KNOPPIX RELOADED – Remastering des Live-Systems

Klaus Knopper

KNOPPERNET

in Zusammenarbeit mit dem

LINUX TAG

LinuxTag e.V.

Stand: 11.02.2004

Summary

KNOPPIX (Knopper's Unix) is a collection of GNU/Linux software designed to run completely from CD without any installation necessary, with automatic hardware recognition and support for many graphics cards, soundcards and other peripherals.

In order to build (or re-build) a live CD installation, there are some technical and non-technical aspects to take into account, which is essential for rebuilding KNOPPIX as a live platform, for running care2x from CD.

What is this KNOPPIX, anyways?

- Bootable CD/DVD-Rom with
- currentmost Linux 2.4 (2.6)-kernel,
- compressed filesystem image (ca. 1.8 GB uncompressed on one CD, using `cloop` realtime decompression) containing

  - **KDE 3.x** as standard desktop,
  - multimedia players **xmms** and **xine**,
  - productivity applications (i.e. **OpenOffice**, **gimp**, **scribus**, **sketch**),
  - internet access through analog modem, ISDN, DSL and (W)LAN,
  - software for data recovery and network analysis.

The Idea
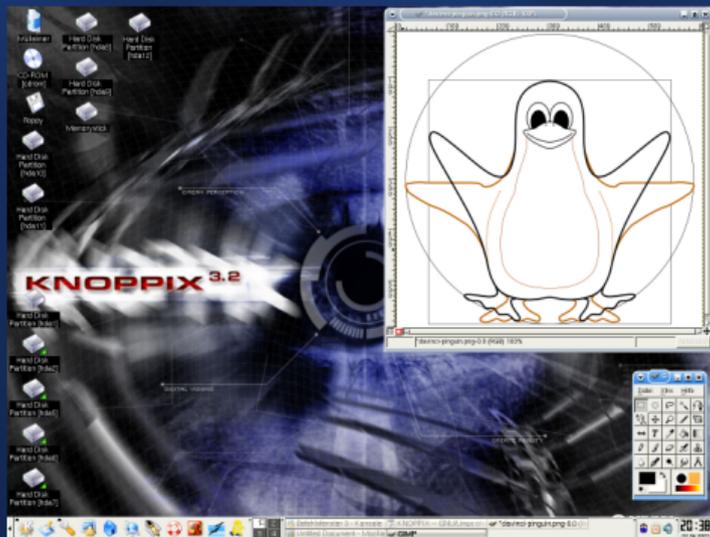
Insert CD, do *nothing* for 3 minutes, start working right away with
the ready configured desktop.

LICENSE

- software collection and KNOPPIX-specific programs, scripts and patches [1]: GNU GENERAL PUBLIC LICENSE

- individial software packages: preferably GPL and other Free software licenses, but also other licenses, as long as they allow "free redistribution for non-commercial as well as commercial use"

- Because of these licenses, the CD can be copied, modified and redistributed by all legal recipients of the CD, even for commercial products.
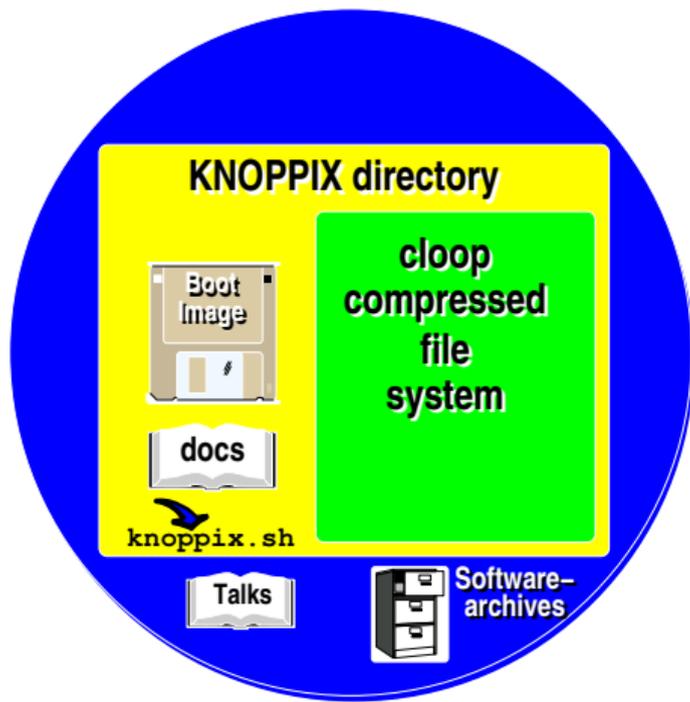
To avoid confusion

... we use slides with a blue background for the basic concept,

... and a green background for the technical geek stuff that you can safely ignore and don't have to worry about, if you are not a technical person.

Note: We need the green slides again for the workshop this afternoon, btw...

