

– General Linux 1 –

Install a boot manager [1]

(Linux Professional Institute Certification)

a

```
.~.  
/V\   by: geoffrey robertson  
//  \  geoffrey@zip.com.au  
@._.@
```

\$Id: gl1.102.2.slides.tex,v 1.2 2003/05/30 05:01:31 waratah Exp \$

^aCopyright © 2002 Geoffrey Robertson. Permission is granted to make and distribute verbatim copies or modified versions of this document provided that this copyright notice and this permission notice are preserved on all copies under the terms of the GNU General Public License as published by the Free Software Foundation—either version 2 of the License or (at your option) any later version.

Install a boot manager [1]

(1.1) 101 Hardware & Architecture [11]

2.102.1 Design hard disk layout [5]

2.102.2 Install a boot manager [1]

2.102.3 Make & install programs from source [5]

2.102.4 Manage shared libraries [3]

2.102.5 Use Debian package management [8]

2.102.6 Use Red Hat Package Manager (RPM) [8]

Install a boot manager [1]

Objective

Candidate should be able to select, install and configure a boot manager. This objective includes providing alternative boot locations and backup boot options (for example, using a boot floppy).

Install a boot manager [1]

Key files, terms, and utilities

`/etc/lilo.conf`

`lilo`

`/boot/grub/grub.conf`

`grub-install`

MBR

superblock

first stage boot loader

Resources of interest

LinuxGazette GRUB article :

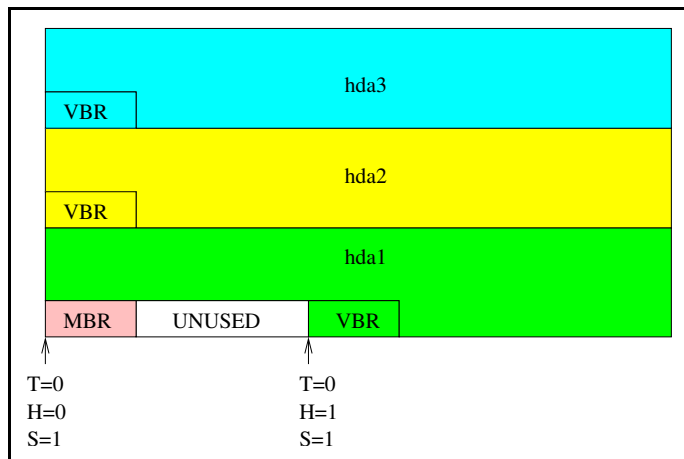
<http://www.linuxgazette.com/issue64/kohli.html>:

The GNU Grub Site :

<http://www.gnu.org/software/grub/>

Disk Organisation

- A disk is organised into:
 - Cylinders
 - Heads
 - Sectors
- All sectors of Cyl 0, Head 0 are reserved:



Disk Organisation

- Fdisk on a floppy confirms this:

```
Disk /dev/fd0: 2 heads, 18 sectors, 80 cylinders  
Units = cylinders of 36 * 512 bytes
```

Device	Start	End	Blocks
/dev/fd0p1	1	1	9
/dev/fd0p2	2	2	18
/dev/fd0p3	3	3	18
/dev/fd0p4	80	80	18

