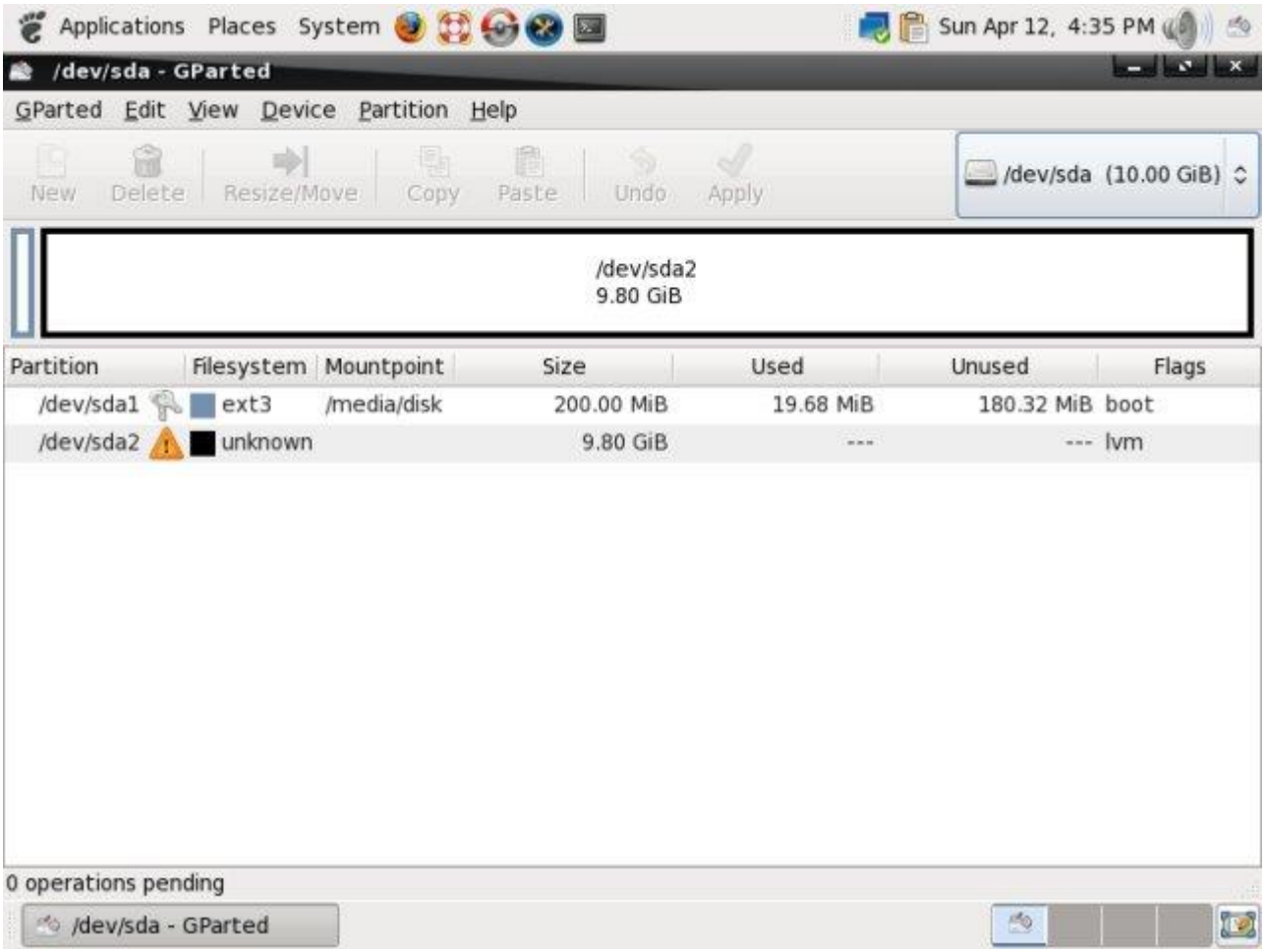
words, no matter how many disks or partitions you have, you can ignore them and use a higher order of hierarchy known as logical volumes, managed by LVM.



Above, you can see an example from the default Fedora 11 installation. Please take a look at the Physical View and Logical View separately. Let's try to understand what we see. The Physical View tells us our Volume Group sits on sda2, a primary partition. What we do not see is sda1, which in fact is a small /boot partition used to boot the system.

Logical View shows us what is contained inside each Volume Group, ignoring the actual physical devices. In our case, we have a single Volume Group, which contains two Logical Volumes, root and swap. For all practical purposes, we do not know or care what configuration exists underneath.

Our LVM takes 90% of hard disk space, but it could also take anywhere between 1% and 100% of any which hard disk and partition that physically exist. For example, if we had two hard disks on the system, LVM could take 54% of the first disk and 90% of the second. Furthermore, this arrangement could span any number of partitions. Here's what the same layout above looks like in GParted:



We have a small EXT3 partition that is used to boot the operating system. You can tell this by the boot flag. And then, we have an unknown filesystem on sda2, which is our LVM; again notice the flag. The filesystem is unknown because the partition may contain several Groups, each with several Volumes, each with a different filesystem. So the question is, which of the possible choices should GParted choose.

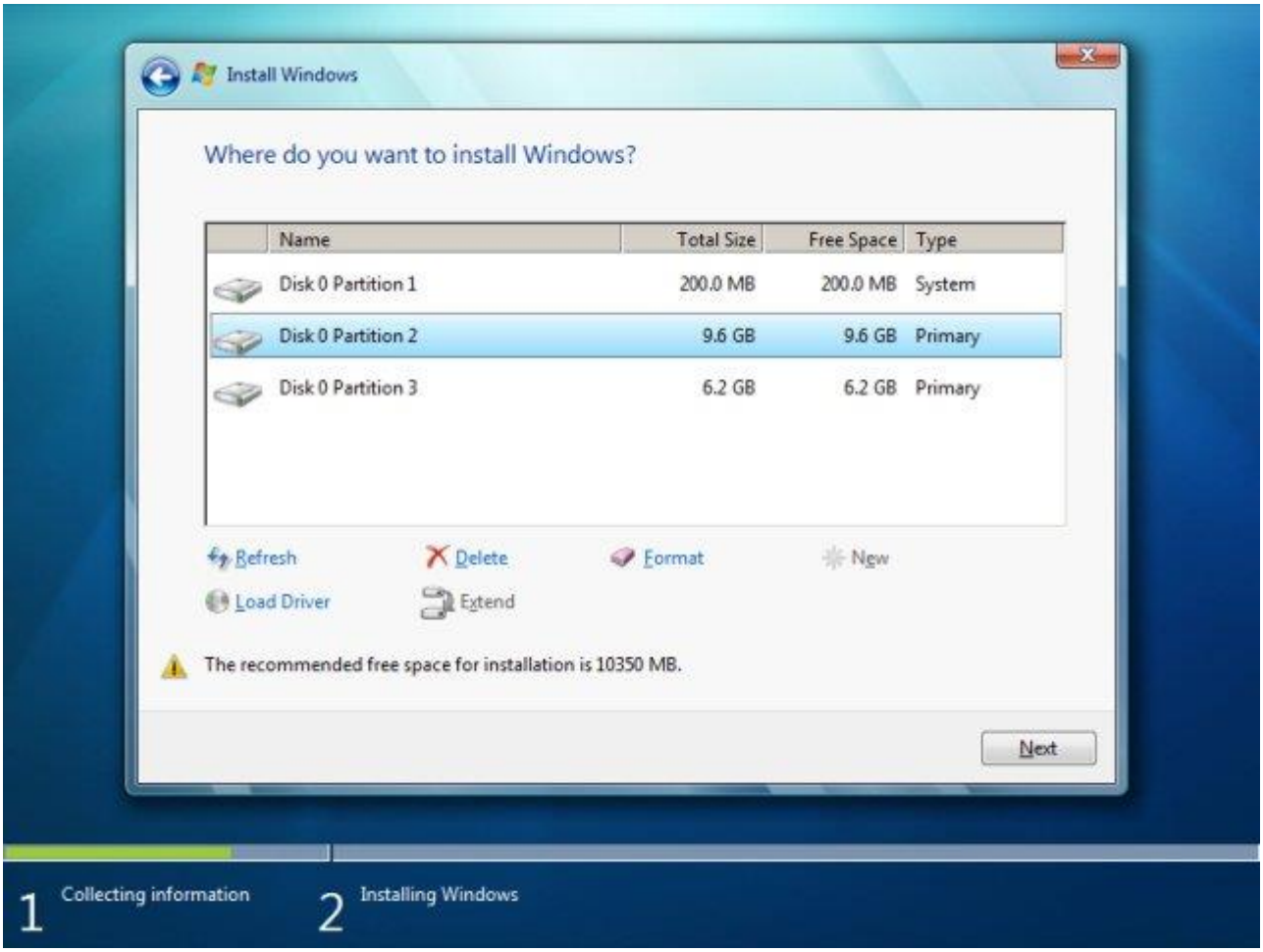
LVM introduces a high degree of freedom and flexibility, allowing users to span physical limitations of individual partitions and/or drives. LVM uses a tricky notation. We won't discuss it in detail here. However, you should be aware of the facts. Like RAID, LVM devices have a special flag denoting them. Remember this when we review different types of partition flags later.

What to install where?

The limitation of only four primary partitions is critical when considering a future setup. It definitely forces us to carefully think through our installation needs and requirements. To make things

worse, some operating systems REQUIRE that they be installed on primary partitions.

Windows is a good example. To have Windows (XP, Windows 7, etc) function properly, they must be installed on primary partitions. To make it even worse, the first primary partition. Take a look at my Windows 7 review, including the partition. Windows 7 ungenerously grabbed no less than three primary partitions for itself!



BSD operating system flavors also like primary partitions. So does Solaris. Take this into consideration when planning multi-boot setups. Linux is far more flexible and can be installed on any partition. Because of this, it is always a good idea to use logical partitions for Linux, when you can, so you do not waste the precious few primary partitions.

General partitioning recommendations

OK, here's a brief summary on what we have learned so far:

- Windows and Linux uses different notation. Windows marks partitions with letters and calls them drives - not necessarily corresponding to *physical* drives. Linux uses three-letter and one-digit notation, beginning with h for IDE and s for SCSI/SATA drives. The third letter marks drive number, as seen by BIOS, with a-d for primary/secondary master/slave for IDE drives and unlimited numbers for SCSI/SATA drives, based on the controller limitations. The digit refers to partition numbers.
- Numbers 1-4 are used to denominate primary partitions, one of which can be an extended partition, a container for logical partitions.
- Logical partitions will always be marked wit number 5 and higher. Physically, logical partitions can be less than their actual number, depending on the number of primary partitions that exist on the system.
- Partitions are counted separately for each physical hard drive as recognized by the system. The exceptions are RAID and LVM configurations.

Now, useful tips to remember when playing with partitions:

- Windows requires primary partitions.
- BSD and Solaris also require primary partitions.
- Linux does not need primary partitions and can be installed on logical ones.
- Always install operating systems that require primary partitions first.
- Carefully think through your partitioning needs and create partitions before installing operating systems. Think seven steps and three years ahead and make sure you have enough room to grow. Scalability is an important factor. Make sure your partitions are neither too small nor too large.
- Do not forget size limitations for older file systems (like FAT32).

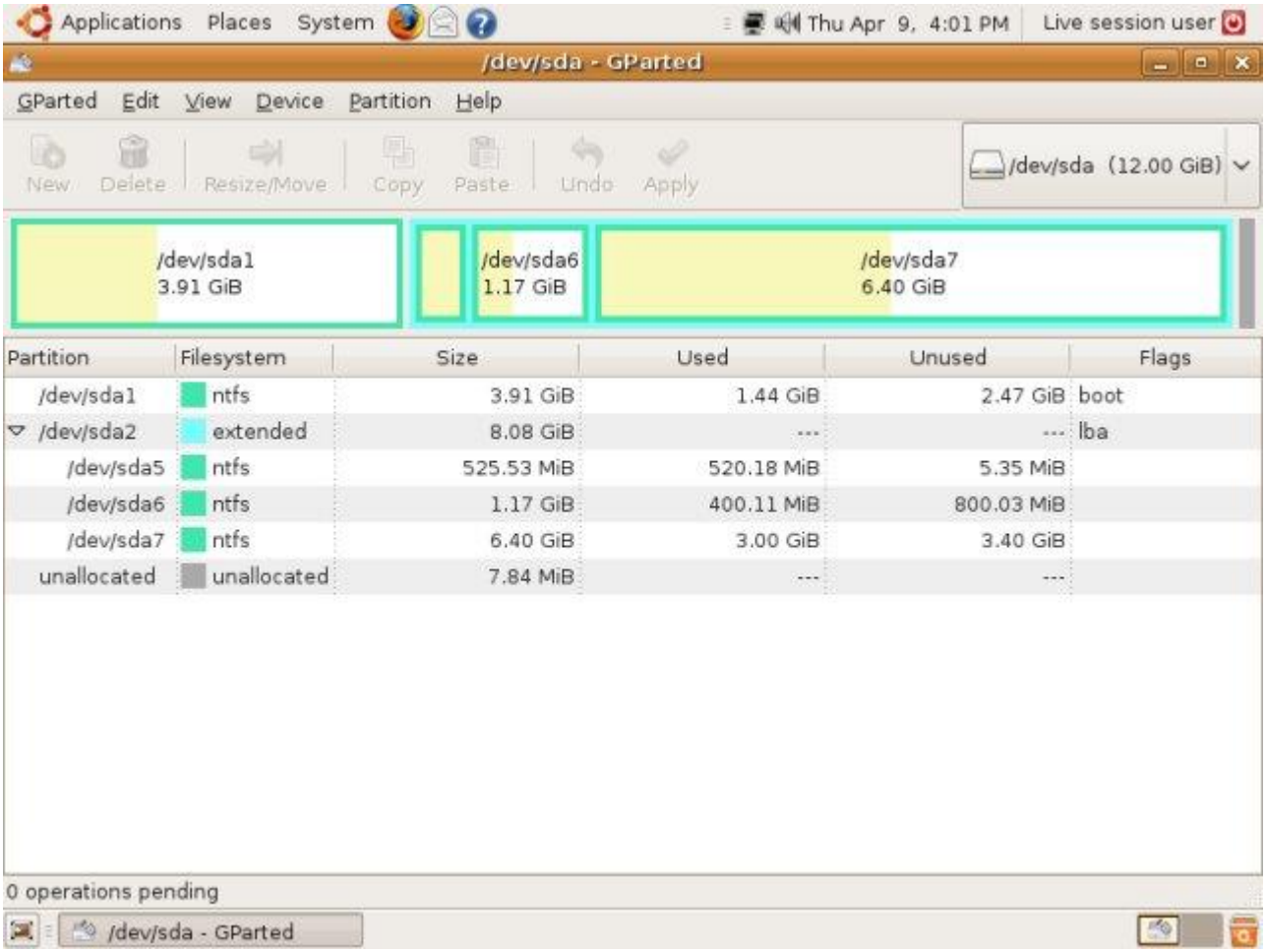
So, now we have a basic understanding of what to expect. Let's start using GParted and review real-life test cases.

