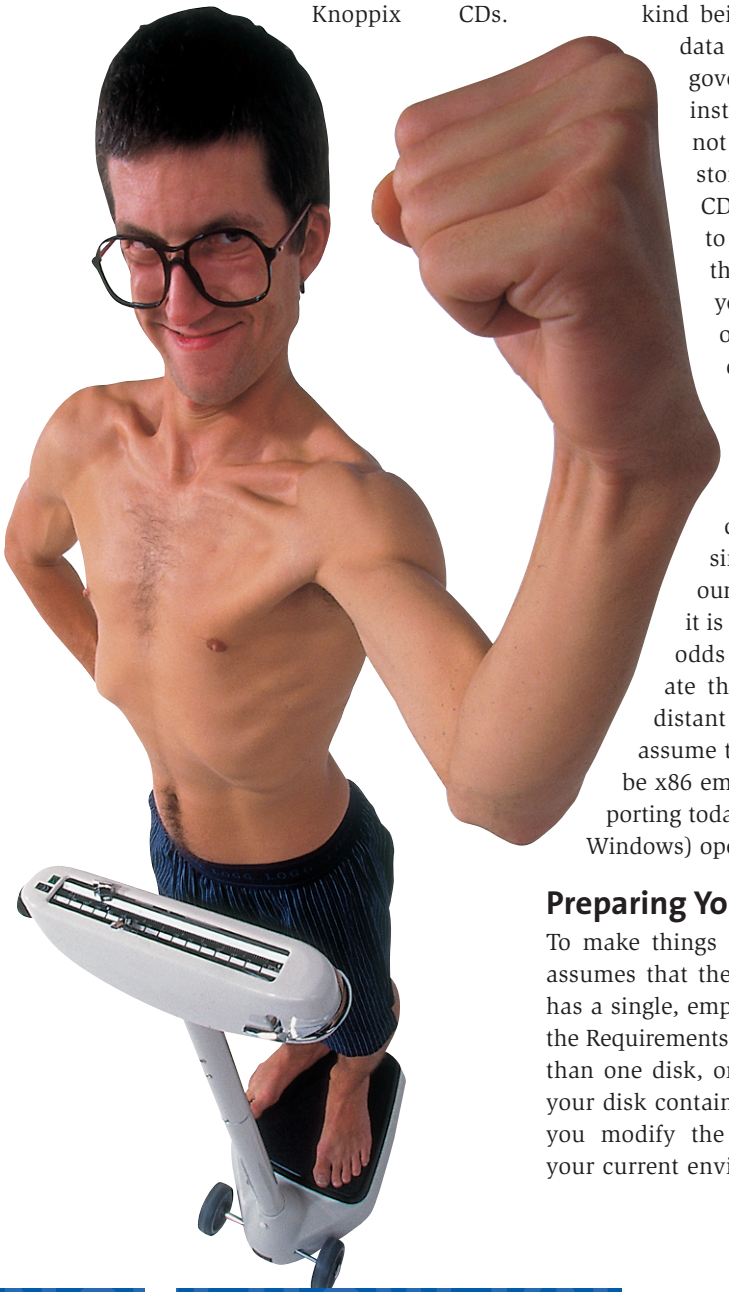
Workshop: Creating an individual Knoppix CD

Slimming Champion

Klaus Knopper's distribution contains a large number of programs and settings that are not quite mainstream. This workshop and a CD writer are all you need to reassert your individual rights. BY ROLF WAGNER

The Knoppix distribution, which is typically booted from CD, has excellent hardware recognition capabilities, and a user-friendly desktop and software design. However, let's face it, who really needs a choice of ten different editors? On the other hand, you might need a program or some data for a presentation. By ditching programs that you either do not need, or do not like, you can make room for your own extensions. More is not always better.

There are no end of applications for specially compiled Knoppix CDs. Thin-client style workstations at the office, public Internet kiosks, hotel and reception areas, Internet cafés, presentations and advertising, video and entertainment, laptop lending in hospitals or schools, educational software, give-aways at trade fairs and the like.



One could also envisage CDs of this kind being used for long-term data archival purposes by government offices and institutions. The issue is not the durability of the storage media – special CDs can store data for up to 300 years – but rather that, within about thirty years, software capable of reading the historic data and file formats will be totally extinct.

By placing the data, the operating system, and the application software on a single medium, like in our example (or in a file), it is possible to improve the odds of being able to evaluate the archive in the more distant future. We can safely assume that in future there will be x86 emulators capable of supporting today's Linux (or Microsoft Windows) operating systems.

Preparing Your Hard Disk

To make things simple, this workshop assumes that the PC you will be using has a single, empty EIDE hard disk (see the Requirements box). If you have more than one disk, or non-EIDE disks, or if your disk contains data, make sure that you modify the commands to reflect your current environment. Failure to do so can lead to data loss! If you are not sure, back up your disks before you start.

