LPI 102.2 - Install a boot manager

Curs 2021 - 2022

ASIX M01-ISO Install a boot Manager

Install a boot manager

Description

Key concepts:

- ❏ Providing alternative boot locations and backup boot options.
- ❏ Install and configure a boot loader such as GRUB Legacy.
- ❏ Perform basic configuration changes for GRUB 2.
- ❏ Interact with the boot loader.

Commands and files:

- ❏ menu.lst, grub.cfg and grub.conf
- ❏ grub-install
- ❏ grub-mkconfig
- ❏ MBR

Install a boot loader

The two bootloaders most commonly used with Linux are the Grand Unified Bootloader (GRUB), or the **Grand Unified Bootloader 2 (GRUB 2)**, though the latter is the one that is used most often. Previously, the Linux Loader (LILO) was the one most implemented, but it has fallen out of wide usage and is present mostly on older or legacy systems.

GRUB can read filesystems and dynamically learn about the hardware. Also, rather than replacing the bootloader installation on disk each time a configuration change is made, the bootloader automatically reads *configuration files*. As a dynamic bootloader, GRUB also offers a *command line interface* that can override the settings from the configuration file.

Usually from the first 512 bytes of the MBR the grub information is located in the first 440 bytes, then is followed for th partition table

Grub Legacy

> The initial bootloader code is very small, under 512 KB, uses 2.5 stages. GRUB Legacy typically writes the stage 1 bootloader to the Master Boot Record (MBR), and that is just enough code to get the stage 1.5 bootloader, which usually occupies the first 30KiB of the disk that directly follows the MBR. The stage 1.5 loader has just enough code to load up the filesystem drivers needed to load the stage 2 loader from the /boot/grub location.

Configuration files:

- /boot/grub/menu.lst
- */boot/grub/grub.conf*

Naming disks and partitions:

- (hd0) → /dev/sda
- (hd0,0) → /dev/sda1
- (hd1,2) → /dev/sdb3

Commands:

- grub-install '(hd0)'
- grub-mkconfig -o /boot/grub/grub.conf

```
# ## grub-install '(hd0)'
# ## grub-mkconfig /boot/grub/grub.conf
```

```
default=0
fallback=1
timeout=5
splashimage=(hd0,0)/grub/splash.xpm.gz
hiddenmenu
password notencypted

#bootable title sections
title CentOS (2.6.32-358.6.1.el6.i686)
        root (hd0,2)
        kernel /vmlinuz-2.6.32-358.6.1.el6.i686 ro root=/dev/mapper/vg_livecd-lv_root
rd_NO_LUKS LANG=en_US.UTF-8 rd_LVM_LV=vg_livecd/lv_swap rd_NO_MD
rd_LVM_LV=vg_livecd/lv_root SYSFONT=latarcyrheb-sun16 crashkernel=auto  KEYBOARDTYPE=pc
KEYTABLE=us rd_NO_DM rhgb quiet
        initrd /initramfs-2.6.32-358.6.1.el6.i686.img
title CentOS (2.6.32-358.2.1.el6.i686)
        password --md5 $1$D20Ia1$iN6djlheGF0NQoyerYgpp/
        root (hd0,2)
        kernel /vmlinuz-2.6.32-358.2.1.el6.i686 ro root=/dev/mapper/vg_livecd-lv_root
rd_NO_LUKS LANG=en_US.UTF-8 rd_LVM_LV=vg_livecd/lv_swap rd_NO_MD
rd_LVM_LV=vg_livecd/lv_root SYSFONT=latarcyrheb-sun16 crashkernel=auto  KEYBOARDTYPE=pc
KEYTABLE=us rd_NO_DM rhgb quiet
        initrd /initramfs-2.6.32-358.2.1.el6.i686.img
title OtherOS (Windows)
        rootnoverify (hd0,0)
        chainloader +1
```

Configuration file:

default

Specifies the title to attempt to boot by default after the timeout number of seconds has passed.

fallback

Specifies the title to attempt to boot if the default title fails to boot successfully.

timeout

Specifies the number of seconds to wait before automatically attempting to boot the default title.

splashimage
: Specify a background graphic that appears behind the text of the menu.

hiddenmenu
: Prevents GRUB Legacy from displaying all but the default bootable title until the user presses a key. If the user presses a key, then all titles are displayed.

title
: The title directive starts a new block of directives that form the directives necessary to boot the system. A title block ends when the next title directive appears or when the end of the file is reached.

root
: Uses the special hard disk syntax to refer to the location of the /boot directory.

kernel
: This line specifies the kernel image file, followed by all the parameters that are passed to the kernel, such as ro for read-only and root=/path/to/rootfs.

initrd
: This line should specify an initial ramdisk that matches the version and release of the Linux kernel. This file provides a minimal filesystem during kernel initialization prior to mounting the root filesystem.

password
: This option can be used as either a global option or a title option. When specified globally, this requires the user to submit the specified password before appending, editing, or using the GRUB Legacy command line. As a title option, this requires the user to submit the password before GRUB will attempt to boot the title.

rootnoverify
: This directive is used to specify a bootable partition for a non-Linux operating system.

chainloader
: Used to specify a path to another bootloader or +1 if the bootloader is located in the first sector of the partition specified by the rootnoverify directive.