- Note the first partition is smaller than the rest

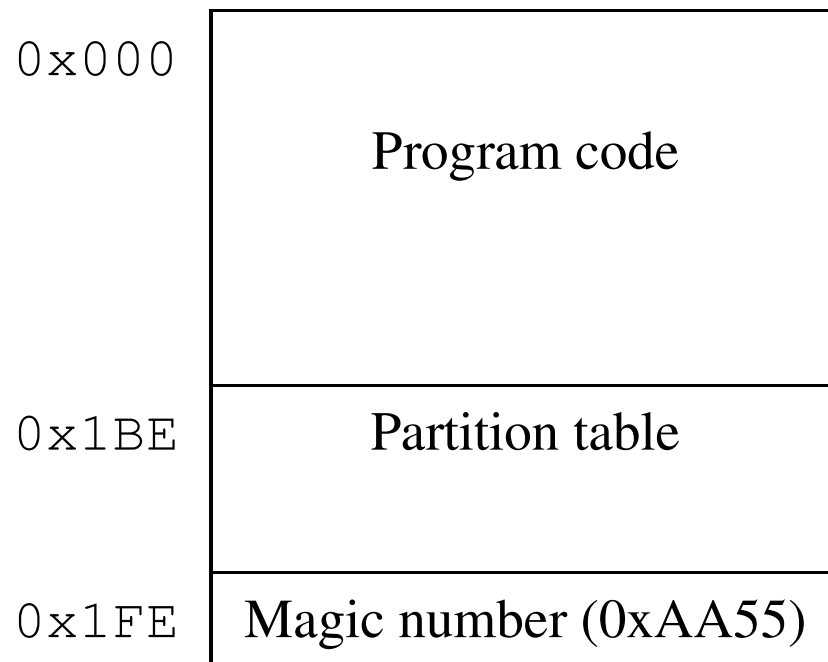
The DOS Boot Process

- A Power On Self Test is performed.
- Control is passed to the boot device
- The first sector on disk is loaded into memory
- The MBR code is executed:
 - It reads the partition table
 - Looks for an active partition
 - Loads the boot sector of active partition
 - Executes the code in that boot sector

The Master boot record

- The MBR is the first block (sector) on the disk
- It contains:
 - Boot Code: 446 bytes
 - Partition Table 64 bytes
 - MBR Signature 2 bytes (0x55AA)
 - TOTAL 512 bytes

The Master boot record



Boot Loaders

A boot loader is a program that is responsible for selecting the operating system to be booted. Once the desired OS is selected for boot, the boot loader must transfer control to it. Typical boot loaders are:

- The DOS boot loader. Not interactive
- LILO: An interactive boot loader
- GRUB: An interactive boot loader
- Boot Manager: An interactive boot loader

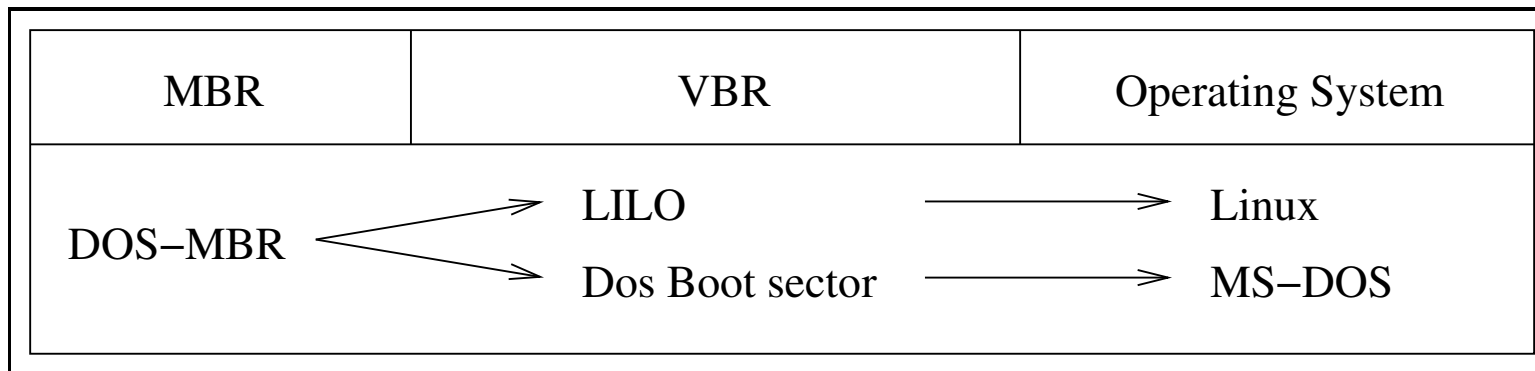
LILO - The Linux Loader

- LILO is a two stage loader:
- Stage 1 is 446 bytes long & is located in *either*
 - The MBR (Master boot record. Eg in /dev/hda) *OR*
 - The VBR (Volume boot record. Eg in /dev/hda1)
- Stage 2 is a file (/boot.b) located in /boot it contains the bulk of the lilo functionality

