

Disk Imaging with Knoppix

Introduction

This document explains how to use the CD-ROM bootable version of Linux, named Knoppix, to make and restore images of computer hard drives.

Knoppix makes a very good system recovery tool for these reasons:

- It boots a graphical environment in as little as 128 MB of RAM and works with almost any PC hardware. Smaller configurations down to 64 MB can use command line mode if necessary (however we won't cover command line imaging).
- Even if you don't have an image, it is good at recovery of damaged hard drives allowing you to copy the data to another network drive.
- It is free open source software.

Knoppix has the following drawbacks:

- It is somewhat intimidating to use because most operations are from the command line.
- You must shut the computer down to perform an image.
- It is not very easy to write an image to a CD-R drive unless you do it later from the networked drive where it was saved.
- The Windows NTFS file system support is experimental, but this is not a real problem because the experimental part is the ability to write files and not the image. The *partimage* program gives warnings that are not really as serious as they sound.

The new Norton Ghost Version 9 imaging program offers these advantages over Knoppix:

- Images can be made while the computer is running Windows.
- There are more options for making images and the interface is easier to use.

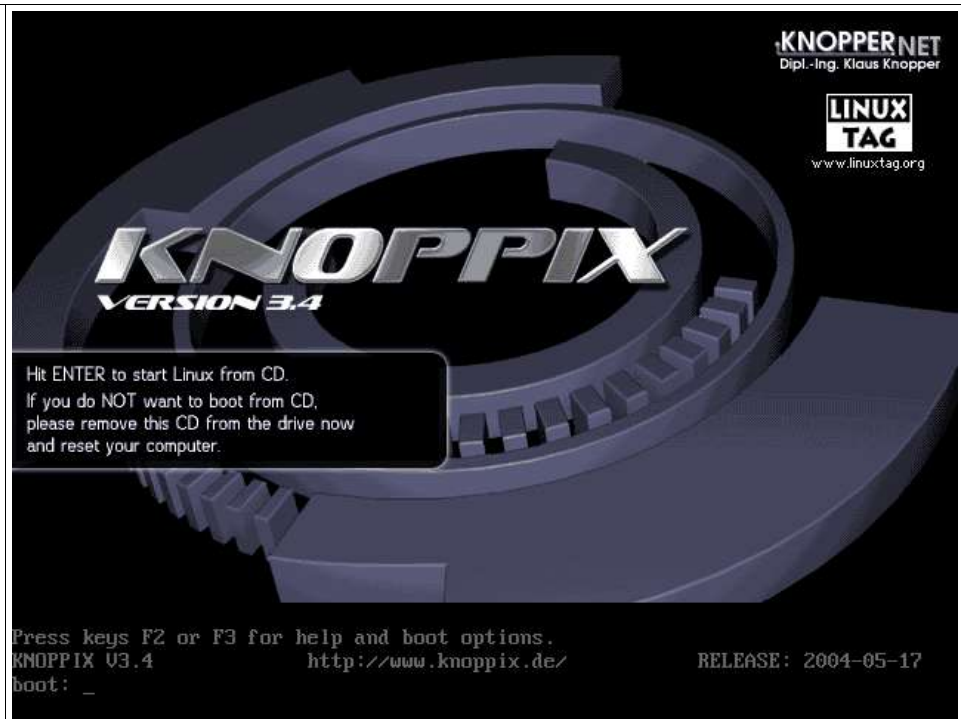
However, Norton Ghost has the following disadvantages:

- Recovery requires a computer with at least 256 MB of RAM and supported hardware.
- The .NET environment, used by the runtime Ghost program, requires at least 512 MB of RAM to run smoothly.
- If the computer won't run Windows, an image can't be made and files can't be recovered.
- While open files can be imaged, their copy on the image may contain corrupt data. It is necessary to shut down database servers and other applications with open files when making the image to avoid corruption of data. This is also a problem when using other backup software that supports open file backups and is a limitation of Windows.

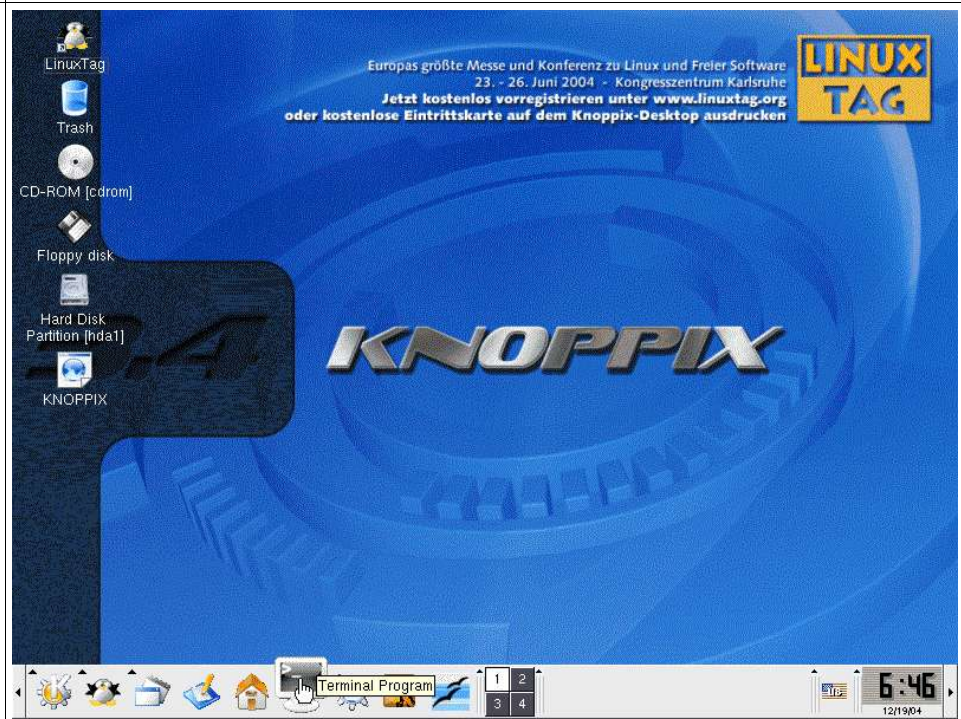
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Creating an Image with Knoppix

Boot the Knoppix CD-ROM on your computer. You may need to adjust the boot priority in the BIOS so the CD is booted before the hard drive. Just press *ENTER* to start Knoppix or use *F2* or *F3* for more options if you need to do something special.

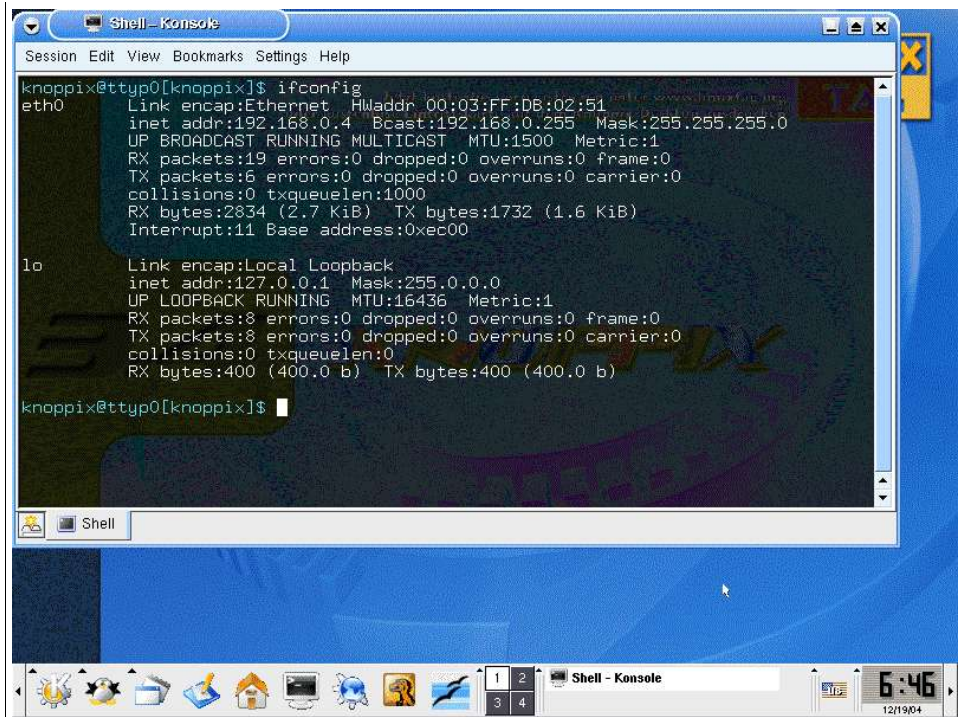


Knoppix will boot the KDE GUI if you have at least 128 MB of RAM. Get rid of the welcome web page and start the Terminal Program by pressing the icon at the bottom of the screen. Do not double click items like you do in Windows or you will get two copies. Linux normally uses only a single click to open items.



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You can use the *ifconfig* command to see if the network is up and running. You should see your assigned network address on the *eth0* interface. If you don't see the *eth0* interface you may need to manually configure an address.