The basic content of a KNOPPIX CD

Remaster uncompressed CD part, steps

1. Copy old CD content to a directory on harddisk.

2. Add your own stuff.

3. Burn this directory to CD, make sure to tell your burning program that `KNOPPIX/boot.img` is the bootimage.

Remaster uncompressed CD part, example

Exchange the Desktop Wallpaper:

```
mount /dev/cdrom /mnt/cdrom
cp -a /mnt/cdrom/ /tmp/knoppix_cd
chmod -R u+w /tmp/knoppix_cd
rm -f /tmp/knoppix_cd/KNOPPIX/boot.cat
cp new.jpg /tmp/knoppix_cd/KNOPPIX/background.jpg
mkisofs -l -r -J \
        -b KNOPPIX/boot.img -c KNOPPIX/boot.cat \
        /tmp/knoppix_cd | cdrecord -v -pad -
```

Remaster bootimage, steps

1. Copy kernel with all components necessary to access a (IDE/SCSI) CD-Rom, to floppy disk (ext2 or vfat).

2. Create and copy initial ramdisk containing `/linuxrc` startscript, device files in `/dev`, additional modules to the same floppy disk.

3. Install sysllinux and modify syslinux.cfg accordingly.

Remaster bootimage, example

```
mkdosfs -r 16 -f 1 /dev/fd0
mount /dev/fd0 /mnt/floppy
cp /boot/vmlinuz /mnt/floppy/
rdev /mnt/floppy/vmlinuz /dev/ram1
dd if=/dev/zero of=miniroot.img bs=3000k count=1
mke2fs -b 1024 -N 8192 -F -q -m 0 miniroot.img
mount -t ext2 -o loop miniroot.img /initrd
rm -rf /initrd/lost+found
cp -a miniroot-template/* /initrd/
chown -R root.root initrd/*
umount /initrd
gzip -9cv miniroot.img > miniroot.gz
cp miniroot.gz syslinux.cfg /mnt/floppy/
umount /mnt/floppy
syslinux /dev/fd0
```

Remaster compressed part, theory

Basic procedure: Unpack cloop-Image to harddisk, modify the software installation, create new ISO image and re-compress.

Problems:

- Data on a CD-Rom is always read-only. But some programs require certain files to be modifyable. ☞ create symlinks for those files to the `/ramdisk` directory and make sure they are copied there prior to program execution (i.e. user home directories, database files etc.).

- The **cloop** blockdevice as well as the iso9660 CD-Rom filesystem are both read-only by design, therefore any changes you make have to be done within a virtual harddisk installation.

Remaster compressed part, example

```
extract_compressed_fs /mnt/cdrom/KNOPPIX/KNOPPIX \
  > iso.tmp
mount -o loop,ro,dev,suid iso.tmp /mnt/tmp
rsync -Hav /mnt/tmp/ /tmp/knoppix_fs
(ggf. Hardlinks reparieren...)
chroot /tmp/knoppix_fs
  mount -t tmpfs none /tmp
  mount -t proc none /proc
  apt-get install ...
  apt-get clean
  umount /proc ; umount /tmp
^D
mkisofs -pad -l -R -U /tmp/knoppix_fs | \
  create_compressed_fs - 65536 > /tmp/KNOPPIX
```

Caution: The last step does require a lot of virtual memory!

Post-mortem considerations, for experts

It's not working, what could have gone wrong?

- After upgrades or reconfigurations, some leftover, incorrect config files and temporary files may be left, and should be removed prior to creating the cloop image containing the new system.

- Running out of space because of a Kernel-Bug: Inodes in hardlinks of iso9660 are not identical. ☞ duplicate space allocation for hardlinks when copied to HD.

- Frequent mistake: The filesystem was mounted *nosuid,nodev* before **chroot**, no devices will work (including **/dev/null**).

- Again, some files must be relocated into writable (RAM) areas, and may have been missed when upgrading or installing new software.

care2x-specific issues

- The MySQL database files must be relocated into the `/ramdisk` before the mysql server can modify them.

- Most of the files in the HTML/PHP document tree must also be relocated.

- Excessive logging and/or handling of large data files can hog system memory and finally lock up the system, if not enough RAM is present.

- Where to store and load data that needs to be saved over reboot?

There may be an easier way...

During boot, KNOPPIX executes a shell script called `knoppix.sh` from the KNOPPIX directory if present. You could, in theory, install, configure, run and shutdown all third-party software from there, using space in the ramdisk for all writable data.

Drawback: Needs some shell magic, and probably needs more memory than installing the software onto the compressed filesystem part would.

Links (1)

[1] http://www.knopper.net/knoppix/sources/
KNOPPIX Source Repository

[2] KNOPPIX Info / Forum / Contakt/ Developers List:
http://www.knoppix.de/
http://www.linuxtag.org/forum/
knoppix@knopper.net
debian-knoppix@linuxtag.org