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This HOWTO is about partitionning usual mass storage that can be magnetic rotating hard drives or Solid State Drives (SSD - including flash cards or USB keys).

Writing the Partition HOWTO, I noticed that, as of year 2009, at least, partitionning is very complicated. However, most partitionning tasks can be done very easily with the appropriate tools, so this HOWTO for any people that want to understand the partitionning without going too deeply inside.

A more complete partition use description can be found on the Partitions-and-mass-storage-HOWTO, <u>available for example here</u>

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3. Definitions

3.1. Disks

Disks are usually made of rotating plates, read by magnetic heads. Tracks are circular parts of the plates. As we may have several plates, a stack of plate is seen as a cylinder. All the heads are moved at the same time, reading each it's track. All the tracks read at the same time are a cylinder as well.

Each track is divided as sectors that can be 512 or 4k bytes long.

So Mass Storage disks are nearly always described as "CHS", that is Cylinders number, Heads number, Sectors by track number, and the product of all these numbers gives the visible disk size.

However, this have no meaning for SSD and even with true rotating hard drive, the CHS have absolutely no more any meaning! It keeps using only by inertia... so don't worry too much about these numbers, and if possible ignore them.

3.2. Partitions

Partition is from "part". A partition is a part of a drive with some special attributes.

Computers makers seems pretty dumb when seeing how they keep underestimating the possible next disk size, so each year they have to issue a new standard. Disks firmware are buggy, so the software tools have to fix them - and do quite well the job.

That is to say that understanding fully why the Partitionning tool choose to create the partitions the way they do is very complex. It's explained fully (or mostly) on the Partitions-and-mass-storage-HOWTO, you probably won't read and don't have to now.

Windows makes little use of partitions. One can install as many Windows version he wants on the same partition (and often do). It may even proove difficult to install Windows on just an other drive on the same computer.

Nor Unix nor Linux have any such problem. Just on the contrary, Linux **love** to use at least three partitions. This mean you can have as many Linux on your drive as you want, each on it's special part(ition) of the drive, erase the partition without losing your data (backup first is still better) for example. The two main Linux partitions are used for the system ("/" or "root") and the users data ("home"). The third ("swap") is used to add some more memory and is written directly sector by sector by the system. You usually don't even see it.

4. Making Room for Linux

4.1. Using Windows

Most of the time, your computer come with a paid Windows. If you are not an experienced Linux User, it's probably better to keep this Windows, just for safety in case you have to show your computer to the vendor tech (If your vendor is Linux fiendly you are lucky!). So you have to make room for your prefered Linux.

If You have Windows XP, little luck. Most XP computers come with only one partition on the disk and XP don't know how to make it smaller (If you have two, see the next paragraph). What you have to do is to "defragment" the drive (look in disk properties, you will probably have to "verify" the drive first) - if the computer is brand new and never used, this is not necessary. The "defragmentation" makes the work easier for the Linux partitionner.

If you have Windows Vista, go to Control center, Administration tools, Disk tools to see the actual disk partitionning. If you have luck, may be there is yet a "data" partition. If so, you have just to look where is this partition located and what it's size is. It will be used for Linux.

If not, clic right on the system disk partition rectangle, you will see a resize option. Use it. Keep some room for Vista (50Gb, for example) and OK, you have now several partitions on your drive.

If you see in this screen a small partition (usually around 9Gb), be specially cautious. This is the "system restore partition" that holds the Windows Vista (or XP) original system. Your computer manual should explain how to copy this to two DVD's. Do this before any use of your computer. Make notice of the size and place of this partition (it can be at the very beginning of the drive or at the very end), try to not erase it right now. Don't erase it during the computer insurance time.

4.2. Using Linux

You, as a dummy Linux user, have better use a very well known Linux Distribution. There are more than a hundred Linux distributions and I don't have used all of them, of course, so I can't be sure some of them couldn't erase your drive if ever you don't understand a question.

However I'm rather sure Ubuntu, openSUSE, Mandiva, Red Hat Fedora, new Debian can be reasonably safe for a beginner.

So launch the Linux install. Probably you will have to insert a Cd or DVD and run. May be you will install immediately or launch a live system (Linux working from memory, not from drive), then install froms there.

Anyway, you will have to answer some basic questions and at a moment you will be asked if you want to keep windows or erase it. Beleive me, keep it for now, it will be easy to remove later.

