



Klaus Knopper is the creator of Knoppix and co-founder of the LinuxTag expo. He currently works as a teacher, programmer, and consultant. If you have a configuration problem, or if you just want to learn more about how Linux works, send your questions to: klaus@linux-magazine.com

ASK KLAUS!



soon as something is “hotplugged.” *Linux Magazine* issue 71 from October 2006 covered this topic.

udev, with HAL (hardware abstraction layer), notifies your desktop of any newly plugged-in device via the dbus system bus, and your desktop will (if it is configured to do so) present options about what to do with the device: mount as a hard disk or access it with a helper program (for video disks or digicams).

In any case, if you have `/proc/sys/kernel/hotplug`, the kernel is already compiled with hotplug support, which is also needed for udev, just not via a single script entered into `/proc/sys/kernel/hotplug` anymore.

The hotplug-specific configurations and scripts are in `/etc/udev/*`. The config file responsible for your desktop displaying or removing disk icons, or starting associated programs is `/etc/udev/hal.rules`, which calls the desktop-specific actions via a socket your desktop listens on. Knoppix also uses this feature to add entries in `/etc/fstab`, and to create its own KDE desktop icons, but this kind of adaptation is distribution-specific.

Setting the Correct Page Size

I'm new to Linux, and am using PCLinuxOS on my desktop. How do I set the

size of my web browser page? When I change to another desktop and press “konqueror”, the web page reverts back to its original size.



There is a setting for the browser profile at startup. After resizing Konqueror to the desired geometry, go to the *Settings* menu and choose *Configure View Profiles...* In the dialog (Figure 1), check *Save window size in profile* and save this profile as *webbrowsing*, which is the default profile if Konqueror starts in web browser mode.

Note there is also a bug in Konqueror (at least I think it's a bug). When started with a fixed size, for example with:

```
konqueror --geometry 825x600+85+70
http://www.debian.org/
```

as it is done by some scripts, Konqueror seems to “remember” this initial geometry.

Hotplugging in Dapper Drake

I just finished the Hotplug article in the October issue, and I want to try some hotplug experiments. The file `/proc/sys/kernel/hotplug` comes up empty on both Drake and FC5 systems. Do you have to compile the kernel to get the hotplug features? If you do, how does Ubuntu do the auto-mount of USB memory sticks?



If you use a recent distro, `/proc/sys/kernel/hotplug` is just empty because it's not used anymore.

Most distros now use udev(d) to autodetect changes in the hardware configuration, load modules, and start services as

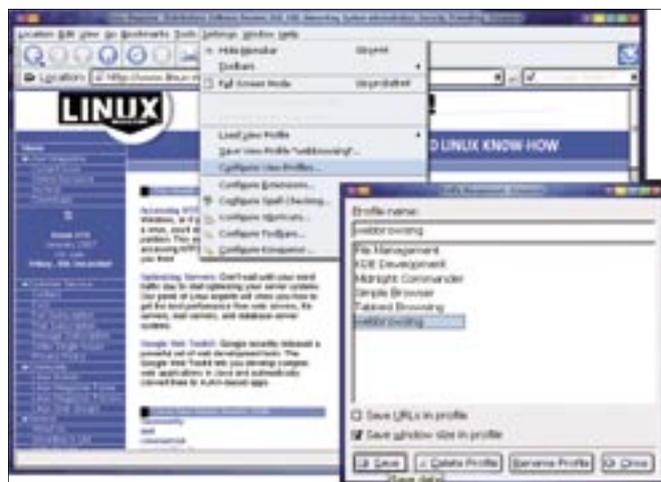


Figure 1: Saving the window size in a Konqueror profile.

try and sets it automatically on each page load, which can be very annoying.

Bootable USB Key



I am new to Linux and want to create a bootable USB key. Any good sites that could walk me through this step by step?



Creating a bootable USB key is (technically) easy. I should start with a brief introduction to the topic of booting from USB.

Not all boards are capable of booting from USB. Furthermore, some combinations of USB sticks and boards won't boot together, even though they may boot separately. And then, some key-board combinations only boot in a certain way, depending on how the USB key was prepared and what's set in the BIOS.

