

Boot the System

- **Introduction**
- **Lab Topology**
- **Exercise 1 - Boot the System**
- **Review**

Introduction

Welcome to the **Boot the System** Practice Lab. In this module you will be provided with the instructions and devices needed to develop your hands-on skills.

Linux System

Ubuntu

Boot Events

Learning Outcomes

In this module, you will complete the following exercise:

- Exercise 1 - Boot the System

After completing this lab, you will be able to:

- Configure boot menu in Ubuntu
- Check boot events in the log files

Exam Objectives

The following exam objectives are covered in this lab:

- **LPI: 108.2 System logging**
- **CompTIA: 3.4 Given a scenario, implement logging services.**

Note: Our main focus is to cover the practical, hands-on aspects of the exam objectives. We recommend referring to course material or a search engine to

research theoretical topics in more detail.

Lab Duration

It will take approximately **1 hour** to complete this lab.

Help and Support

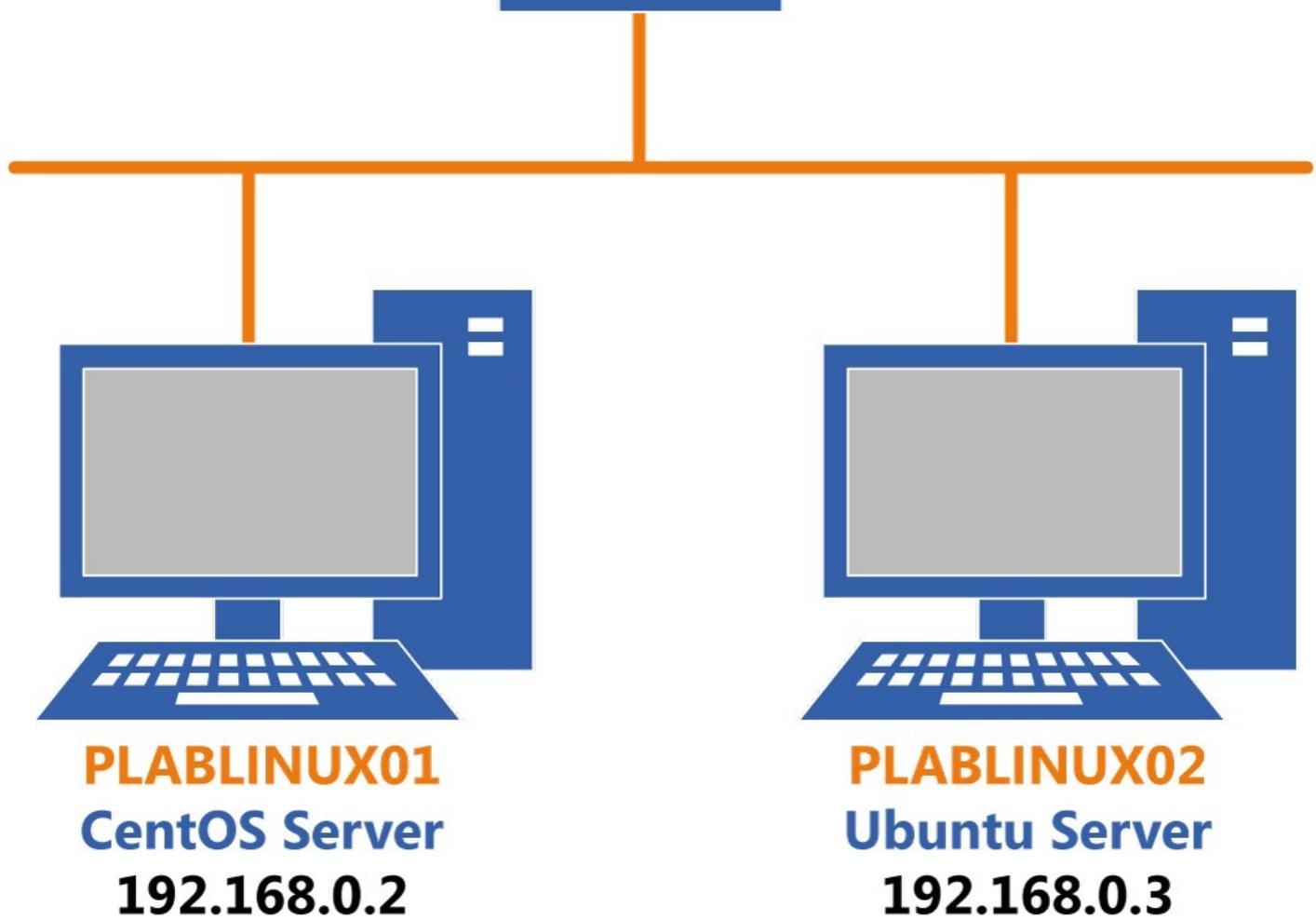
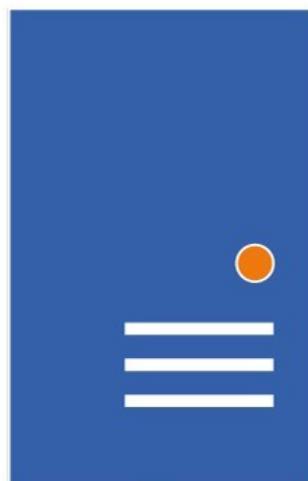
For more information on using Practice Labs, please see our **Help and Support** page. You can also raise a technical support ticket from this page.

Click Next to view the Lab topology used in this module.

Lab Topology

During your session, you will have access to the following lab configuration.

PLABSA01
Windows Server 2016
192.168.0.1



Depending on the exercises you may or may not use all of the devices, but they are shown here in the layout to get an overall understanding of the topology of the lab.

- **PLABSA01** (Windows Server 2016)
- **PLABLINUX01** (CentOS Server)
- **PLABLINUX02** (Ubuntu Server)

Click Next to proceed to the first exercise.

Exercise 1 - Boot the System

Booting a system refers to initialization various parameters of the system or any hardware device. The booting process loads various files and libraries from the operating system.

In this exercise, you will understand the files used in the system bootup process and boot events.

Learning Outcomes

After completing this exercise, you will be able to:

- Log into a Linux System
- Configure boot menu in Ubuntu
- Check boot events in the log files

Your Devices

You will be using the following device in this lab. Please power these on now.

- **PLABLINUX02** (Ubuntu Server)



Task 1 - Configure the Boot Menu in Ubuntu

Every operating system works with a boot menu. When you have a single operating system on a system, the operating system is loads itself without an issue. However, assume that you have a Windows system and you also load Ubuntu in the system and make it a dual-boot system. In this case, Ubuntu will make it the default operating

system that boots up the system. You can alter some of the boot settings to ensure that they are as per your choice or requirement.

In this task, you will learn to configure the boot menu in Ubuntu. To configure the boot menu, perform the following steps:

Step 1

On the desktop, right-click and select **Open in Terminal**.

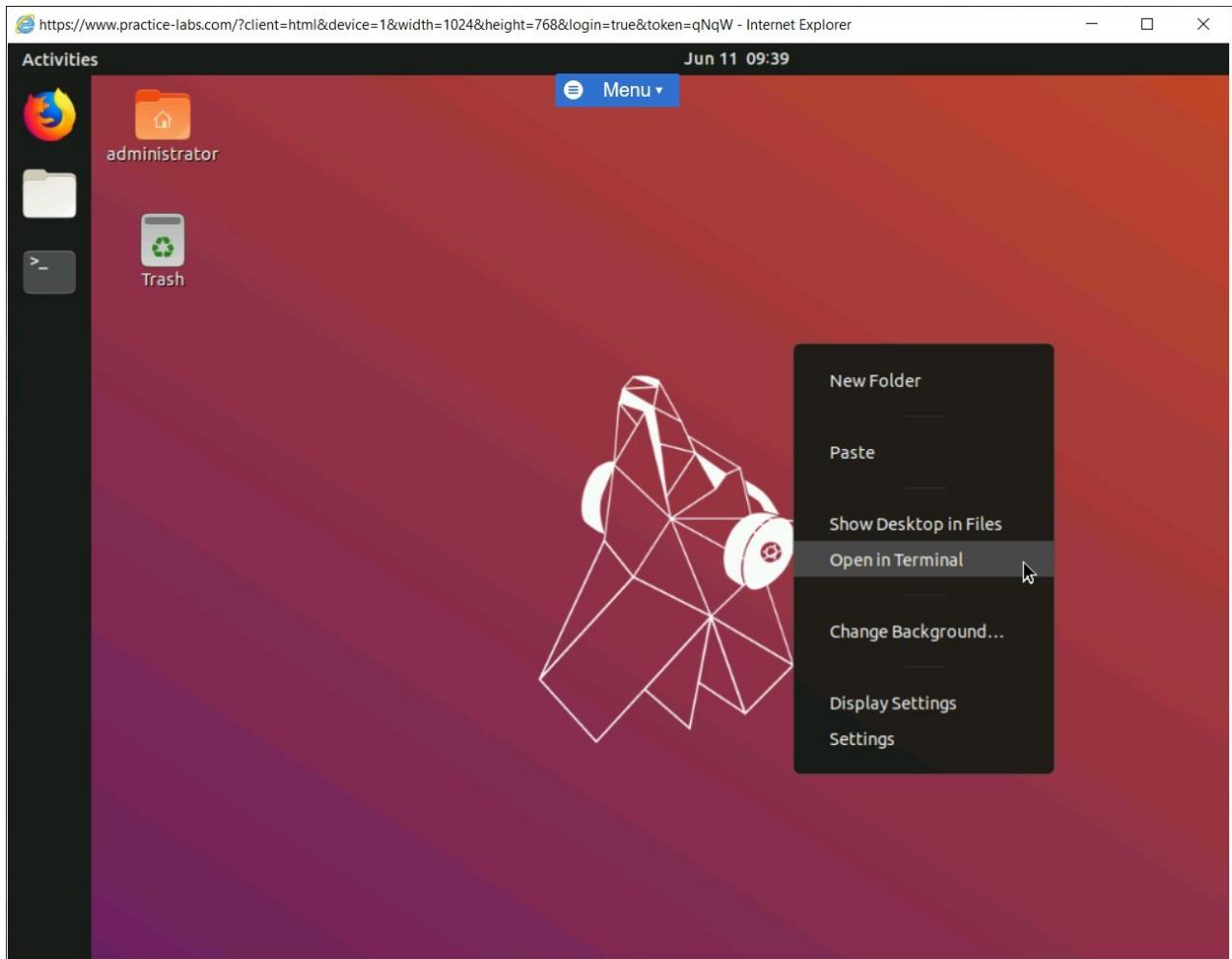


Figure 1.1 Screenshot of PLABLINUXo2: Selecting the Open Terminal option from the context menu.

Step 2

Alert: Even though this device contains a single operating system, for the sake of demonstration, assume that it is a dual-operating system, with Ubuntu and Windows.

The terminal window is displayed. You will need to view the **/etc/default/grub** file to see the Ubuntu boot settings. To do this, type the following command:

```
cat /etc/default/grub
```

Press **Enter**.