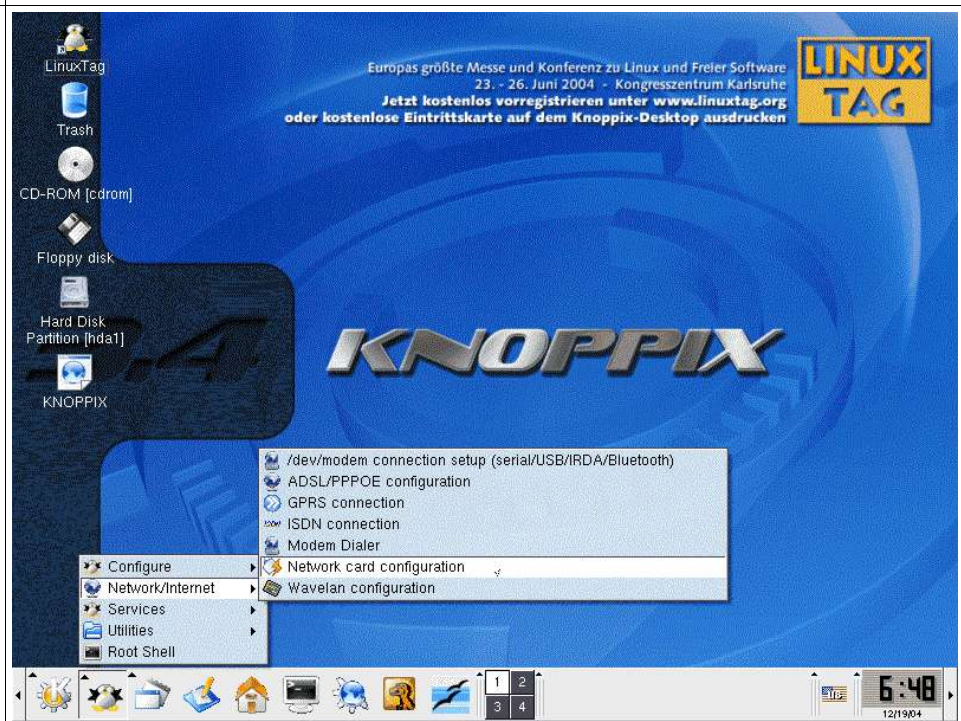


```
knoppix@tty0[knoppix]$ ifconfig
eth0      Link encap:Ethernet  HWaddr 00:03:FF:DB:02:51
          inet addr:192.168.0.4  Bcast:192.168.0.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:19  errors:0  dropped:0  overruns:0  frame:0
          TX packets:6  errors:0  dropped:0  overruns:0  carrier:0
          collisions:0  txqueuelen:1000
          RX bytes:2834 (2.7 KiB)  TX bytes:1732 (1.6 KiB)
          Interrupt:11  Base address:0xec00

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:8  errors:0  dropped:0  overruns:0  frame:0
          TX packets:8  errors:0  dropped:0  overruns:0  carrier:0
          collisions:0  txqueuelen:0
          RX bytes:400 (400.0 b)  TX bytes:400 (400.0 b)

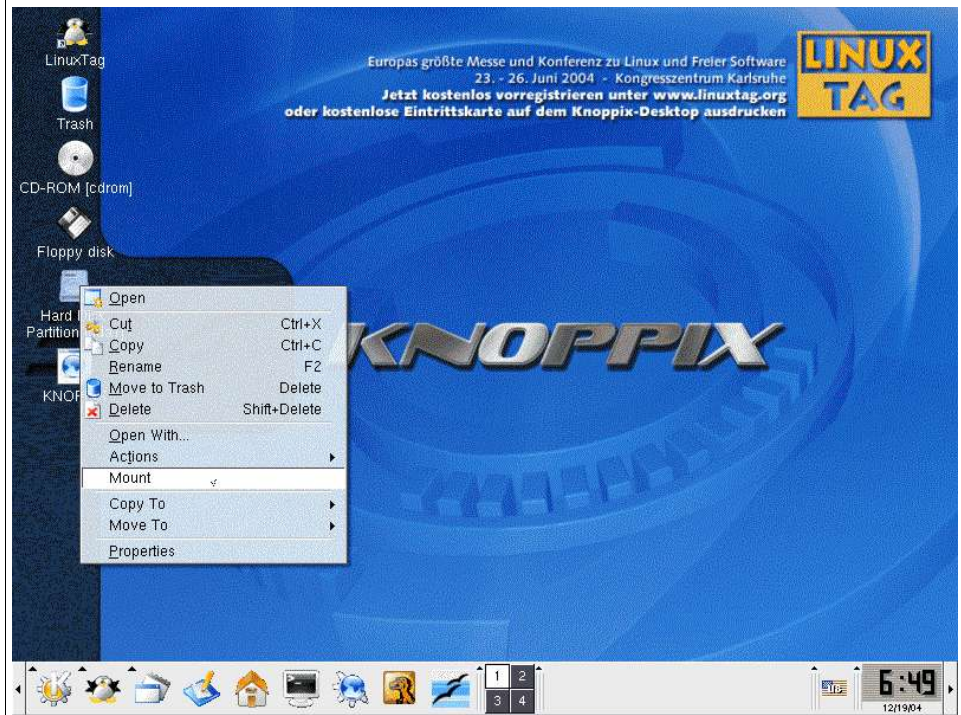
knoppix@tty0[knoppix]$
```

If you need to manually configure the network, just click the Knoppix bird as shown below to start a configuration wizard.

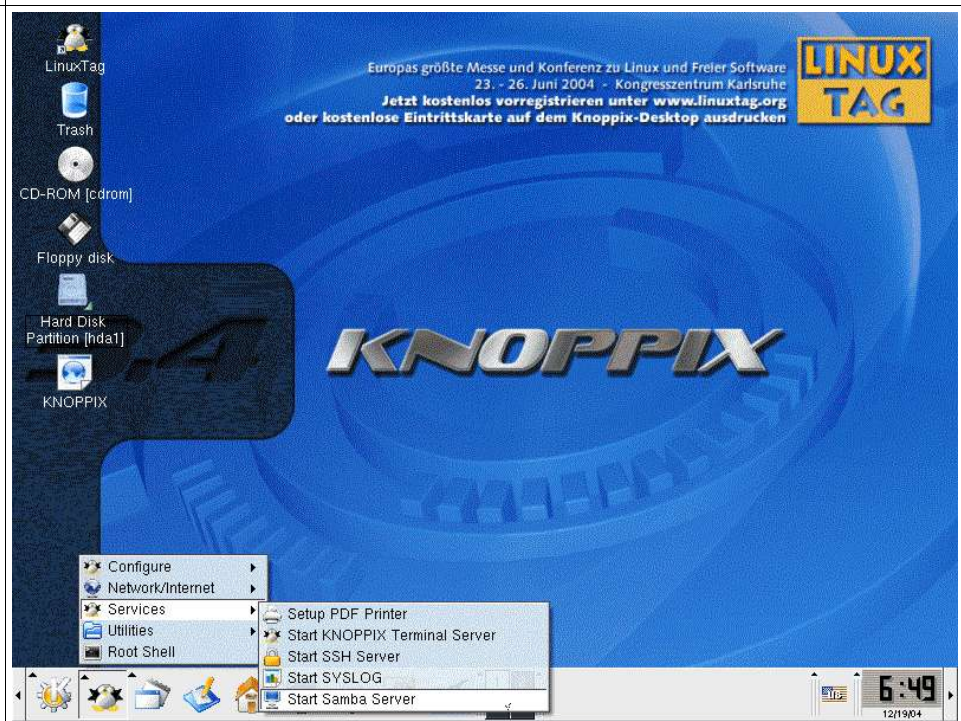


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If you only need to copy some files off of a damaged hard drive, you can right click it and perform a mount command. This will make it available for use. If you are going to make an image of the drive skip this step. The drive must be in the un-mounted state to make an image.

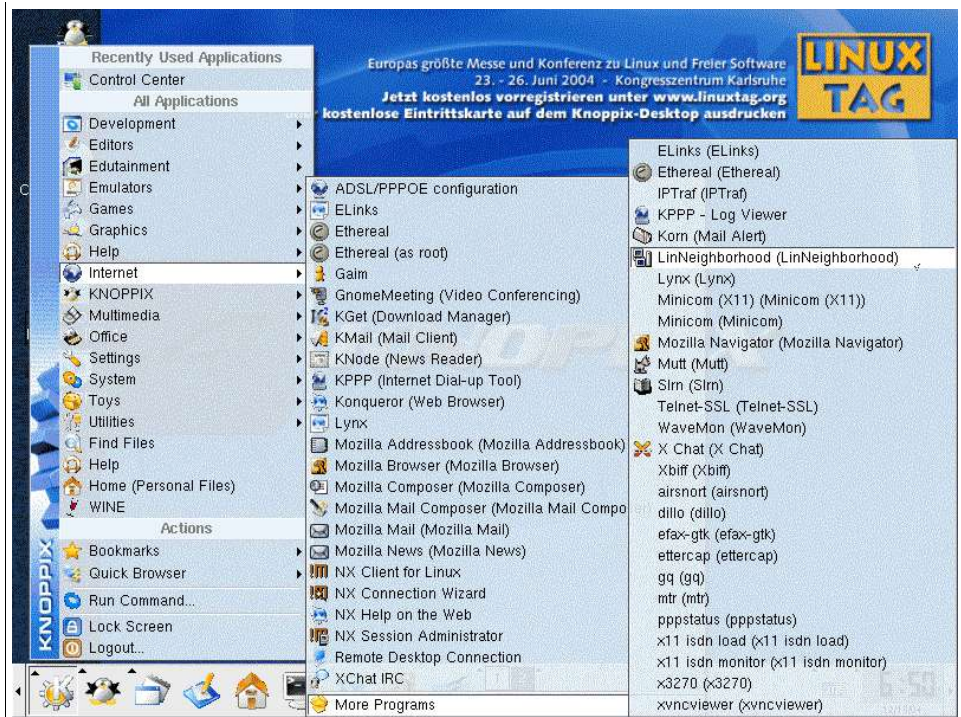


Once the disk is mounted, the icon will show a small triangle in the lower right corner. You can share it on the network by starting the Samba Server as shown here. Just remember the user and password you setup. Go to a windows machine and you should be able to connect to the shared drive and copy files off of it. Skip this step if you are making an image.

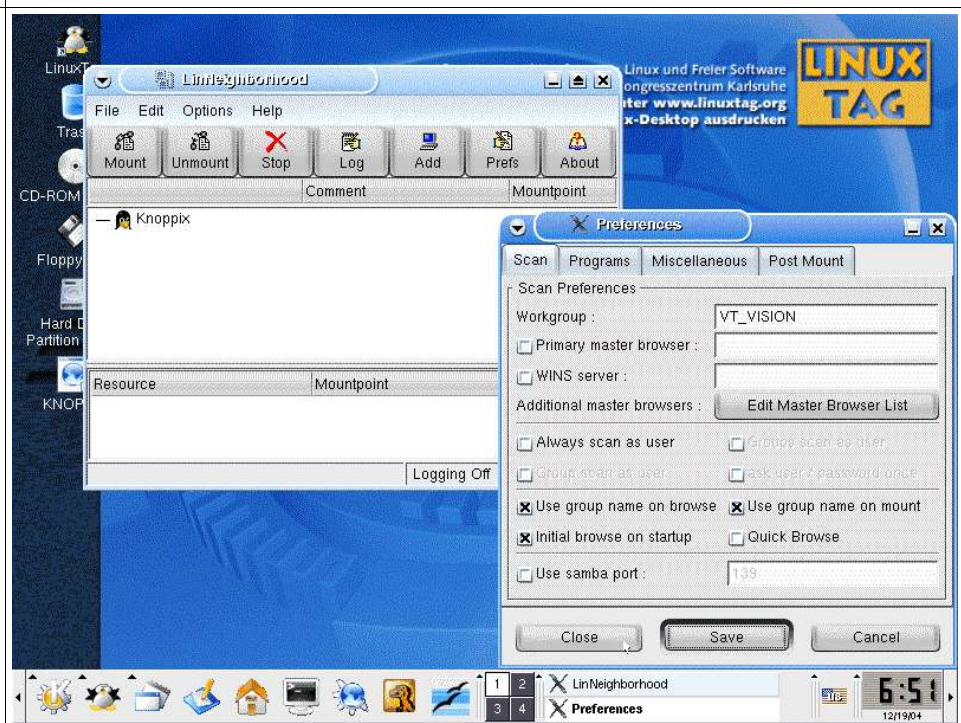


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If we are making an image, we need somewhere to store it. We could use a USB hard drive to store the image, but normally we will use a network drive. To connect to a network drive we will use *LinNeighborhood*. You can start it by using the main menu selection as shown here.