To make matters even worse, some keys pretend to start loading the operating system but then fail BIOS built-in checksum procedures after transferring only a few kilobytes of data. I have also seen cases when success depends on which USB port you use and whether you used a cable between the key and computer.

This may not sound very promising; however, for a majority of (USB boot-capable) board and key combinations, it works. A USB boot key is a really nice way of booting Knoppix, since you can store your persistent image (or virtual writable disk) right on the same key.

Keep in mind that there are some obstacles to handle in the boot process. At the time when the bootloader should read the Linux kernel and `initrd` from the key, there is no operating system running, and the computer's BIOS must do all the work of detecting partitions and loading data from the drive without having any other "drivers" available other than those in the BIOS firmware of the board. On the other hand, as soon as the Linux kernel is loaded, the USB key has "gone away." In other words, it is not visible anymore and has to get re-detected by the kernel using the modules from the initial ramdisk that contain the USB drivers and the filesystem used in the partitions containing the main data for Knoppix (i.e., the cloop compressed filesystems).

There are still many things that can go wrong when booting from USB, even if

you follow the steps correctly. It's probably not your fault if doesn't work.

For all examples, we use `/dev/sda` as the device name for your USB key. This is most likely incorrect, especially if your computer hosts SATA disks. Please double check which device name the USB key gets assigned when it is plugged in each time – even when the USB key is plugged in again!

For most commands, you won't need root permissions if the key's device files in `/dev` are writable for the normal user account and mountable via correspond-

For repartitioning the USB drive, you can use the same tools you use for a regular hard disk (i.e., `qtparted` or (my favorite) `fdisk` or `sfdisk`).

The partition type for a DOS/FAT filesystem (the least problematic for USB boot) would be "6" for FAT16 and "b" for FAT32. Use FAT16 for partitions smaller than 2 GB and FAT32 for partitions larger than that. See above for the `sfdisk` command to set the "Bootable" (or "active") partition flag, which is independent from the partitions filesystem or content.



ing entries in `/etc/fstab`. If they are not, use `sudo` or your root shell and be twice as careful.

Step #1: Create the file system

Some USB sticks will only boot when they are partitioned in a certain way, and some BIOSes apparently look for a certain partition and filesystem header or refuse to boot. We had some cases where a board only wanted to boot from an unpartitioned USB key, and others cases where both a DOS master boot record and the "bootable" partition flag were required.

First try booting with a more or less unmodified default partition table and filesystem. Most new USB keys have a (kind of) valid partition table in which only the first primary partition is formatted as FAT16 or FAT32. Make sure that the partition in this case is bootable.

For a USB key partition that appears as `/dev/sda1`, the command to just set the "bootable" partition flag would be:

```
sfdisk -A1 /dev/sda
```

The `mkdosfs` command for formatting a FAT16 partition `/dev/sda1` is:

```
mkdosfs -F16 /dev/sda1
```

Whereas for FAT32, it would be

```
mkdosfs -F32 /dev/sda1
```

Needless to say that, at this point, you lose all the data on that partition. But if you repartition and reformat a USB key, you should back up all the data on it (and possibly all the data on any partition or disk that you could accidentally confuse with the USB drive).

Many USB keys won't recognize or display the new partition table immediately, so it's a good idea to unplug and replug the USB key or hard disk after each of the aforementioned steps. Re-check the new partition table with:

```
cat /proc/partitions
```

after it has been plugged in again for a few (dozens of) seconds. (Some drives

are slow in partition table detection.) If the drive now appears with a new device name (i.e., *sdb* instead of *sda*), you probably forgot to *umount* a filesystem from it before unplugging. You can do it now. It most likely no longer exists, though, after you repartition the drive.

For USB keys without partition (if the partitioned boot method fails), skip the partitioning step and enter the *mkdosfs* command on the entire USB key.

That was the hardest part, though no installation was involved yet. The rest is really easy.

Step #2: Install syslinux as the kernel loader

What isolinux does for CD or DVD, syslinux is doing for DOS-formatted partitions or disks.