Alert: If you wrongly edit this file, then you will end up with a system that will not boot. Therefore, take precaution while editing this file. It is always good to make a backup of the grub file.

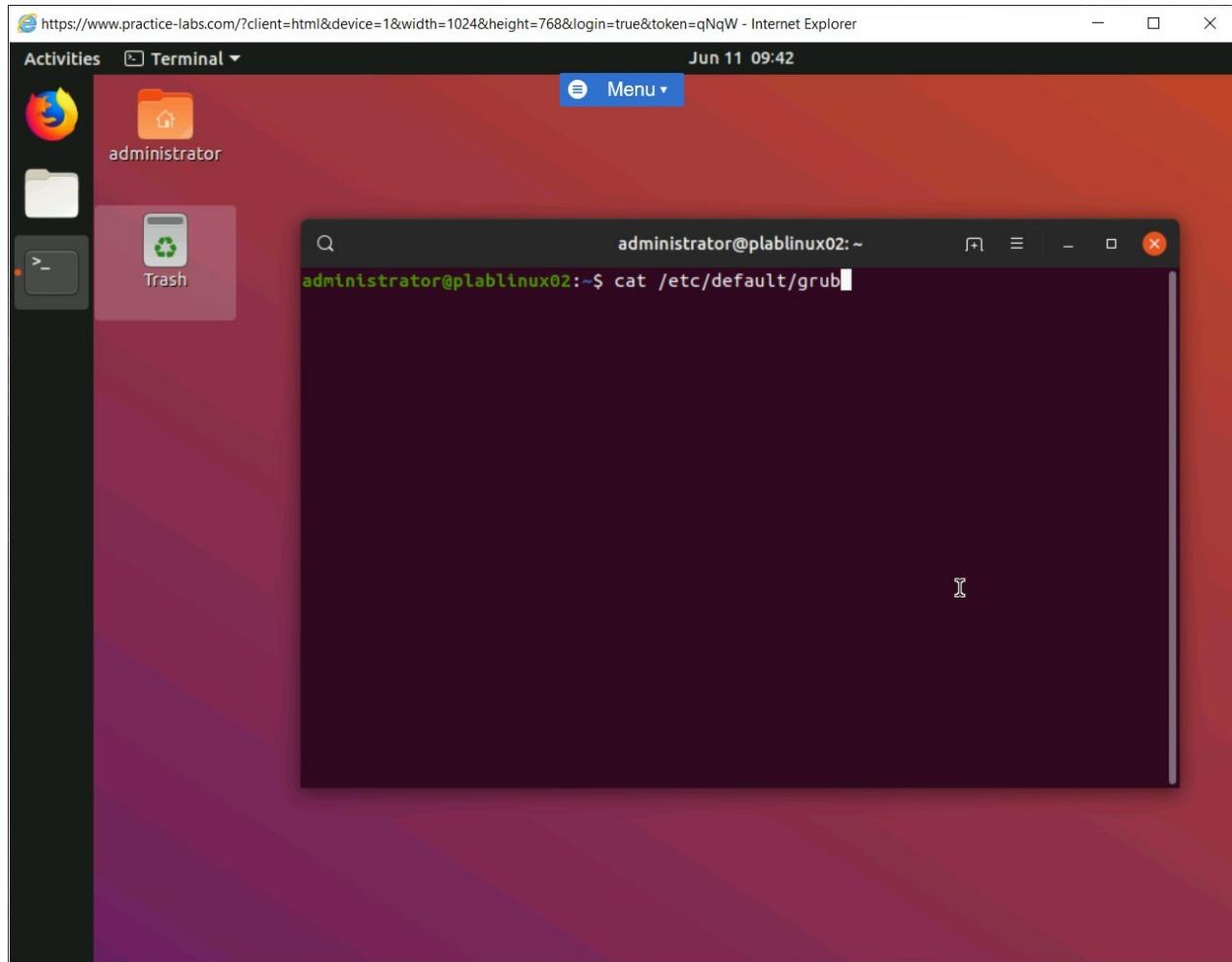
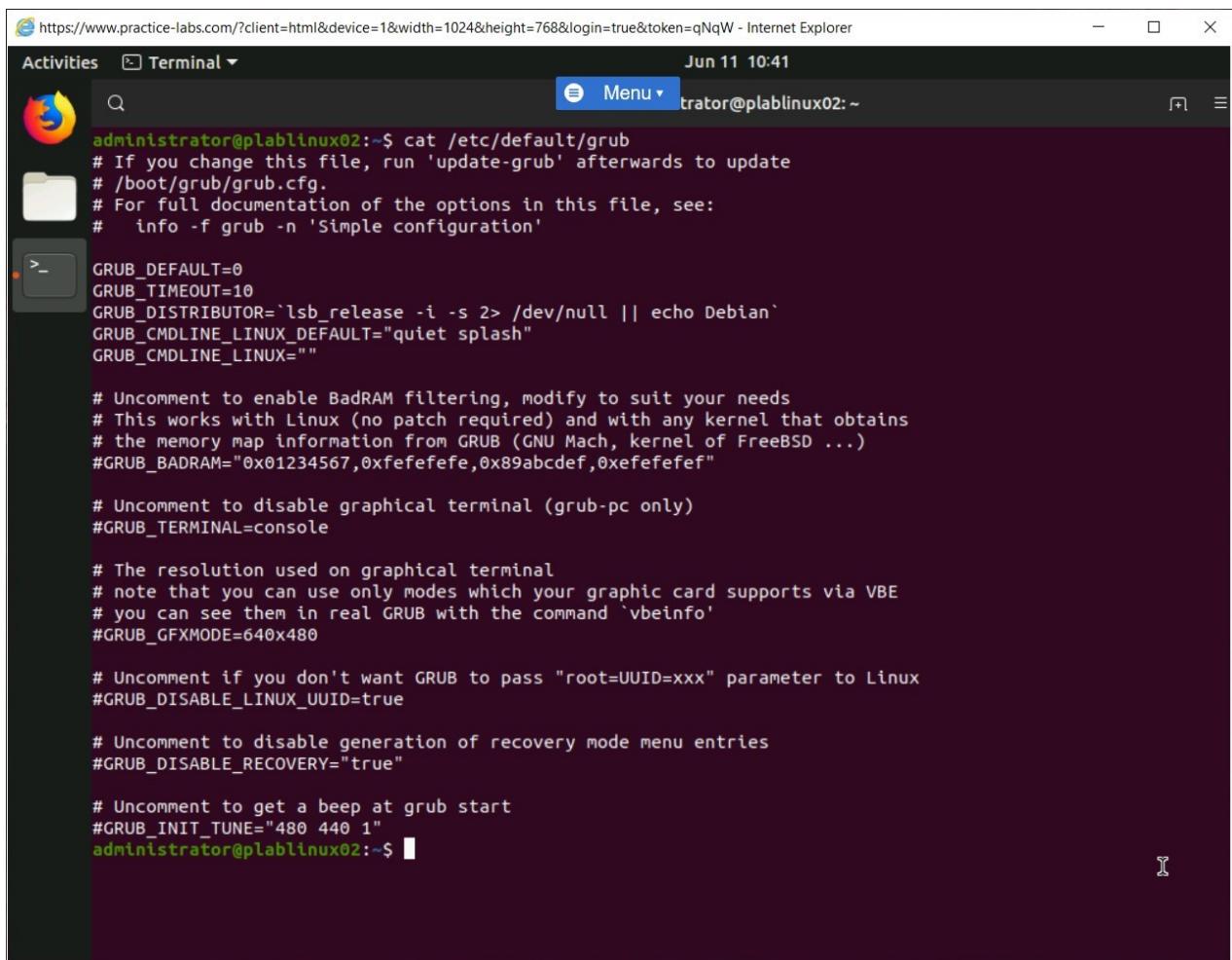


Figure 1.2 Screenshot of PLABLINUX02: Executing command to open the **/etc/default/grub** file.

Step 3

The **/etc/default/grub** file is displayed.

Note: If required, maximize the terminal window.



A screenshot of a Linux terminal window titled "Terminal". The window shows the command "cat /etc/default/grub" being run in a terminal session. The output of the command is displayed, showing various GRUB configuration parameters. The terminal window has a dark background and includes standard Linux navigation icons (back, forward, search) and a menu bar at the top.

```
administrator@plablinux02:~$ cat /etc/default/grub
# If you change this file, run 'update-grub' afterwards to update
# /boot/grub/grub.cfg.
# For full documentation of the options in this file, see:
#   info -f grub -n 'Simple configuration'

GRUB_DEFAULT=0
GRUB_TIMEOUT=10
GRUB_DISTRIBUTOR=`lsb_release -i -s 2> /dev/null || echo Debian`
GRUB_CMDLINE_LINUX_DEFAULT="quiet splash"
GRUB_CMDLINE_LINUX=""

# Uncomment to enable BadRAM filtering, modify to suit your needs
# This works with Linux (no patch required) and with any kernel that obtains
# the memory map information from GRUB (GNU Mach, kernel of FreeBSD ...)
#GRUB_BADRAM="0x01234567,0xfefefefe,0x89abcdef,0xefefefef"

# Uncomment to disable graphical terminal (grub-pc only)
#GRUB_TERMINAL=console

# The resolution used on graphical terminal
# note that you can use only modes which your graphic card supports via VBE
# you can see them in real GRUB with the command 'vbeinfo'
#GRUB_GFXMODE=640x480

# Uncomment if you don't want GRUB to pass "root=UUID=xxx" parameter to Linux
#GRUB_DISABLE_LINUX_UUID=true

# Uncomment to disable generation of recovery mode menu entries
#GRUB_DISABLE_RECOVERY="true"

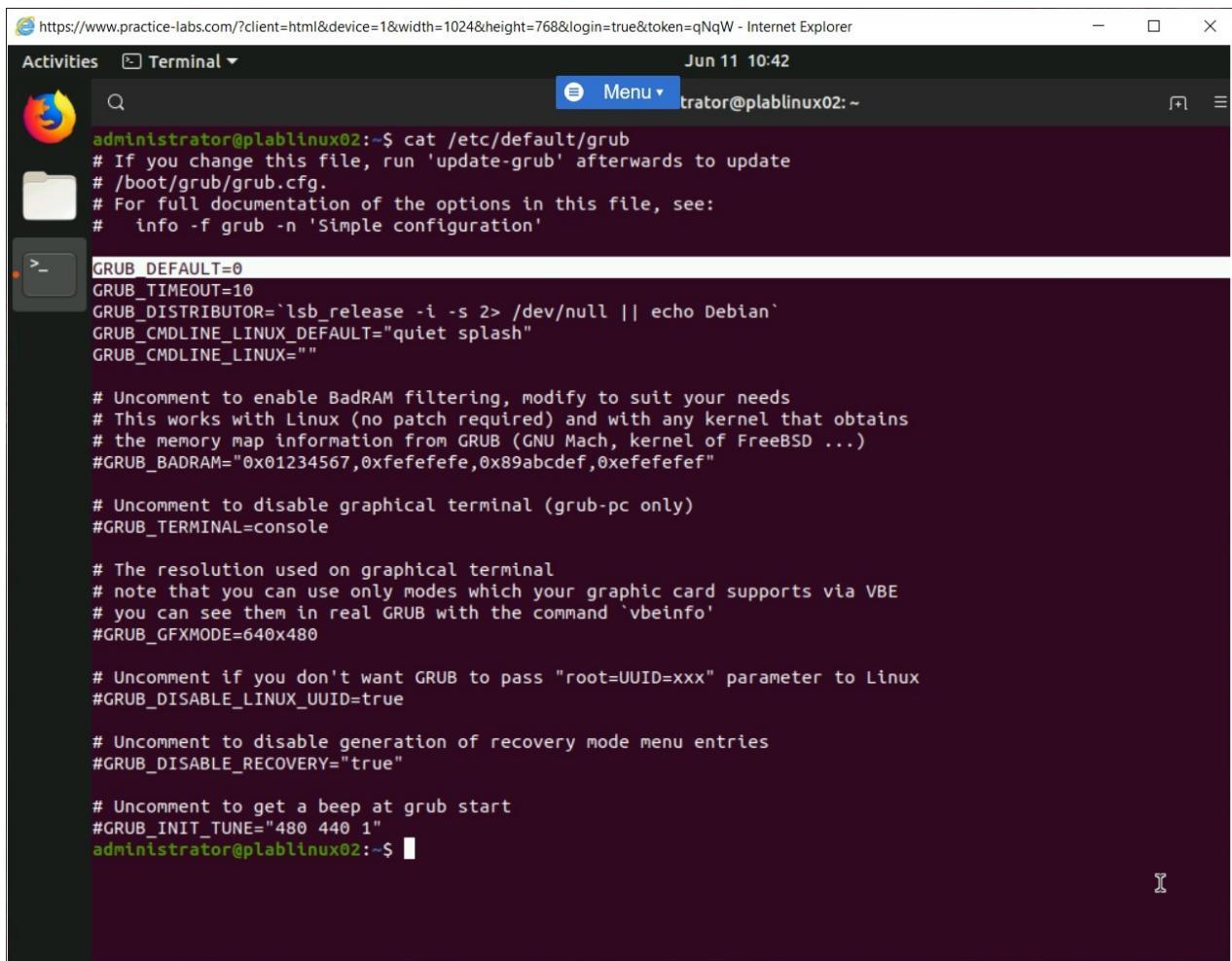
# Uncomment to get a beep at grub start
#GRUB_INIT_TUNE="480 440 1"
administrator@plablinux02:~$
```