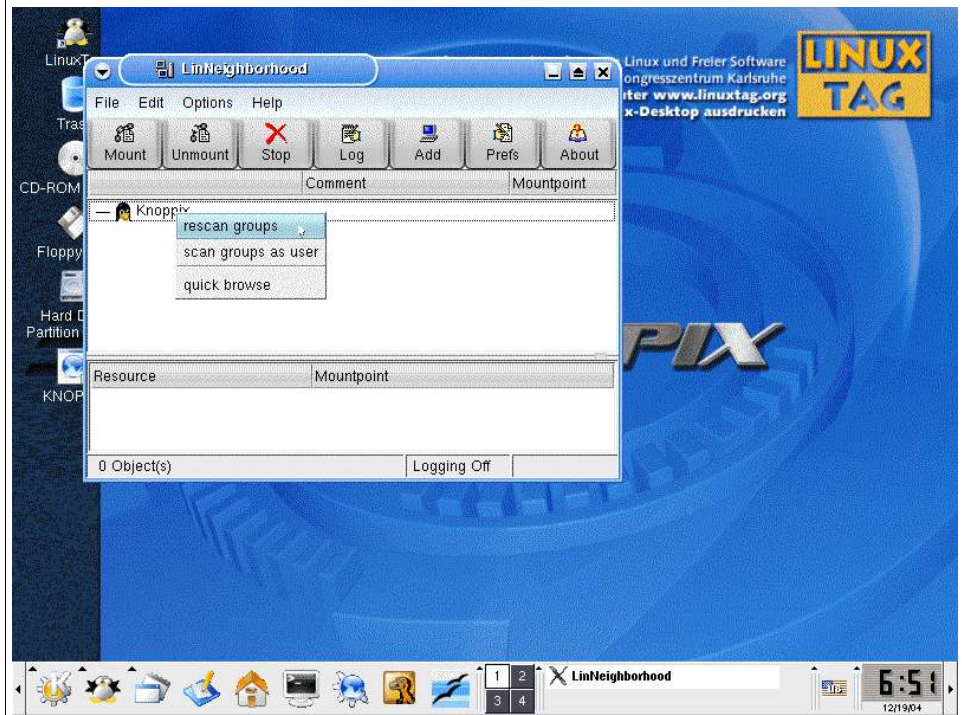


Press the *Prefs* button and set your *Workgroup* (my workgroup is VT_VISION), then press *Save* and *Close*.

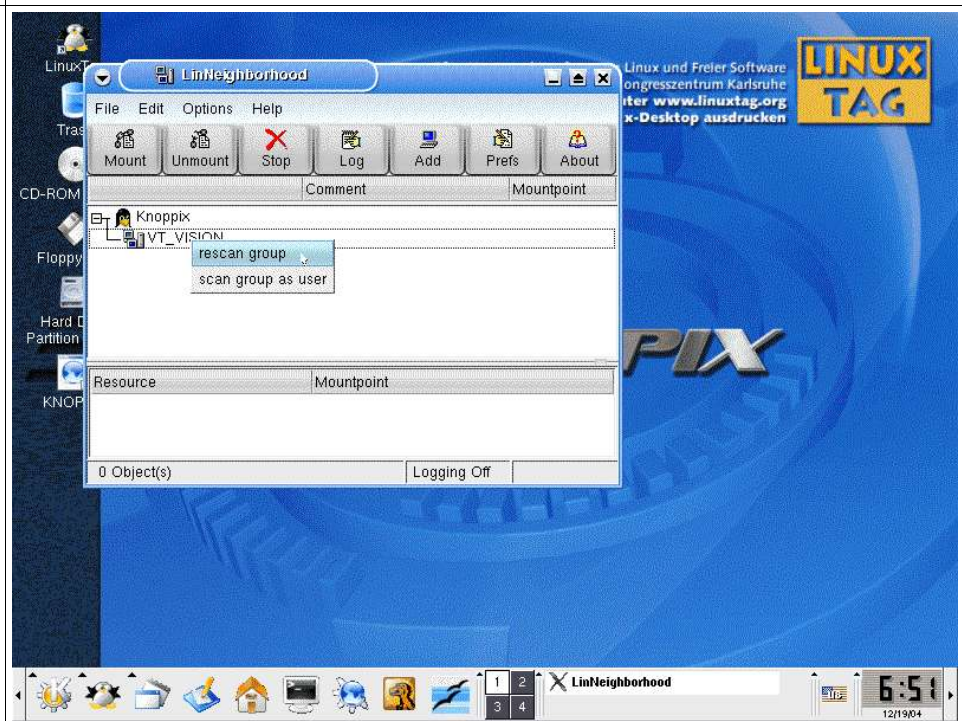


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Right click the Knoppix item and select *rescan groups*.



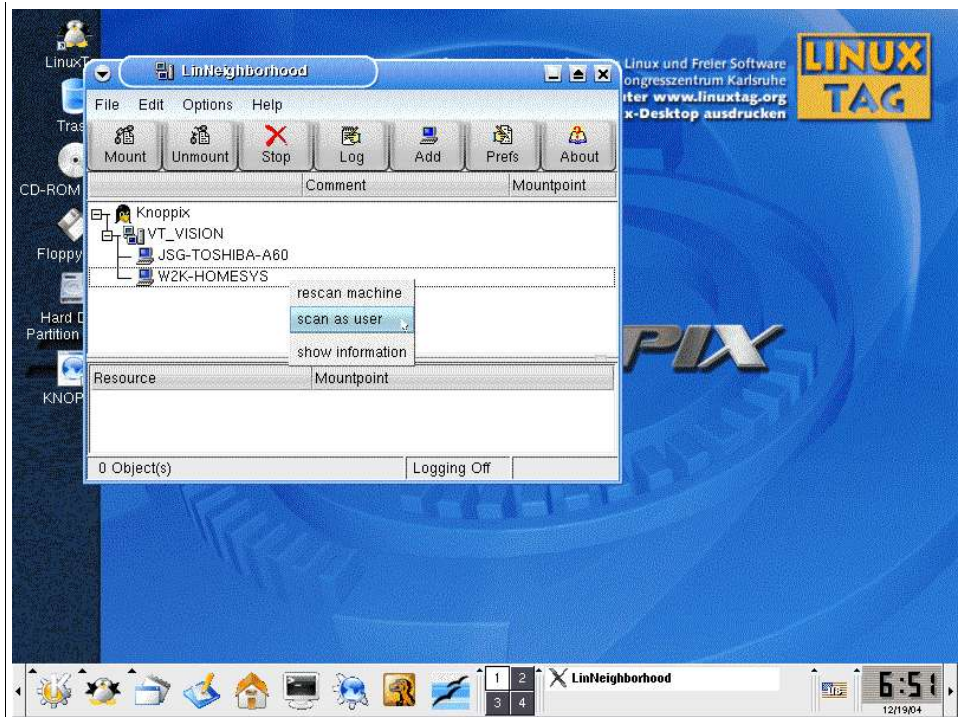
This should open your group. Right click it and again select *rescan group*.



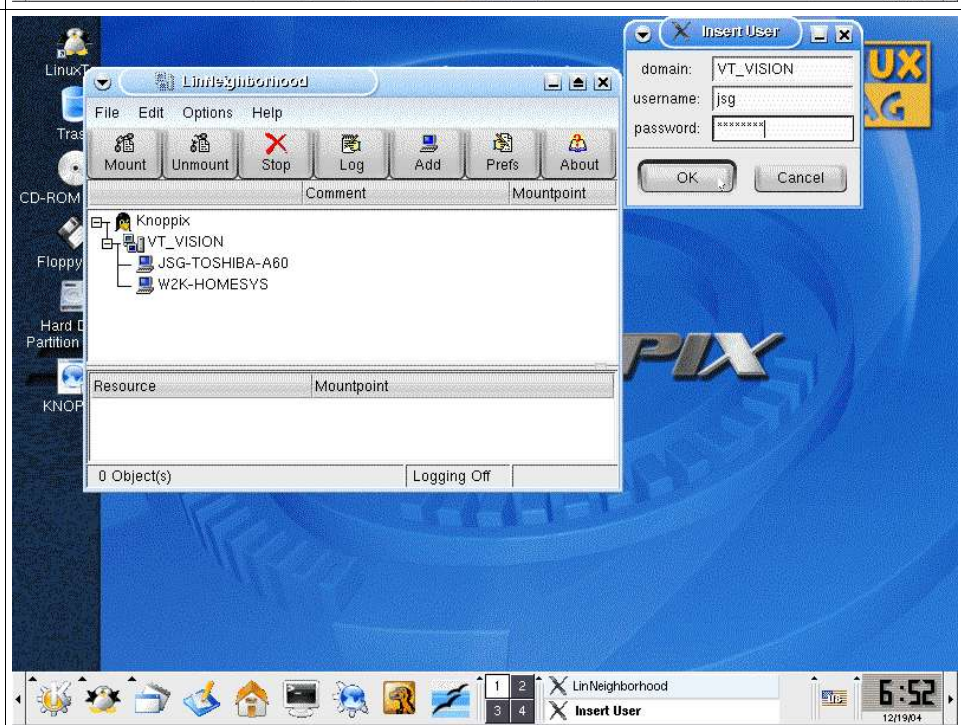
Disk Imaging with Knoppix

This should show the computers in your workgroup. If you have problems getting this far, you can press the *Log* button to show the actual commands being issued and any errors they return.

Right click the computer you want to store the image file on and select *scan as user*.



You will need to enter your Windows user name and password or you will not be able to access the shares.

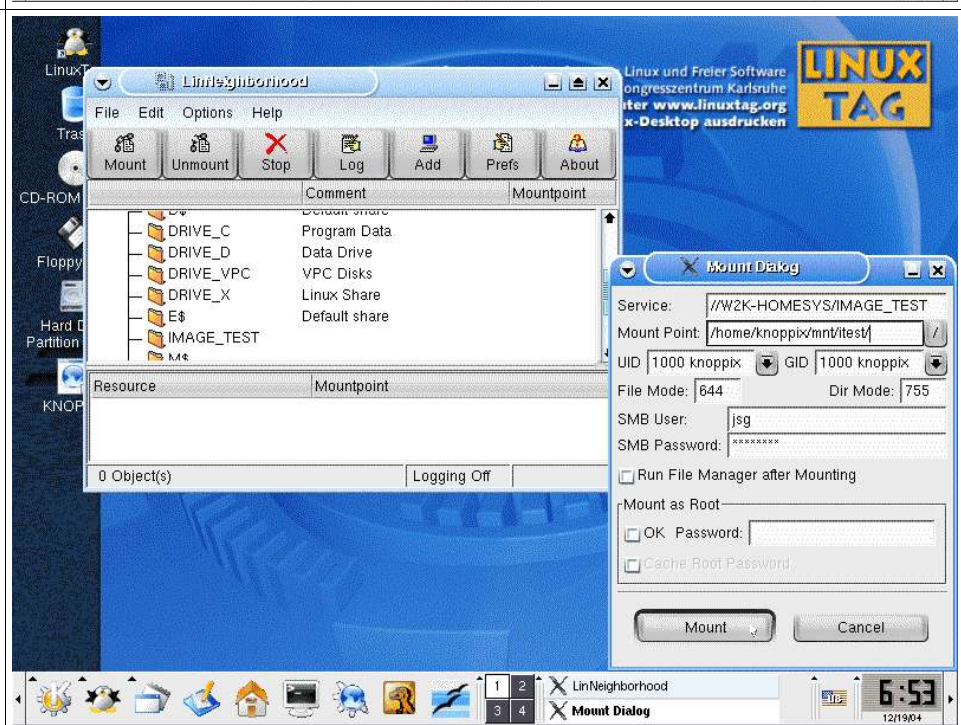


Disk Imaging with Knoppix

This will open the shares on the computer. You can now select the share to use and press the *Mount* button.