For partitioned drives:

```
syslinux /dev/sda1
```

For unpartitioned drives:

```
syslinux /dev/sda
```

(Make sure you are using the correct device name for your system.)

If you use a partitioned USB key, you can also set (or reset) the master boot record properly. It's not always necessary to do this, however. You may want to see if booting works without changing the MBR first.

Install a syslinux master boot record for partitioned drives:

```
ms-sys -s devicename
```

Use */dev/sda* if */dev/sda1* is the USB key's FAT16/FAT32 partition; watch out for the correct device name.

Step #3: Copy boot files and data

You need to mount the USB key (or partition, when using partitioned mode) case-sensitive for this step:

```
mkdir -p /media/usbkey
mount -t vfat -o rw,umask=000,shortname=winnt /dev/sda1 /media/usbkey
```

Next, you should change */dev/sda1* to the partition in question, and then skip the partition number in case of using the entire key.

Now copy the boot files from the Knoppix CD or DVD. Let's assume the CD is mounted under */cdrom* in a live Knoppix session, though you can very well do all these steps with any Linux distribution.

```
cp /cdrom/boot/isolinux/* /media/usbkey
```

While *isolinux* searches all bootfiles in */boot/isolinux*, *syslinux* searches them in the */* directory on a FAT filesystem.

But wait... *syslinux* has a different name for its config file!

```
mv /media/usbkey/isolinux.cfg /media/usbkey/syslinux.cfg
```

You can safely delete the *iso/eltorito*-specific files, since we don't need them.

```
rm -f /media/usbkey/isolinux.bin /media/usbkey/boot.cat
```

Now, the key is already bootable, containing both the kernel and *initrd*, and we can start copying the *loop* file(s), which reside in the Knoppix directory on the CD.

```
rsync -hav --progress /cdrom/KNOPPIX /media/usbkey/KNOPPIX
```

After this is done, you have to *umount* the device in order to sync the pending buffer data to disk and close the session. Don't be surprised if this command takes a long time; there may be a lot of unwritten data in memory due to the fabulous Linux dynamic block buffer cache that makes disk writes appear way faster than they really are.

```
umount /media/usbkey
```

Step #4: Set the computer BIOS

A board capable of booting from USB usually has at least two modes of USB booting:

- USB hard disk boot
- USB ZIP-drive boot

which should really read "boot from a partitioned USB drive" or "boot from an unpartitioned USB drive."

For the "default" new USB key, *USB hard disk* would be correct, but it really

depends on what you have already done in Step #1.

Troubleshooting

If your USB key doesn't work the first time, your problem might be:

- The USB pendrive is not recognized as bootable in the boot sequence. Check that the BIOS settings match the way the drive was prepared, try to plug it into a different USB port, and, as a last resort, try to prepare the USB pen with the other method described above.
- USB boot starts, but the kernel loading fails after some time, or after a "checksum error." In this case, it seems the USB key does not work with this board. We had a good success ratio using "Trekstor" keys. If your budget allows, try a few brands for boot-compatibility. Perhaps the key will still work in the other mode (unpartitioned or partitioned).
- Kernel and *initrd* boot, but Knoppix complains about a "missing KNOPPIX filesystem" and drops you to a rescue shell. The key was not detected during boot. This may be caused by slow response (the keys partitions are not yet available when *linuxrc* is trying to mount them) or the controller is not supported. Apparently the USB key was known by the BIOS before, yet Linux does not find it later. Remember that the BIOS uses an entirely different set of drivers for the key than Linux has. This problem may be an interrupt problem with the controller. In this case, the usual Knoppix cheatcode candidates may help:

```
knoppix acpi=off
noapic npnbios=off
pci=bios irqpoll ...
```

Knoppix 5.1.0 features a script called *mkbootdev*, written by Martin Öhler and me, that will do all the steps above with a few mouse clicks. If you start *mkbootdev* from the shell in a running Knoppix CD or DVD while your USB pen is plugged in and no partitions from it are mounted, it will guide you through Steps 1 through 3. ■

Send your Linux questions to klaus@linux-magazine.com.