Using GParted - Understanding the software

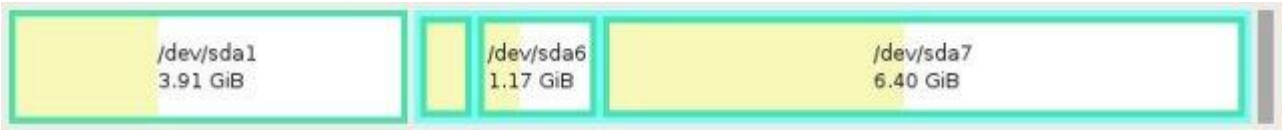
The first thing to do is to launch the application. The exact location of the utility in the menus will vary from one distro to another. For

instance, on Ubuntu, you will find GParted under System > Administration > Partition Editor.

Whether you're working in-vivo or from a live CD, you'll need administrative (root) privileges to work with partitions. Now, before we use GParted, let's make a quick look of its functions. When you launch GParted the first time, it will scan the existing devices on the machine and present a layout for each hard disk separately. It will open displaying the information for the first disk (as recognized by BIOS). Something like this:

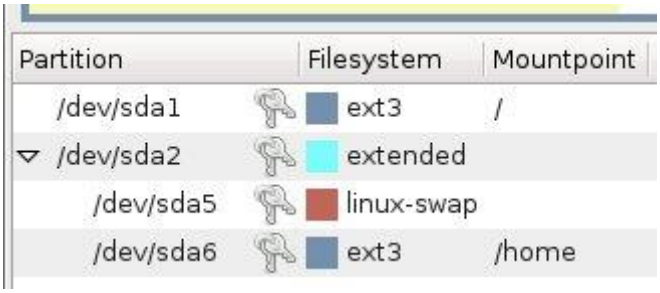


Like most GUI tools, GParted has functions displayed both as buttons and entries in the File menu. This means you can perform every tasks in two different ways. Partition layout, if it exists, is displayed on a visual ribbon, with different colors marking different partitions and their filesystems. Free hard disk space will be marked in gray. Free spaces on existing partitions will be marked in white. Partition space filled with data will be marked in yellow, with the visual fill-up bar roughly corresponding to actual percentage taken.



The same information is also shown in the table form below the color bar. The Partition column will list all existing partitions on the particular device, starting with /dev/ for device, followed by hdXY or sdXY notation, we already discussed.

The second column, Filesystem indicates the filesystem the partition uses, if any. Different filesystems are marked by different colors, so there are no mistakes. If a partition is in use by the system, there will also be a key symbol displayed near the partition, indicating it is used (mounted) and that operations cannot be performed on it.

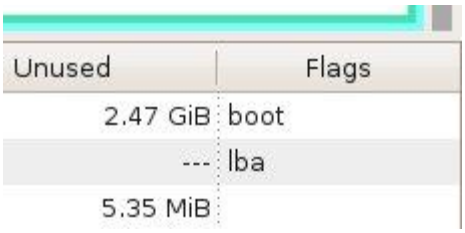


The Mountpoint refers to a directory under the root (/) where you can access the data contained on the partition. Unlike Windows, which separates drives by their letter and treats each individually, all filesystems on Linux are mounted under a single tree, aptly called root. Even if you have network shares used by the system, they are accessed the same way as local files, by changing path into one of the directories or sub-directories. Thus, for instance, if you access /home, you will see all the data that is physically written on the /dev/sda6 partition.

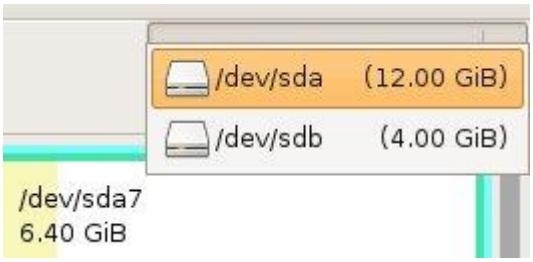
The Extended partition has no mountpoint, because it is not used directly. It's a container. swap is also special. It's similar to the Windows pagefile. swap is a piece of hard disk used by the system to swap between real and virtual memory, increasing the processing capacities on the expanse of some performance loss. As such, swap is not used manually by users; it's treated as a raw device. Read to and write from swap is done on the partition level rather than via mountpoints and human-readable filesystems.

Size, Used and Unused are all part of the same equation - partition capacity. I believe they are self-explanatory.

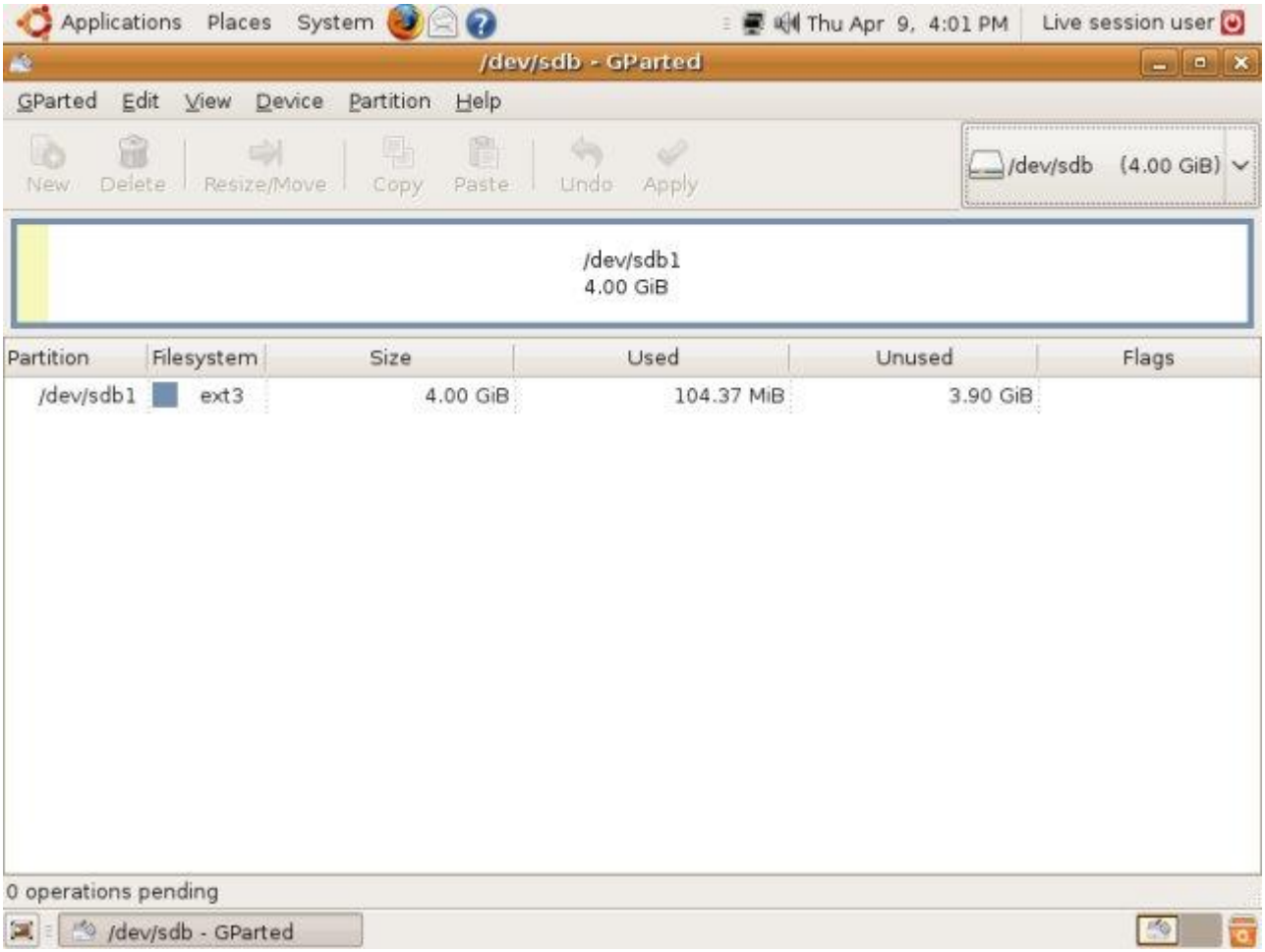
Flags are interesting. In order to be able to understand what each partition does, operating systems use flags. One of these flags is the boot flag, which tells the system, be it Windows or Linux or any other, that the particular partition marked with the boot flag is the one where the operating system should use to boot. Another useful flag is lba, which stands for Logical Block Addressing; you can read more about LBA on Wikipedia.



I've mentioned earlier that by default, GParted displays the first device only. But what if you want to work on the second hard disk? Not to worry, switching it very easy. In the right corner above the color bar, there's a drop-down button, allowing you to change visible devices.

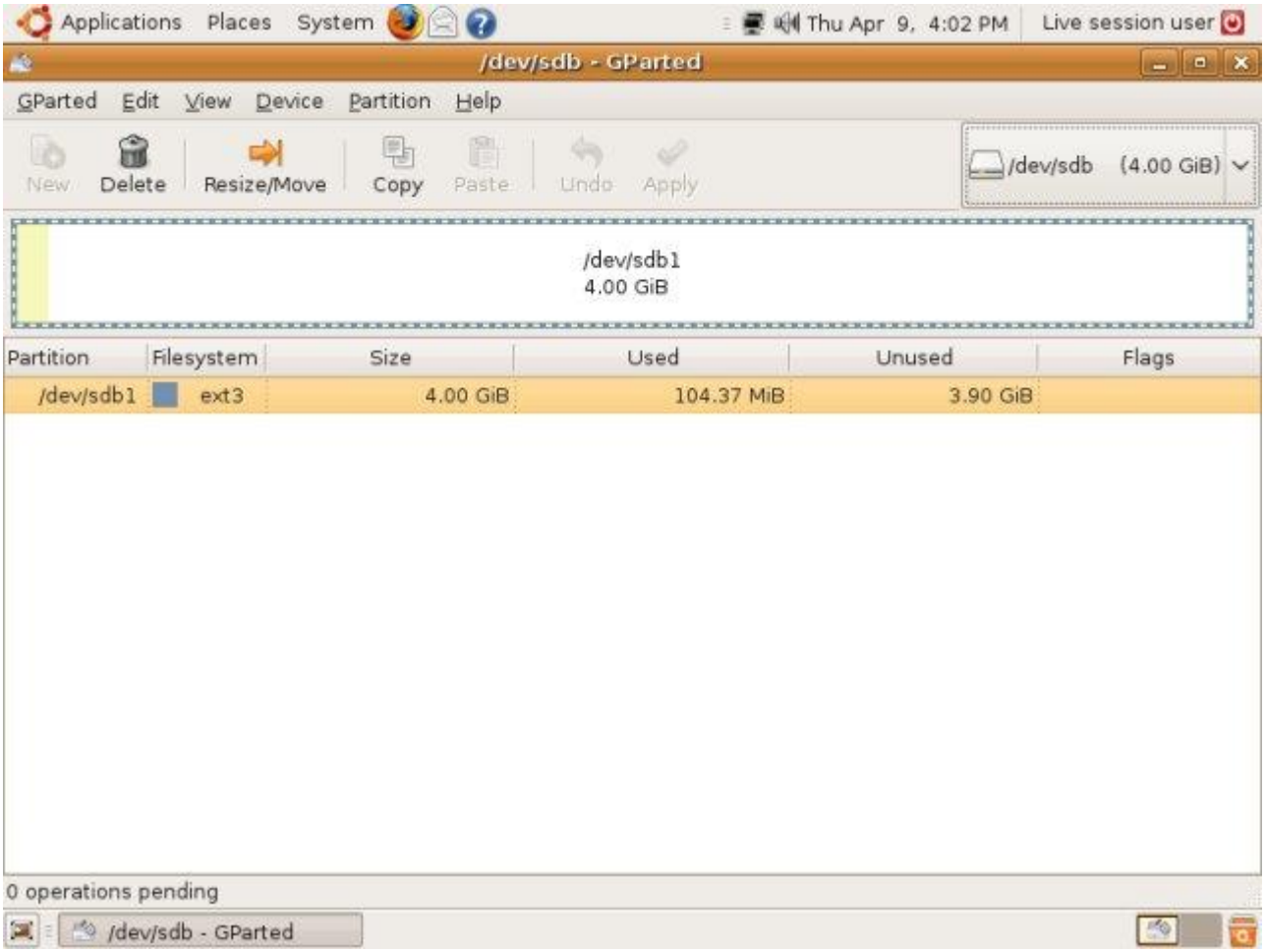


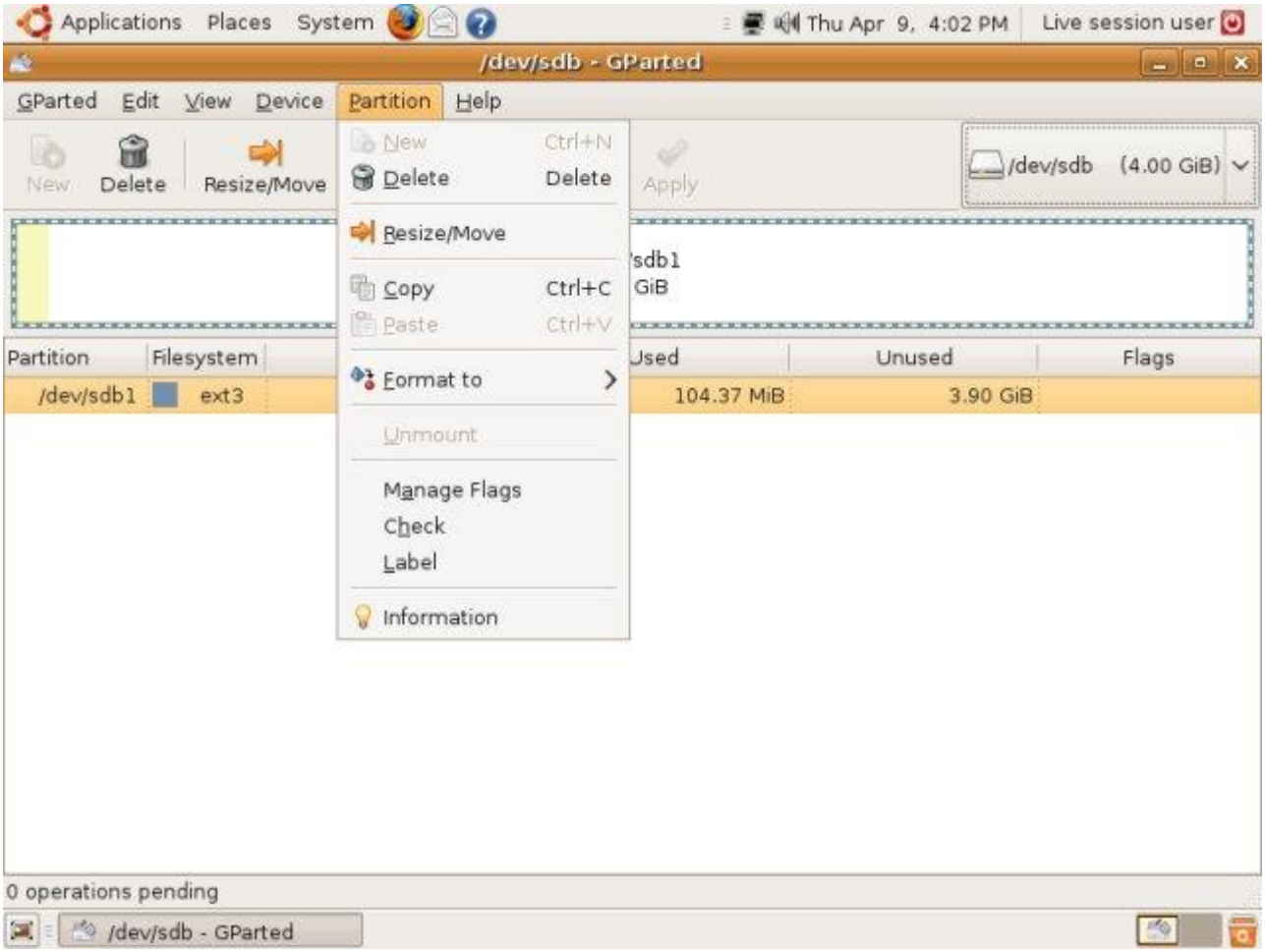
And the view will then switch to relevant device:



Core functions

The core functions of GParted are the creation, resizing/moving, deletion, and formating of partitions. The usage is very simple: highlight the relevant empty space or an existing partition and perform the desired tasks. You can use the buttons or the menu. The buttons/functions will be grayed out until you choose the relevant bit of hard disk space to work on:


Applications
Places
System
Thu Apr 9, 4:02 PM
Live session user
/dev/sdb - GParted
GParted
Edit
View
Device
Partition
Help
New
Delete
Resize/Move
Copy
Paste
Undo
Apply
/dev/sdb (4.00 GiB)
/dev/sdb1
4.00 GiB
Partition
Filesystem
Size
Used
Unused
Flags
/dev/sdb1
ext3
4.00 GiB
104.37 MiB
3.90 GiB
0 operations pending
/dev/sdb - GParted



Now, we're ready to start working.