This opens the mount dialog where you can setup the settings for mounting the drive. We normally want to change the *Mount Point* setting. LinNeighborhood normally creates a long mount point string that is hard to enter into the commands we will be using later. Replace the part after `/home/knoppix/mnt/` with something easy to remember. In our case we used `/home/knoppix/mnt/itest/`

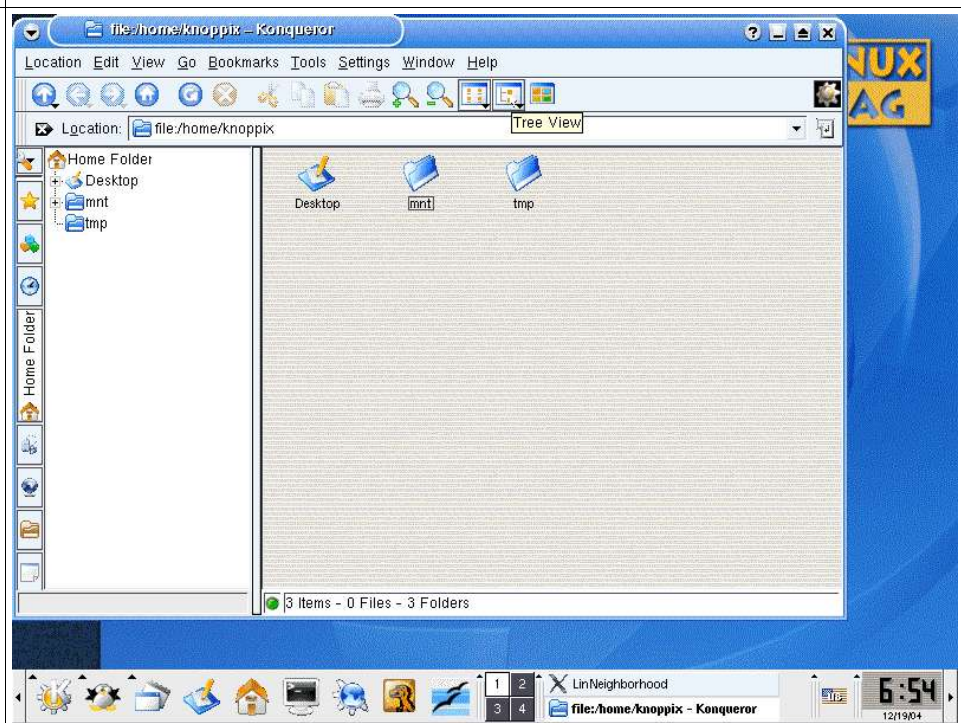


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The drive is now mounted. We can click the *Personal Files* button to open a file explorer to see if the network drive is working.

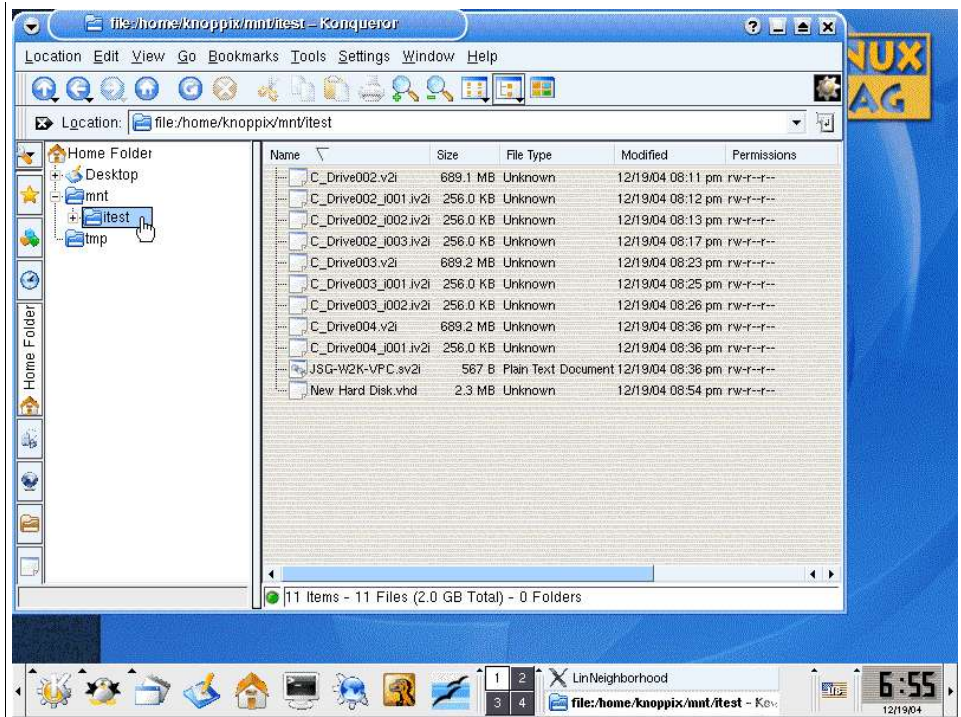


This puts you in your home user *knoppix* folder.

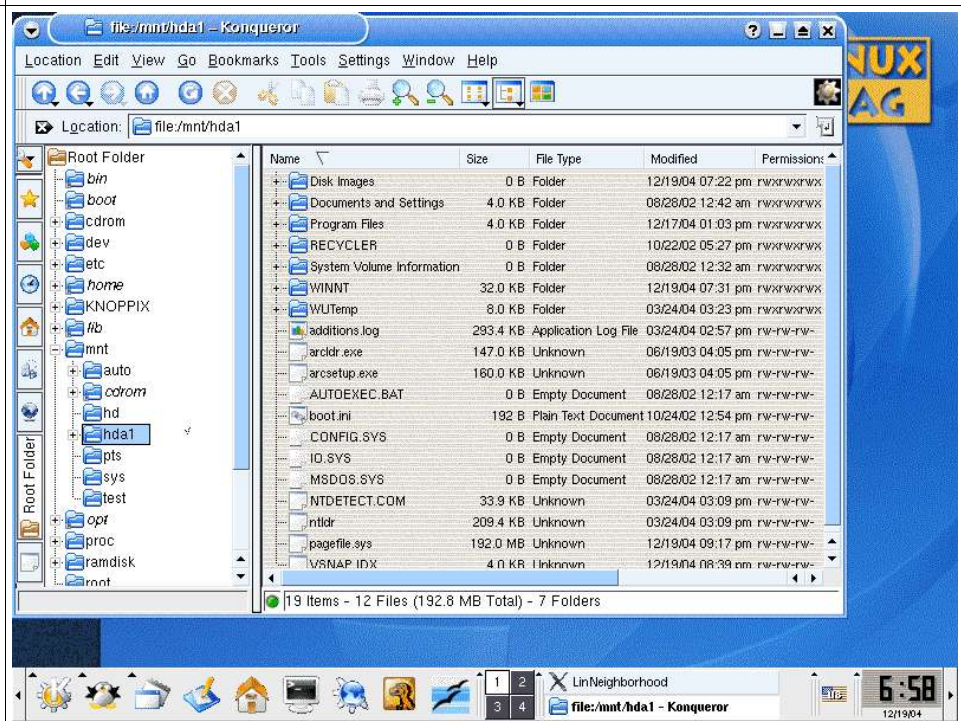


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Open the *mnt* folder and you can see your network drive.



If we mounted our hard drive as shown before, we could now copy files to the network drive. You need to open up the hard drive in another file explorer window or press the *Root Folder* button on the lower left to get at the files. Your network drive is now in the home folder. The Linux file structure can be a little confusing at first, but shouldn't be too hard to figure out. Just forget about the DOS drives used in Windows.



Disk Imaging with Knoppix

To perform a disk image, we will use the console window. Press the *Terminal* button below to get into a console. Use the *su* command to obtain root privileges. We can use *fdisk* to check our partitions similar to using it under DOS. However, be careful as the commands are slightly different. It is best to image the drive before we try to mess it up.

```

knoppix@tty0[knoppix]$ su
root@tty0[knoppix]# fdisk /dev/hda

The number of cylinders for this disk is set to 2088.
There is nothing wrong with that, but this is larger than 1024,
and could in certain setups cause problems with:
 1) software that runs at boot time (e.g., old versions of LILO)
 2) booting and partitioning software from other OSs
   (e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): p

Disk /dev/hda: 17.1 GB, 17179803648 bytes
255 heads, 63 sectors/track, 2088 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/hda1  *           1         2088     16771828+    7  HPFS/NTFS

Command (m for help):
  