LILO Boot sequence

LILO in the VBR

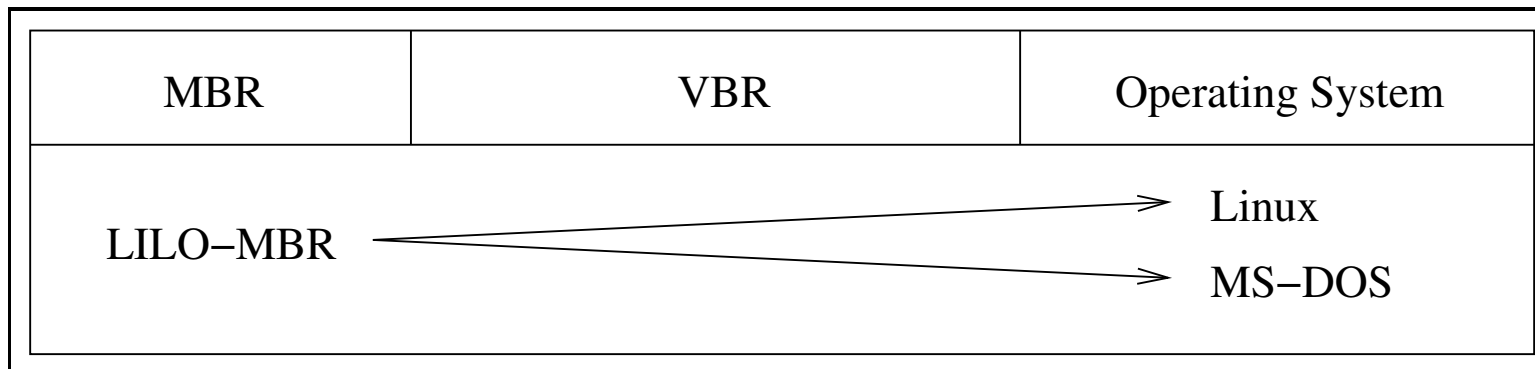
When LILO is installed in the VBR, it is up to the MBR to transfer control to it. This is normally done by setting the partition where LILO is installed to 'active'. You would use fdisk (either dos or linux) to do this:



LILO Boot sequence

LILO in the MBR

When LILO is installed in the MBR, the BIOS transfers control directly to LILO's 1st stage boot loader. In this case, the VBR is not used and it does not matter which partition is marked active in the partition table:





LILO and the BIOS

LILO uses the BIOS INT13 calls to read the following files:

- /boot/boot.b - The second stage loader
- /boot/map - The map file
- All kernels
- The Volume Boot sectors of all OS's it boots
- The boot message if one has been set



Configuring LILO

LILO is entirely configured within the file `/etc/lilo.conf`. This file contains three areas.

- Global Options (eg signon message, delay time etc)
- General 'per operating system' options
- Linux kernel options (Linux only - eg root device, ro etc)



Installing LILO

Once LILO has been configured, it can be installed by running `/sbin/lilo` as root from the command line. This will do the following:

- Make a backup copy of the boot sector (MBR or VBR)
- Create a `/boot/map` file with the locations of:
 - `/boot/boot.b`
 - The kernel
 - `/boot/message`
 - `/boot/chain.b`
- Make a boot sector containing the location of the map file
- Write the boot sector to either the MBR or VBR.

LILO

LILO diagnostics

When LILO runs, it prints the word 'L I L O' in the top left hand corner of the screen, one letter at a time:

- 'L' - Stage 1 loaded & running.
- 'LI' - Stage 2 was loaded but could not run
- 'LIL' - Stage 2 was loaded but could not locate the descriptor table
- 'LIL?' - Stage 2 was loaded at an incorrect address
- 'LIL-' - Stage 2 was loaded but descriptor table is corrupt
- 'LILO' - LILO has started up correctly.

GRUB

GRUB operates in a similar manner to LILO. It is a two stage loader that can load stage 1 into either the MBR or VBR.

The main differences between LILO and GRUB are:

- Stage 2 can be located beyond the 1024 cylinder limit.
- GRUB can boot from network devices using tftp
- GRUB has many more configuration options
- GRUB is effectively a mini shell and can be configured 'on-the-fly' by giving it commands directly at boot time.

GRUB

Hard Disk Naming Conventions

GRUB uses a different naming convention to that of the rest of the Linux world. In general, the syntax used is: `hdN,X` where: N is the hard disk number (0 for the first, 1 for the second...) X is the partition number (0 for the first, 1 for the second...)

