Dr. Linux

BOOT OPTIONS

Marianne Wachholz dons the white coat this month to serve up a few tricks for the boot manager LILO

No comment?

Q Although as superuser (*root*) I have **decommented** the domain

```
#image = /boot/memtest.bin
#label = memtest86
```
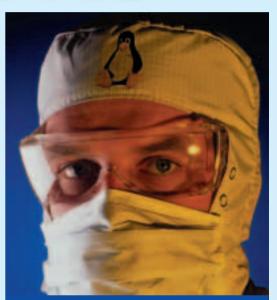
in my */etc/lilo.conf*, when I boot up the selection *memtest86* still appears as a menu item and also functions. Why is my change not being accepted?

Dr. Linux: You've obviously not quite completed all the administrative work of the superuser. Not only does the *Li*nux *Loa*der (LILO) need reinstalled after installing a new kernel, but it also needs re-installed after any change to */etc/lilo.conf*. This is when the *lilo* command transfers the changes into the map file, which is found in the */boot* directory in a standard installation, and creates an updated version of */boot/boot.b*. The start sectors of these two files on the hard disk and other information is written into the **boot sector**.

This procedure can be explained by taking a look at the way LILO works. There is not enough space in the boot sector to store large programs. For this reason, only the first part of the boot manager is located here as a tiny piece of code (start program), which is executed by the **BIOS** of the computer. It has the task of loading the main LILO program, the file */boot/boot.b*.

However, at this point there is still no operating system of any kind running, which could make a driver available to access a filesystem. As such, the start program can't do anything with file names and path specifications. In the interaction with the BIOS of the computer, there is in the first instance

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Complicated organisms, which is just what Linux systems are, have some little complaints all of their own. Dr. Linux observes the patients in the Linux newsgroups, issues prescriptions here for the latest problems and proposes alternative healing methods.

only the option of reading sectors of a hard drive. For the LILO start code to find the main program, it turns to the sector numbers also designated by LILO in the boot sector, among which */boot/boot.b* can be found.

After a successful start the main program allows the user to choose between the various operating systems (where available). If the choice falls on Linux, LILO has to load the **kernel**. To do so, the file */boot/map* is evaluated, which in turn contains the start sectors on which the kernel file plus additional data begin, which LILO needs to start an operating system.

This also explains the fact that any write-access to files under */boot* and also moving files into or out of */boot* renders the current */boot/map* unusable. This is true even when files are later written back under the same name into the */boot* directory, because it is

Decomment In scripts and many configuration files there exists the option to have lines ignored by the program reading in, by placing the character # at the beginning of a line. This means you can insert explanations into a file without its function being affected. The additional information remains visible to humans, but is ignored when the computer evaluates the file. This is a particularly useful option for backing-up an original configuration and testing new configurations.

more than likely that these will end up in different sectors from the old data.

The necessary maps and the installation of the LILO bootloader are dealt with as *root*:

```
perle@maxi:~ > su - root
Password: your_root password
root@maxi:~ # /sbin/lilo
```

Before making even minor changes it is preferable and safer to enable the bootloader installation program *lilo* to first "say" what it thinks of the new configuration. You can take this phrase quite literally: add the options *-v* (for "verbose", talkative) and *-t* (for "Test mode") to the installation command:

```
root@maxi:~ # /sbin/lilo -v -t
LILO version 21.6 (test mode), Copyright (C)
1992-1998 Werner Almesberger Linux Real Mode
Interface library Copyright (C) 1998 Josh
Vanderhoof Development beyond version 21
Copyright (C) 1999-2000 John Coffman
Released 04-Oct-2000 and compiled at 21:55:07
on May 15 2001.

Warning: COMPACT may conflict with LBA32 on
some systems
Reading boot sector from /dev/fd0
Merging with /boot/boot.b
Mapping message file /boot/message
Syntax error near line 20 in file
/etc/lilo.conf
```

The options leading to the conflict, *compact* and *lba32* are explained in Listing 1. On the other hand the syntax error demonstrates what happens if one writes a newly entered option incorrectly (such as *dafault* instead of *default*).

The option *-v* can be applied up to five times in one command. But since the level "maximum verbosity" can only be used by absolute experts, it's

Boot sector On data media such as diskettes or partitions on a hard drive, the first sector is designated as boot sector. In the case of hard drives, the term used for the first sector is the Master Boot Record (MBR).

BIOS Basic Input/Output System; the basic software of the computer. When the computer is fired up, this program performs a self-test, which among other things defines the graphics mode and checks the motherboard and the main memory. Users can make changes to the BIOS settings. More precise information can be found in the pamphlets that come with computers or a motherboard. You can also find further information on the Web site *http://sysdoc.pair.com/bios.html*.

Kernel The operating system kernel consists of the components which comprise the actual operating system. Only the kernel has direct access to the resources of the computer, i.e. to disk space, memory and computing time, the keyboard etc. If a command is sent or a program invoked, the kernel loads the required program code into the main memory and starts the corresponding task. Tasks have no access to these resources – they have to ask the kernel for them. The Linux operating system kernel distributes the necessary computing time and the memory so quickly, that it gives the impression that programs can run at the same time.

better to begin with fewer *-v* options.