At this moment you will be presented a screen with a graphic of the proposed disk partitions. Scan it to verify the Windows partition is not touched - not formatted. It is probably labelled "NTFS" or "Windows". Verify also that the Windows system backup partition is not touched. It may not have any identified label. In some partitionner, the partition table may be called *Disklabel*.

You may have to give Linux the name or position of the Vista partition created on the previous step. If your Windows is XP, you will be proposed to shrink the Windows Partition **this is good**.

Then accept the partitionning sheme your distribution proposes. **Do not try to be an expert**. At install time, no good Linux Partition tool should erase a Windows system partition. If it does, write me, I will include a notice here.

Modern Linux distributions are perfectly able to resize a Windows partition to make room to Linux. Let some room to Windows, though, if you plan to use it.

So, in summary, **trust your Linux install**. Most install problems are user's problem, not Linux Distribution problems!!

Do **not** try "LVM" or "RAID" for your first install. To use these things, read the hole Partitions-and-mass-storage-HOWTO.

5. Images of the partitionning tools

5.1. Windows XP

Here you can see the XP tool for partitionning (french version). The partition is the dashed c: rectangle. You can see the contextual menu (right clic) with no resizing - the resizing option can be seen only in the Vista similar menu.

📕 Gestion de l'ordinateur						
I Fichier Action Affichage Fend				_ 8	×	
⇐→ 🗈 📧 😫 🖓 🗙 🖆	r 🖻 🔯 📓		 A		_	
 Gestion de l'ordinateur (local) Outils système Observateur d'événements Obseirs partagés Obsiers et groupes locau: Obsiers et groupes l		n Type De base	 Statut Sain (Système)	Capacité 7,72 Go	Est 1,E	-
 	Disque 0 De base 7,72 Go Connecté	(C:) 7,72 Go N Sain (Syst	Ouvrir Explorer		~	_
	CD-ROM 0 DVD (D:) Aucun média		Marquer la partiti Modifier la lettre Formater			ien
< >	Partition principa	le	 Supprimer la part	ition		
		-	Propriétés			_
	🗄 🔜 Favoris rése	au	 Aide			

If the computer used Windows for a while, you will have to *verify* and *defragment* the disk. This is found in the disk context menu, tab "tools". Defragmenting is re-organising the files in the disk. On the picture below, you see a badly fragmented disk. Vertical lines are files. To be able to shrink the partition with the Linux tools, you must have a large blank on the right of the rectangle on the defrag window. Even only one file on the right prevents resizing.

If you can't resize, you can only backup all your data, make the partitionning (with Parted magic, for example), deleting all the disk, reinstall XP then install Linux. Given you will probably have to reinstall Windows from time to time, you can use this moment to make room for Linux.

Volume	État de la session	Système de fichiers	Capacité	Espace libre	% Espace libre
<mark>)</mark> (C:)	Défragmentation en	NTES	7.72 Go	1.86 Go	24 %
1.10					
<					
Econo occupá a	sur le disque avant la défragme	optation (actimation) (
Espace occupe s	sur le disque avancia derragnie	incación (escinación) :			
Espace occupé s	ur le disque après la défragme	ntation (estimation) :			

5.2. Parted Magic

Parted Magic is a CD or USB key utility extremely usefull if you have to deal with partitions (find it with web search Probably <u>http://partedmagic.com/</u>). It allows repartitionning, resizing of partitions (if possible), and even search for lost partitions if you happen to have trashed your partition table (experts only). Do not confuse Parted Magic (free and open source) with the proprietary program Partition Magic (expensive).

This tool is by far the more friendly. If you read this HOWTO you are probably not as Dummy as you may think, at least you are curious. So you may have benefits to use Parted magic at least to make one free partition the Linux installer will easily find and use (and certainly repartition again, that's normal).

Here is the booting screen, you should be able to boot any computer with this CD.

	Parted Magic Boot Options Menu (F1 for more options) 1. Default settings (Runs from RAM / Ejects CD) 2. Alternate graphical server 3. Safe Graphics Settings (vga=normal) 4. Failsafe Settings 5. Console (boots to the shell) 6. Local boot 7. Reboot 8. Memtest86+
	The Linux LiveCD Partitioning Tool
* http://ww	3.0, (C) 2008, Patrick Verner ww.partedmagic.com er: Author excluded from any liability.