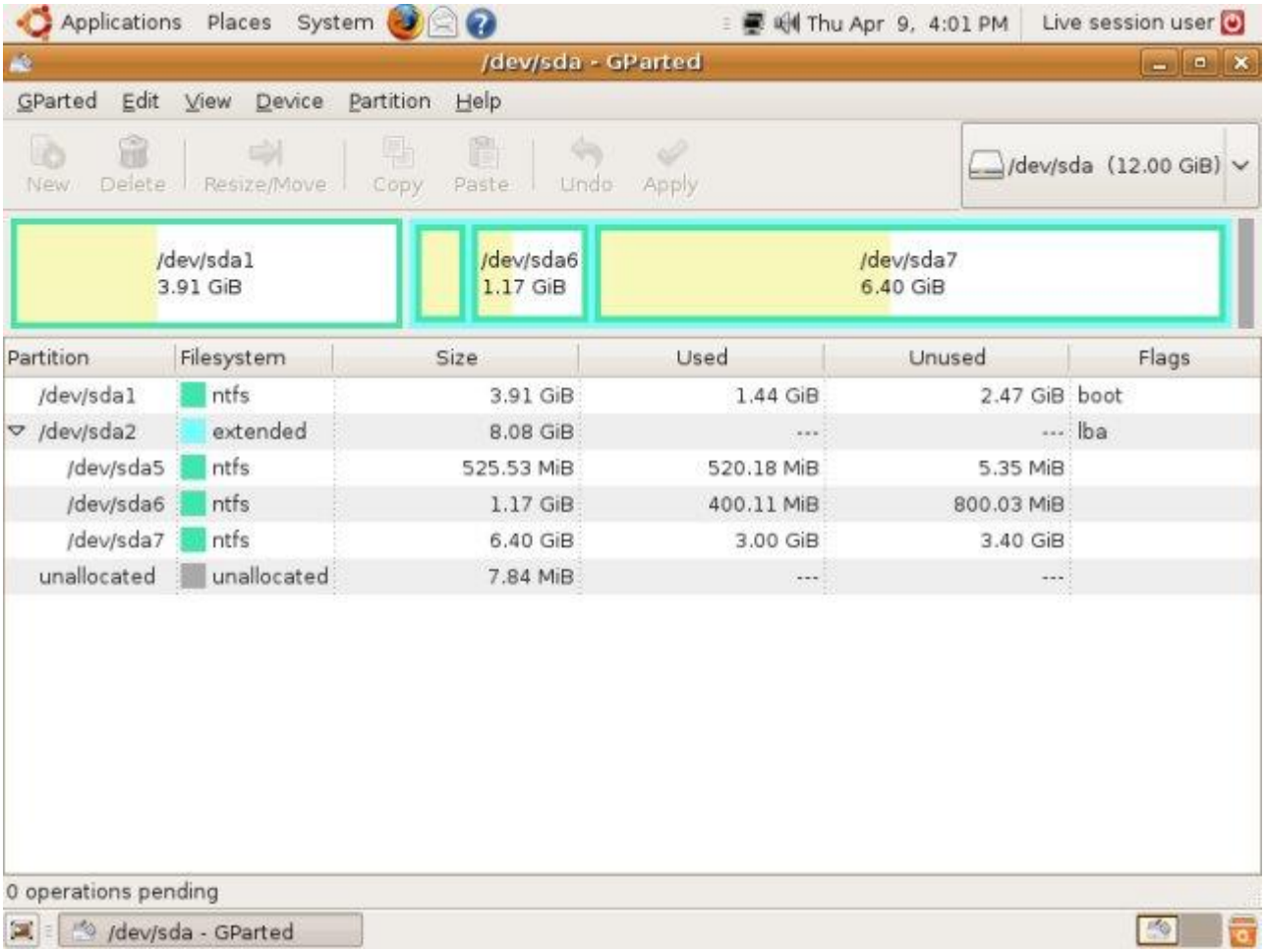
GParted - real life examples

Our test case is a machine with two SATA disks. On the first disk, we have Windows installed, with several data partitions. The second disk is currently occupied by a single Ext3 partition. This is an excellent example of a complex system that a new Linux user will face when trying to install the Linux for the first time. If the disk is empty, the choices are rather simple. But what about a disk already used, with critical data on it? Not to worry, we'll have it sorted out.

Identifying the right device

We know the notation, we're familiar with GParted GUI. Now, all we need is to decide what our target device will be. Let's see what we have:

First disk:

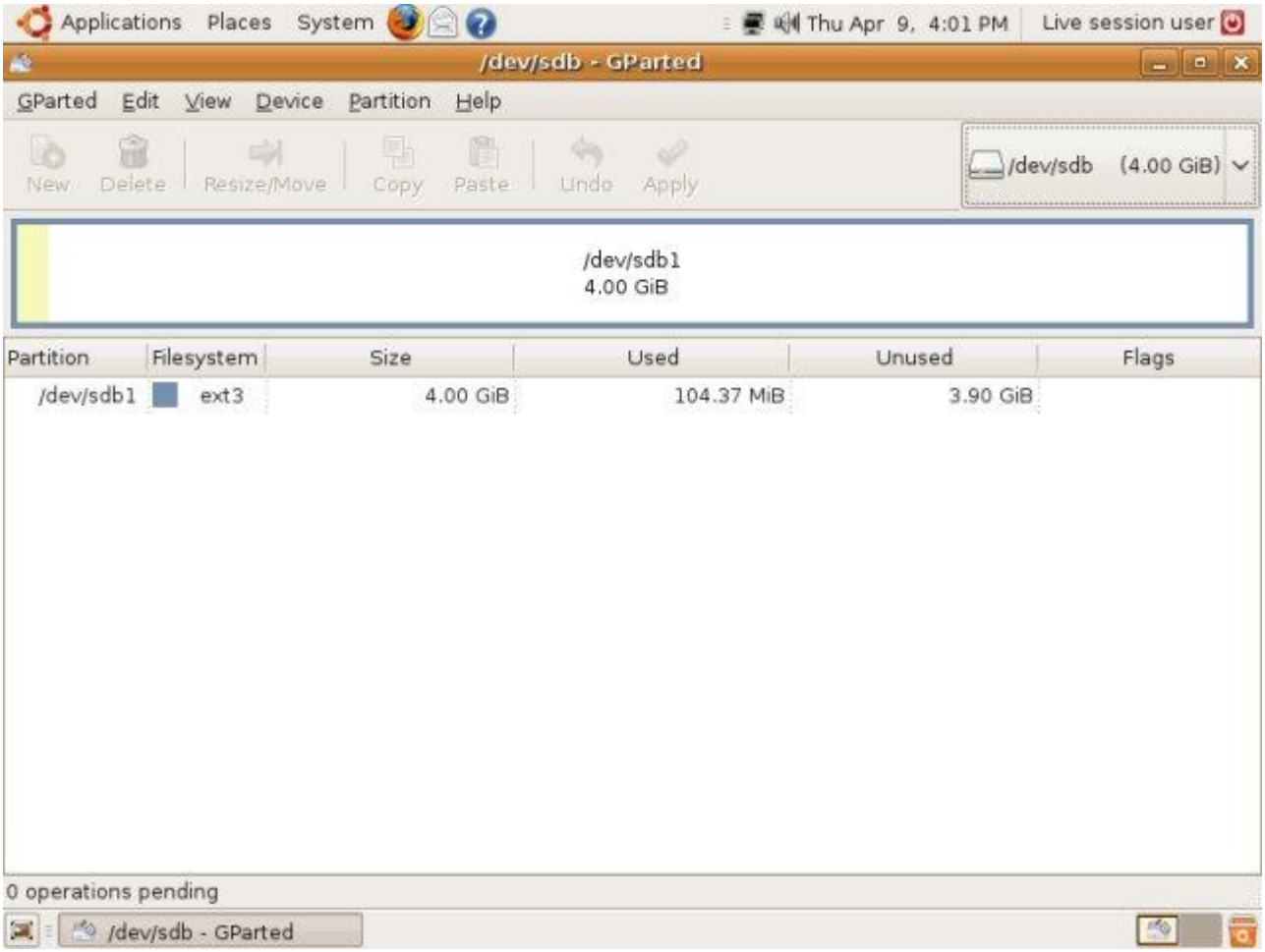


We have NTFS filesystem on the first partition (sda1). It's a primary partition. This is most likely a Windows C: drive. It also has the boot flag. We won't touch it.

The second in the list is sda2, the Extended partition, marked with lba flag as it is larger than 8GB. Inside it, we have three more NTFS partitions, which are likely D:, E: and F: drives in Windows. These are logical partitions, therefore they start with number 5. Please note sda7 is NOT the seventh partition; it's fourth on the color bar! We won't be touching those either.

The last bit of unallocated (gray) space is used by the Windows system. Ignore it. It will always be there on systems with Windows. So, it's the second disk we want, sdb.

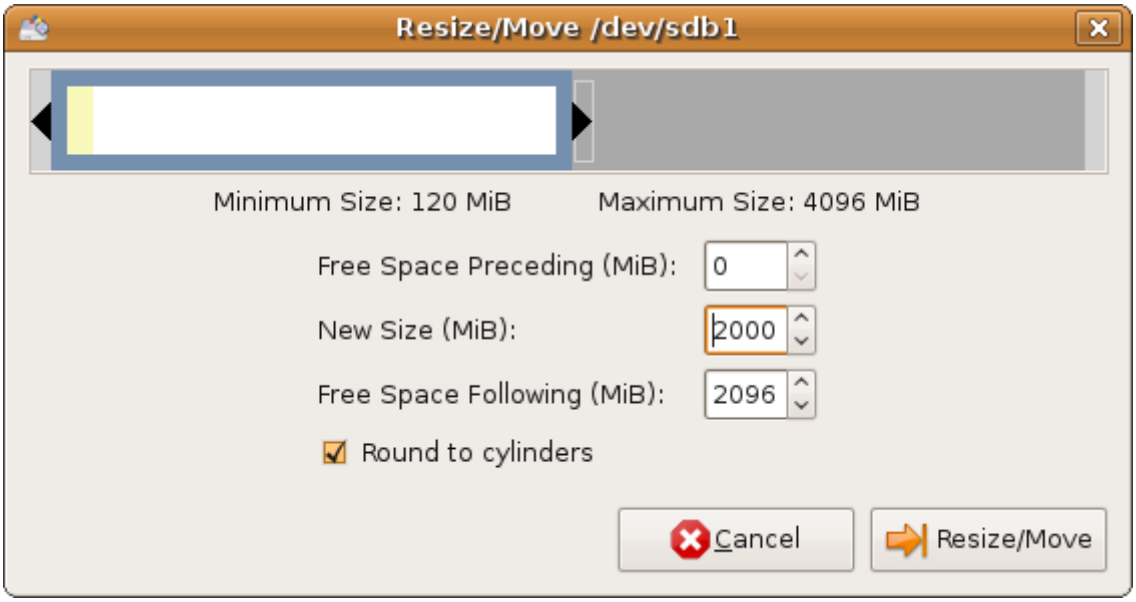
Second disk:



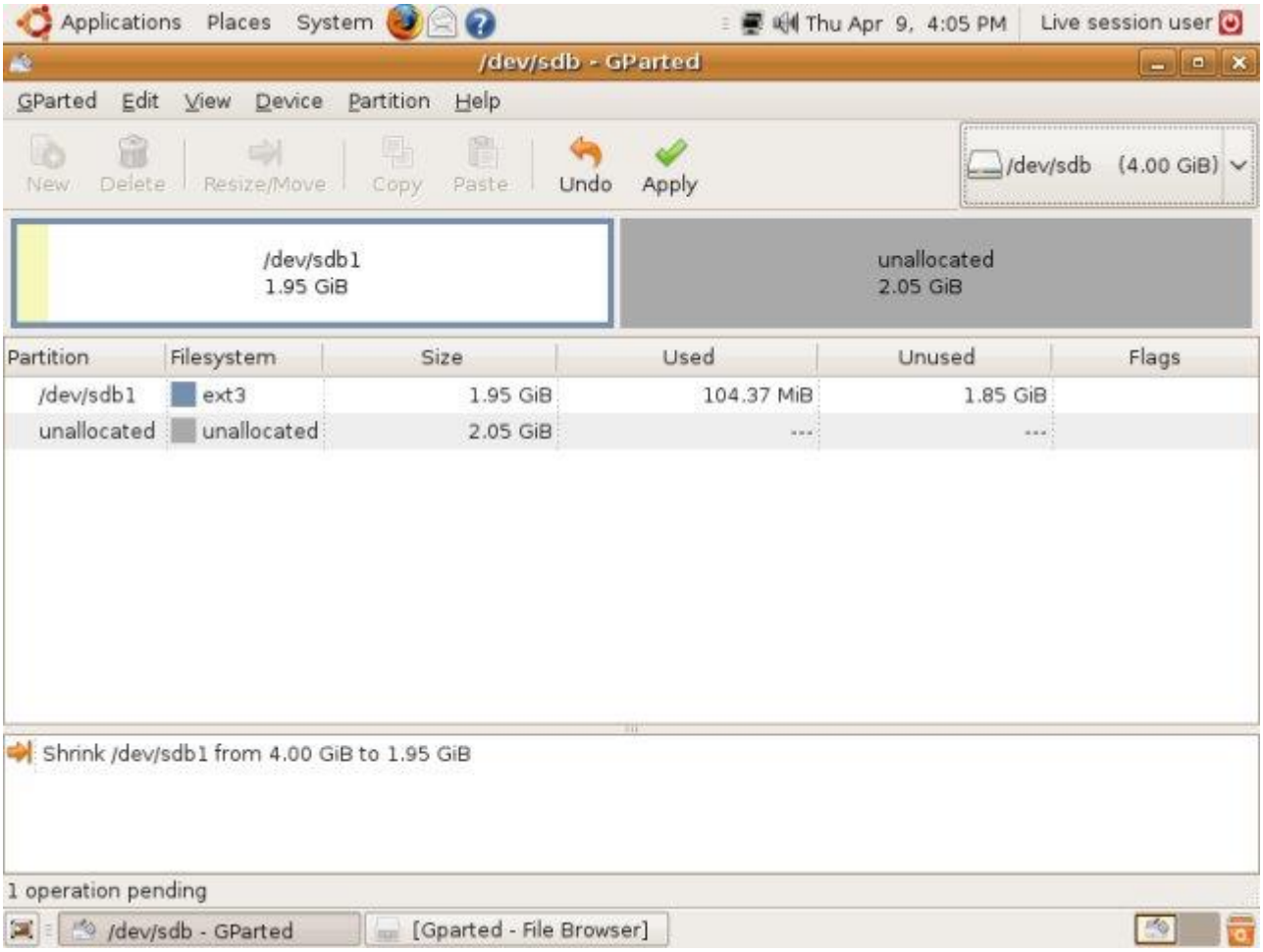
Currently, it has a single ext3 partition. It's most likely a left-over from an older installation or some testing. The partition is almost entirely empty, which makes it ideal for our games.