Start by booting from the Knoppix CD, then open up a shell and type *sudo su* to assume root privileges. You can now install your Knoppix distribution on your hard disk, that is on */dev/hda2*. We will be working on slimming down this distribution in the course of the workshop. In the shell, and retaining your root privileges, now launch the installation script, *knoppix-installer*, to launch the GUI setup program (see Figure 1).

Installing the Knoppix CD on Your Hard Disk

It makes sense to partition your hard disk. Item *3* of the setup program launches the qtparted partitioning tool. The first partition should be at least 3.5 GBytes, the second about 2.5 GBytes and you will need about 705 MBytes for the swap partition. Specify *ext3* and *Primary Partition* for the first two partitions. The third partition is also a "Primary Partition" of the *linux-swap* type.

Now continue with item *1. Configure Installation*. The wizard, which provides

Requirements

You will need a standard PC with a total of 1 GByte memory, that is 256MByte RAM and a 750MByte swapfile. The customized Knoppix CD has a compressed filesystem that can occupy up to 700MByte. This is the reason for the memory requirement. You will additionally need:

Hard disk 6GByte or more. The disk should be empty initially. You will be creating three partitions on this disk.

CD writer and CD/RW media

Knoppix CD, Version 3.3 [1]

Optionally: Debian CD, Version 3.0r2 [2], [3] and two formatted floppy disks

Figure 1: The *knoppix-installer* script launches a GUI-based installer, allowing you to copy the original Knoppix from CD and install it on your hard disk.

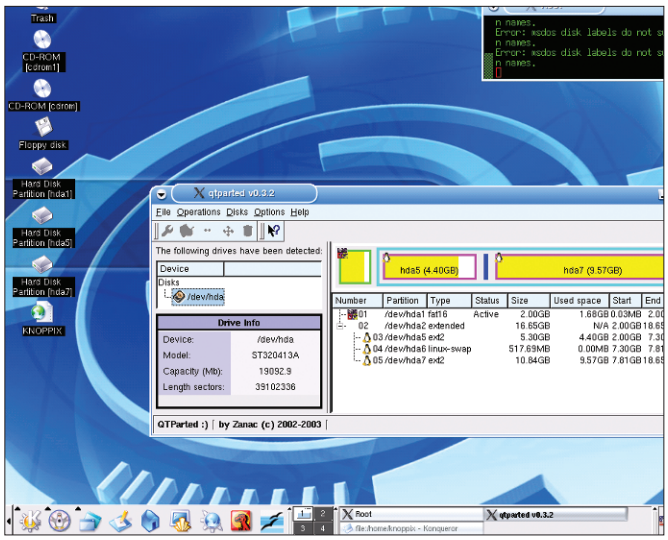


Figure 2: Partitioning your disk – make sure that hda is big enough.

context sensitive help, will want to know what system type you need. The answer to this question is *knoppix*. Your target partition is hda2. The second menu item launches the time-consuming file copy.

Options – Copying Debian to Your Disk

If you will be using your computer for tasks other than Knoppix mastering, you might like to install a current Debian distribution on the first partition, */dev/hda1*. This will allow you to use the machine for your daily work. The close relationship between Debian and Knoppix means that the major distribution in this setup is well-suited to modifying Knoppix CDs, storing your own (de-) install script files, for creating packages, and so on. If you already have a Linux distribution on hda1 – preferably Debian – you will not need to remove and reinstall. Simply go on using the existing system. Note that the partition will need a lot of free space, and that you need more free space for hda2, and to expand the swap partition!

No matter whether you keep your existing installation, or choose a new install, make sure you have working lilo or grub boot options for hda1 (Debian) and hda2 (Knoppix). Create a boot floppy for both installations. If you are looking for a minimalist approach, you do not actually need a distribution on hda1 – formatting with Ext 3, or another filesystem that Knoppix understands, will do the trick.

Getting Ready to Customize the Knoppix CD

Now boot Knoppix from your hard disk, that is from hda2. Use the KDE desktop to make both partitions writable (Knoppix will typically mount them as read-only). Locate the icons on the desktop, click them, and close the windows that open when you do. Now right-click the icons and remove the checkmark in the *Properties / Device / Read-only* checkbox (see Figure 3), then right-click and select *Change Read/Write mode* to make them writable.