Figure 1.3 Screenshot of PLABLINUX02: Displaying the contents of the /etc/default/grub file.

Step 4

Notice the **GRUB_DEFAULT=0** parameter. The value of **0** makes Ubuntu the default operating system to boot.

If there is more than one operating system, Ubuntu will make itself the default operating system to boot from. In case, you want to make it the second operating system to boot from, change this value to **1**. Remember that the boot numbering starts from **0**, not from **1**. The value of **0** is considered to be the default operating system.



The screenshot shows a terminal window titled "Terminal" with the URL "https://www.practice-labs.com/?client=html&device=1&width=1024&height=768&login=true&token=qNqW - Internet Explorer". The terminal window displays the contents of the file "/etc/default/grub". The output is as follows:

```
administrator@plablinux02:~$ cat /etc/default/grub
# If you change this file, run 'update-grub' afterwards to update
# /boot/grub/grub.cfg.
# For full documentation of the options in this file, see:
#   info -f grub -n 'Simple configuration'

GRUB_DEFAULT=0
GRUB_TIMEOUT=10
GRUB_DISTRIBUTOR='lsb_release -i -s 2> /dev/null || echo Debian'
GRUB_CMDLINE_LINUX_DEFAULT="quiet splash"
GRUB_CMDLINE_LINUX=""

# Uncomment to enable BadRAM filtering, modify to suit your needs
# This works with Linux (no patch required) and with any kernel that obtains
# the memory map information from GRUB (GNU Mach, kernel of FreeBSD ...)
#GRUB_BADRAM="0x01234567,0xfefefefe,0x89abcdef,0xefefefef"

# Uncomment to disable graphical terminal (grub-pc only)
#GRUB_TERMINAL=console

# The resolution used on graphical terminal
# note that you can use only modes which your graphic card supports via VBE
# you can see them in real GRUB with the command 'vbeinfo'
#GRUB_GFXMODE=640x480

# Uncomment if you don't want GRUB to pass "root=UUID=xxx" parameter to Linux
#GRUB_DISABLE_LINUX_UUID=true

# Uncomment to disable generation of recovery mode menu entries
#GRUB_DISABLE_RECOVERY="true"

# Uncomment to get a beep at grub start
#GRUB_INIT_TUNE="480 440 1"
administrator@plablinux02:~$
```

Figure 1.4 Screenshot of PLABLINUX02: Displaying the contents of the /etc/default/grub file.

Step 5

When you have more than one operating system, you can boot directly to the last operating system in the list. You will need to change the **GRUB_DEFAULT** setting. Instead of a value of **0**, you need to change the value to **saved**. Change the following value:

GRUB_DEFAULT=0

to:

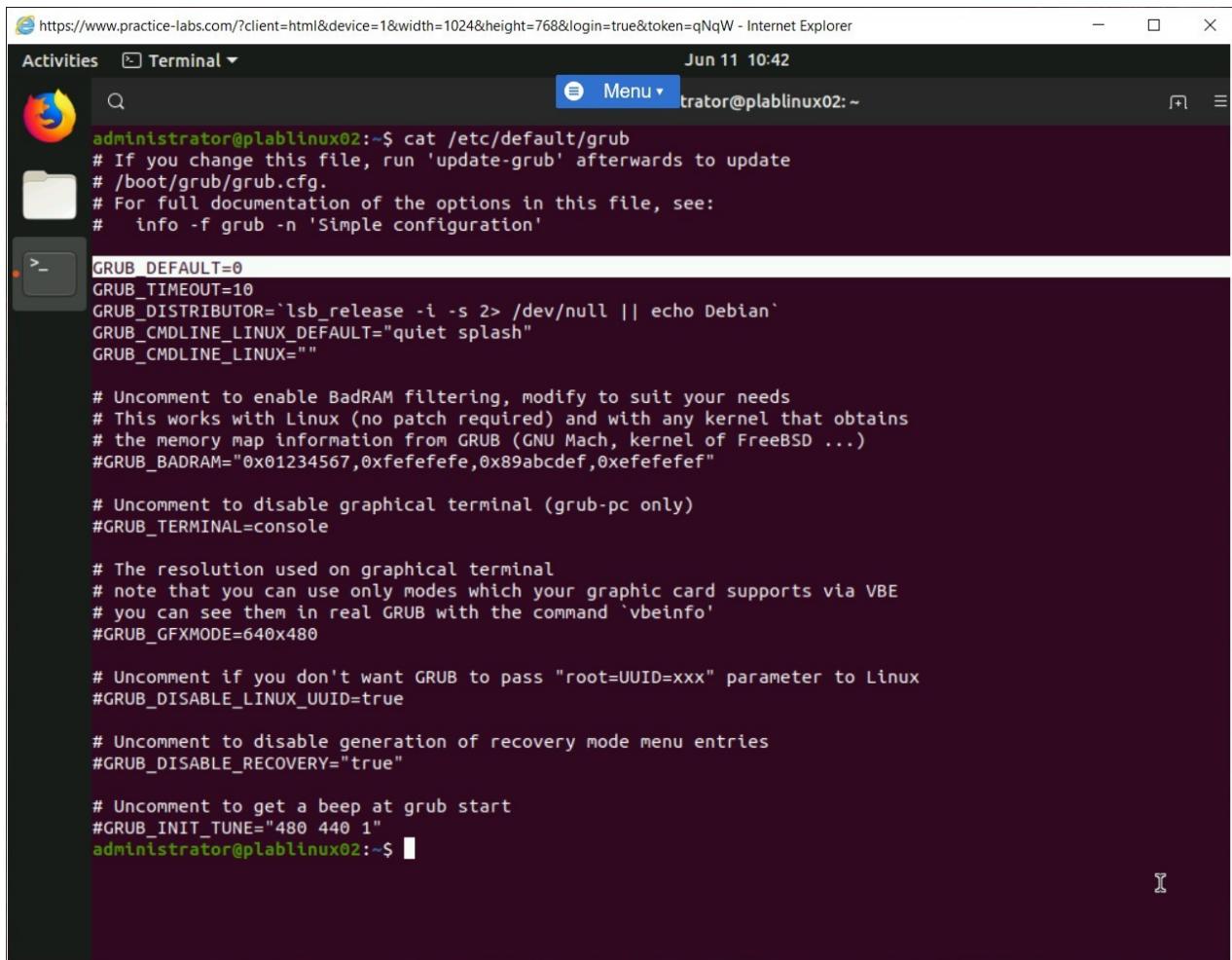
GRUB_DEFAULT=saved

After changing the value, you need to add one more parameter:

```
GRUB_SAVEDEFAULT=true
```

This should allow you to boot directly to the last operating system in the list.

Note: The value that needs to be changed has been highlighted. The GRUB_SAVEDEFAULT=true should be embedded right below it.



The screenshot shows a terminal window titled "Terminal" with the command "cat /etc/default/grub" running. The output displays the configuration parameters for GRUB. A specific line, "GRUB_SAVEDEFAULT=true", is highlighted in yellow, indicating it is the parameter to be added. The terminal window also shows the desktop environment with icons for Activities, Terminal, and a menu bar at the top.

```
https://www.practice-labs.com/?client=html&device=1&width=1024&height=768&login=true&token=qNqW - Internet Explorer
Activities Terminal ▾ Jun 11 10:42
administrator@plablinux02:~$ cat /etc/default/grub
# If you change this file, run 'update-grub' afterwards to update
# /boot/grub/grub.cfg.
# For full documentation of the options in this file, see:
#   info -f grub -n 'Simple configuration'

GRUB_DEFAULT=0
GRUB_TIMEOUT=10
GRUB_DISTRO='lsb_release -i -s 2> /dev/null || echo Debian'
GRUB_CMDLINE_LINUX_DEFAULT="quiet splash"
GRUB_CMDLINE_LINUX=""

# Uncomment to enable BadRAM filtering, modify to suit your needs
# This works with Linux (no patch required) and with any kernel that obtains
# the memory map information from GRUB (GNU Mach, kernel of FreeBSD ...)
#GRUB_BADRAM="0x01234567,0xfefefefe,0x89abcdef,0xefefefef"

# Uncomment to disable graphical terminal (grub-pc only)
#GRUB_TERMINAL=console

# The resolution used on graphical terminal
# note that you can use only modes which your graphic card supports via VBE
# you can see them in real GRUB with the command `vbeinfo'
#GRUB_GFXMODE=640x480

# Uncomment if you don't want GRUB to pass "root=UUID=xxx" parameter to Linux
#GRUB_DISABLE_LINUX_UUID=true

# Uncomment to disable generation of recovery mode menu entries
#GRUB_DISABLE_RECOVERY="true"

# Uncomment to get a beep at grub start
#GRUB_INIT_TUNE="480 440 1"
administrator@plablinux02:~$
```