Task 1: Resize partition

This is the first thing we'll do. We'll shrink sdb1 to make space for more partitions. Highlight the partition and click on Resize/Move or in the menu, Partition > Resize/Move. Choose the new size. You can type in the numbers or drag the color bar.

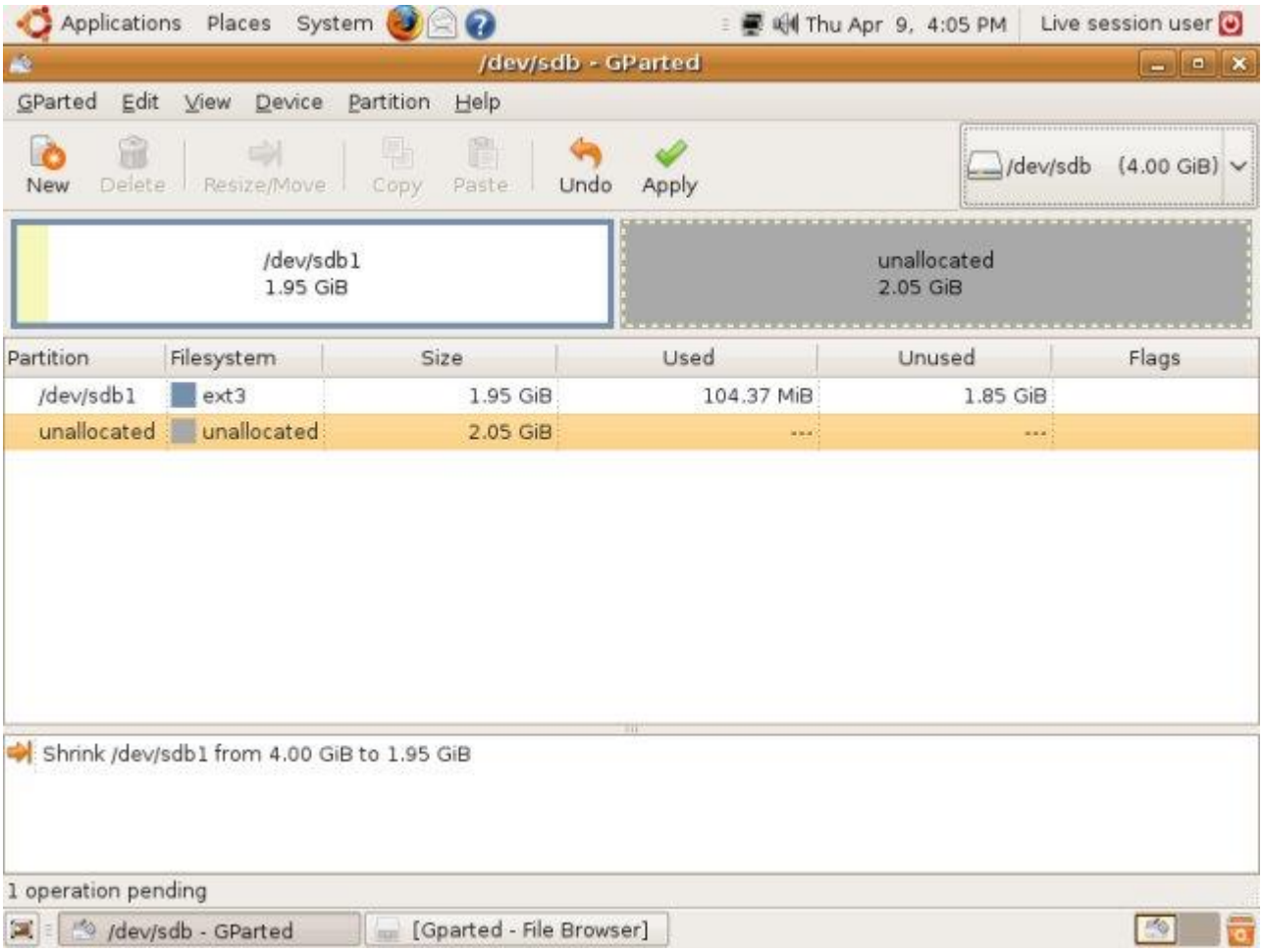


When the task is done, we will have freed approx. 2GB of space:

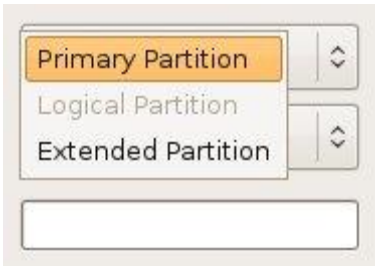


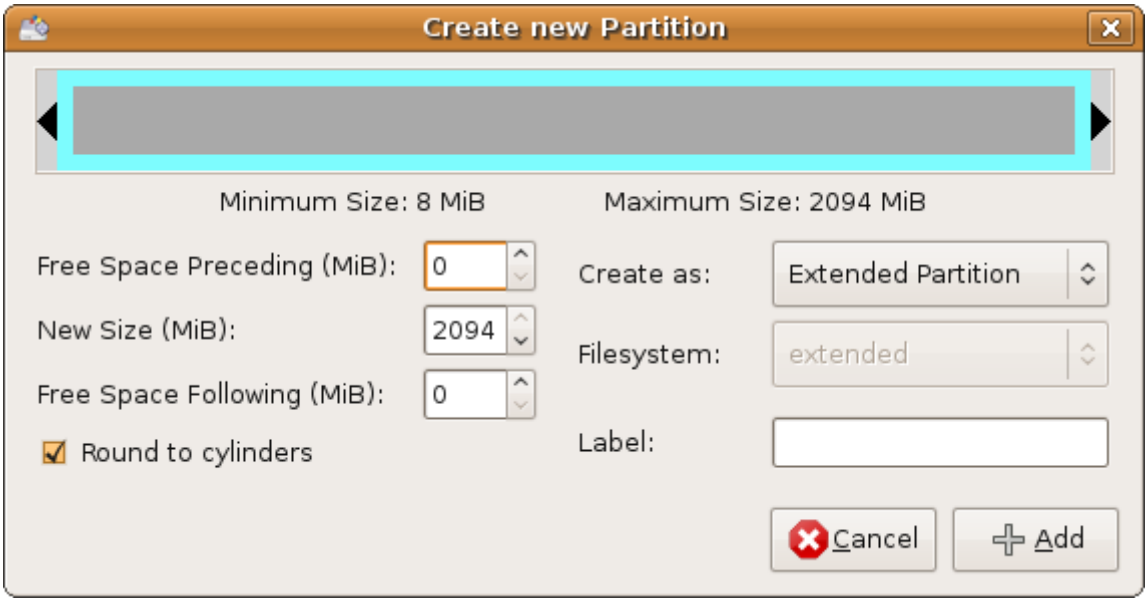
Task 2: Create new partition

Now, we will create a new partition in the free, unallocated space after resized sdb1. We'll mark the free space and click on New.

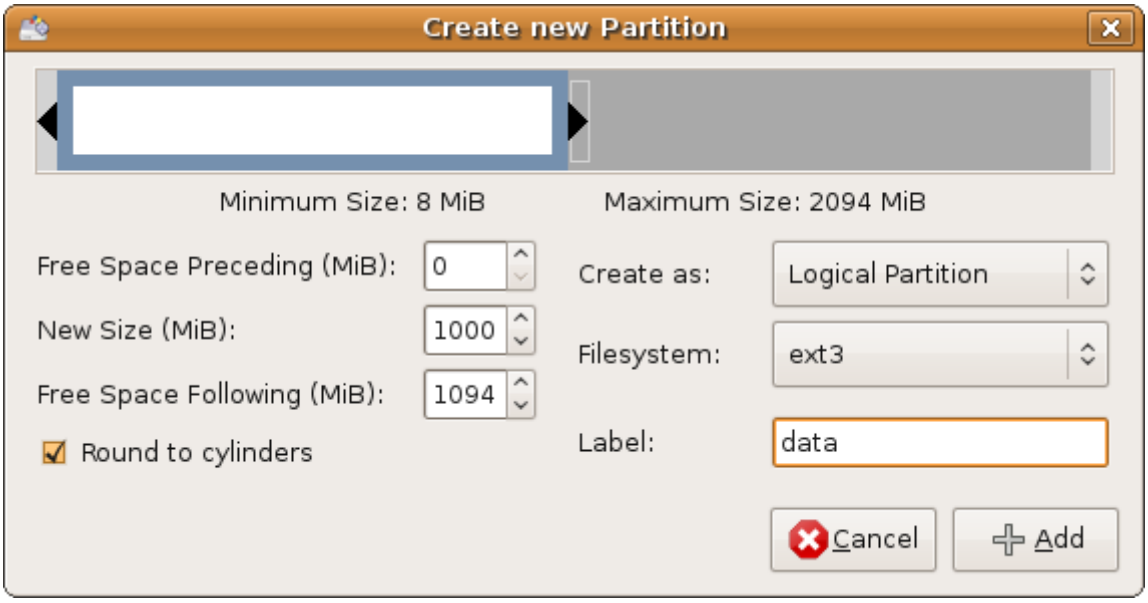


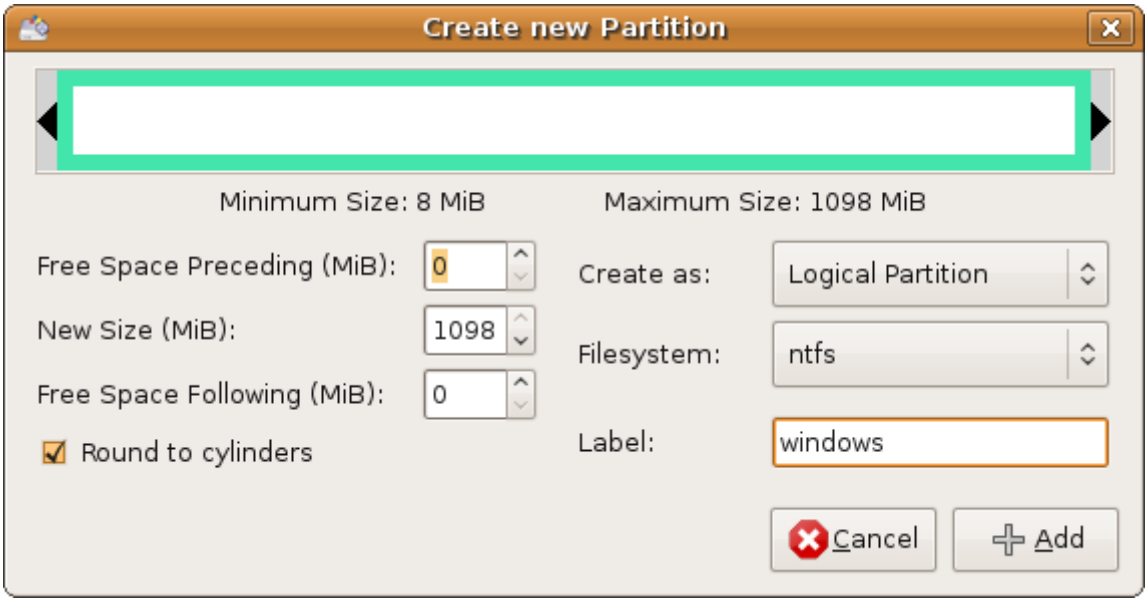
In order not to waste the precious few primary partitions we have, we will create the Extended partition and then place other partitions inside it.