Now pop up a shell and enter *sudo su*. Type *cd /mnt/hda1* to change directory to the first partition. You need two new directories:

```
mkdir custom
mkdir custom/KNOPPIX_CD
```

Now copy the contents of the Knoppix CD, except for the compressed root filesystem, to the *custom/KNOPPIX_CD* directory. Insert the CD and type:

```
cd /mnt/cdrom
tar cpf - . --exclude ./KNOPPIX➥
/KNOPPIX | (cd /mnt/hda1/custom➥
/KNOPPIX_CD; tar xpf -)
```

Cutting down

This section assumes you are still logged on as root and have opened a shell in Knoppix, which you booted from hda2. Now is the time to start thinking about the software you want to keep or discard. Just to help you keep track, many Knoppix mirrors have a *contrib* directory that contains a minimal Knoppix distribution with a 240 MByte footprint. You only need the *Packages.txt* file from this directory. The file is about 46 KByte, compared to the 110 KByte of the file on the standard distribution CD. You can compare the two files to discover hundreds of programs that you might want to discard.

Why not start by ditching a few editors that you never use. Your options are vim, hexedit, nedit, emacs21, netris, zile, joe, lde, mparted, gettext-el, vim-scripts, and vim-gtk. If you can make do with KWriter, KSpread,

Figure 4: Discard any unwanted games on your Knoppix CD; why not start with Freeciv?

or Abiword, you could discard Open Office to save over 200 MBytes of uncompressed disk space. You can remove packages by typing *apt-get -u remove packagename* – the package name is *openoffice-de-en* in this case.

Get rid of games that you do not like; possibly Freeciv (see Figure 4). The package names are *freeciv-server*, *freeciv*, *freeciv-data*, and *freeciv-client-gtk*. You can enter *apt-cache search game* to display a list of installed games.

You can also drop language files such as *kde-i18n-ru*, *kde-i18n-ja* to save another 10 MBytes of memory. If you want to know which locale packages are installed, type *apt-cache search kde-i18n*.

Of course, you may want to install additional packages. To do so, type *apt-get -u install packagename*. The following command will sort the packages by size:

```
dpkg-query -W -showformat='${Installed-Size} ${Package}\n' | sort -n
```

Armed with this knowledge, and a certain amount of enthusiasm, you can really sort out your Knoppix distribution, package by packages. When you are done, quit the terminal and return to the KDE desktop on Knoppix.

To enhance the independent look & feel of your Knoppix distribution, you might like to add, remove, re-group, or re-name the menu entries. You can also re-launch the *K* start button. Change the desktop design and then shutdown the machine.

Creating a Compressed Image

Next, boot your machine from the original Knoppix CD again, and allow write access to your partitions, as described previously. As the target Knoppix is not running at present, you can continue tidying up; for example, delete the *.bash_history*, all the *tmp* files, and the packages below */var/cache/apt/archives*. Now let's master the CD to take a look at the results of all that work. You will have ample opportunity for fine tuning later.

The first step will compress the contents of the hda2 partition and save them in a file called *KNOPPIX* on the first partition. To do so, again launch a character-based shell and enter the following:

```
mkisofs -R -L /mnt/hda2 | create_compressed_fs - 65536 > /mnt/hda1/custom/KNOPPIX_CD/KNOPPIX/KNOPPIX
```

The file will use your customized Knoppix as its root filesystem. Depending on the speed of your machine, and the scope of the changes you make, it may take up to half an hour to write this file.

Creating an ISO Image and Burning the CD

Type *cd /mnt/hda1/custom* to change to the first partition. The following:

```
mkisofs -J -T -v -r -c KNOPPIX/boot.cat -b KNOPPIX/boot.img -o knoppix_custom.iso KNOPPIX_CD
```

will create the ISO image. This should only take a few minutes. Of course, you can specify a few options for mkisofs if you like, for example to label the disk and supply author information. This is useful if you want to distribute CDs or maintain a media database.

The *knoppix_custom.iso* file should now be in the */mnt/hda1/custom* directory and ready for burning on CD. If your CD writer happens to be your only boot drive, you have a problem. The current operating system will not want to do without its boot/root filesystem, and will thus not release the CD writer. Don't panic – just boot the Knoppix system from hda2 in this case. If required, again make the partitions writable (this should not be necessary for the next step – burning). Now change directory to */mnt/hda1/custom*.

Figure 3: Use the KDE desktop to enable write access to both partitions, as Knoppix tends to prefer mounting with read-only access.

It makes sense to use CD/RW media while experimenting. This allows you to re-write, if something goes wrong. Insert a CD/RW in the writer. You can then use a GUI-based burning tool such as the K3b tool provided by Knoppix (you will need to set up the tool), or take the command line option, using *cdrecord -v dev=0,0 knoppix_custom.iso*.

You will need to change the *dev=* parameter to reflect your setup. It also makes sense to enable buffer underrun support for your drive. You can also use a pipe to connect the mkisofs command with the second call to cdrecord. Now boot your machine from the CD/RW and revel in the beauty of your own Knoppix.