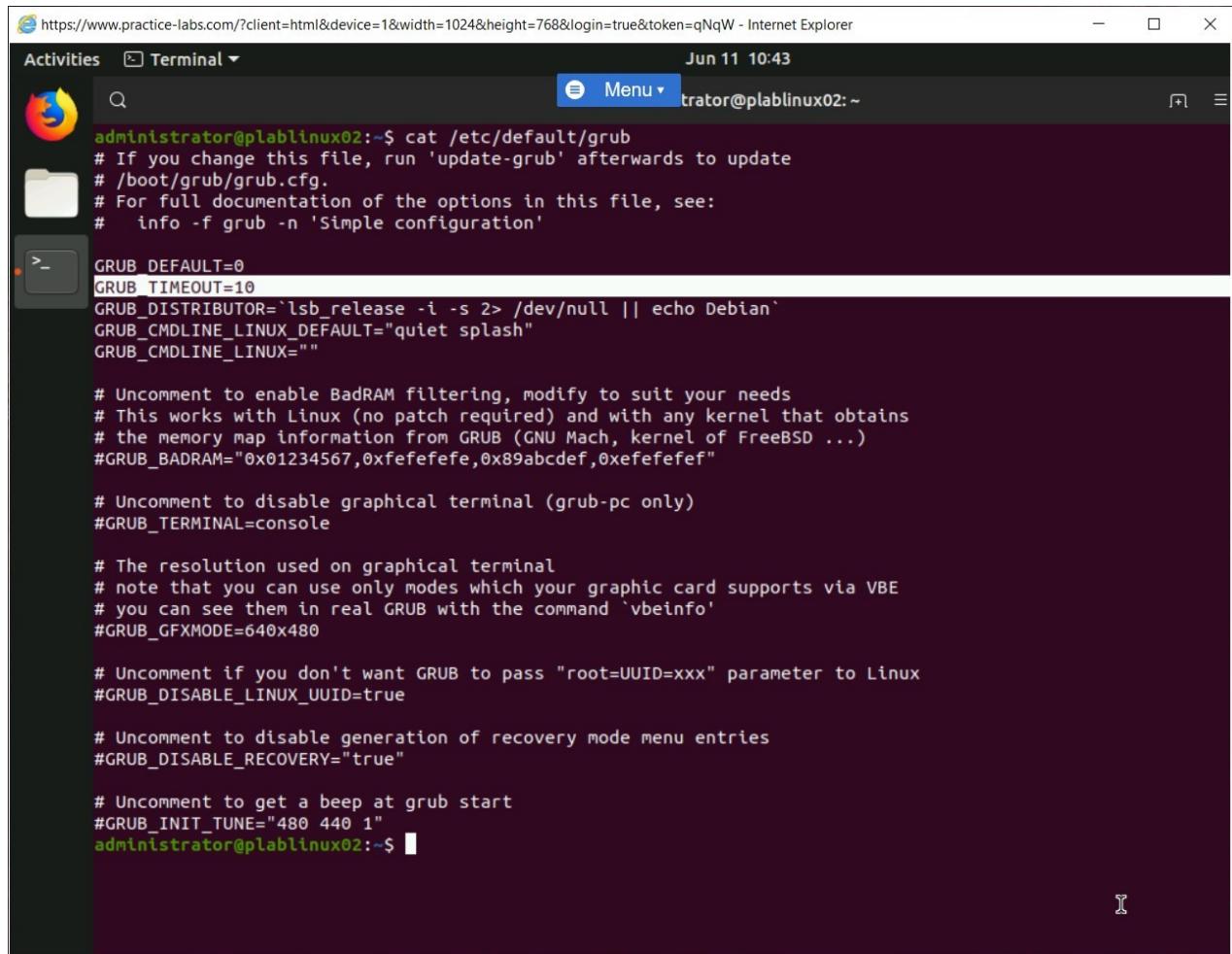
Figure 1.5 Screenshot of PLABLINUX02: Displaying the contents of the /etc/default/grub file.

Step 6

By default, Ubuntu is set to boot in **10** seconds. You can change this timing from the following parameter:

GRUB_TIMEOUT

If you set the value to **0**, Ubuntu will start to boot immediately. If you change it to **x** number of seconds, then the boot menu will be displayed for **x** seconds.



The screenshot shows a terminal window titled "Terminal" with the command "cat /etc/default/grub" running. The output displays various GRUB configuration options. The "GRUB_TIMEOUT=10" line is highlighted in green, indicating it is the current setting. Other options shown include GRUB_DEFAULT=0, GRUB_CMDLINE_LINUX_DEFAULT="quiet splash", and GRUB_CMDLINE_LINUX="".

```
https://www.practice-labs.com/?client=html&device=1&width=1024&height=768&login=true&token=qNqW - Internet Explorer
Activities Terminal Jun 11 10:43
Administrator@plablinux02:~$ cat /etc/default/grub
# If you change this file, run 'update-grub' afterwards to update
# /boot/grub/grub.cfg.
# For full documentation of the options in this file, see:
#   info -f grub -n 'Simple configuration'

GRUB_DEFAULT=0
GRUB_TIMEOUT=10
GRUB_DISTRIBUTOR='lsb_release -i -s 2> /dev/null || echo Debian'
GRUB_CMDLINE_LINUX_DEFAULT="quiet splash"
GRUB_CMDLINE_LINUX=""

# Uncomment to enable BadRAM filtering, modify to suit your needs
# This works with Linux (no patch required) and with any kernel that obtains
# the memory map information from GRUB (GNU Mach, kernel of FreeBSD ...)
#GRUB_BADRAM="0x01234567,0xfefefefe,0x89abcdef,0xefefefef"

# Uncomment to disable graphical terminal (grub-pc only)
#GRUB_TERMINAL=console

# The resolution used on graphical terminal
# note that you can use only modes which your graphic card supports via VBE
# you can see them in real GRUB with the command 'vbeinfo'
#GRUB_GFXMODE=640x480

# Uncomment if you don't want GRUB to pass "root=UUID=xxx" parameter to Linux
#GRUB_DISABLE_LINUX_UUID=true

# Uncomment to disable generation of recovery mode menu entries
#GRUB_DISABLE_RECOVERY="true"

# Uncomment to get a beep at grub start
#GRUB_INIT_TUNE="480 440 1"
Administrator@plablinux02:~$
```

Figure 1.6 Screenshot of PLABLINUX02: Displaying the contents of the /etc/default/grub file.

Step 7

Clear the screen by entering the following command:

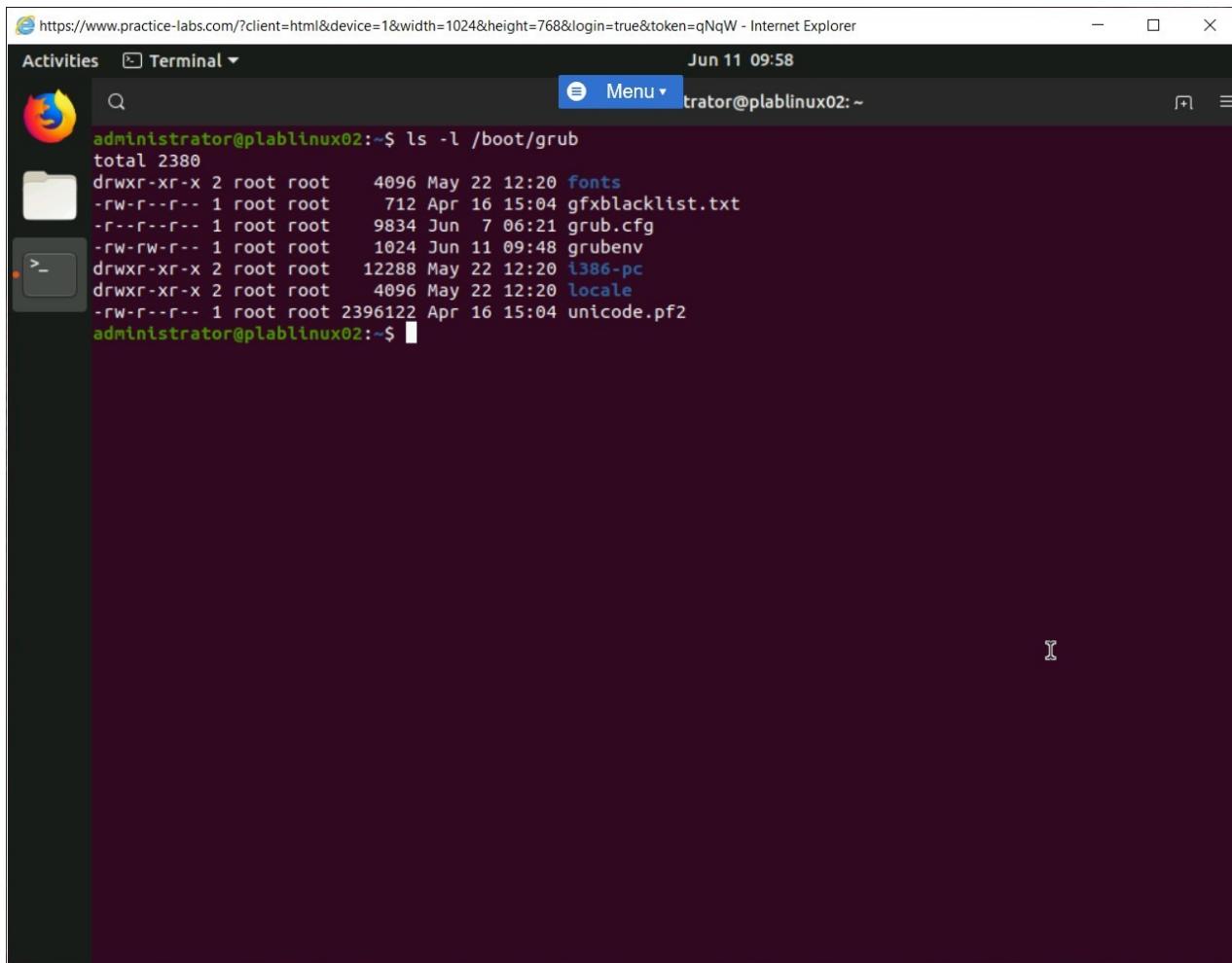
```
clear
```

You can also change the GRUB background image. To be able to do this, you need to copy the image file to the /boot/grub/ directory. To view the contents of this directory,

type the following command:

```
ls -l /boot/grub
```

Press **Enter**. This directory



The screenshot shows a terminal window titled "Terminal" with the command "ls -l /boot/grub" run by the user "administrator@plablinux02". The output lists several files and directories in the /boot/grub directory, including "fonts", "gfxblacklist.txt", "grub.cfg", "grubenv", "i386-pc", "locale", and "unicode.pf2". The terminal window is part of a desktop environment with icons for a browser, file manager, and terminal visible on the left.

```
Administrator@plablinux02:~$ ls -l /boot/grub
total 2380
drwxr-xr-x 2 root root    4096 May 22 12:20 fonts
-rw-r--r-- 1 root root     712 Apr 16 15:04 gfxblacklist.txt
-r--r--r-- 1 root root   9834 Jun  7 06:21 grub.cfg
-rw-rw-r-- 1 root root   1024 Jun 11 09:48 grubenv
drwxr-xr-x 2 root root   12288 May 22 12:20 i386-pc
drwxr-xr-x 2 root root    4096 May 22 12:20 locale
-rw-r--r-- 1 root root 2396122 Apr 16 15:04 unicode.pf2
Administrator@plablinux02:~$
```

Figure 1.7 Screenshot of PLABLINUX02: Viewing the contents of the /boot/grub directory.