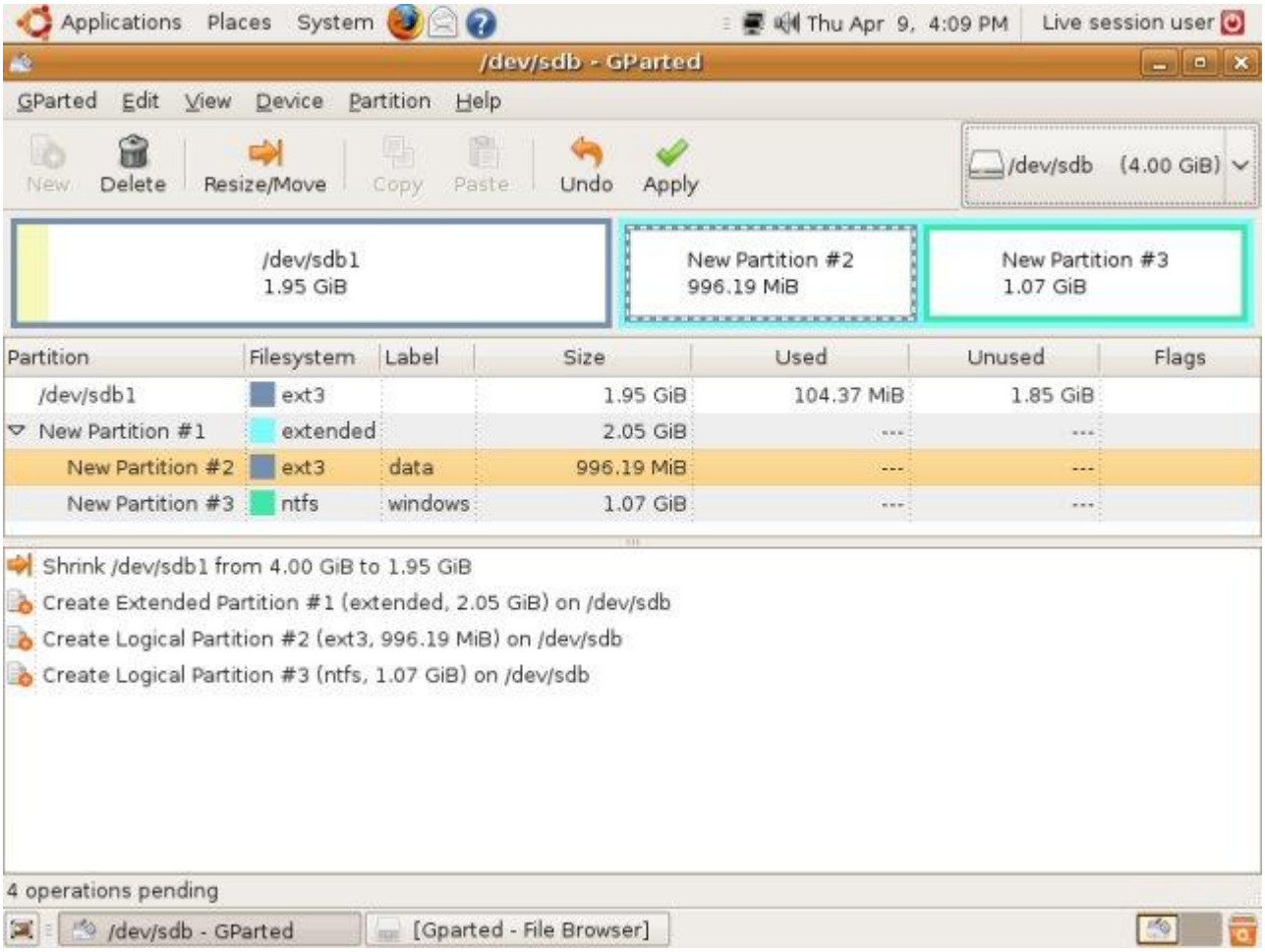


Then, we will create an Ext3 partition and an NTFS partition:





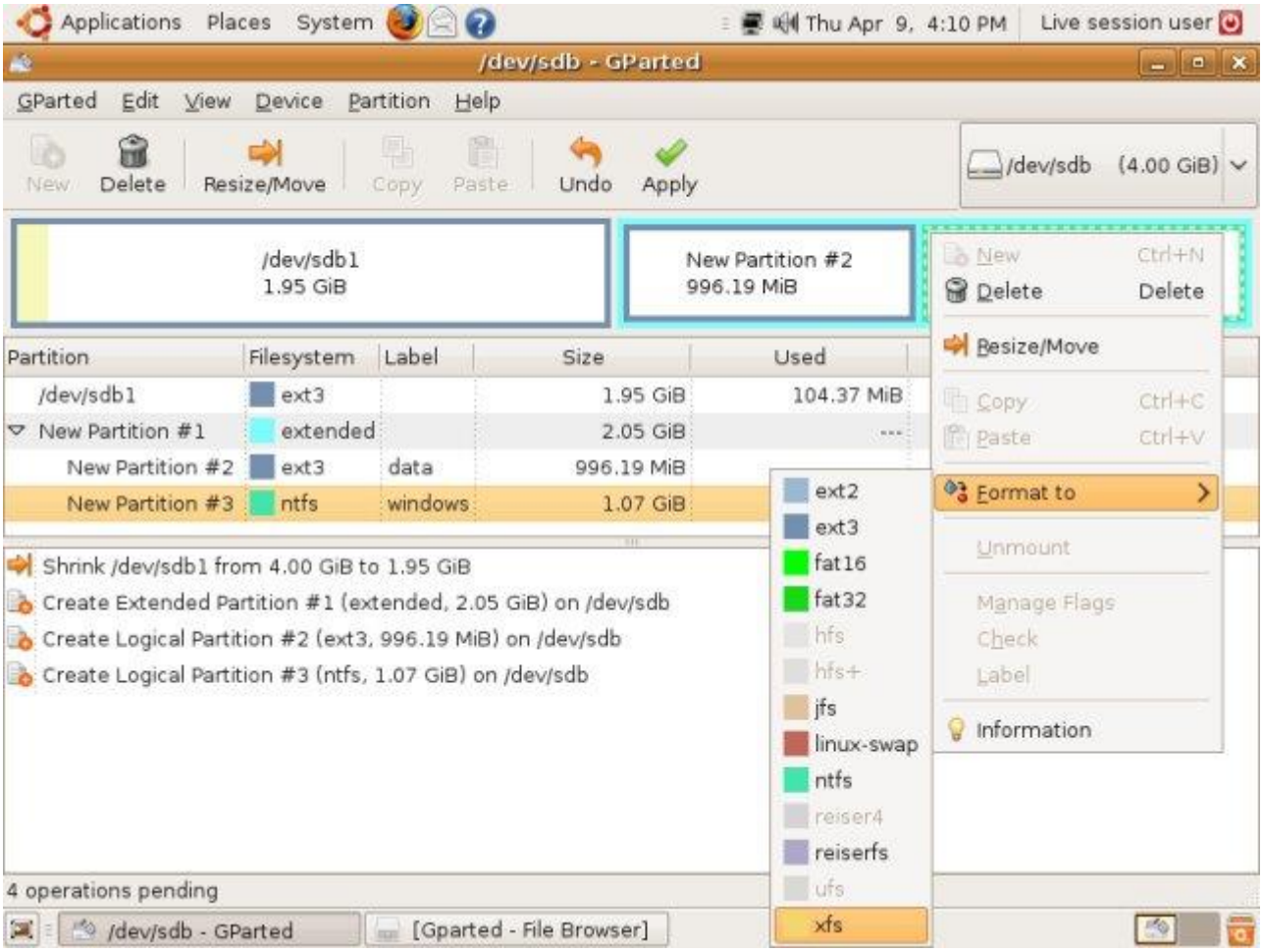
Please note I also added Labels to the two newly created partitions, so we can more easily identify them later. Here's our task list:



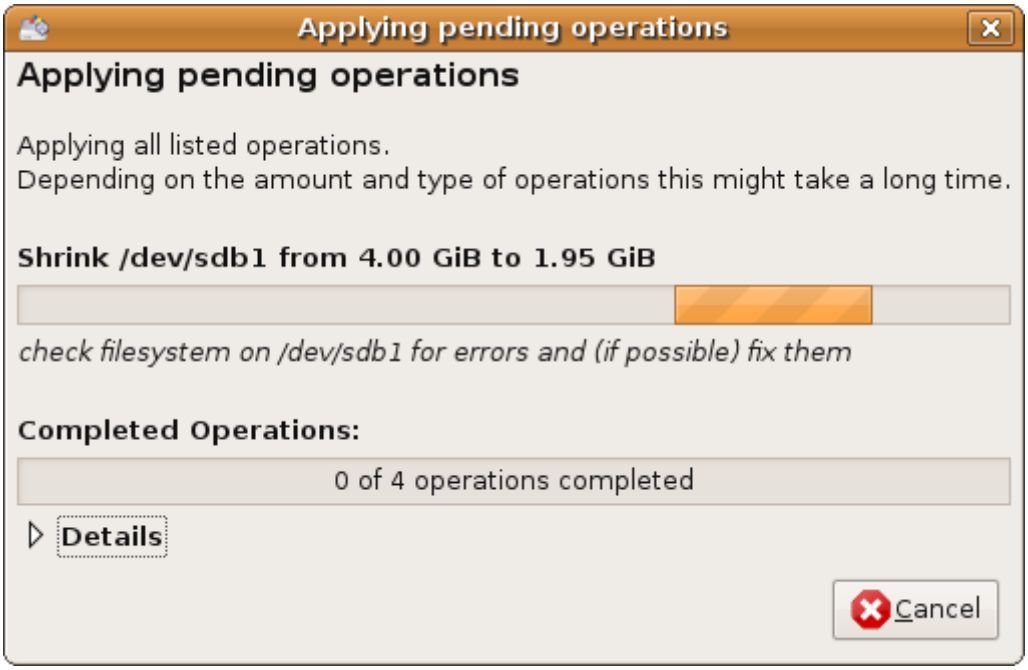
Please note that none of these tasks have taken place yet. Until you click Apply, none of the changes will be committed to the disk. This

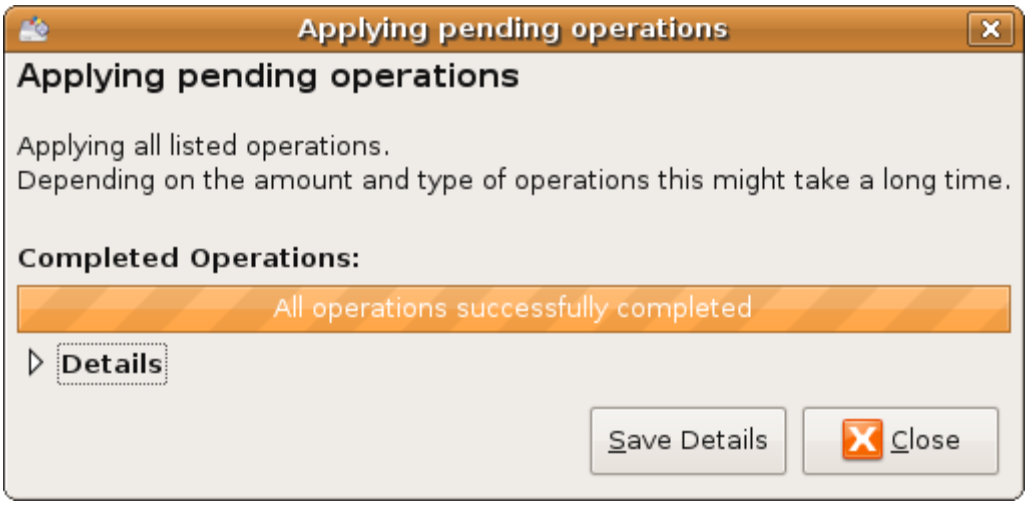
allows you to play freely. You will have the chance to confirm the changes.

If you want to change the filesystem chosen for any which partition, you can do it without deleting the partition and creating a new one instead. You can simply format it with the new filesystem you desire. Either via the menu or by right-clicking on the partition, choose Format to. Notice the color legend. Each filesystem has a different color, making it more difficult to get confused.



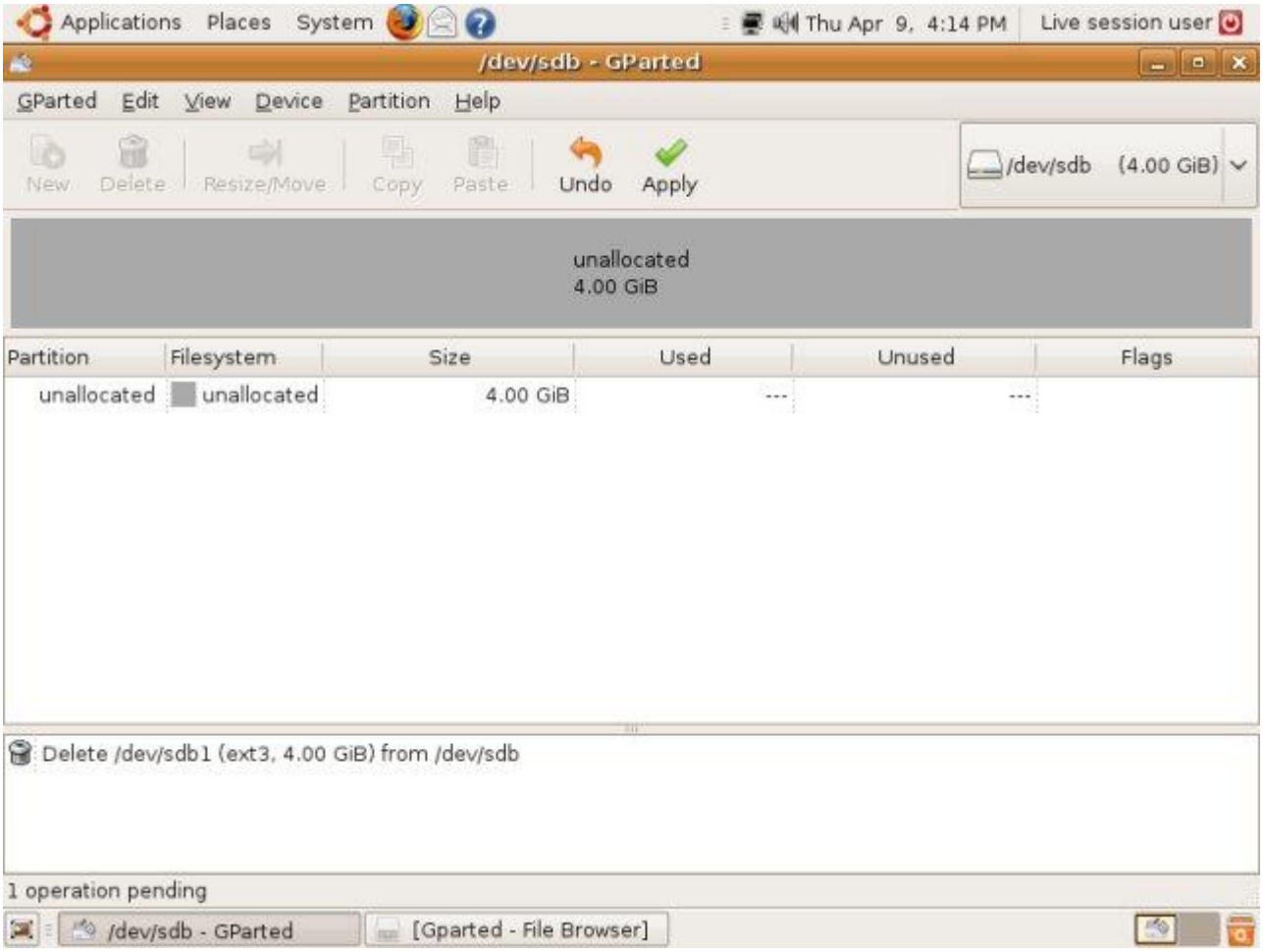
Once you click Apply, GParted will commit the changes:





Task 3: Delete partition

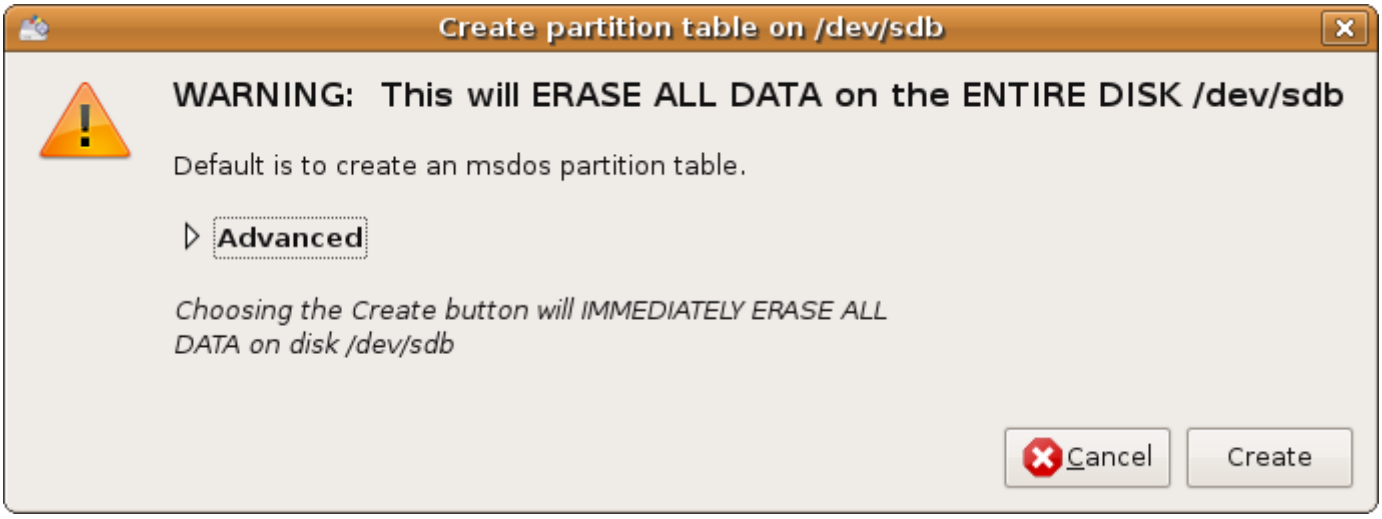
Sometimes, in order to grow or move partitions or create an alternative layout, you will have to delete partitions. Again, it's a very simple thing. Simply select the partition and click on Delete. It will be gone - still, again, you need to click on Apply to commit the changes. And you can also always Undo the operation.