Creating a Boot Screen

If you want to add yet another individual touch to your CD, you can modify the image displayed when the CD boots. To do so, first launch Knoppix from CD again (preferably the original), or from the second partition. Ensuring that both partitions are writable, create two more directories on hda1:

```
mkdir /mnt/hda1/custom/bootscreen
mkdir /mnt/hda1/custom/bootscreen/unpacked
cd /mnt/hda1/custom/bootscreen
```

Copy the *boot.img* file to the first directory of both; either from hda1 as follows:

```
cp /mnt/hda1/custom/KNOPPIX_CD/KNOPPIX/boot.img .
```

or from the Knoppix CD as follows:

```
cp /cdrom/KNOPPIX/boot.img
```

Now mount the image file as a loopback device – it contains the splash screen, among other things – copy the required file and modify it:

```
mount -o loop boot.img unpacked
cp unpacked/logo.16 .
lss16toppm <logo.16 >logo16.ppm
```

The Gimp can load and modify files in PPM format – this is what you want to

do next. Unfortunately the Gimp cannot store files in PPM format. Store the results of your artistic activity in the current directory as *logo16.bmp* for the time being. Quit the Gimp and convert the BMP file using the following commands:

```
bmptoppm <logo16.bmp >logo16.ppm
ppmtolss16 <logo16.ppm >logo.16
```

The next command copies the screen back into the image file:

```
cp logo.16 upacked
```

You can also use your favorite editor to modify the *boot.msg* file in the *unpacked* directory. Make sure that you do not modify the first line in *boot.msg*!

Now umount the image file and copy it back to the directory from which you will burn the image onto your CD:

```
umount unpacked
cp boot.img /mnt/hda1/custom
/KNOPPIX_CD/KNOPPIX
```

Finished! Now follow the steps described in *Creating the ISO Image and Burning the CD*. There is no need to create a new compressed root filesystem. After all, the changes only affect the primary boot.

Modifying Boot Messages

Boot messages are the text output created by Knoppix when you boot from CD (not to be confused with the *boot.msg* file referred to just a while back!). You can add a few boot messages to the collection on the standard Knoppix CD, or change the color of the output. On a more functional level, you can also change the boot order – this might be useful, if you want to demonstrate your own server software, for example.

If this was not your last, or second to last step, launch Knoppix from CD or disk, and allow write access to the partitions. Then pop up a shell and follow these steps, which are similar to modifying the boot screen at first:

```
mkdir /mnt/hda1/custom/messages
mkdir /mnt/hda1/custom/messages
/unpacked
cd /mnt/hda1/custom/bootscreen
cp /mnt/hda1/custom/KNOPPIX_CD
/KNOPPIX/boot.img .
mount -o loop boot.img unpacked
```

The *unpacked* directory should now contain a file called *miniroot.gz*:

```
cp unpacked/miniroot.gz /mnt
/hda1/custom/messages
cd /mnt/hda1/custom/messages
gunzip miniroot.gz
```

Now mount the *miniroot* file created by the last step as follows:

```
mount -o loop miniroot unpacked
```

The ASCII file responsible for Knoppix boot messages is called *unpacked/linuxrc*; you can now edit the file, and simply save it when you are finished. The following command returns the file to its place in the CD master:

```
umount unpacked
gzip -9 miniroot
cp miniroot.gz /mnt/hda1/custom
/bootscreen/unpacked
cd /mnt/hda1/custom/bootscreen
umount unpacked
cp boot.img /mnt/hda1/custom
/KNOPPIX_CD/KNOPPIX
```

As previously described, you can now go on to create an ISO image and write the image to your CD.

On a smaller scale, you can also change the *linuxrc* on a Knoppix boot floppy to reflect your personal taste. This makes sense for systems without CD drives, such as older laptops, or for USB sticks. The steps are similar to the ones just described, except that you need to edit the *miniroot.gz* from the Knoppix boot floppy and store it on the floppy again, when you are finished. ■

Knoppix on your Windows hard disk

Knoppix is kind to Windows users. It not only automatically mounts FAT and NTFS partitions, but can even run from a FAT 32 partition. To allow this to happen, use the Windows Explorer to copy the whole of the CD onto your Windows *C:* drive. Knoppix will boot from floppy. To allow this to happen, you first need to insert a formatted disk in drive *A:*. Now double-click *mkfloppy.bat* in the *C:\KNOPPIX* directory to create a boot floppy. Finished!

The advantage of this approach is that you can use the CD drive for other tasks. Knoppix will respond more smoothly, and be capable of creating home directories. If you intend to create a customized Knoppix using an MS Knoppix like the one described here, you will need a swapfile of about 750MByte and a good game plan.

INFO

[1] Knoppix: *http://www.knopper.net*

[2] Debian GNU/Linux: *http://www.debian.org*

[3] Current Knoppix/Debian DVD from Linux Magazine, Issue 35, October 2003