Step 8

If you make any changes to the **/etc/default/grub** file, you need to ensure that the **/boot/grub/grub.cfg** file is updated. As a caution, this file should not be edited directly. Edit the **/etc/default**

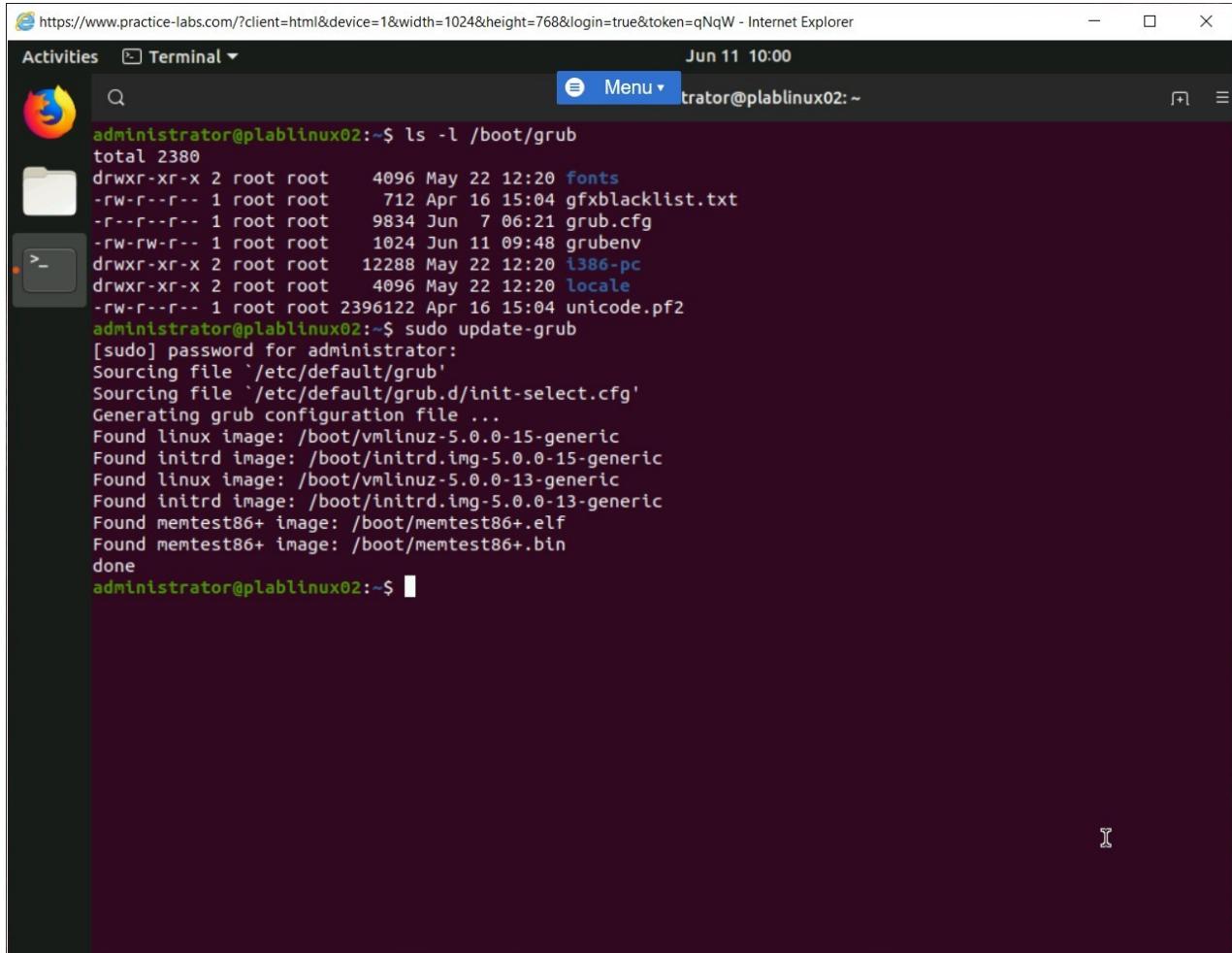
```
sudo update-grub
```

Press **Enter**.

When prompted, type the following password:

Passw0rd

Press **Enter**. Notice that the update-grub command runs successfully.



The screenshot shows a terminal window titled "Terminal" with the URL "https://www.practice-labs.com/?client=html&device=1&width=1024&height=768&login=true&token=qNqW - Internet Explorer". The terminal window has a dark background. The command "ls -l /boot/grub" is run, showing a list of files in the /boot/grub directory. Then, the command "sudo update-grub" is run, which generates a new grub configuration file. The terminal window also shows the date and time as "Jun 11 10:00".

```
administrator@plablinux02:~$ ls -l /boot/grub
total 2380
drwxr-xr-x 2 root root    4096 May 22 12:20 fonts
-rw-r--r-- 1 root root     712 Apr 16 15:04 gfxblacklist.txt
-r--r--r-- 1 root root   9834 Jun  7 06:21 grub.cfg
-rw-rw-r-- 1 root root   1024 Jun 11 09:48 grubenv
drwxr-xr-x 2 root root  12288 May 22 12:20 i386-pc
drwxr-xr-x 2 root root   4096 May 22 12:20 locale
-rw-r--r-- 1 root root 2396122 Apr 16 15:04 unicode.pf2
administrator@plablinux02:~$ sudo update-grub
[sudo] password for administrator:
Sourcing file `/etc/default/grub'
Sourcing file `/etc/default/grub.d/init-select.cfg'
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-5.0.0-15-generic
Found initrd image: /boot/initrd.img-5.0.0-15-generic
Found linux image: /boot/vmlinuz-5.0.0-13-generic
Found initrd image: /boot/initrd.img-5.0.0-13-generic
Found memtest86+ image: /boot/memtest86+.elf
Found memtest86+ image: /boot/memtest86+.bin
done
administrator@plablinux02:~$
```

Figure 1.8 Screenshot of PLABLINUX02: Executing the update-grub command to update the /boot/grub/grub.cfg file.

Task 2 - Check Boot Events in the Log Files

In Linux, log files are stored in the **/var/log/** directory. The **/var/log/** directory contains a number of subdirectories that contain logs for specific purposes, such as printer and user login.

The key subdirectories and files in the **/var/log/** directory are:

- **/var/log/messages**: Contains general log messages
- **/var/log/boot**: Contains system boot log messages
- **/var/log/debug**: Contains debugging log messages

- /var/log/auth.log: Contains user login and authentication logs messages
- /var/log/daemon.log: Contains running services messages
- /var/log/dmesg: Contains Linux kernel ring buffer log messages
- /var/log/dpkg.log: Contains binary package log including package installation messages
- /var/log/faillog: Contains failed login log messages
- /var/log/kern.log: Contains kernel messages
- /var/log/lpr.log: Contains printer messages
- /var/log/mail.*: Contains mail server messages
- /var/log/mysql.*: Contains MySQL server messages
- /var/log/user.log: Contains userlevel logs messages
- /var/log/xorg.0.log: Contains X.org messages
- /var/log/apache2/*: Contains Apache Webserver messages
- /var/log/lighttpd/*: Contains Lighttpd Webserver messages
- /var/log/fsck/*: Contains fsck messages
- /var/log/apport.log: Contains application crash report messages

It is important to note that all directories and files may not exist in every Linux system. Several of them are application specific directories and files.

In this task, you will view the boot events.

To view the boot events, perform the following steps:

Step 1

Clear the screen by entering the following command:

```
clear
```

To view the boot events, type the following command:

```
journalctl -b
```

Press **Enter**.

