4.2.1 GRUB Legacy

Click one of the buttons to take you to that part of the video.

GRUB Legacy 0:00-0:39

In this video, we're going to discuss the Linux boot process as it relates to the GRUB bootloader. We'll cover both installing and configuring GRUB and how to use GRUB interactively.

Before we begin, I want to mention that most distributions don't use GRUB anymore. Not too long ago, nearly every version of Linux used it. But now, it's largely been replaced by GRUB2. You'll still see it sometimes, though, so it's important to know how GRUB works, how to configure it, and how to use it.

So, with that, you might be asking, "What in world is GRUB, and what does it do?"

GRUB is an acronym for Grand Unified Bootloader. It's a bootloader that can boot a Linux kernel.

How GRUB Works 0:40-1:32

First, let's talk about how GRUB works.

The GRUB bootloader is actually divided into two separate pieces. We call these pieces stages. We have Stage 1 and Stage 2.

Stage 1 of the GRUB bootloader is usually stored in the boot device's Master Boot Record. Stage 1 has a very limited role in the boot process. Its only job is to point to Stage 2's location.

Stage 2 of GRUB is actually stored on-disk, in a partition.

When Stage 1 loads it, Stage 2 presents the user with a graphical menu so they can select which kernel image to load, or even which operating system to load, because GRUB can load Linux or Windows.

One of the really nice features of a GRUB menu is that you can configure it to boot from a default kernel image after a default timeout value has expired. This means that if the user doesn't manually select an operating systems (or kernel image), the system will automatically load the default kernel image.

Install GRUB 1:33-2:22

With this in mind, let's discuss how to install GRUB.

With the older Linux distribution, when you initially installed your Linux system, you were prompted to select a bootloader, and then you could select GRUB and install it.

If GRUB wasn't installed for some reason, and you still wanted to use it, you could install it using the grub-install command.

From a shell prompt, you would enter 'grub-install', and then you would specify the devices that contained the master boot record, where stage 1 of GRUB will be installed.

For example, let's say we want to install the Stage 1 of GRUB into the Master Boot Record of the first SCSI hard disk drive in your system, or even the first SATA hard disk drive in your system.

At the shell prompt, we'll enter 'grub-install', and then we'll specify the device name. Because it's the first SATA or SCSI hard disk drive in the system, the device name is /dev/sda.

Configure GRUB 2:23-2:44

With GRUB installed, the next thing we need to do is configure it by editing a text file.

Here's a key point to remember: the name of the file that you need to edit varies from distribution to distribution.

For example, on a SUSE Linux distribution, we would edit the /boot/grub/menu.lst file. On other distributions, such as Fedora, you would edit the grub.conf file.

Global Options and Menu Selections 2:45-3:01

The GRUB configuration file is divided into two sections. The first section contains the global options that apply to all of the menu items within the file.

The second section contains the individual menus. This section is used to define each menu item in the GRUB menu, which are identified by title sections.

Reference Hard Disks 3:02-3:54

Before we go further, we need to discuss how GRUB refers to hard disk drives.

Normally, when we refer to a hard disk drive or a partition on a hard disk drive in Linux, we use a file in the /dev directory.

For example, to refer to the first hard disk drive on the system, such as a SATA hard disk drive, we'd use /dev/sda. To refer to the first partition on that drive, we'd use the /dev/sda1 device file.

GRUB refers to hard disk drives with a different syntax. It uses hd# followed by the partition number.

For example, GRUB references the first partition on the first hard disk drive in our system, /dev/sda1, as 'hd0 (the first hard disk in the system) comma, 0'. It doesn't matter if it's an IDE, SATA, or SCSI hard drive --GRUB still refers to it using this syntax.

GRUB Creates the GRUB Root 3:55-4:40

Another thing you need to be aware of is the fact that GRUB creates its own root, the GRUB root.

This is very confusing because we associate the file system root with the / directory, right? Well, the GRUB root and the file system root are different things.

The GRUB root is the partition where the /boot directory resides, where your GRUB Stage 2 files are installed.

Here's the confusing thing: if you haven't created a separate partition for the /boot directory, then GRUB will use the full path to refer to the GRUB root, which is usually /boot/grub.

If, on the other hand, you have created a separate partition for the /boot directory, which isn't a bad idea, then this partition becomes the GRUB root. Then GRUB refers to files in the GRUB root without including /boot in the path.

GRUB Configuration Options 4:41-5:14

With this in mind, let's take a look at some of the options you can use in the GRUB configuration file.

First, under the global section, we have an option called default, which specifies the menu item that will be booted automatically if the user doesn't make a manual selection.

Next, we have the option named timeout. Timeout specifies the number of seconds to wait until the default menu item is selected and loaded. By default, this is usually set to eight seconds.

Then we have the gfxmenu option. Gfxmenu specifies the location of the image file that will be used to display the graphical GRUB boot menu.

Title Options 5:15-6:10

Under title options, we have the root option, which specifies the location of the partition that will be mounted as the GRUB root.

This section also includes the option named kernel, which is used to specify the location of the Linux kernel.

Usually, this option points to /boot/vmlinuz, which is actually just a link that points to the actual Linux kernel file in /boot.

You might also see an option called vga=. This option specifies the vga mode that the system should use during boot. We also have an option called resume=. Resume= points to the system's swap partition.

And last, there's the initrd option, which specifies the initrd image that GRUB should use to create the initial RAM disk during the boot process.

Usually, the /boot/initrd file is specified and, like the vmlinuz file, the initrd file in /boot is actually just a symbolic link to the real initrd image file.

Use GRUB Interactively 6:11-7:20

One of the features that made GRUB so popular was the ability to use it interactively.

Interactive use means you're not stuck with whatever's configured in the menu.lst file--you can customize the boot process to suit your needs.

To do this in the GRUB menu, you need to press the escape key (Esc) during the boot process and then select OK.

When you do, a text-based GRUB menu will be displayed. And if you want to edit a menu item,

you can press the e key, and then you can arrow up and down, select the appropriate line, and press e again to edit the line.

You can even add a new line to create your own custom GRUB boot menu entry by pressing o.

When you're done, you just press b to start the boot process.

In addition, when you're using the GRUB menu, you can also supply kernel options when the system boots.

At the bottom of the GRUB menu, there's a field called boot options. You can supply any kernel options or commands you want in that field.

For example, let's say this system is configured to boot into runlevel 5, but you want the system to boot into runlevel 3 just once. All you have to do is put the number 3 in the boot options field. This input is passed to the init process as a parameter, and it tells the init process to boot the system into runlevel 3.

Summary 7:21-7:32

So, that's how you use the GRUB bootloader on Linux.

In this video, we explored how GRUB works. We discussed how GRUB is installed and configured using either the menu.lst or grub.conf files.

And then we discussed how to use GRUB interactively.