```

We will use the command line version of *partimage* because it is easy to type the setup parameters on the command line. The parameters are explained below.

```

knoppix@tty0[knoppix]$ su
root@tty0[knoppix]# fdisk /dev/hda

The number of cylinders for this disk is set to 2088.
There is nothing wrong with that, but this is larger than 1024,
and could in certain setups cause problems with:
 1) software that runs at boot time (e.g., old versions of LILO)
 2) booting and partitioning software from other OSs
   (e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): p

Disk /dev/hda: 17.1 GB, 17179803648 bytes
255 heads, 63 sectors/track, 2088 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

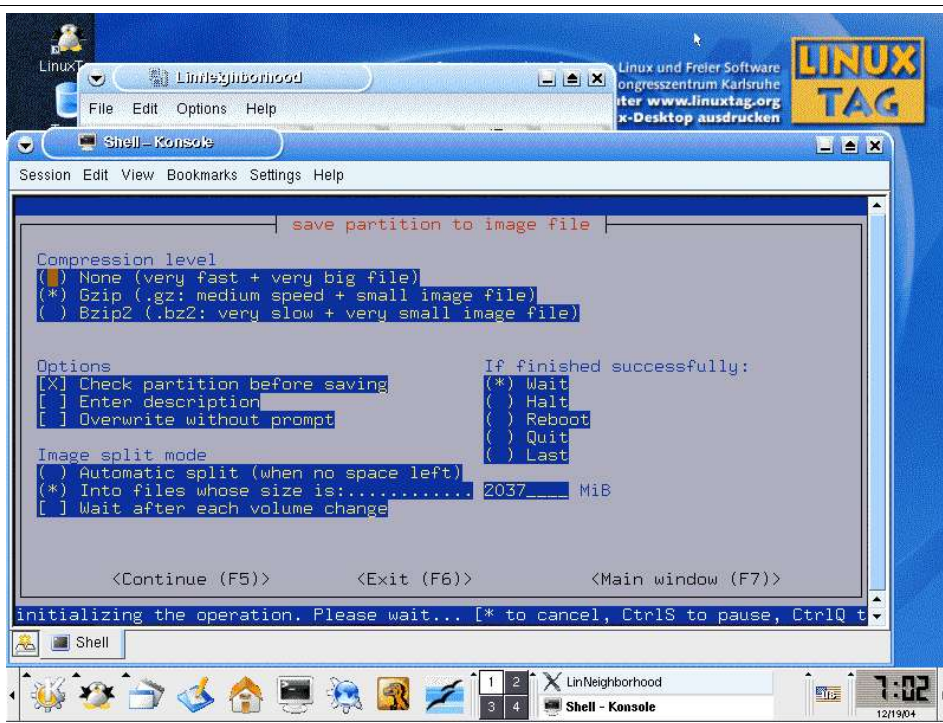
   Device Boot      Start         End      Blocks   Id  System
/dev/hda1  *           1         2088     16771828+    7  HPFS/NTFS

Command (m for help): q

root@tty0[knoppix]# partimage -z1 -d save /dev/hda1 /home/knoppix/mnt/itest/hda
1.img
  
```

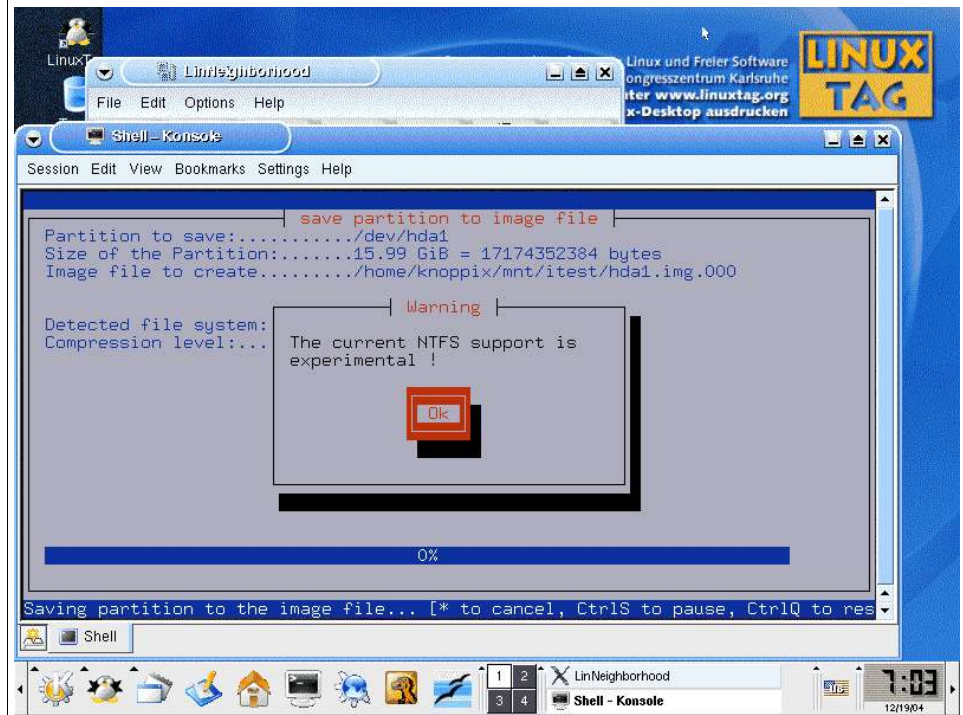
partimage	Starts the <i>partimage</i> program.
-z1	Specifies gzip compression of the image.
-d	Avoids having to enter a description.
save	Specifies to save an image.

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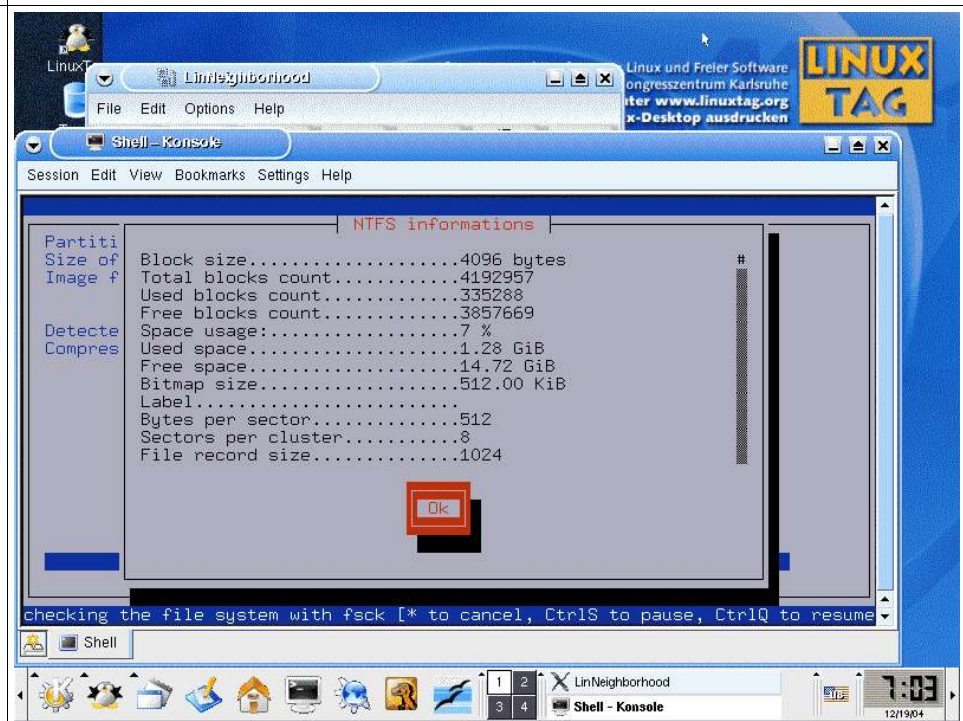
<p>/dev/hda1</p>	<p>The partition to save. The following should help explain the Linux disk names:</p> <p>/dev/hda1 First primary partition, primary disk, first controller.</p> <p>/dev/hda5 First extended partition, primary disk, first controller.</p> <p>/dev/hdb5 First extended partition, secondary disk, first controller.</p> <p>/dev/hdc1 First primary partition, primary disk, second controller.</p> <p>All your disk partitions will usually be listed on the desktop if you are confused by the Linux names.</p>
<p>/home/knoppix/mnt/itest/hda1.img</p>	<p>The path and file name of the image file to save the image in. The extension is not needed, but helps explain what the file is.</p>
<p>The <i>partimage</i> program shows you the first setup screen. We have selected Gzip with the -z1 parameter. It will normally split the files at 2 GB because this is the normal limit for older Linux versions and DOS systems. Press <i>F5</i> to go to the next setup screen.</p>	

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The program warns you if you are saving a NTFS partition used by Windows NT, 2000 and XP. Linux fully supports NTFS for read operations so this message is nothing to worry about.

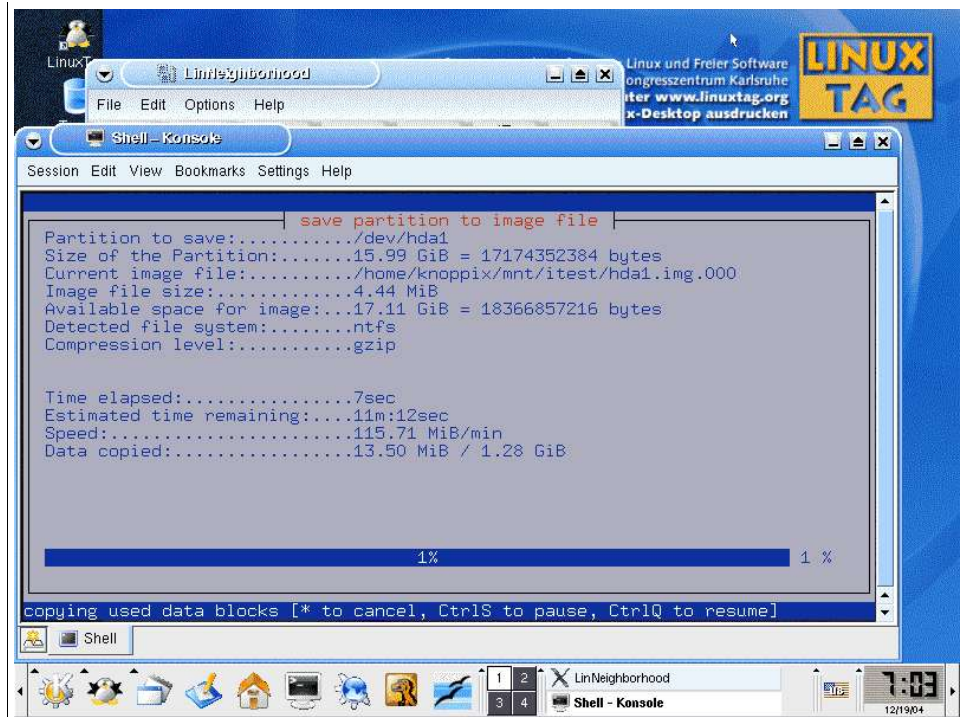


It will next tell you about the structure of the disk.