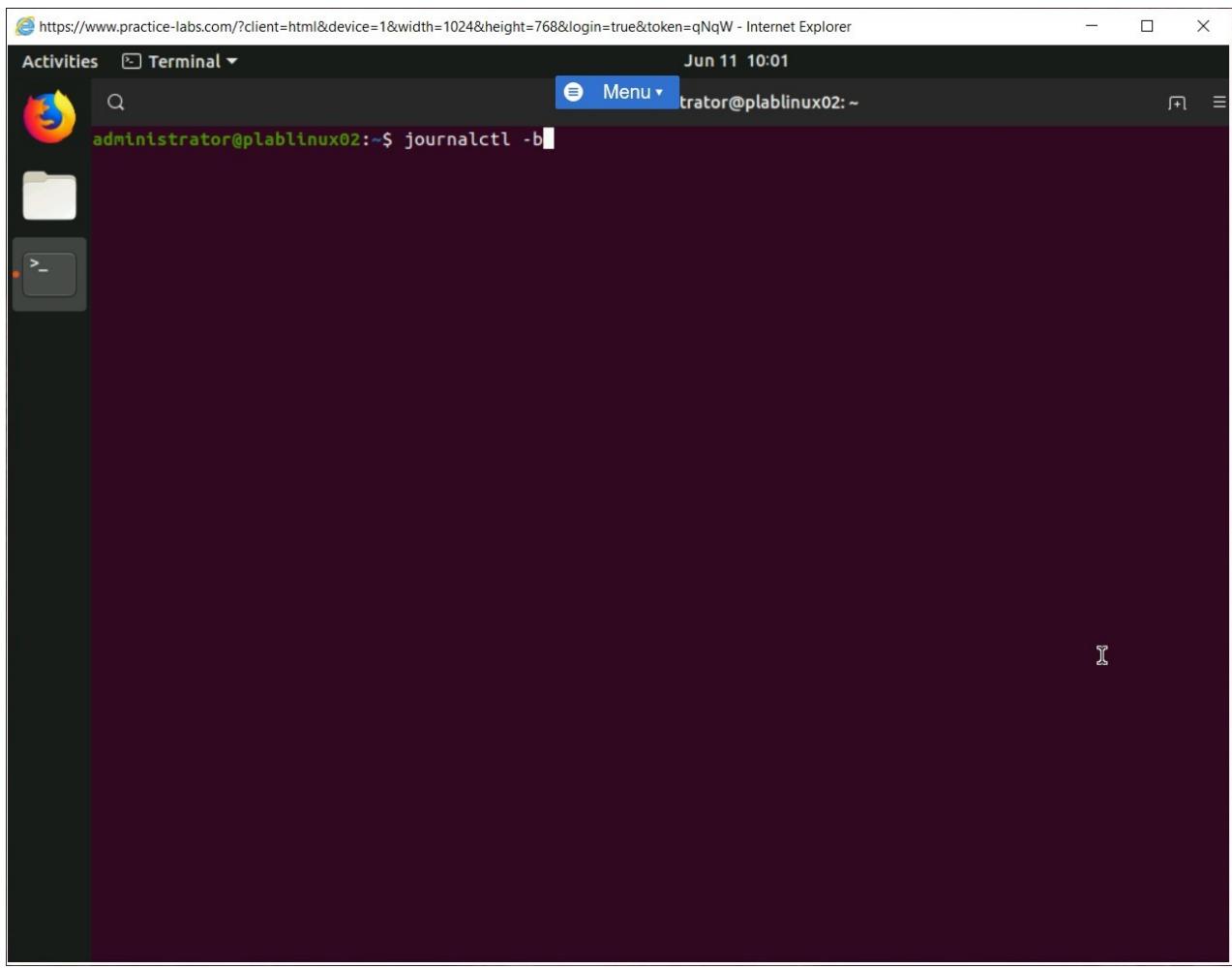
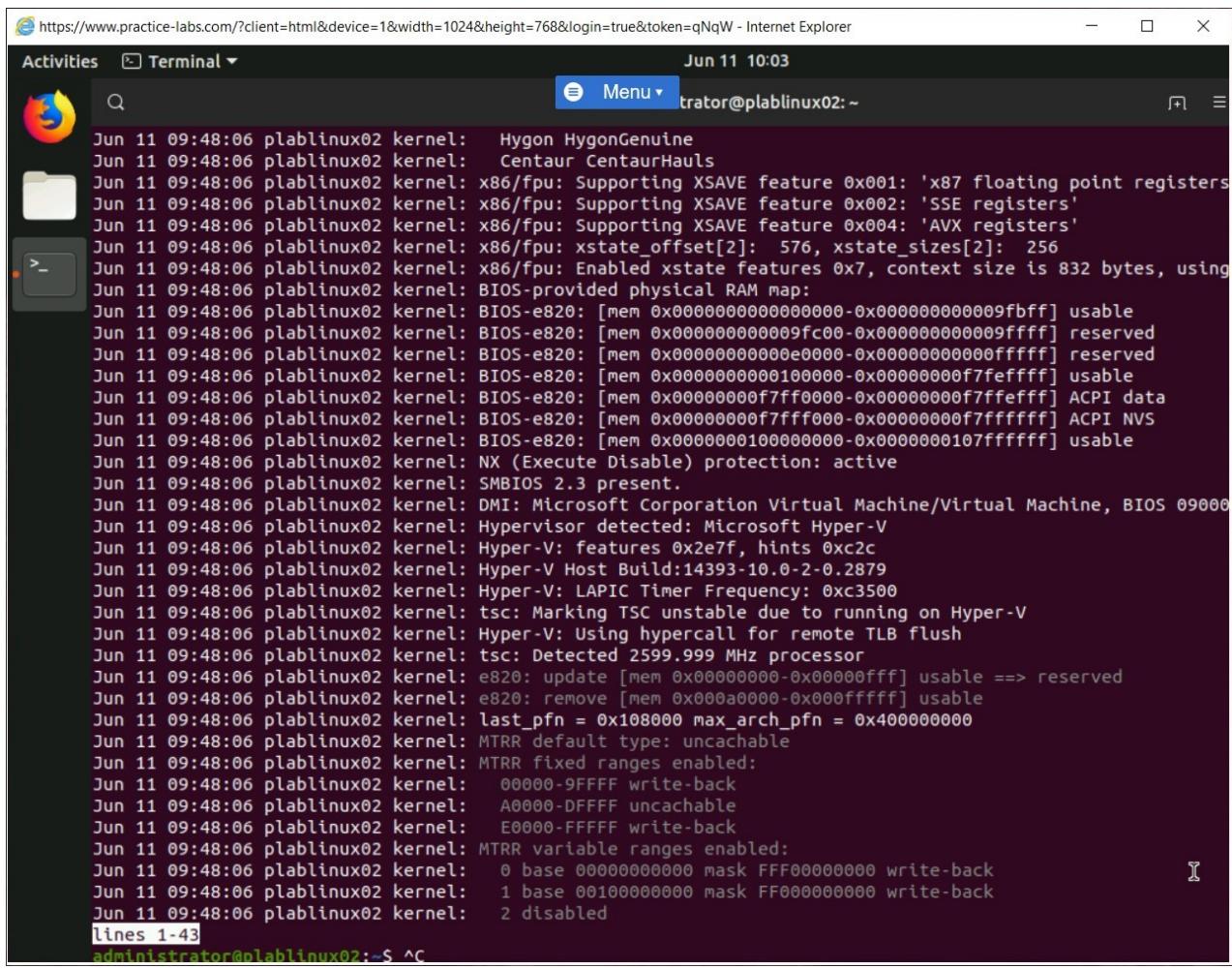


Figure 1.9 Screenshot of PLABLINUX02: Viewing the boot events.

Step 2

The output of the journalctl command is displayed.

Note: To break the command, press *Ctrl + C*.



The screenshot shows a terminal window titled "Terminal" with the URL "https://www.practice-labs.com/?client=html&device=1&width=1024&height=768&login=true&token=qNqW - Internet Explorer". The terminal window displays the output of the "journalctl" command. The output includes kernel boot messages such as "Jun 11 09:48:06 plablinux02 kernel: Hygon HygonGenuine", "Jun 11 09:48:06 plablinux02 kernel: Centaur CentaurHauls", and various BIOS and kernel configuration details like memory maps and processor detection. The terminal window has a dark theme with white text and a black background.

```
Jun 11 09:48:06 plablinux02 kernel: Hygon HygonGenuine
Jun 11 09:48:06 plablinux02 kernel: Centaur CentaurHauls
Jun 11 09:48:06 plablinux02 kernel: x86/fpu: Supporting XSAVE feature 0x001: 'x87 floating point registers'
Jun 11 09:48:06 plablinux02 kernel: x86/fpu: Supporting XSAVE feature 0x002: 'SSE registers'
Jun 11 09:48:06 plablinux02 kernel: x86/fpu: Supporting XSAVE feature 0x004: 'AVX registers'
Jun 11 09:48:06 plablinux02 kernel: x86/fpu: xstate_offset[2]: 576, xstate_sizes[2]: 256
Jun 11 09:48:06 plablinux02 kernel: x86/fpu: Enabled xstate features 0x7, context size is 832 bytes, using
Jun 11 09:48:06 plablinux02 kernel: BIOS-provided physical RAM map:
Jun 11 09:48:06 plablinux02 kernel: BIOS-e820: [mem 0x0000000000000000-0x000000000009fbff] usable
Jun 11 09:48:06 plablinux02 kernel: BIOS-e820: [mem 0x000000000009fc00-0x000000000009ffff] reserved
Jun 11 09:48:06 plablinux02 kernel: BIOS-e820: [mem 0x00000000000e0000-0x000000000000ffff] reserved
Jun 11 09:48:06 plablinux02 kernel: BIOS-e820: [mem 0x0000000000100000-0x000000000f7feffff] usable
Jun 11 09:48:06 plablinux02 kernel: BIOS-e820: [mem 0x000000000f7ff0000-0x000000000f7fffffe] ACPI data
Jun 11 09:48:06 plablinux02 kernel: BIOS-e820: [mem 0x000000000f7fff000-0x000000000f7fffffe] ACPI NVS
Jun 11 09:48:06 plablinux02 kernel: BIOS-e820: [mem 0x0000000010000000-0x00000000107fffffe] usable
Jun 11 09:48:06 plablinux02 kernel: NX (Execute Disable) protection: active
Jun 11 09:48:06 plablinux02 kernel: SMBIOS 2.3 present.
Jun 11 09:48:06 plablinux02 kernel: DMI: Microsoft Corporation Virtual Machine/Virtual Machine, BIOS 09000
Jun 11 09:48:06 plablinux02 kernel: Hypervisor detected: Microsoft Hyper-V
Jun 11 09:48:06 plablinux02 kernel: Hyper-V: features 0x2e7f, hints 0xc2c
Jun 11 09:48:06 plablinux02 kernel: Hyper-V Host Build:14393-10.0-2-0.2879
Jun 11 09:48:06 plablinux02 kernel: Hyper-V: LAPIC Timer Frequency: 0xc3500
Jun 11 09:48:06 plablinux02 kernel: tsc: Marking TSC unstable due to running on Hyper-V
Jun 11 09:48:06 plablinux02 kernel: Hyper-V: Using hypercall for remote TLB flush
Jun 11 09:48:06 plablinux02 kernel: tsc: Detected 2599.999 MHz processor
Jun 11 09:48:06 plablinux02 kernel: e820: update [mem 0x00000000-0x00000fff] usable ==> reserved
Jun 11 09:48:06 plablinux02 kernel: e820: remove [mem 0x000a0000-0x000fffff] usable
Jun 11 09:48:06 plablinux02 kernel: last_pfn = 0x108000 max_arch_pfn = 0x400000000
Jun 11 09:48:06 plablinux02 kernel: MTRR default type: uncachable
Jun 11 09:48:06 plablinux02 kernel: MTRR fixed ranges enabled:
Jun 11 09:48:06 plablinux02 kernel: 00000-9FFFF write-back
Jun 11 09:48:06 plablinux02 kernel: A0000-DFFFF uncachable
Jun 11 09:48:06 plablinux02 kernel: E0000-FFFFF write-back
Jun 11 09:48:06 plablinux02 kernel: MTRR variable ranges enabled:
Jun 11 09:48:06 plablinux02 kernel: 0 base 0000000000 mask FFF0000000 write-back
Jun 11 09:48:06 plablinux02 kernel: 1 base 0010000000 mask FF00000000 write-back
Jun 11 09:48:06 plablinux02 kernel: 2 disabled
lines 1-43
administrator@plablinux02:~ ^C
```

Figure 1.10 Screenshot of PLABLINUX02: Showing the output of the journalctl command.