Task 4: Create Partition Table

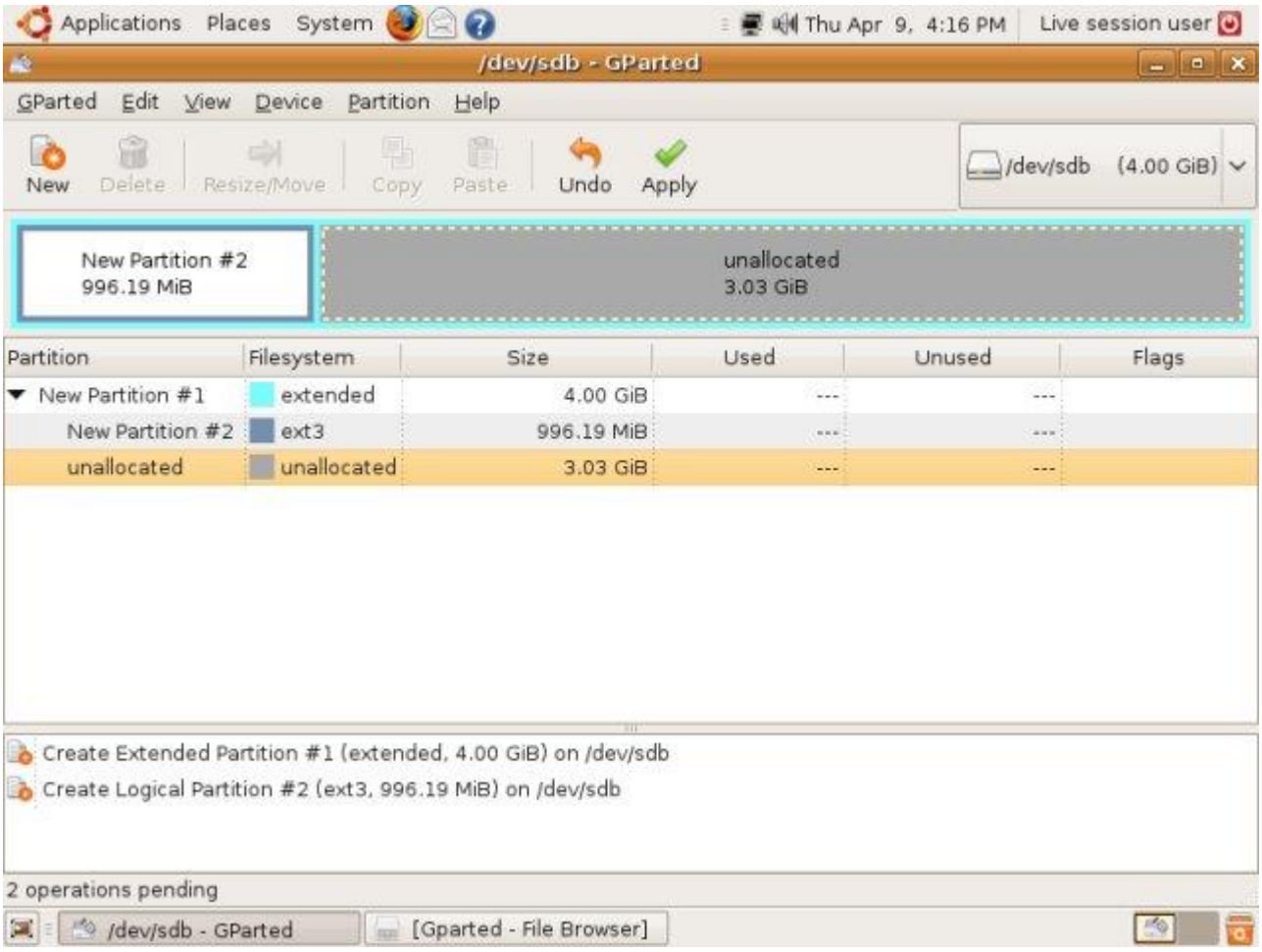
Empty hard disks will have no partition table - no "master" map defining the partitioning layout. Similarly, if you want to wipe the entire drive of existing partitions without manually deleting each one, you can simply reinitialize (recreate) the partition table. This is a drastic operation, so be careful when you do it:

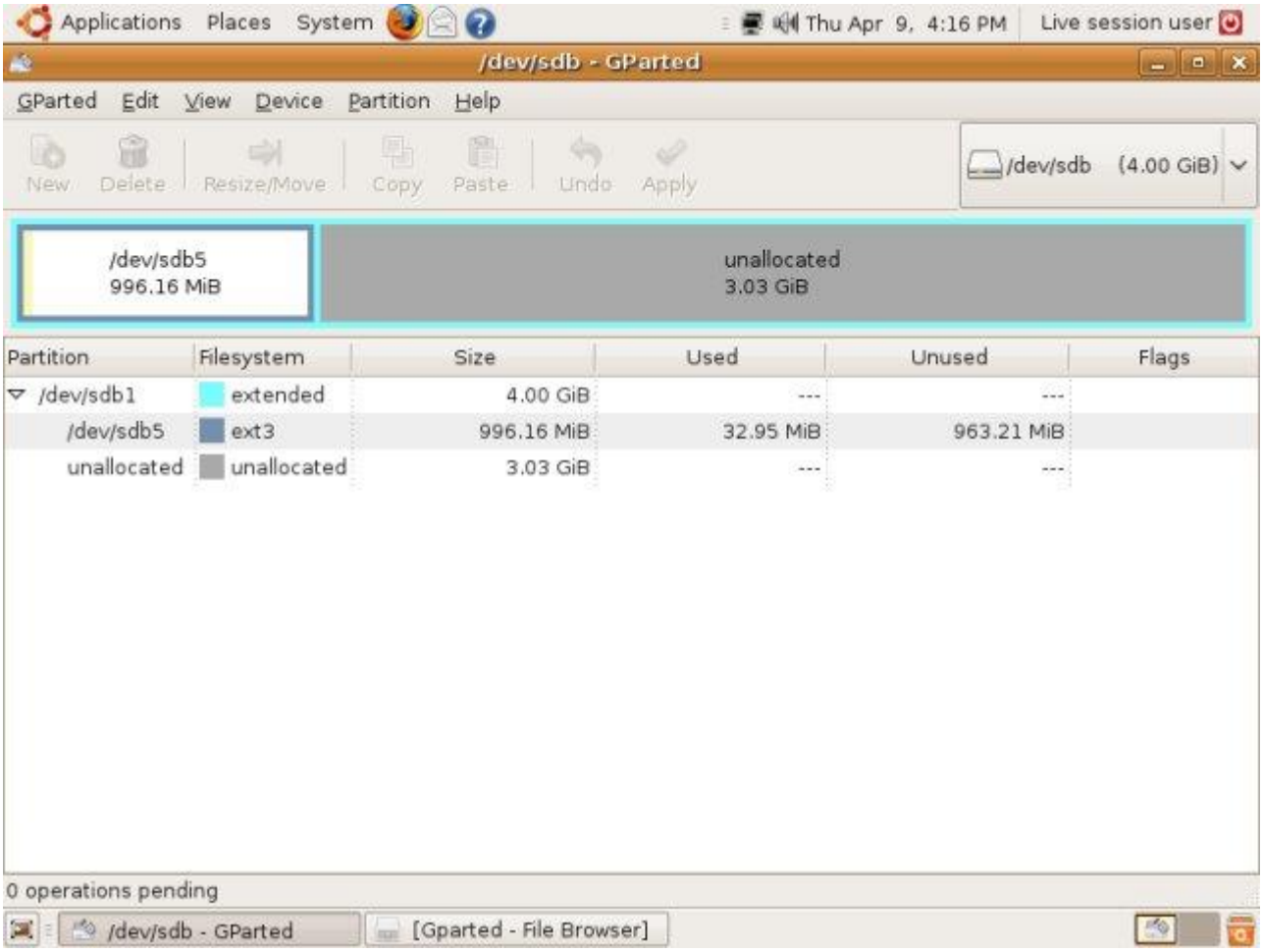
You will be warned:



Task 5: Create only Extended partition

This is an unusual setup, but it could happen. Your first partition won't be a primary partition used by this or that operating system, it will be the Extended partition itself. The concept is the same as before:

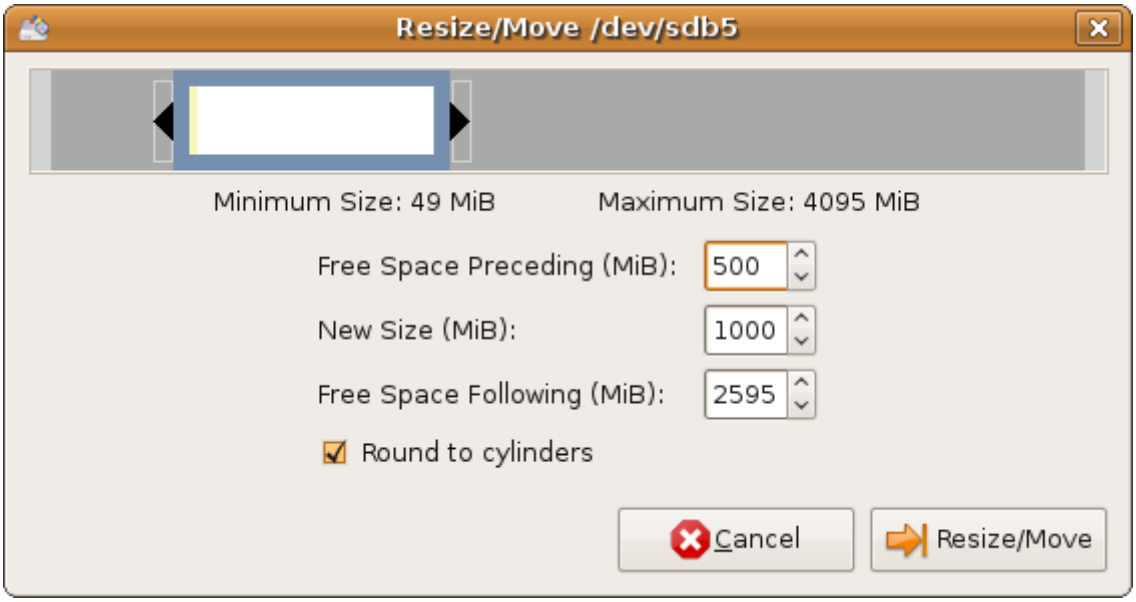


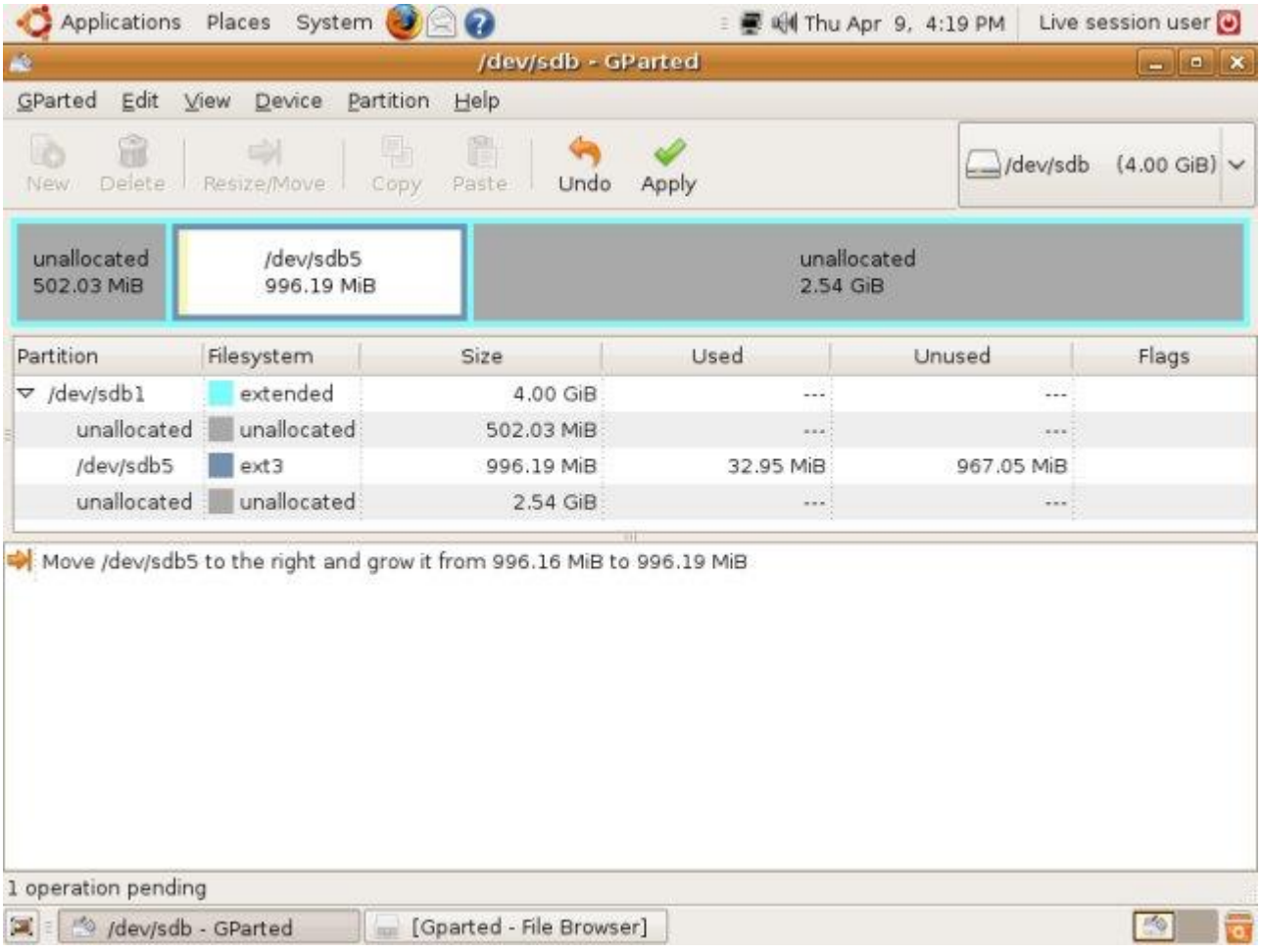


Please note that sdb5 will be the first partition on the disk here!