You start a graphical screen, as usual. You have icons at the bottom of the screen, clic to use. The partitionning tool is gparted, a very friendly tool. Notice gparted gives you immediately the free space in the Windows partition (the images here is that of a very small disk - only 8Gb).

aic						CPU Hist	tory:
gic 🥂	-		/	/dev/sda - GPartec	1		_ = ×
G	Parted Edit	<u>View</u> <u>D</u> evice	e <u>P</u> artition <u>H</u> elp				
1	New Delete	Resize/Mov	ve Copy Pas	te Undo Apply	/	🙆 /dev/s	da (7.73 GiB) 🗢
				/dev/sda1 7.72 GiB			
Pa	artition	Filesystem	Mountpoint	Size	Used	Unused	Flags
	/dev/sda1	ntfs	/media/sda1	7.72 GiB	5.81 GiB	1.91 GiB	boot
	unallocated	unallocate	d	7.84 MiB			
m		ndina					
0 (operations pe	nding					

Right clic on the desired partition gives you the needed options.

v/sda1		
'2 GiB] <u>N</u> ew	Ctrl+N
	🗑 <u>D</u> elete	Delete
lesystem ntfs	斜 <u>R</u> esize/Move	
unalloca	Copy	Ctrl+C
	🚺 <u>P</u> aste	Ctrl+V
	✤ Eormat to	,
	<u>M</u> ount on	,
	M <u>a</u> nage Flags	
	C <u>h</u> eck	
	<u>L</u> abel	
	💡 Information	

In the resizing window, you can resize with the mouse (moving the partition limit with the mouse), or give a numerical value.

Partition-Mass-Storage-Dummies-Linux-HOWTO
--

1	Resize/Move /dev/sdal	
n: ′B	•	U
'B Si Id	Minimum Size: 5964 MiB Maximum Size: 7915 MiB	±
e	Free Space Preceding (MiB):	
k	New Size (MiB): 6237	
s:	Free Space Following (MiB): 1678 🚔	
	✓ Round to cylinders	
	Cancel	Resize/Move

Here is a view of a much bigger disk.

🔄 /dev/sda - G	rted	9							
<u>GParted</u> Édition	Af	fichag	e <u>P</u> ériphérique	e Partitio <u>n</u> Aid <u>e</u>					
19 🗱 🔶		ÐI	Č 🖌					dev/sda (46	65.76 Gio) 🗘
/dev/sda1 50.01 Gio			v/sda7 01 Gio			/dev/sda8 <mark>34</mark> 3.74 Gio			
Partition		Systè	me de fichiers	Point de montage	Étiquette	Taille	Utilisé	Inutilisé	Marqueurs
/dev/sda1	I		ntfs	/windows/C	ACER	50.01 Gio	23.70 Gio	26.31 Gio	lba, type
✓ /dev/sda2	I		extended			415.75 Gio	277778	1.000	boot, Iba, typ
/dev/sda5	I		linux-swap			2.01 Gio	325525	6.5.5.5	type
/dev/sda6	I		ext3	1		20.00 Gio	9.51 Gio	10.49 Gio	type
/dev/sda7	0		ext3	/home		50.01 Gio	5.59 Gio	44.41 Gio	type
/dev/sda8	I		ext3	/local/data-jdd		343.74 Gio	157.33 Gio	186.41 Gio	type

On the same Parted Magic CD, you have also other tools, like "Testdisk". This one is much less friendly, but also very powerfull (and being so allow easily to destroy your disk). You will be able to use it sometime in the future, not now.



5.3. openSUSE

openSUSE is a friendly Linux Distribution, trying to reduce as much as possible the risk of removing accidentally files on the disk while installing.

If you insert the openSUSE DVD in your drive when Windows is running, the DVD starts and propose to install Linux. It creates a special Windows starting menu and reboot to the install without any work to do for the user.

On this first image, openSUSE warns that it's not possible to resize the XP disk, you have to remove it entirely if you want to install Linux.



After I did quite a long cleaning work (including removing of unusefull files) on the XP disk, from inside XP, the diagnostic is better:



5.4. Mandriva

Mandriva is even simpler, the options are to remove Windows or to use part of the drive.