Step 3

Clear the screen by entering the following command:

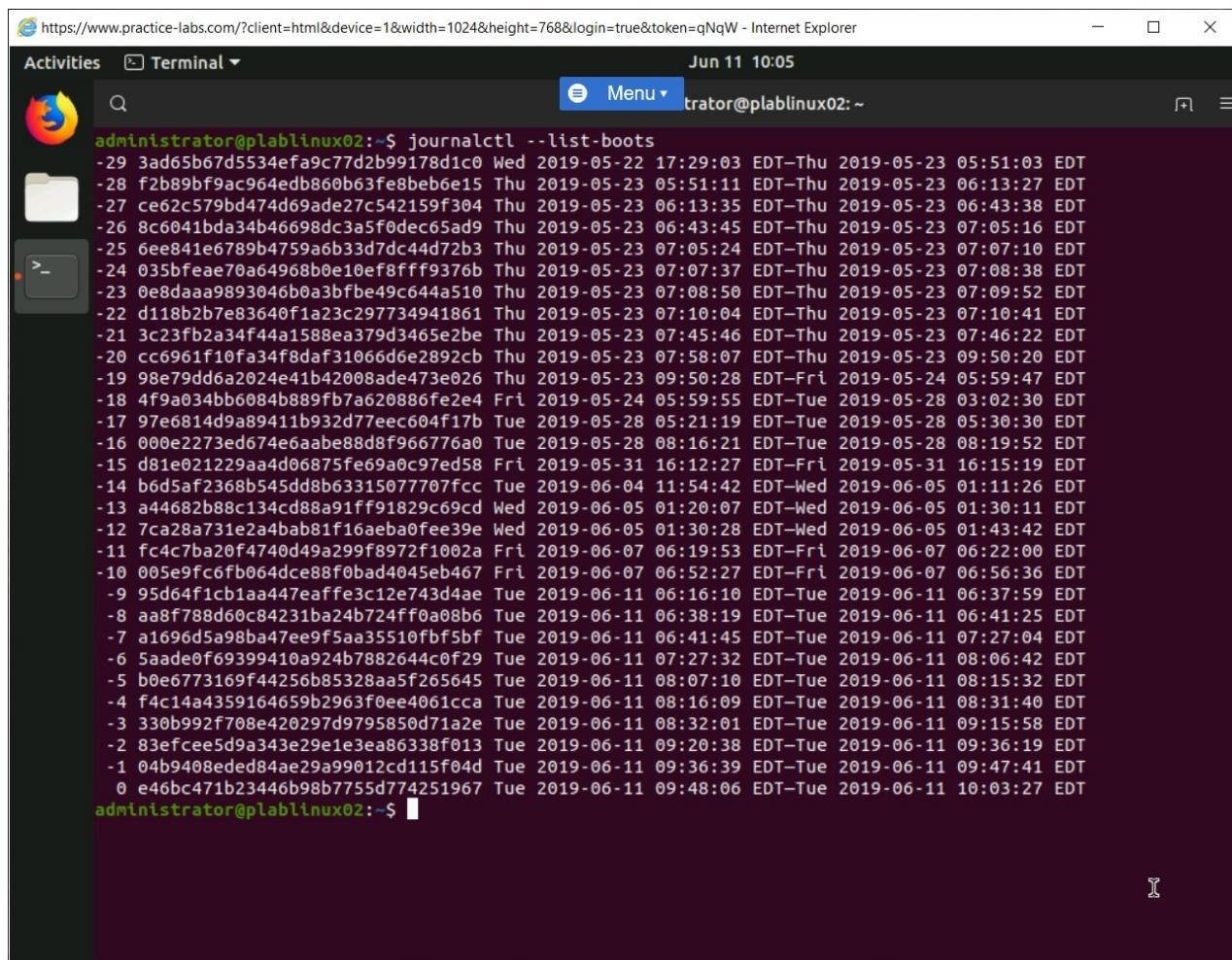
```
clear
```

To view the details that were logged during a previous boot, type the following command:

```
journalctl --list-boots
```

Press **Enter**.

Note: The output of this command may differ in your lab environment.



The screenshot shows a terminal window titled "Activities Terminal" with the URL "https://www.practice-labs.com/?client=html&device=1&width=1024&height=768&login=true&token=qNqW - Internet Explorer". The terminal window displays the command "journalctl --list-boots" followed by a long list of boot entries. The entries are timestamped and show details about each boot attempt. The terminal window has a dark theme with a purple header bar.

```
administrator@plablinux02: ~$ journalctl --list-boots
-29 3ad65b67d5534efa9c77d2b99178d1c0 Wed 2019-05-22 17:29:03 EDT-Thu 2019-05-23 05:51:03 EDT
-28 f2b89bf9ac964edb860b63fe8beb6e15 Thu 2019-05-23 05:51:11 EDT-Thu 2019-05-23 06:13:27 EDT
-27 ce62c579bd474d69ade27c542159f304 Thu 2019-05-23 06:13:35 EDT-Thu 2019-05-23 06:43:38 EDT
-26 8c6041bda34b46698dc3a5f0dec65ad9 Thu 2019-05-23 06:43:45 EDT-Thu 2019-05-23 07:05:16 EDT
-25 6ee841e6789b4759a6b33d7dc44d72b3 Thu 2019-05-23 07:05:24 EDT-Thu 2019-05-23 07:07:10 EDT
-24 035bfeae70a64968b0e10ef8fff9376b Thu 2019-05-23 07:07:37 EDT-Thu 2019-05-23 07:08:38 EDT
-23 0e8d9aa9893046b0a3bfbef49c644a510 Thu 2019-05-23 07:08:50 EDT-Thu 2019-05-23 07:09:52 EDT
-22 d118b2b7e83640f1a23c297734941861 Thu 2019-05-23 07:10:04 EDT-Thu 2019-05-23 07:10:41 EDT
-21 3c23fb2a34f44a1588ea379d3465e2be Thu 2019-05-23 07:45:46 EDT-Thu 2019-05-23 07:46:22 EDT
-20 cc6961f10fa34f8daf31066d6e2892cb Thu 2019-05-23 07:58:07 EDT-Thu 2019-05-23 09:50:20 EDT
-19 98e79dd6a2024e41b42008ade473e026 Tue 2019-05-23 09:50:28 EDT-Fri 2019-05-24 05:59:47 EDT
-18 4f9a034bb6084b889fb7a620886fe2e4 Fri 2019-05-24 05:59:55 EDT-Tue 2019-05-28 03:02:30 EDT
-17 97e6814d9a89411b932d77eecd604f17b Tue 2019-05-28 05:21:19 EDT-Tue 2019-05-28 05:30:30 EDT
-16 000e2273ed674e6aabe88d8f966776a0 Tue 2019-05-28 08:16:21 EDT-Tue 2019-05-28 08:19:52 EDT
-15 d81e021229aa4d06875fe69a0c97ed58 Fri 2019-05-31 16:12:27 EDT-Fri 2019-05-31 16:15:19 EDT
-14 b6d5af2368b545dd8b63315077707fcc Tue 2019-06-04 11:54:42 EDT-Wed 2019-06-05 01:11:26 EDT
-13 a44682b88c134cd88a91ff91829c69cd Wed 2019-06-05 01:20:07 EDT-Wed 2019-06-05 01:30:11 EDT
-12 7ca28a731e2a4bab81f16aeba0fee39e Wed 2019-06-05 01:30:28 EDT-Wed 2019-06-05 01:43:42 EDT
-11 fc4c7ba20f4740d49a299f8972f1002a Fri 2019-06-07 06:19:53 EDT-Fri 2019-06-07 06:22:00 EDT
-10 005e9fc6fb064dcce88f0bad4045eb467 Fri 2019-06-07 06:52:27 EDT-Fri 2019-06-07 06:56:36 EDT
-9 95d64f1cb1aa447eaffe3c12e743d4ae Tue 2019-06-11 06:16:10 EDT-Tue 2019-06-11 06:37:59 EDT
-8 aa8f788d60c84231ba24b724ff0a08b6 Tue 2019-06-11 06:38:19 EDT-Tue 2019-06-11 06:41:25 EDT
-7 a1696d5a98ba47ee9f5aa35510fbf5bf Tue 2019-06-11 06:41:45 EDT-Tue 2019-06-11 07:27:04 EDT
-6 5aade0f69399410a924b7882644c0f29 Tue 2019-06-11 07:27:32 EDT-Tue 2019-06-11 08:06:42 EDT
-5 b0e6773169f44256b85328aa5f205645 Tue 2019-06-11 08:07:10 EDT-Tue 2019-06-11 08:15:32 EDT
-4 f4c14a4359164659b2963f0ee4061cca Tue 2019-06-11 08:16:09 EDT-Tue 2019-06-11 08:31:40 EDT
-3 330b992f708e420297d9795850d71a2e Tue 2019-06-11 08:32:01 EDT-Tue 2019-06-11 09:15:58 EDT
-2 83efcee5d9a343e29e1e3ea86338f013 Tue 2019-06-11 09:20:38 EDT-Tue 2019-06-11 09:36:19 EDT
-1 04b9408eeded84ae29a99012cd115f04d Tue 2019-06-11 09:36:39 EDT-Tue 2019-06-11 09:47:41 EDT
0 e46bc471b23446b98b7755d774251967 Tue 2019-06-11 09:48:06 EDT-Tue 2019-06-11 10:03:27 EDT
administrator@plablinux02: ~$
```

Figure 1.11 Screenshot of PLABLINUX02: Viewing the details that were logged during a previous boot.

Step 4

To view the details of the boot shown with the `journalctl --list boots` command, type the following command:

```
journalctl --boot=e46bc471b23446b98b7755d774251967
```

Press **Enter**.

The screenshot shows a terminal window titled "Terminal" with the URL "https://www.practice-labs.com/?client=html&device=1&width=1024&height=768&login=true&token=qNqW - Internet Explorer". The terminal window displays the command "journalctl --list-boots" followed by a long list of boot entries. The last entry is "administrator@plablinux02:~\$ journalctl --boot=e46bc471b23446b98b7755d774251967".