Task 6: Move partition

You may also want to move partitions. This is not the most common task either, but you might need it. It's just like resizing, except that you specify the value for Free Space Preceding in the options.

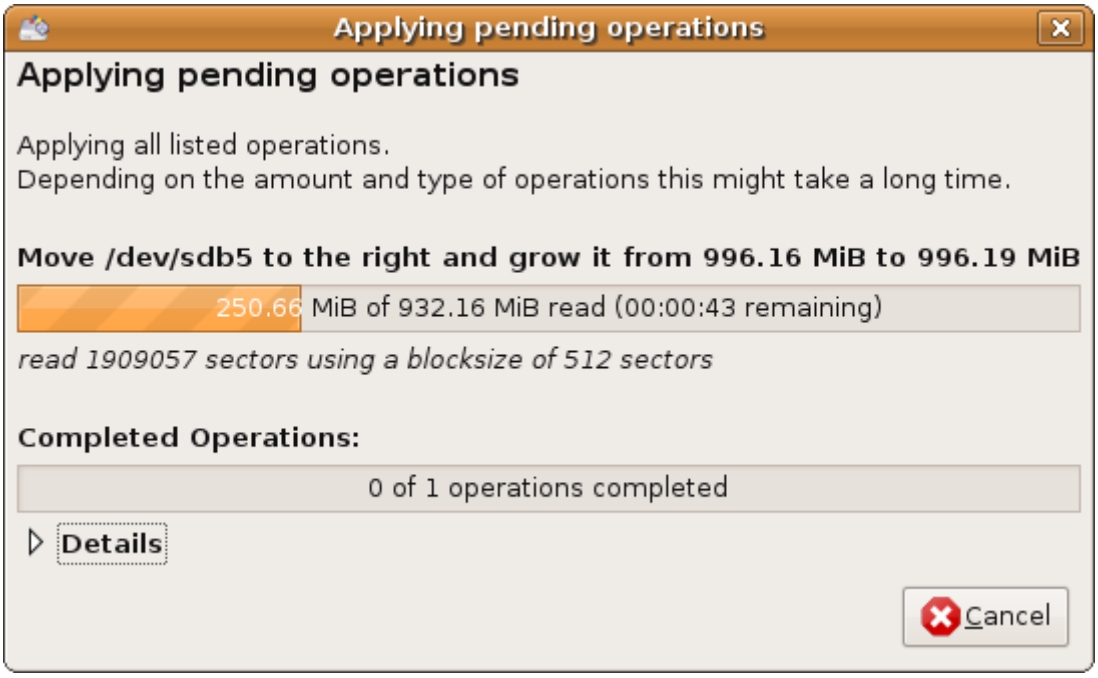

Resize/Move /dev/sdb5
Minimum Size: 49 MiB
Maximum Size: 4095 MiB
Free Space Preceding (MiB):
500
New Size (MiB):
1000
Free Space Following (MiB):
2595
Round to cylinders
Cancel
Resize/Move


Applications
Places
System
Thu Apr 9, 4:19 PM
Live session user
/dev/sdb - GParted
GParted
Edit
View
Device
Partition
Help
New
Delete
Resize/Move
Copy
Paste
Undo
Apply
/dev/sdb (4.00 GiB)
unallocated
502.03 MiB
/dev/sdb5
996.19 MiB
unallocated
2.54 GiB
Partition
Filesystem
Size
Used
Unused
Flags
/dev/sdb1
extended
4.00 GiB

---
unallocated
unallocated
502.03 MiB

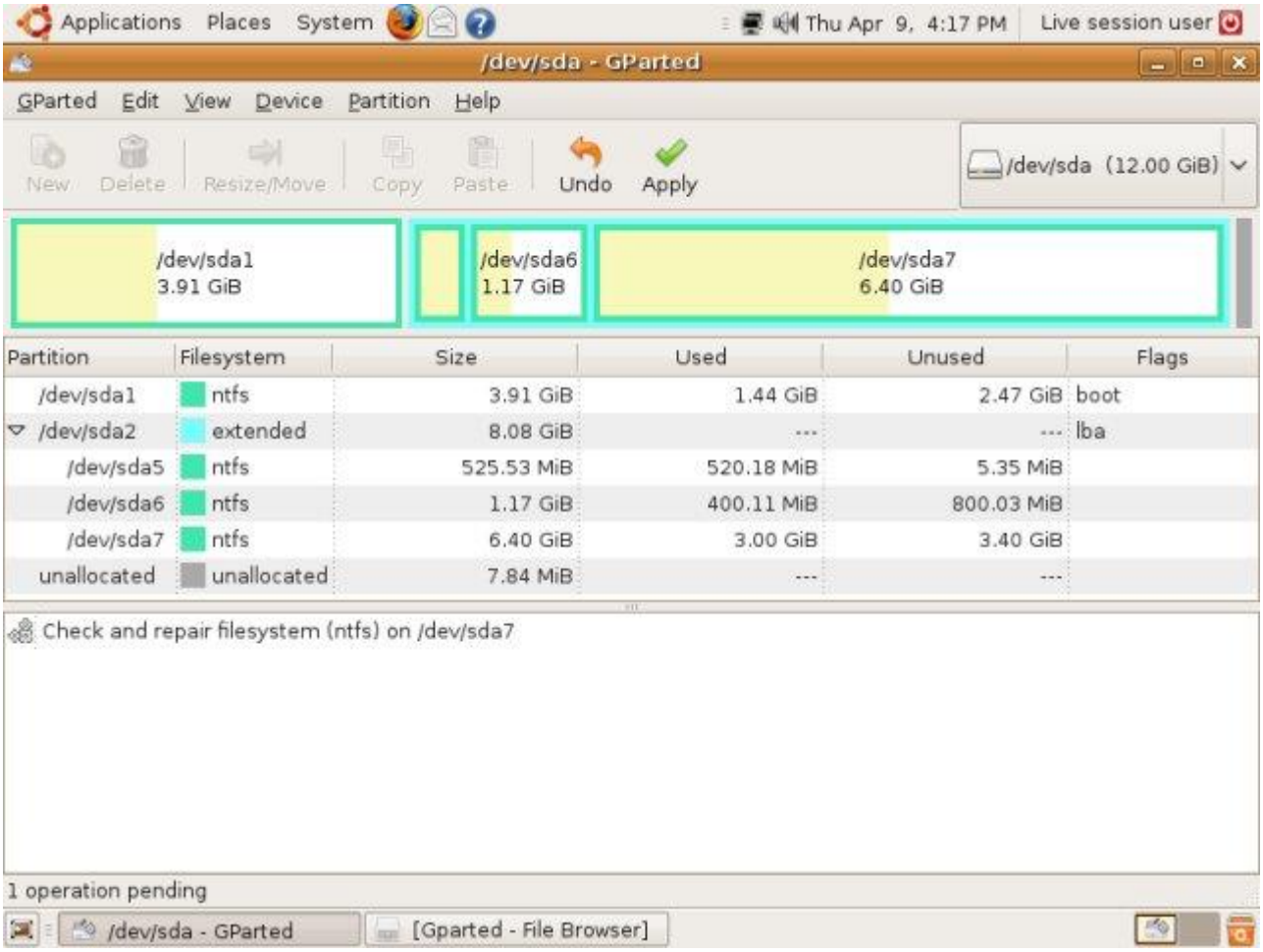
/dev/sdb5
ext3
996.19 MiB
32.95 MiB
967.05 MiB
unallocated
unallocated
2.54 GiB

Move /dev/sdb5 to the right and grow it from 996.16 MiB to 996.19 MiB
1 operation pending
/dev/sdb - GParted
[Gparted - File Browser]



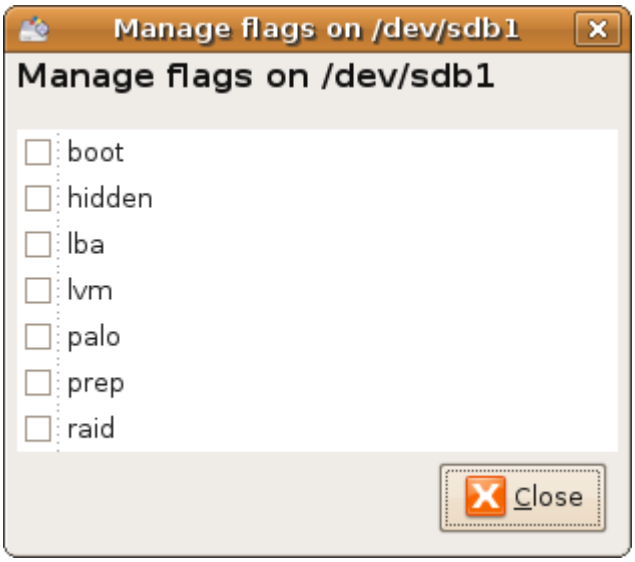
Task 7: Check & repair filesystem

GParted can also be used to try to fix errors on corrupt filesystems, like after a sudden power outage, for instance. Choose the relevant partition, right-click > Check.



Flags

Setting flags should usually be left to operating systems you're about to install, but you can do it yourself, if you want. Here's the list of all the flags GParted supports:



GParted capabilities

Wonder what filesystems can GParted work with? It gives you a nice graphical overview of its abilities. As you can see, it can do quite a lot with a large number of filesystems. Most notably, it works well with both FAT32 and NTFS, which is very important for Windows users.

Advanced tasks

This section is not strictly related to GParted. It's more of a bonus appendix, showing you a number of useful tricks that can enhance your partitioning skills. Here, though, we will have to leave the GUI behind and work with command line tools.

Change the Inode size

Inodes are data structure units that regulate how the filesystem will treat directories and files residing on it. A filesystem with small inodes will be able to house a very large number of files, but it won't have the best read/write performance. A filesystem will large inodes will be more suited for I/O throughput, but it won't be able to store too many files on it. Whatever the need, changing inodes cannot be done through the GParted GUI.

Why should you care?

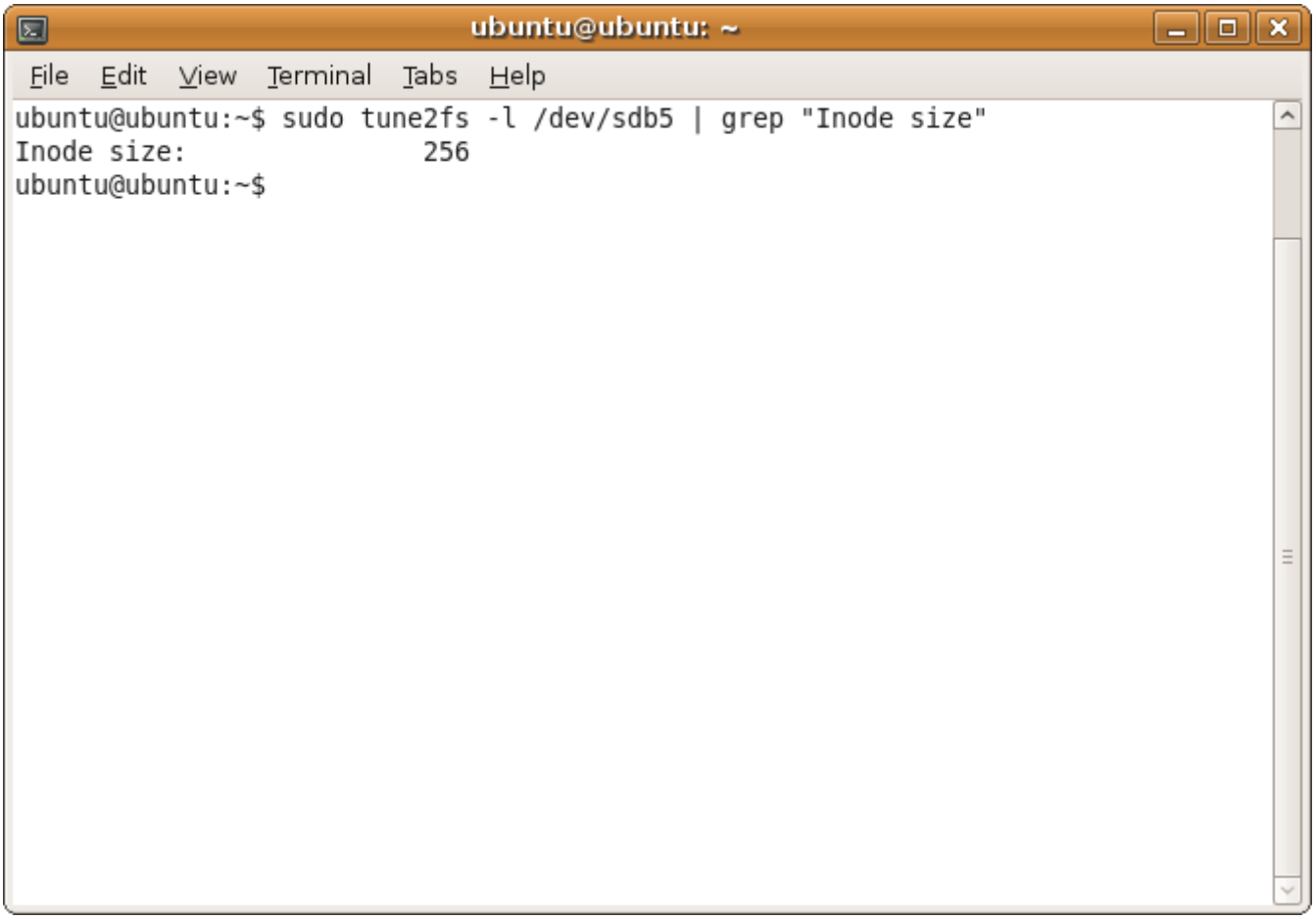
That's a good question. Why would anyone be interested in changing the defaults set by the filesystem. Well, it turns out that some imaging software, like Acronis True Image, can only work with Linux filesystems that use inodes of the 128-byte size. However, some modern distributions, like Ubuntu 8.10 Intrepid Ibex, use 256-byte inodes, thus making the software unusable with this Ubuntu release.

This has caused quite a stir among the Acronis True Image users who happen to dual boot Windows and Linux and like to use their product to create system backups of both their operating systems.