If you need the *lilo* messages, in order to track down unfamiliar error messages with the aid of the documentation (Box 1), create a text file with the outputs:

```
root@maxi:/tmp # /sbin/lilo -v -v -v -t >
Liloinf.txt
The boot sector and the map file have *NOT*
been altered.
```

In the example LILO's messages are filed in Liloinf.txt in the current directory (in this case: */tmp*).

Since we are in the test mode – as the error message line "*The boot sector and the map file have *NOT* been altered.*" reassuringly informs us – working with LILO loses a great deal of its terror.

Box 1: LILO documentation

Along with LILO, the comprehensive English User's Guide by Werner Almesberger is also installed on your system. You will usually find this under */usr/share/doc/packages/lilo* or else in */usr/doc/lilo*. The file is often called user.ps.gz, or on some systems user.tex or user.div.

You'll find everything your system can provide on the subject of LILO – directories of this name, documentation files or the binary program itself – if you place on a command line the command:

```
perle@maxi:~ > locate lilo
```

Precise information on the LILO program and on the configuration file *lilo.conf* are provided by the manpages ("manual pages"), from

which the options proposed here also originate.

The LILO-Mini-HOWTO provides background information and describes the standard installation of the LILO bootloader. The Linux-Boot-Prompt-HOWTO contains a collection of all boot parameters you can send, with the aid of LILO, during the procedure of booting to the Linux kernel.

If, when booting with LILO, nothing whatsoever appears or only a part of the word such as "LI" or even "L01010101", the SuSE database (*http://sdb.suse.de/en/sdb/html/kgw_lilo_errmsg.html*) is of interest, and not only to users of SuSE Linux. Additional support database entries on LILO can be found at *http://sdb.suse.de/en/sdb/html/key_form.html*.

Password for Linux

Q On my computer I run Windows (for my children's games and educational software) and Linux, which can be used for connecting to the Internet. I would like to prevent my children booting up Linux, as at their age they should only be using the Internet under strict supervision. I would also like to avoid accidentally switching off the computer "improperly" if Linux were to start unintentionally. In order to make use of the available gaming and educational software, the children should be able to boot Windows on their own, but not Linux. Are such requirements realistic?

Dr. Linux: You can define the boot behaviour of LILO with a wide variety of options. The general settings basically consist of the options in the global section at the start of lilo.conf file, as described in the manpage under "GLOBAL OPTIONS".

A system section begins with an "image" or an "other" line ("per-image section"), which applies to any of the respective operating systems LILO is to boot. A few of the global options here can be overwritten on a case-by-case basis.

The global option "default" is used to define which operating system starts after switching on the computer provided no user input is made. If this option does not exist, the operating system normally boots in the first system section.

The password option can be used in both the global section and in the system sections of the individual operating systems. In the example configuration in Listing 1 the system section for Linux contains a corresponding entry. In this way, Linux can only be booted when the right password is entered.

Listing 1: Windows automatically and Linux only with password

```
# LILO-configuration file /etc/lilo.conf
#
# Begin of the global section

boot=/dev/fd0
# "boot" refers to the device in whose first sector
# the LILO boot sector is installed: here, the floppy ↗
drive /dev/fd0.
#
compact
# "compact" boots (a few seconds) faster, but does not ↗
work successfully
# with all systems and is (usually) only worthwhile,
# when a boot diskette is used to start the system.
#
lba32
# Keywords to avoid the 1024-cylinder limit. Only functions
# when the BIOS supports the option and can lead to ↗
 conflicts with
# the option "compact".
#
vga=normal
# "vga" sets the VGA text mode at the start.
#
message=/boot/message
# In this directory, LILO finds the file to be output ↗
on the screen
# during loading, e.g. an image or text.
#
read-only
# The root partition is only mounted legibly for the
filesystem test
# and only after that shifted into the final read and
# write mode.
#
prompt
# Request for input, enabling the desired system to be ↗
selected
# when there is more than one bootable operating system ↗
on the hard disk
timeout=100
# Definition of the wait-time in tenths of a second for ↗
keyboard inputs
# at the prompt. If no input is made, after the time runs ↗
out the
# first image in the system section will be booted, ↗
unless another
# is prescribed by the option "default".
#
default=windows
# End of the global section
#
#
# Linux system section
image = /boot/vmlinuz
 root = /dev/hda7
 label = Linux
 password=your_password
# To protect the password from unauthorised eyes, simply ↗
delete it
# after installation from the /etc/lilo.conf. ↗
Alternatively, change
# the file rights such that only root can read the ↗
configuration file.
#
#append="<parameter>"
# To transfer kernel parameters such as e.g. hardware ↗
components.
# Not set here.

# Windows system section
other = /dev/hda1
 label = windows
 table = /dev/hda
```