🧔 Mandriva Live	- 🗆 🗙
The DrakX Partitioning wizard found the following solutions: Remove Microsoft Windows® Use the free space on the Microsoft Windows® partition Custom disk partitioning	
Cancel	Next
Register	

If you choose this solution, you have a windows to select what part of the disk is for XP, what part for Linux, as usual.

ø	Mandriva Live	- 🗆 X
V [(hich size do you want to keep for Microsoft Windows(:] (7.7GB, ntfs)?	® on partition hda1
s	ze	7456

5.5. Fedora

Red Hat was the first really handy Linux Distribution, but for many years now, it's no more aimed to John Doe but to professionals (with the associated support and price). It's average user conterpart is Fedoraproject.

Fedora can be dowloaded as a live CD, you start it (no boot options) and then clic on an icon to begin the installation.

On the partitionning screen, Fedora give a drop down list of the choices possible, one is resizing (here the french screen)

Redimensionne les partitions existantes et crée le partitionnement p Éfaut dans l'espace disponible	par d
Chiffrer le système	
électionner le(s) périphérique(s) à utiliser pour cette instal	mation.
Configuration avancée de stockage	nstallation ?
sda 7915 MB ATA VBOX HARDDISK	v
E <u>x</u> aminer et modifier la structure de partitionnement	

The following screen is for the size, as usual.

installer votre système ?	ner pour
sdal (ntfs, 7906 MB)	~
Redimensionner la <u>c</u> ible : 7907	\$
A <u>n</u> nuler 🛛 🎻 <u>R</u> edimensi	ionner

5.6. Ubuntu Desktop

Ubuntu also have a friendly screen to resize partitions, but one have to go to "manual" to find it, what can be a little scary.

	Install	
Prepare disk space		
How do you want to partition the disk?		
Before:	/dev/sda1	
After:	Ubuntu 8.10 100%	
 Guided - use entire disk SCSI1 (0,0,0) (sda) - 8.3 GB ATA 	VBOX HARDDISK	
 Guided - use the largest continuor 	us free space	
🔿 Manual		
Step 4 of 7	Quit	Back

It's the "edit" button that allows resizing. Do **not** format the XP main partition! This would erase all the content.

			9	9%	0%
vice	Туре	Mount point	Format?	Size	Used
ev/sda					
dev/sda1	ntfs			8291 MB	6237 MB
ee space				8 MB	
w partitio	n tabl	e New part		it partition	Delete partition
م مرجعات حام ،					

5.7. Debian

Debian is now as pretty as most distributions. The boot menu (first CD) gives more options than many - this is not a live CD.



The partitionner. Choices are the same as Ubuntu does (Ubuntu is built upon Debian).



"Manual" have the resize option.

Partition disk	5	
You are editing partition #1 of IDE1 master (hda). This partition is formatted with the ntfs Partition settings:		
Use as:	do not use	
Bootable flag:	on	
Resize the parti	tion (currently 8.3 GB)	
Copy data from	another partition	
Erase data on t	his partition	
Delete the parti	tion	
Done setting up	the partition	

You have to give a number - no slide, no view of the free space.

Partition disks	
The minimum size for this partition is 6.2 GB (or 75%) and its maximum size is 8.3 GB.	
Hint: "max" can be used as a shortcut to specify the maximum size, or enter a percentage (e.g. "20%") to use that percentage of the maximum size.	
New partition size:	

5.8. Others

Many Linux distributions are available, for example from <u>ibiblio</u>. If any of these distributions uses gparted, it's possible very easily to partition a drive with them, as we could see with Parted magic. Here the example of *Puppy* Linux.

🖄/dev/sda - GPart	ted	×
<u>G</u> Parted <u>E</u> dit <u>V</u> iew	N <u>D</u> evice <u>P</u> artition <u>H</u> elp	
New Delete Res	esize/Move Copy Paste Undo Apply	ła (2.00 GiB) 🔻
	New Partition #2	e
Partition	Applying all listed operations.	Flags
New Partition #1	Depending on the amount and type of operations this might take a long time.	
New Partition #2	Create Primary Partition #2 (ext3, 1.71 GiB) on /dev/sda	
	Completed Operations:	
	1 of 2 operations completed	
	▶ Details	
Create Primary Pa		
D operations pending	n	7

This distributions may be a bit more difficult to understand, but it installs is extremely low end hardware (256Mb ram for live cd, 2GB Hard drive).