Examples: `(hd0,1)` refers to the 1st physical drive, 2nd primary partition
`(hd1,6)` refers to the 2nd physical drive, 3rd logical partition
`(fd0)` refers to the floppy drive

A file within a partition can be referred to by appending a path to it: EG:
`(hd0,0)/boot/vmlinuz`, refers to the file `/boot/vmlinuz` on the 1st drive, 1st partition

GRUB

Installing GRUB

Once the configuration file has been created, there are two ways to install GRUB:

Option 1: Run grub from the command line:

```
[root@cds grub]# /sbin/grub
grub> root (hd0,6)
grub> setup (hd0)
        or;
grub> setup (hd0,4)
```

GRUB

Installing GRUB

Option 2: Use the grub-install command: To install into the MBR:

```
[root@cds grub]# grub-install /dev/hda
```

To install into the VBR:

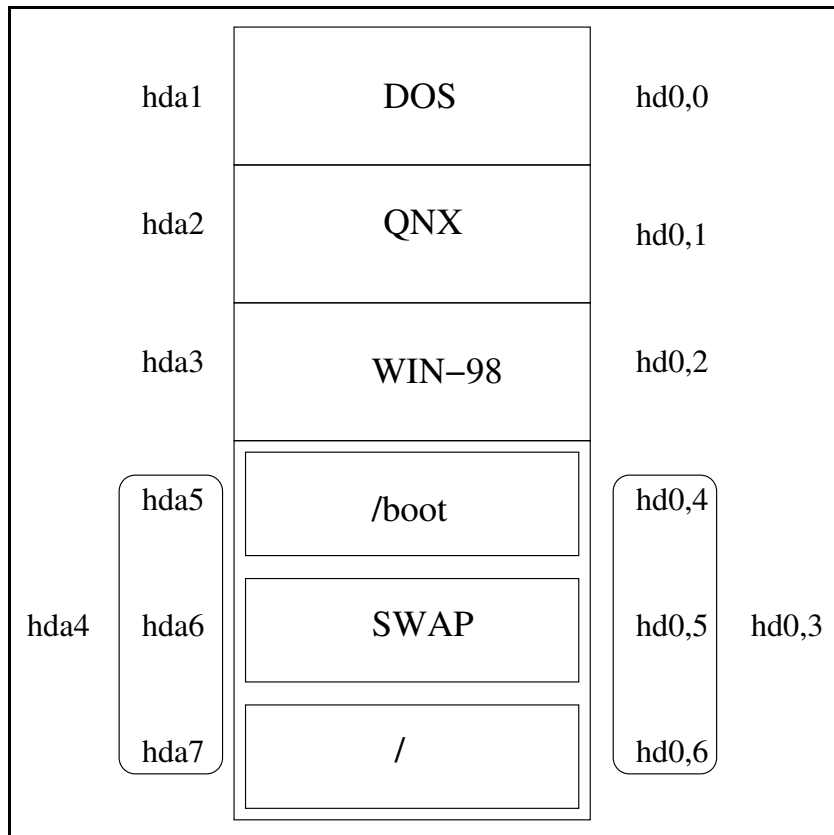
```
[root@cds grub]# grub-install /dev/hda5
```

If you have a separate /boot partition, then you need to specify boot directory:

```
[root@cds grub]#  
grub-install --root-directory=/boot /dev/hda5
```

Sample Installation

The diagram below shows the disk layout used for the sample configuration scripts.



Sample Installation

LILO configuration

```
# Global configuration options
boot=/dev/hda
timeout=20
message=/boot/message
prompt
default=linux
vga=normal
map=/boot/map
install=/boot/boot.b
```



```
# Per image options
other=/dev/hda3
    label=WIN98

other=/dev/hda2
    label=QNX

other=/dev/hda1
    label=DOS

image=/boot/vmlinuz
    label=linux
    root=/dev/hda7
    read-only
```

Sample Installation

GRUB configuration

```
default=0
timeout=10
fallback=1
splashimage=(hd0,0)/boot/grub/splash.xpm.gz

title RedHat 7.2
    root (hd0,4)
    kernel /vmlinuz ro root=/dev/hda7
    initrd /initrd.img
```

```
title Windows
    root (hd0,2)
    makeactive
    chainloader +1
```

```
title QNX
    root (hd0,1)
    makeactive
    chainloader +1
```

```
title DOS
    root (hd0,0)
    makeactive
    chainloader +1
```