The solution to the problem is very simple. First, we need to check what our filesystem currently uses. This is done using the tune2fs system utility.

```
(sudo) tune2fs -l /dev/<device-name> | grep "Inode size"
```

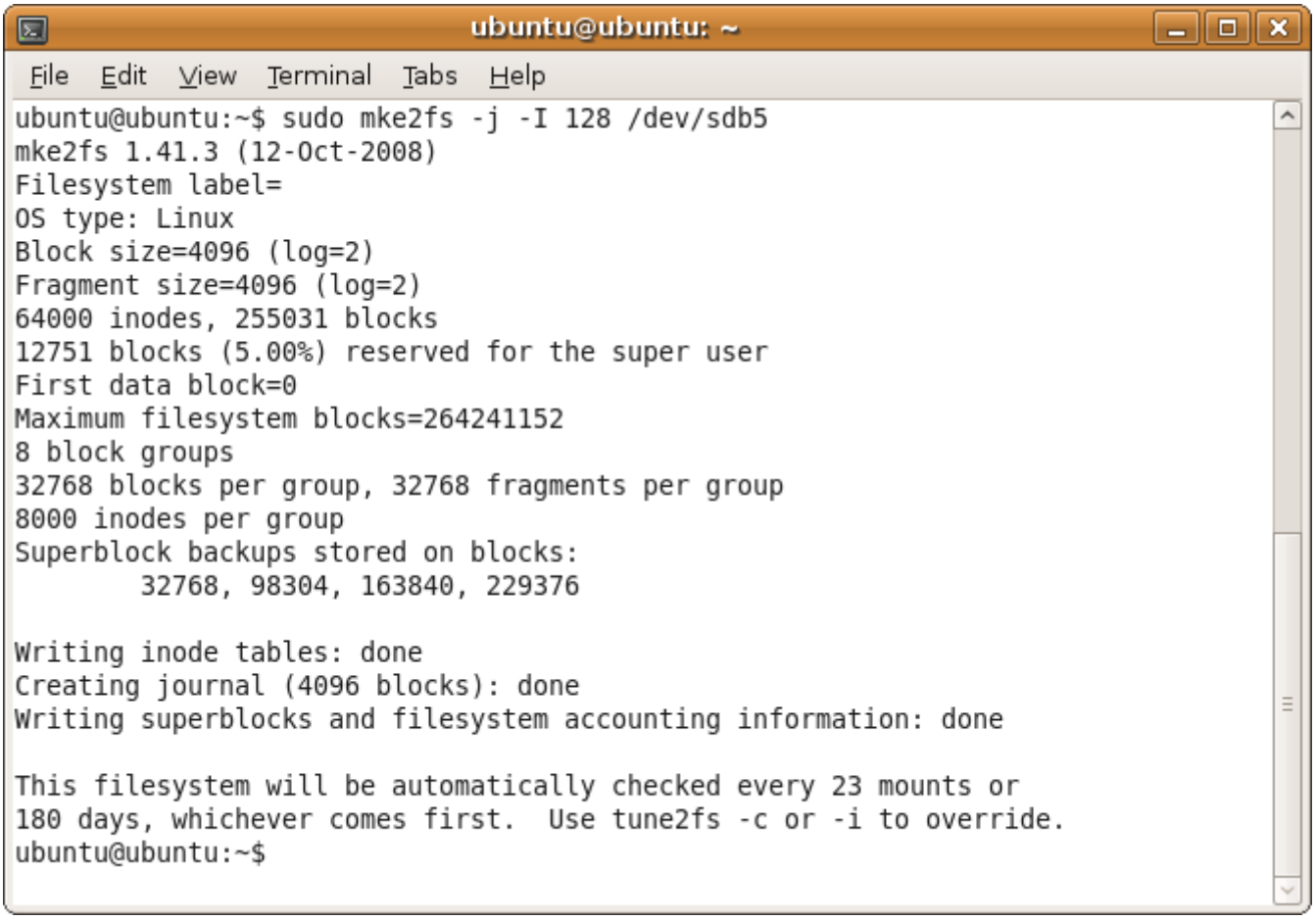
The above command polls the filesystems on the relevant /dev/ device for information. The grep command merely extracts the specific bit we need. Let's see what we get on our Ext3 filesystem formatted by GParted (our sdb5 from earlier):



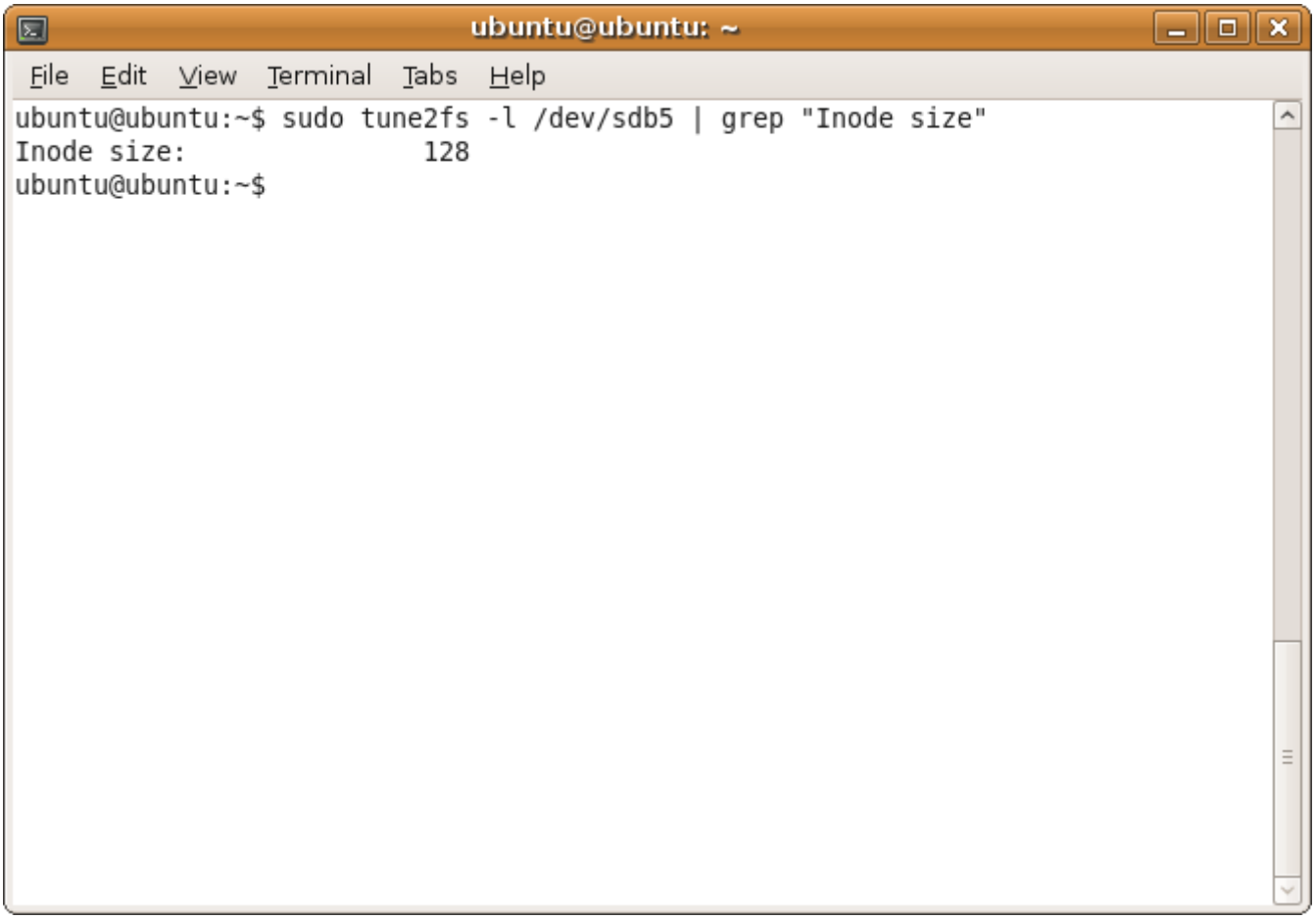
We have the Inode size: 256. Not good. We won't be able to use Acronis. So we need to change the size. This can be done using the mke2fs formatting utility for Ext2-based filesystems.

```
(sudo) mke2fs -j -I 128 /dev/sdb5
```

This will format the sd5 device as Ext3 filesystem (-j flag) with Inode size 128 (-I flag).



Indeed, if we check again:



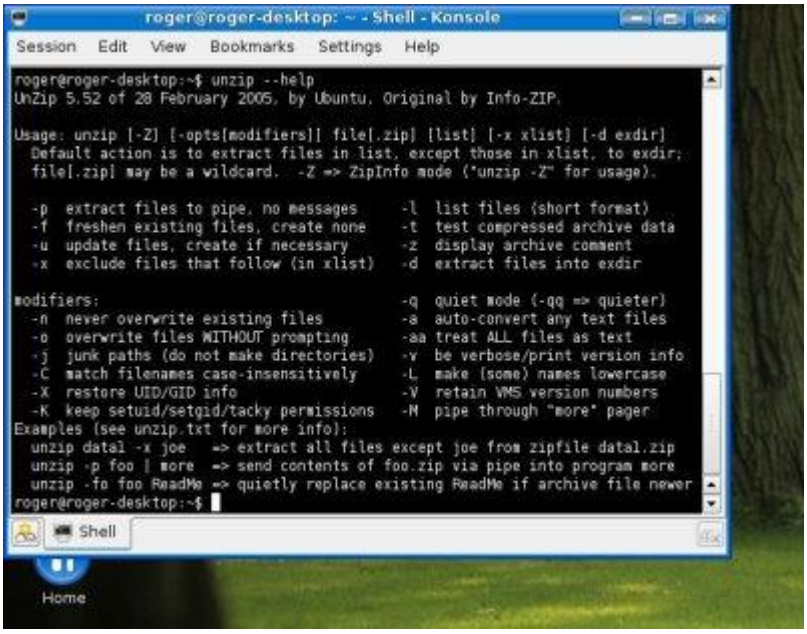
Our Inode size is good now. In general, I recommend all dual-boot users, especially those fond of imaging, to perform these steps manually on all partitions they intend to use for Linux and image from Windows and/or using a Windows-based program like Acronis. That's about it. We now know the ins and outs of partitioning and working with GParted. Congratulations! Now, for some extras.

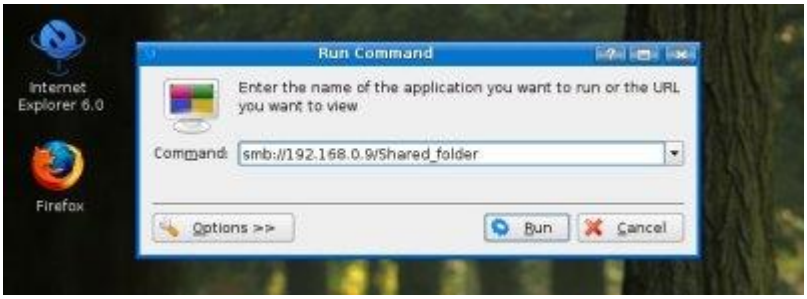
Recommended reading material

I most strongly recommend you at least take a look at the following articles. They are very detailed and thorough and should give you important information regarding the Linux operating system.

Highly useful Linux commands & configurations

This tutorial will teach you the basic of Linux notation, command line usage, compilation, and setup of most common system configurations, like network and graphic drivers, printers, sharing, and more.

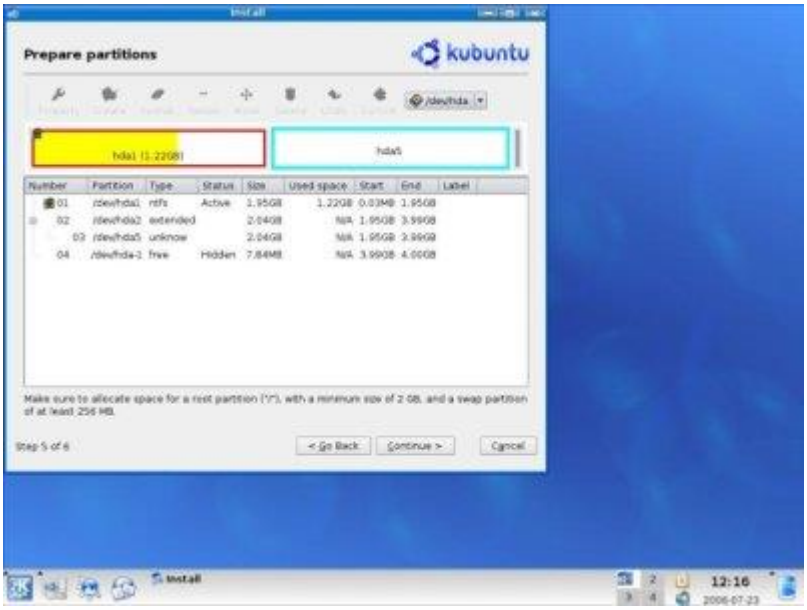




Dual booting - Windows & Linux

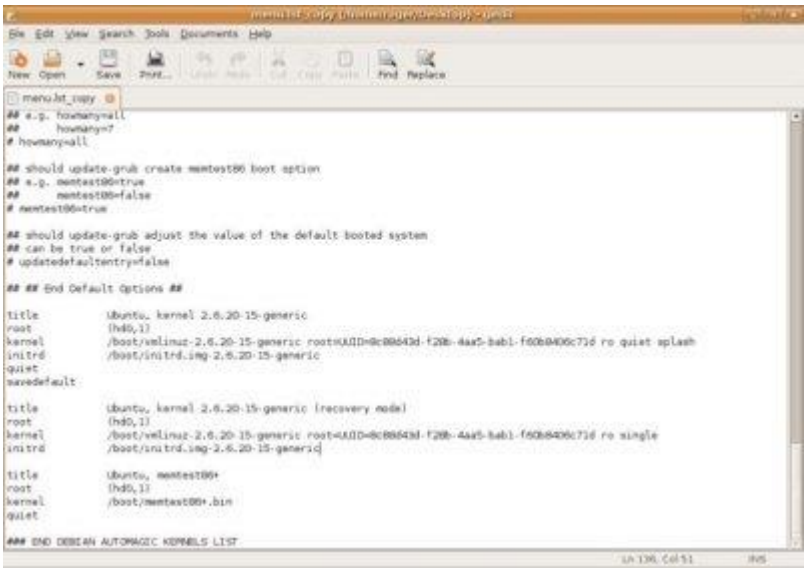
This tutorial demonstrates a side-by-side installation of Windows XP and Kubuntu, a KDE flavor of the popular Ubuntu distro. Although the tutorial uses Kubuntu 6.06 as the demonstration platform, very little has changed in the releases since, at least when it comes to partitioning, especially the basic principles of it.

The two tutorials for Windows and Kubuntu, respectively, also detail the installation of these individual operating systems, so if you're not familiar with how this should be done, you're most welcome to read them.



[GRUB bootloader - Full tutorial]

This is a must-read article for anyone considering Linux or dual-booting with Windows. The tutorial explains the basic and advanced concepts of the bootloading procedure and tackles the most common issues arising from handling different operating systems and partitioning.




GNU GRUB version 0.95 (630K lower / 7043200K upper memory)
OpenSolaris 2008.11 snv_101b_rc2 X86
OpenSolaris 2008.11 snv_101b_rc2 X86 text boot
Use the ↑ and ↓ keys to select which entry is highlighted.
Press enter to boot the selected OS, `e' to edit the
commands before booting, or `c' for a command-line.
The highlighted entry will be booted automatically in 13 seconds.
opensolaris