Interactive mode:

If the A key is pressed, then GRUB Legacy will allow additional kernel parameters to be appended. This is commonly used to specify the runlevel number to take the system to, instead of the default runlevel.

If the E key is pressed, then any of the directives that are included within the selected title can be edited; the root, kernel, or initrd values can be changed in order to be able to boot the system in a different manner. The changes that are made at the GRUB Legacy menu are not permanently edited into the /boot/grub/grub.conf file.

If the C key is pressed at the GRUB Legacy menu, then the GRUB command prompt will be provided. At this command prompt, any GRUB Legacy directives can be added, including specifying custom root, kernel, and initrd directives. If entered correctly, followed by the boot directive, then the system will boot correctly.

Grub2

The new GRUB, GRand Unified Bootloader 2, offers several advantages:

- Dynamically loaded modules
- Non-ASCII character support
- Ability to boot from partitions inside of Logical Volume Management (LVM) or RAID devices
- Ability to work with architectures that don't have a PC BIOS

From the first stage loader, the location of the second stage loader is found. The second stage loader diskboot.img is used as the first sector of the third stage loader, and this points directly to the third stage.

The third stage loader core.img uncompresses itself, accesses its own GRUB 2 kernel and filesystem drivers and attempts to access the actual root filesystem's /boot/grub directory.

If it can access the /boot/grub directory on disk, it then loads the appropriate fourth stage module normal.mod which then reads the /boot/grub/grub.cfg file and presents either a GUI for GRUB 2 or the CLI menu so the user can choose an image to boot.

Configuration files:

- /boot/grub/grub.conf
- /boot/grub2/grub.conf
- /etc/grub.d
- /etc/default/grub

Naming disks and partitions:

- (hd0) → /dev/sda
- (hd0,1) → /dev/sda1
- (hd1,2) → /dev/sdb2

Commands:

- update-grub
- grub-mkconfig
- grub2-mkconfig

```
#1
menuentry "Default OS" {
    set root=(hd0,1)
    linux /vmlinuz root=/dev/sda1 ro quiet splash
    initrd /initrd.img
}
```

```
#2
# cat /etc/default/grub
GRUB_TIMEOUT=5
GRUB_DISTRIBUTOR="$(sed 's, release .*$,,g' /etc/system-release)"
GRUB_DEFAULT=saved
GRUB_DISABLE_SUBMENU=true
GRUB_TERMINAL_OUTPUT="console"
GRUB_CMDLINE_LINUX="rd.lvm.lv=fedora/root rd.lvm.lv=fedora/swap rhgb quiet"
GRUB_DISABLE_RECOVERY="true"
```

```
#3
# ls /etc/grub.d/
00_header             10_linux               20_linux_xen     30_uefi-firmware  README
01_users              10_reset_boot_success  20_ppc_terminfo  40_custom
08_fallback_counting  12_menu_auto_hide      30_os-prober     41_custom
```

```
#4
# ls /boot/efi/EFI/fedora/
BOOTX64.CSV  grub.cfg     grub.cfg.mk  grubx64.efi  shim.efi     shimx64-fedora.efi
fonts        grub.cfg.bk  grubenv      mmx64.efi    shimx64.efi
```

```
#5
# ## grub-install /dev/sda
# ## grub-mkconfig -o /boot/grub/grub.conf
# ## update-grub
```

```
#6
# grub2-script-check /boot/efi/EFI/fedora/grub.cfg

# grub2-script-check /boot/grub/grub.conf

# grub-install --boot-directory=/mnt/tmp /dev/sda

# grub-install --boot-directory=/boot /dev/sda
```

```
#7
# ls /boot/grub2/i-386
```

Grub rescue

When the boot system crashes grub can swow the grub rescue propmt.

```
#7
grub rescue> set prefix=(hd0,msdos1)/boot/grub
grub rescue> insmod normal
grub rescue> insmod linux
```

Example Exercises

1. Show the grub config file.
2. Generate a new grub configuration file for stdout.
3. Modify interactively the boot selecting the runlevel 1 (systemd.unit=rescue.target).
4. Modify interactively the boot appending the option quiet (or deleting it)
5. Change de timeout to -1 in the grub configuration file.
6. Create a new entry in the grub configuration file starting the system in rescue mode.
7. Boot the system using init=/bin/bash

8. Realitza els exercicis indicats a: 102.2 Install a boot manager
9. Realitza els exercicis del Question-Topics 102.2.