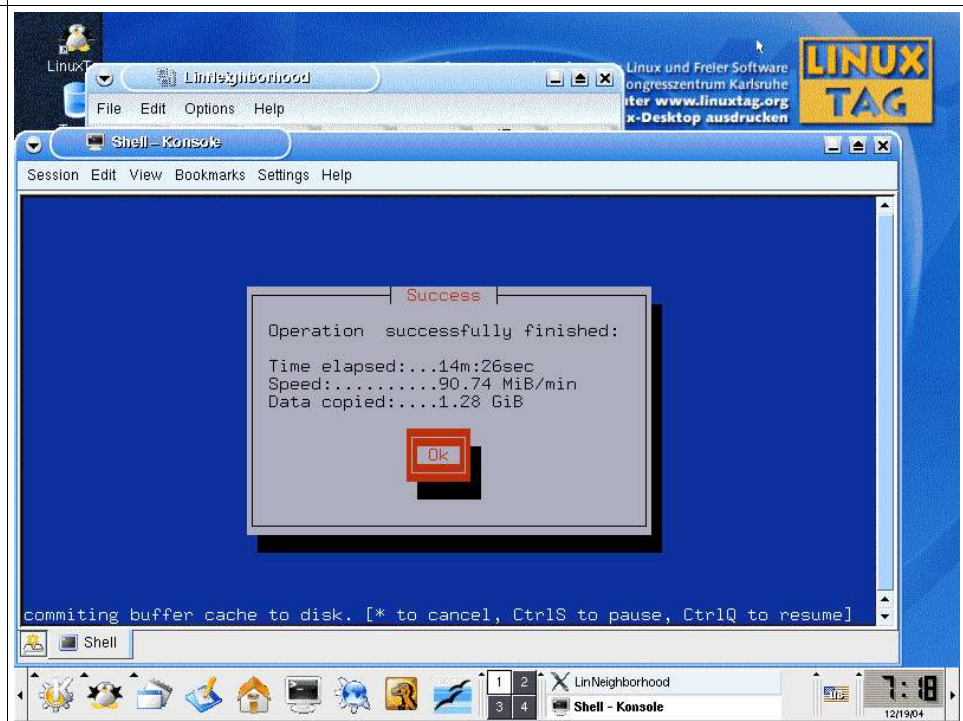


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As the program works, it keeps statistics on the operation to let you know how soon it will finish.



When everything is done you will get this message.



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If you need further information on *partimage*, look at the manual page.

Type: `man partimage`

Use page up/down to read the manual and press the *q* key to exit.

We can also optionally save the MBR (Master Boot Record) of the disk drive using the *dd* command. Be very careful with this command because it can quickly erase a hard drive. The parameters are explained below:

```

Command (m for help): p
Disk /dev/hda: 17.1 GB, 17179803648 bytes
255 heads, 63 sectors/track, 2088 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/hda1  *           1         2088    16771828+   7  HPFS/NTFS

Command (m for help): q

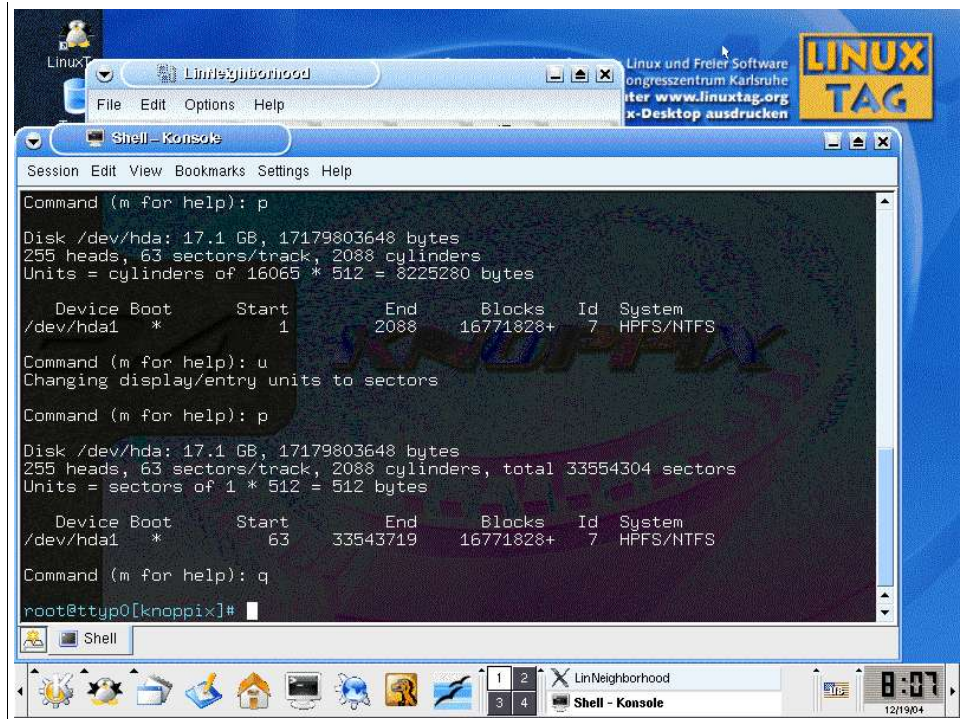
root@tty0[knoppix]# partimage -z1 -d save /dev/hda1 /home/knoppix/mnt/itest/hda1.img
root@tty0[knoppix]# man partimage
Reformatting partimage(1), please wait...
root@tty0[knoppix]# dd bs=512 count=63 if=/dev/hda of=/home/knoppix/mnt/itest/mbr.img
63+0 records in
63+0 records out
32256 bytes transferred in 0.496950 seconds (64908 bytes/sec)
root@tty0[knoppix]#
root@tty0[knoppix]#

```

<code>dd</code>	Starts the <i>dd</i> program.
<code>bs=512</code>	Sets the sector block size.
<code>count=63</code>	Sets the number of sectors to copy.
<code>if=/dev/hda</code>	Copies from the first hard drive.
<code>of=/home/knoppix/mnt/itest/mbr.img</code>	Sets the output file for the MBR image.

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We can also use the `fdisk` command to list the partition setup for the drive. We normally don't need to do this because *partimage* can restore the MBR.

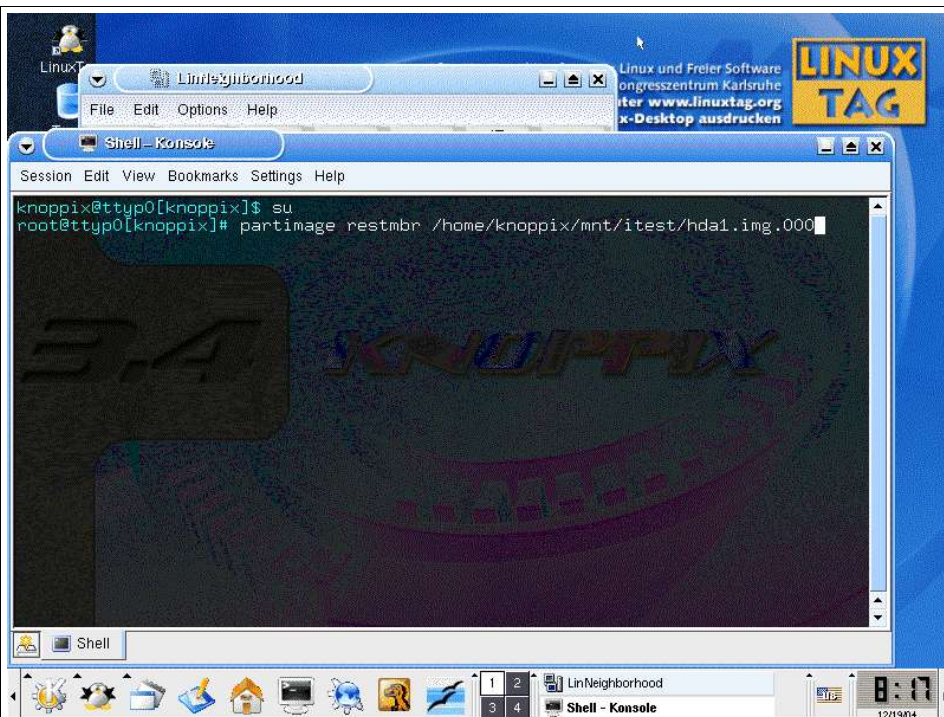


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Restore the Image with Knoppix

To restore the image, put in a new hard drive of the same size or larger than the one that failed and boot Knoppix. Mount your network drive and open a terminal and enter `su` to become the root user. We now use `partimage` to restore the MBR. This is necessary to allow us to restore the partitions and be able to boot them. If the disk is larger than the one you replaced, you will have extra space at the end of it. When you are back up and running, use Windows to turn that extra space into another drive to reclaim the space.

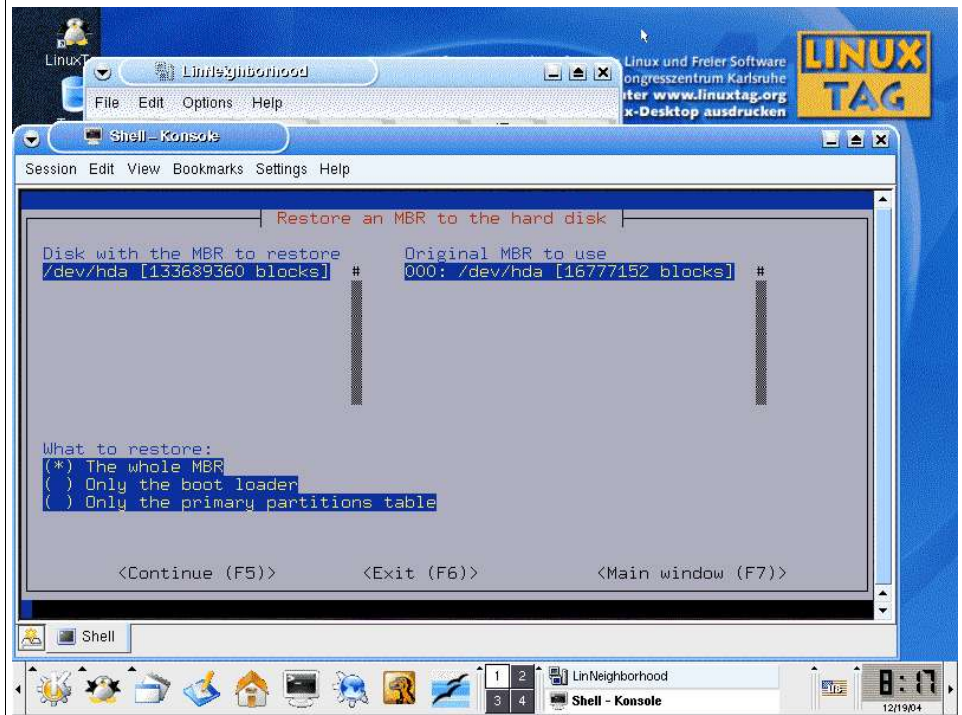
The parameters are explained below:



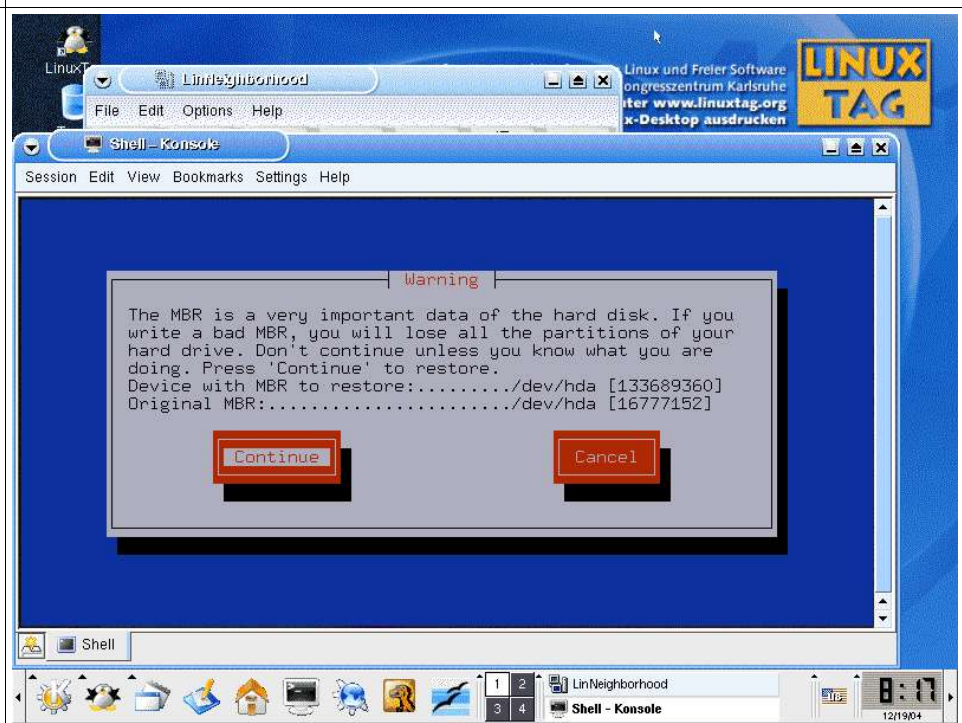
<code>partimage</code>	Starts the <i>partimage</i> program.
<code>restmbr</code>	Restores the MBR and partition table.
<code>/home/knoppix/mnt/itest/hda1.img.000</code>	The name of the primary partition image file. We need to add <code>.000</code> because the first file will have this added to it.

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The program will start with this setup screen. Press *F5* to restore the MBR.

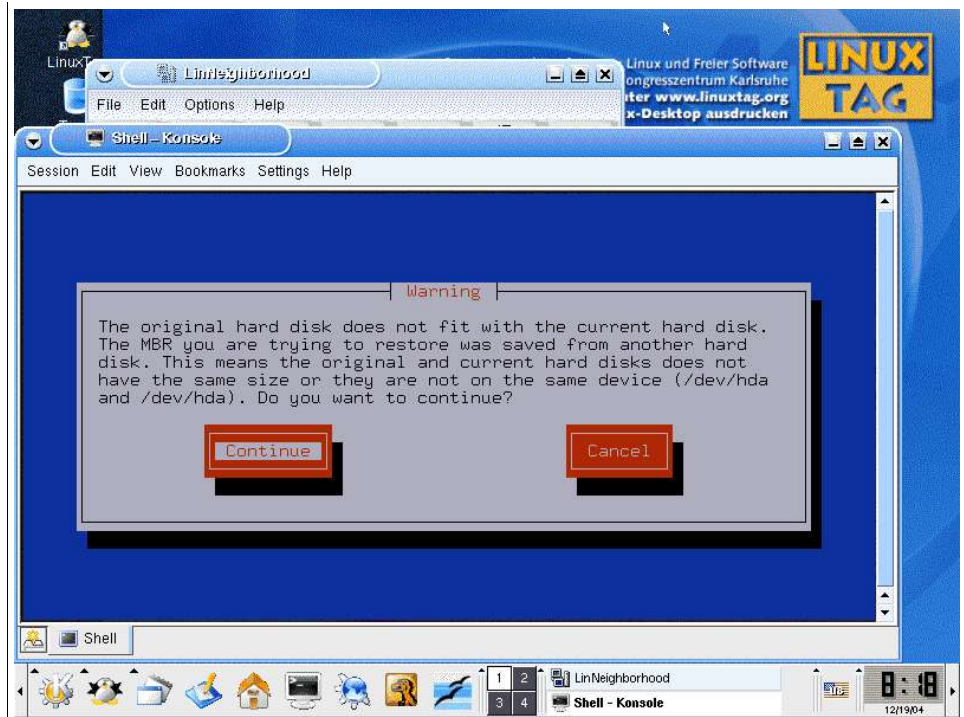


Make sure you don't have other data partitions on the hard drive before you continue with this.

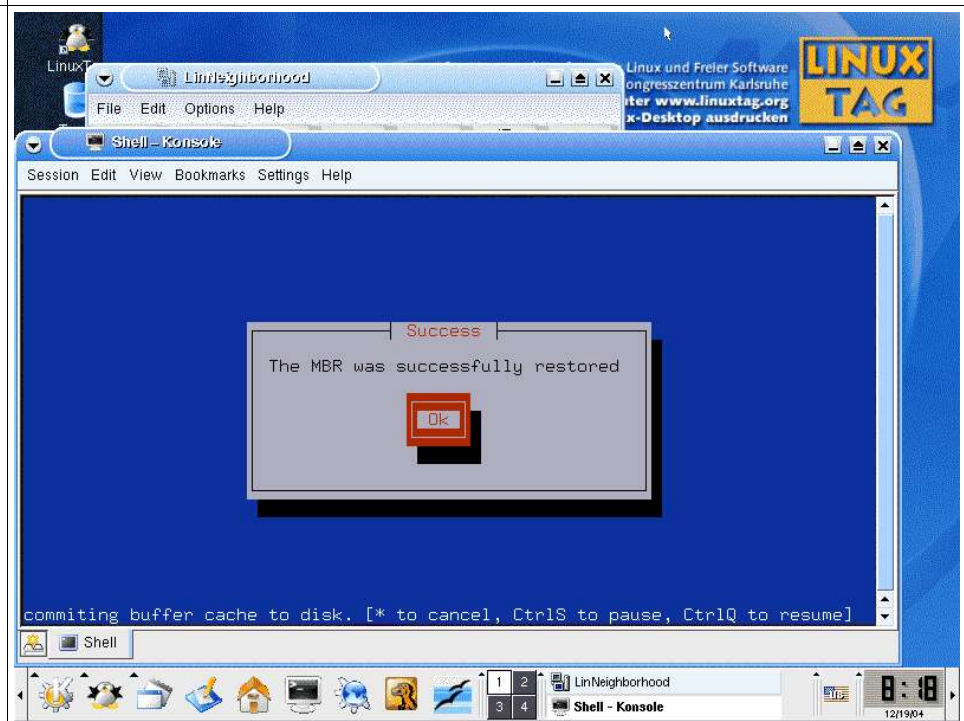


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If the hard drive is larger than the original, you will get this warning.

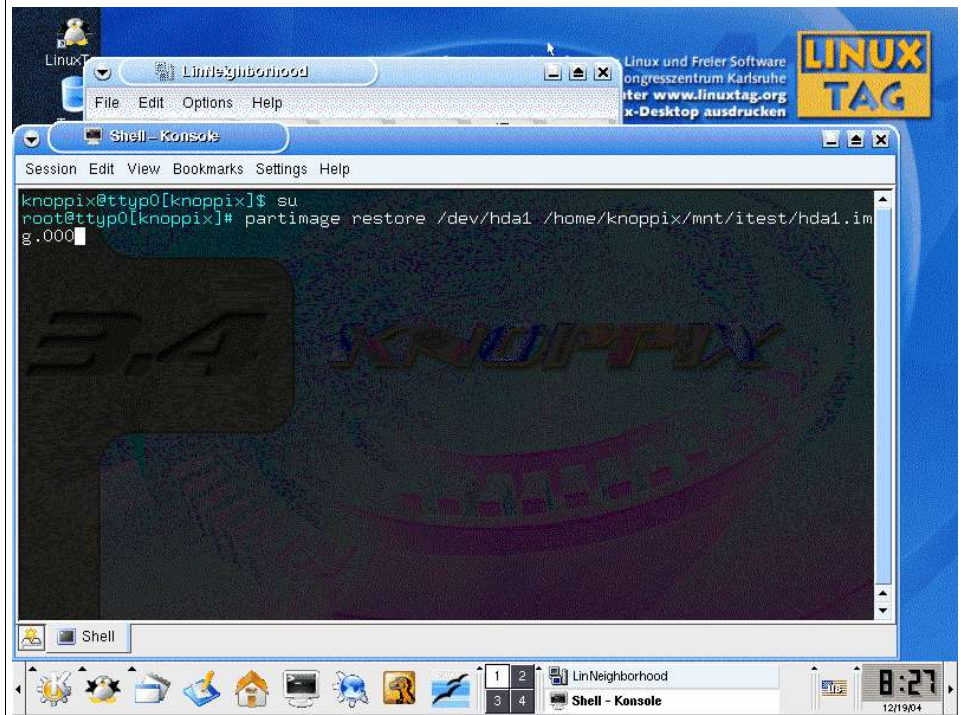


If everything goes well, you will get this message. You may need to reboot Knoppix before you can restore the partition image in the next step.



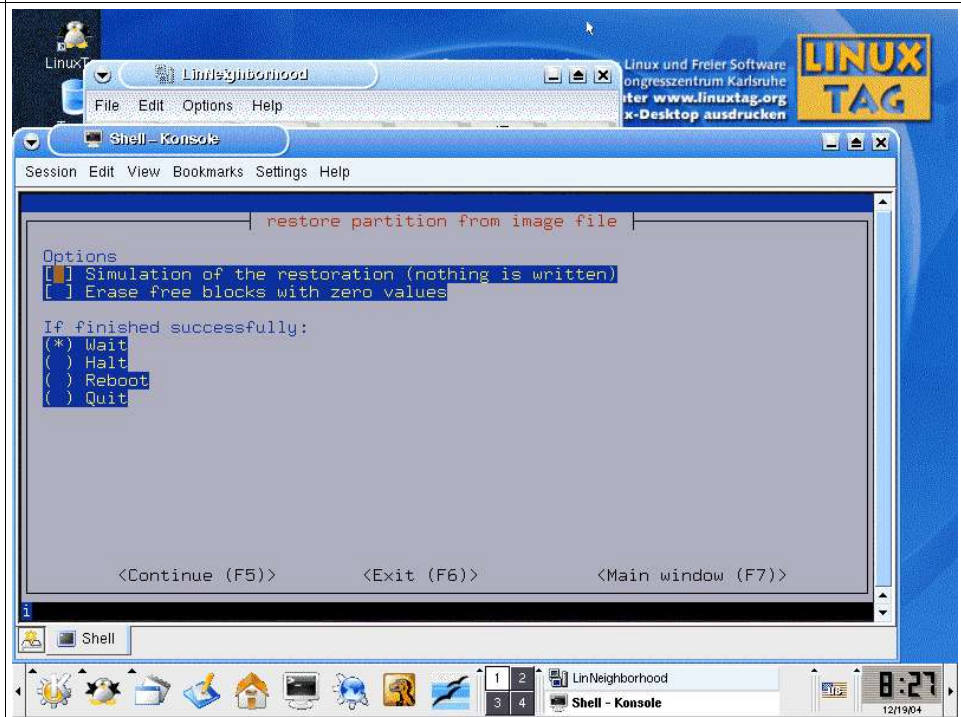
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To restore the partition *hda1*, make sure you are running as root (type *su*) and then start *partimage* with these parameters:



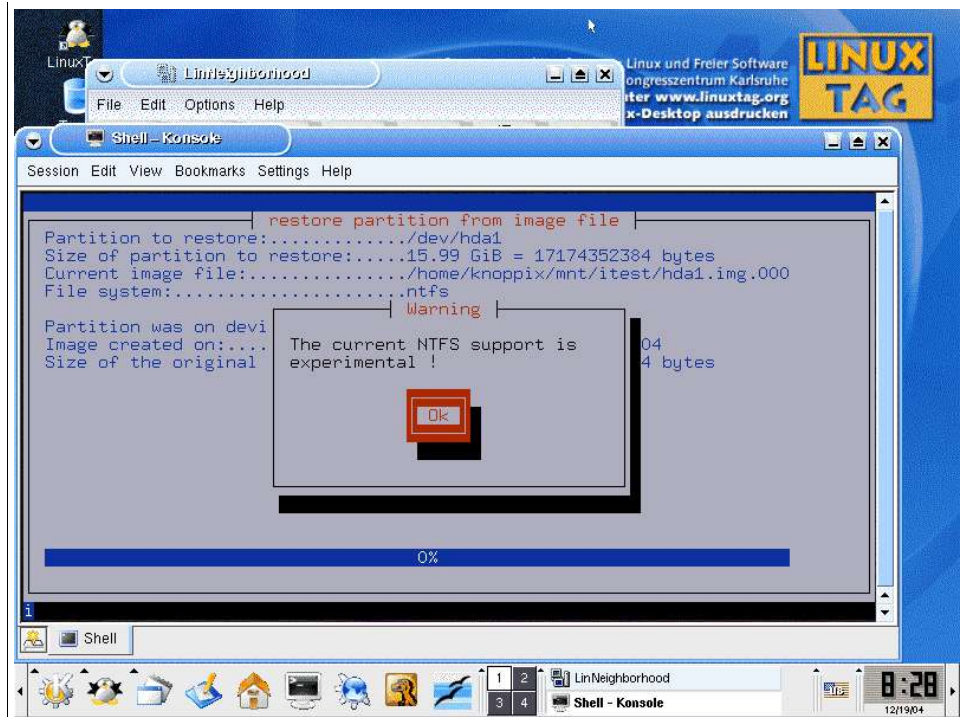
partimage	Start the <i>partimage</i> program.
restore	Restores the specified partition.
/dev/hda1	The partition to restore to.
/home/knoppix/mnt/itest/hda1.img.000	The path and file name of the image file. We need to add .000 because the first split file is given this name.

Press *F5* to select the standard options.

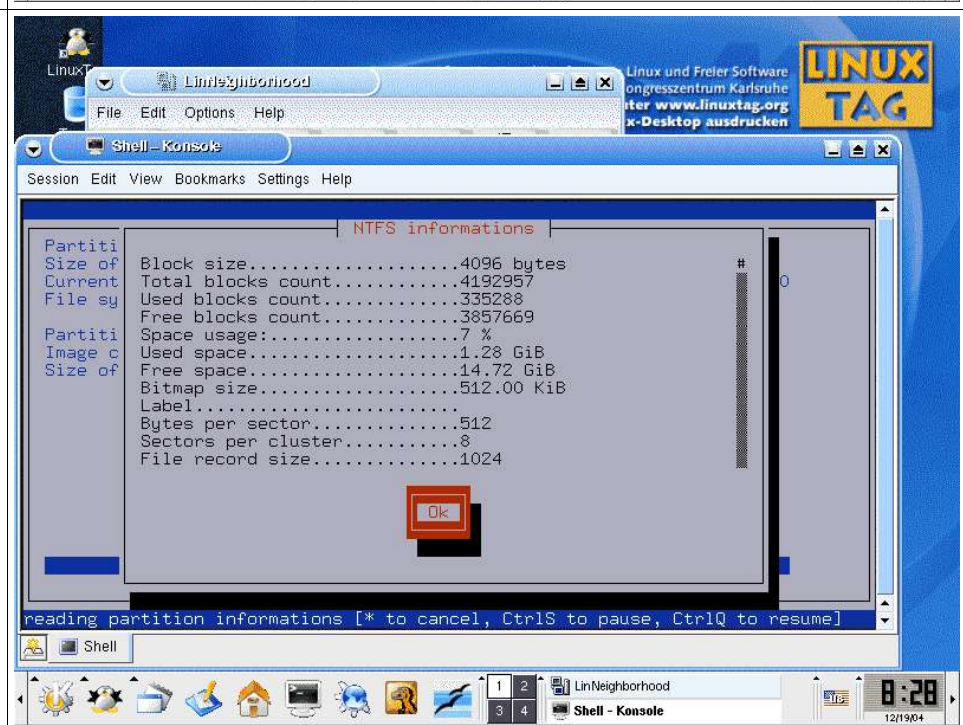


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You will again get this warning if the partition is of type NTFS. Don't worry about it.

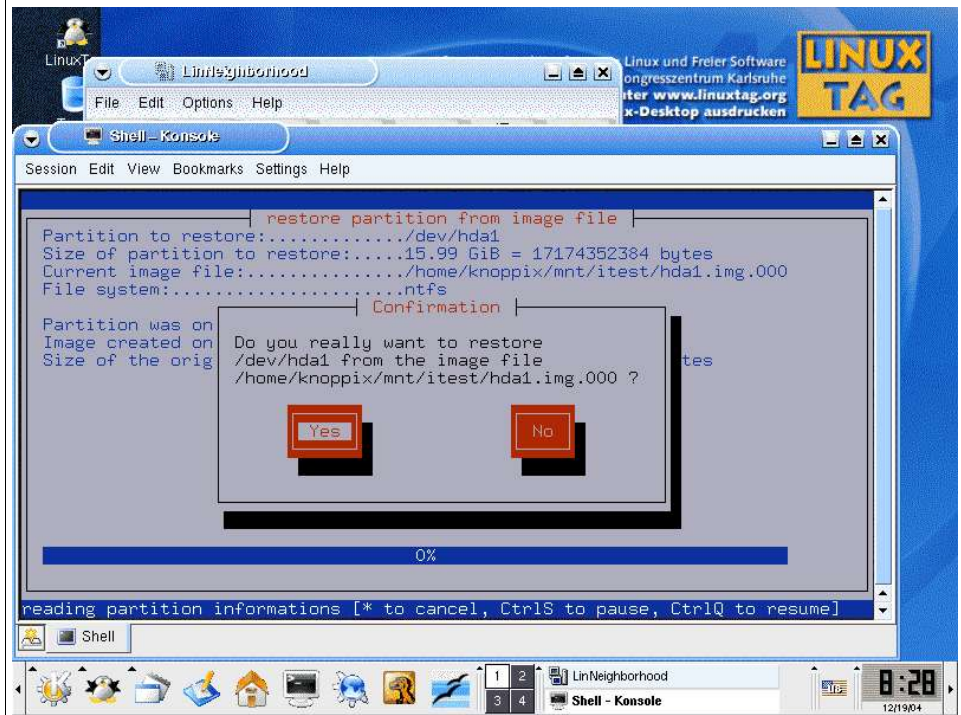


A status dialog will show the statistics for the partition.

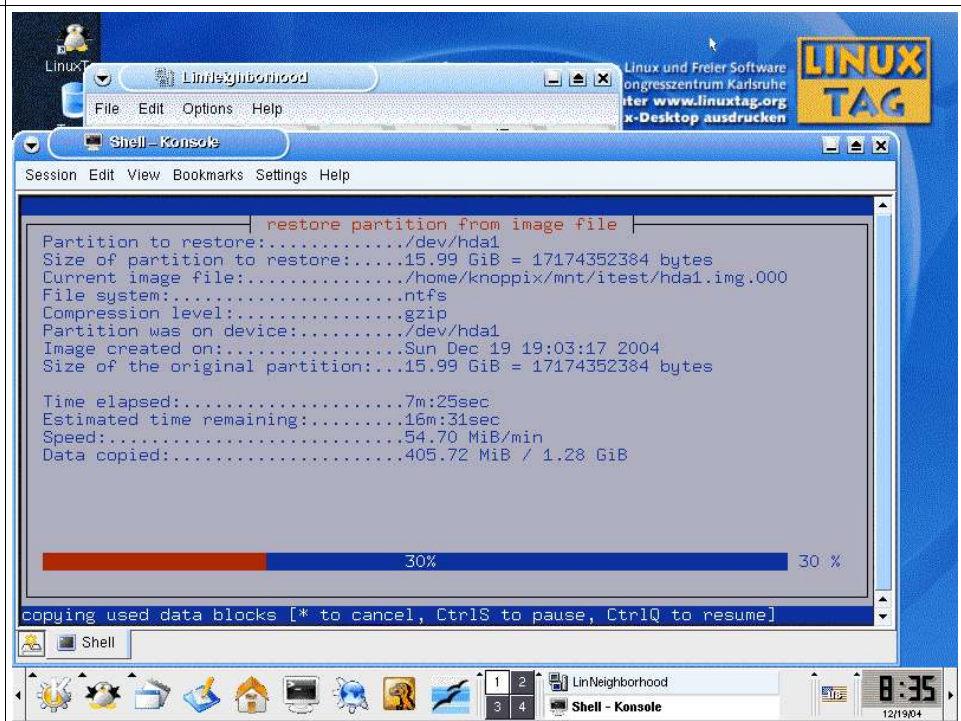


Disk Imaging with Knoppix

Your last chance to abort.



The program provides progress on how it is doing.



Disk Imaging with Knoppix

Copy Your Disk to USB Flash Drive with Knoppix

Here is a simple guide for using a USB Flash Drive to copy data from a damaged hard drive:

1. Make sure the USB Flash Drive is formatted as FAT or FAT32. Knoppix will not write correctly to NTFS partitions.
2. Insert the USB Flash Drive into the problem computer.
3. Boot the problem computer with the Knoppix CD-ROM.
4. Your desktop should show at least two disk drives: *hda1* is your Windows disk, *sda1* is the USB Flash Drive. Adjust the following commands if they are different. If you can't find the USB Flash Drive it is possible that your version of Knoppix doesn't support it.
5. Right-click *hda1* and select the *Mount* command.
6. Right-click *sda1* and select the *Mount* command.
7. Right-click *sda1* and select the *Actions->Change read/write mode* command. Knoppix always mounts drives in the read-only mode so we must enable write mode to write the USB Flash Drive.
8. You can now left-click both drives and copy files from *hda1* to *sda1*.
9. Logoff Knoppix and you now have the files on your USB Flash Drive.
10. You can also use the *sda1* device to make disk images with the *partimage* program. Write your image file to the */mnt/sda1/* path.