

1.106.1

Boot the system

Weight 3

Linux Professional Institute Certification — 102

Angus Lees `gus@inodes.org` Nick Urbanik
`nicku@nicku.org`

This document Licensed under GPL—see section 9

2005 July

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

Outline

Context
Objective
Boot Process
How BIOS finds boot loader
Boot Loaders
LILO

GRUB
Other boot loaders
Chaining Boot Loaders
dmesg
`/etc/modules.conf`
License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

dmesg

`/etc/modules.conf`

License Of This Document

Topic 106 Boot, Initialization, Shutdown and Runlevels [6]

Where we are up to

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

dmesg

/etc/modules.conf

License Of This Document

1.106.1 **Boot the system [3]**

1.106.2 Change runlevels and shutdown or reboot system [3]

Description of Objective

1.106.1 Boot the system

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

dmesg

/etc/modules.conf

License Of This Document

Candidates should be able to guide the system through the booting process. This includes giving commands to the boot loader and giving options to the kernel at boot time, and checking the events in the log files.

Key files, terms, and utilities include:

1.106.1 Boot the system

`dmesg` — command to show kernel message ring buffer

`/var/log/messages` — main syslog file

`/etc/conf.modules` or `/etc/modules.conf`
— `modprobe` configuration file

LILO — older bootloader system, less used now

GRUB — newer, more flexible bootloader system

- ▶ Note that with Red Hat systems, 2.6 kernels use the file `/etc/modprobe.conf`, not `/etc/modules.conf`
- ▶ The name `/etc/conf.modules` has been out of favour for some years

Booting

- ▶ Machine powers up, BIOS POST, spin up SCSI drives, etc
- ▶ BIOS boots boot loader
- ▶ (*Boot loader may load its “second stage” from somewhere else*)
 - ▶ e.g., grub loads `/boot/grub/stage2`
- ▶ Boot loader loads Linux kernel
- ▶ Linux kernel starts up, detects hardware, etc
- ▶ Linux kernel creates a ram disk with kernel modules from `initrd` image file
 - ▶ The drivers in the `/boot/initrd.img` file are often needed to access the hard disk.
- ▶ After loading the
- ▶ Linux kernel mounts /
- ▶ Linux kernel starts `init(8)`
- ▶ `init(8)` starts up rest of system

Finding the boot loader

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

dmesg

/etc/modules.conf

License Of This Document

- ▶ (i386-specific)
- ▶ BIOS boots Master Boot Record (MBR), located at the beginning of the disk.
- ▶ Usual DOS MBR looks for “active” partition and loads the boot loader found in that partition.
- ▶ You can either install your boot loader
 - ▶ in the MBR, replacing the DOS boot loader, or
 - ▶ use a DOS-compatible boot loader and install your boot loader in the active partition.

Outline

Context
Objective
Boot Process
How BIOS finds boot loader
Boot Loaders
LILO

GRUB
Other boot loaders
Chaining Boot Loaders
dmesg
`/etc/modules.conf`
License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

dmesg

`/etc/modules.conf`

License Of This Document

Boot Loaders

LILO

1.106.1
Boot the system
Weight 3

Angus Lees

- ▶ “Usual” i386 boot loader
 - ▶ at least it was a few years ago.
- ▶ `lilo(8)` install command generates suitable assembly code and installs it into either the MBR or a partition. Configured through `/etc/lilo.conf`
- ▶ Remembers actual disk blocks of kernel and uses that to access the file directly (using BIOS disk routines).
- ▶ Because the calculations are done at install time, LILO can get confused by changes in disk configuration.

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

Outline

Context
Objective
Boot Process
How BIOS finds boot loader
Boot Loaders
LILO

GRUB
Other boot loaders
Chaining Boot Loaders
`dmesg`
`/etc/modules.conf`
License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

Boot Loaders

GRUB

1.106.1
Boot the system
Weight 3

Angus Lees

- ▶ The Grand United boot loader.
- ▶ Unlike LILO, GRUB understands some partition formats and reads files through “normal” means.
- ▶ GRUB has drivers for a number of different file systems
- ▶ depends on BIOS to be able to access the hard disk
- ▶ Reads the menu file `/boot/grub/menu.lst` directly from the hard disk
- ▶ No need to change MBR when install a new kernel

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

Outline

Context
Objective
Boot Process
How BIOS finds boot loader
Boot Loaders
LILO

GRUB
Other boot loaders
Chaining Boot Loaders
dmesg
`/etc/modules.conf`
License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

dmesg

`/etc/modules.conf`

License Of This Document

Boot loaders

isolinux, loadlin

- ▶ CDRoms often use `isolinux` as the bootloader
- ▶ `loadlin` allows booting Linux after having booted MSDOS.

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILLO

GRUB

Other boot loaders

Chaining Boot Loaders

dmesg

`/etc/modules.conf`

License Of This Document

Chaining Boot loaders

1.106.1
Boot the system
Weight 3

Angus Lees

- ▶ One bootloader can load another bootloader
- ▶ This is how GRUB or LILO start Windows
 - ▶ Windows has its own bootloader at the start of its partition
 - ▶ We tell GRUB or LILO to “chainload” that boot loader
- ▶ It is often useful to have one GRUB bootloader start another bootloader
 - ▶ For example, if you have several distributions on one disk, have one’s GRUB install its `stage1` into the MBR
 - ▶ Other distributions install GRUB at start of their partition
 - ▶ The first GRUB chainloads the other GRUBs
 - ▶ Keeps maintenance local within each distribution

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

Snarfing kernel output

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot
loader

Boot Loaders

Chaining Boot Loaders

dmesg

/etc/modules.conf

License Of This
Document

- ▶ `dmesg(8)` gives you the last 16k of kernel messages.
- ▶ This is written to `/var/log/dmesg` to refer to after `syslog` starts up
- ▶ `syslog` gathers messages from many daemons as well as the kernel, and sends them to `/var/log/messages`

- ▶ Configuration for `modprobe(8)`
- ▶ AKA `/etc/modules.conf`, or with the 2.6 kernel on Red Hat/Fedora systems, `/etc/modprobe.conf`
 - ▶ Used to be called `/etc/conf.modules` till people realised that seems back to front
- ▶ Gives kernel module options, module aliases and a few more exotic options (like module pre/post load commands).

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

Topics Covered

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

Topics Covered

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

dmesg

`/etc/modules.conf`

License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

dmesg

`/etc/modules.conf`

License Of This Document

Topics Covered

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

dmesg

`/etc/modules.conf`

License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

dmesg

`/etc/modules.conf`

License Of This Document

Topics Covered

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

dmesg

`/etc/modules.conf`

License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

dmesg

`/etc/modules.conf`

License Of This Document

Topics Covered

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

dmesg

`/etc/modules.conf`

License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

dmesg

`/etc/modules.conf`

License Of This Document

Topics Covered

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

Topics Covered

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

Topics Covered

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

Topics Covered

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

Topics Covered

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

Topics Covered

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

Topics Covered

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

LILO

GRUB

Other boot loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

`dmesg`

`/etc/modules.conf`

License Of This Document

License Of This Document

1.106.1
Boot the system
Weight 3

Angus Lees

Context

Objective

Boot Process

How BIOS finds boot loader

Boot Loaders

Chaining Boot Loaders

dmesg

/etc/modules.conf

License Of This Document

Copyright © 2005, 2003 Angus Lees <gus@inodes.org> and Nick Urbanik <nicku@nicku.org>.

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.