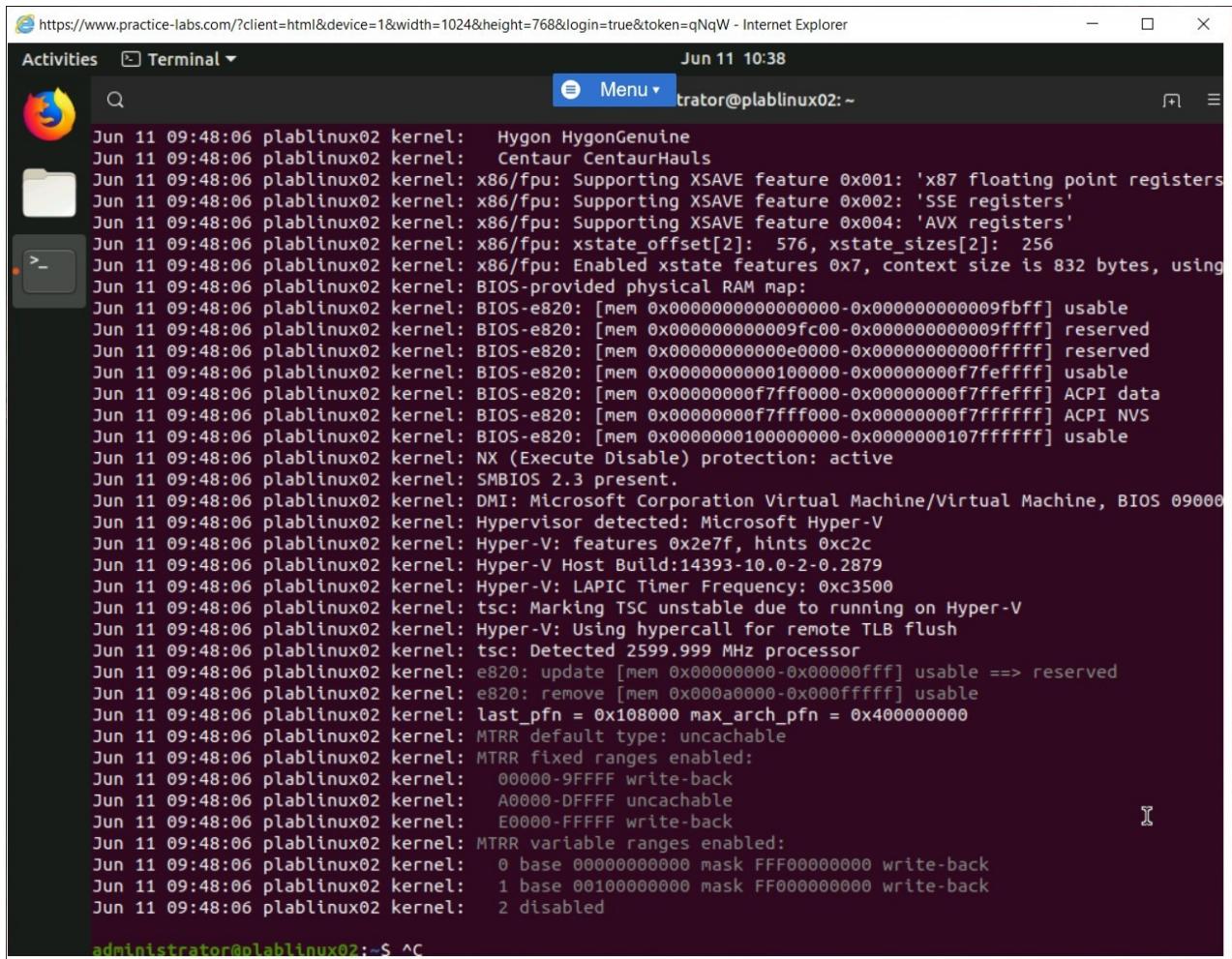
```
administrator@plablinux02:~$ journalctl --list-boots
-29 3ad65b67d5534efa9c77d2b99178d1c0 Wed 2019-05-22 17:29:03 EDT-Thu 2019-05-23 05:51:03 EDT
-28 f2b89bf9ac964edb860b63fe8beb6e15 Thu 2019-05-23 05:51:11 EDT-Thu 2019-05-23 06:13:27 EDT
-27 ce62c579bd474d69ade27c542159f304 Thu 2019-05-23 06:13:35 EDT-Thu 2019-05-23 06:43:38 EDT
-26 8c6041bda34b46698dc3a5f0dec65ad9 Thu 2019-05-23 06:43:45 EDT-Thu 2019-05-23 07:05:16 EDT
-25 6ee841e6789b4759a6b33d7dc44d72b3 Thu 2019-05-23 07:05:24 EDT-Thu 2019-05-23 07:07:10 EDT
-24 035bfeae70a64968b0e10ef8fff9376b Thu 2019-05-23 07:07:37 EDT-Thu 2019-05-23 07:08:38 EDT
-23 0e8daaa9893046b0a3bfbef49c644a510 Thu 2019-05-23 07:08:50 EDT-Thu 2019-05-23 07:09:52 EDT
-22 d118b2b7e83646f1a23c297734941861 Thu 2019-05-23 07:10:04 EDT-Thu 2019-05-23 07:10:41 EDT
-21 3c23fb2a34f44a1588ea379d3465e2be Thu 2019-05-23 07:45:46 EDT-Thu 2019-05-23 07:46:22 EDT
-20 cc6961f10fa34f8daf31066d6e2892cb Thu 2019-05-23 07:58:07 EDT-Thu 2019-05-23 09:50:20 EDT
-19 98e79dd6a2024e41b42008ade473e026 Thu 2019-05-23 09:50:28 EDT-Fri 2019-05-24 05:59:47 EDT
-18 4f9a034bb6084b889fb7a620886fe2e4 Fri 2019-05-24 05:59:55 EDT-Tue 2019-05-28 03:02:30 EDT
-17 97e6814d9a89411b932d77eec604f17b Tue 2019-05-28 05:21:19 EDT-Tue 2019-05-28 05:30:30 EDT
-16 000e2273ed674e6aab88d8f966776a0 Tue 2019-05-28 08:16:21 EDT-Tue 2019-05-28 08:19:52 EDT
-15 d81e021229aa4d06875fe69a0c97ed58 Fri 2019-05-31 16:12:27 EDT-Fri 2019-05-31 16:15:19 EDT
-14 b6d5af2368b545dd8b63315077707fcc Tue 2019-06-04 11:54:42 EDT-Wed 2019-06-05 01:11:26 EDT
-13 a44682b88c134cd88a91ff91829c69cd Wed 2019-06-05 01:20:07 EDT-Wed 2019-06-05 01:30:11 EDT
-12 7ca28a731e2a4bab81f16aea0fee39a Wed 2019-06-05 01:30:28 EDT-Wed 2019-06-05 01:43:42 EDT
-11 fc4c7ba20f4740d49a299f8972f1002a Fri 2019-06-07 06:19:53 EDT-Fri 2019-06-07 06:22:00 EDT
-10 005e9fc6fb064dc88f0bad4045eb467 Fri 2019-06-07 06:52:27 EDT-Fri 2019-06-07 06:56:36 EDT
-9 95d64f1cb1aa447eafffe3c12e743d4ae Tue 2019-06-11 06:16:10 EDT-Tue 2019-06-11 06:37:59 EDT
-8 aa8f788d60c84231ba24b724ff0a08b6 Tue 2019-06-11 06:38:19 EDT-Tue 2019-06-11 06:41:25 EDT
-7 a1696d5a98ba47ee9f5aa35510fbf5bf Tue 2019-06-11 06:41:45 EDT-Tue 2019-06-11 07:27:04 EDT
-6 5aade0f69399410a924b7882644c0f29 Tue 2019-06-11 07:27:32 EDT-Tue 2019-06-11 08:06:42 EDT
-5 b0e6773169f44256b85328aa5f265645 Tue 2019-06-11 08:07:10 EDT-Tue 2019-06-11 08:15:32 EDT
-4 f4c14a4359164659b2963f0ee4061cca Tue 2019-06-11 08:16:09 EDT-Tue 2019-06-11 08:31:40 EDT
-3 330b992f708e420297d9795850d71a2e Tue 2019-06-11 08:32:01 EDT-Tue 2019-06-11 09:15:58 EDT
-2 83efcee5d9a343e29e1e3ea86338f013 Tue 2019-06-11 09:20:38 EDT-Tue 2019-06-11 09:36:19 EDT
-1 04b9408eeded84ae29a99012cd115f04d Tue 2019-06-11 09:36:39 EDT-Tue 2019-06-11 09:47:41 EDT
0 e46bc471b23446b98b7755d774251967 Tue 2019-06-11 09:48:06 EDT-Tue 2019-06-11 10:34:04 EDT
administrator@plablinux02:~$ journalctl --boot=e46bc471b23446b98b7755d774251967
```

Figure 1.12 Screenshot of PLABLINUX02: Executing a command to view the details of a specific boot.

Step 5

The output of this command is displayed.

Note: To break the command, press *Ctrl + C*.



The screenshot shows a terminal window titled "Terminal" with the URL "https://www.practice-labs.com/?client=html&device=1&width=1024&height=768&login=true&token=qNqW - Internet Explorer". The terminal window displays a log of kernel boot events. The log starts with "Jun 11 09:48:06 plablinux02 kernel:" followed by various system initialization messages, including support for XSAVE features, BIOS memory maps, SMBIOS 2.3 detection, and Hyper-V features. It also shows the detection of a 2599.999 MHz processor and the configuration of memory management units (MTTR). The log concludes with the command "administrator@plablinux02: ~ ^C".

```
Jun 11 09:48:06 plablinux02 kernel: Hygon HygonGenuine
Jun 11 09:48:06 plablinux02 kernel: Centaur CentaurHauls
Jun 11 09:48:06 plablinux02 kernel: x86/fpu: Supporting XSAVE feature 0x001: 'x87 floating point registers'
Jun 11 09:48:06 plablinux02 kernel: x86/fpu: Supporting XSAVE feature 0x002: 'SSE registers'
Jun 11 09:48:06 plablinux02 kernel: x86/fpu: Supporting XSAVE feature 0x004: 'AVX registers'
Jun 11 09:48:06 plablinux02 kernel: x86/fpu: xstate_offset[2]: 576, xstate_sizes[2]: 256
Jun 11 09:48:06 plablinux02 kernel: x86/fpu: Enabled xstate features 0x7, context size is 832 bytes, using
Jun 11 09:48:06 plablinux02 kernel: BIOS-provided physical RAM map:
Jun 11 09:48:06 plablinux02 kernel: BIOS-e820: [mem 0x0000000000000000-0x00000000000fbfff] usable
Jun 11 09:48:06 plablinux02 kernel: BIOS-e820: [mem 0x000000000009fc00-0x000000000009ffff] reserved
Jun 11 09:48:06 plablinux02 kernel: BIOS-e820: [mem 0x0000000000e0000-0x00000000000fffff] reserved
Jun 11 09:48:06 plablinux02 kernel: BIOS-e820: [mem 0x00000000001000000-0x00000000107fffff] ACPI data
Jun 11 09:48:06 plablinux02 kernel: BIOS-e820: [mem 0x0000000000f7ff000-0x00000000f7feffff] ACPI NVS
Jun 11 09:48:06 plablinux02 kernel: BIOS-e820: [mem 0x0000000010000000-0x00000000107fffff] usable
Jun 11 09:48:06 plablinux02 kernel: NX (Execute Disable) protection: active
Jun 11 09:48:06 plablinux02 kernel: SMBIOS 2.3 present.
Jun 11 09:48:06 plablinux02 kernel: DMI: Microsoft Corporation Virtual Machine/Virtual Machine, BIOS 09000
Jun 11 09:48:06 plablinux02 kernel: Hypervisor detected: Microsoft Hyper-V
Jun 11 09:48:06 plablinux02 kernel: Hyper-V: features 0x2e7f, hints 0xc2c
Jun 11 09:48:06 plablinux02 kernel: Hyper-V Host Build:14393-10.0-2-0.2879
Jun 11 09:48:06 plablinux02 kernel: Hyper-V: LAPIC Timer Frequency: 0xc3500
Jun 11 09:48:06 plablinux02 kernel: tsc: Marking TSC unstable due to running on Hyper-V
Jun 11 09:48:06 plablinux02 kernel: Hyper-V: Using hypercall for remote TLB flush
Jun 11 09:48:06 plablinux02 kernel: tsc: Detected 2599.999 MHz processor
Jun 11 09:48:06 plablinux02 kernel: e820: update [mem 0x00000000-0x00000fff] usable ==> reserved
Jun 11 09:48:06 plablinux02 kernel: e820: remove [mem 0x000a0000-0x000fffff] usable
Jun 11 09:48:06 plablinux02 kernel: last_pfn = 0x108000 max_arch_pfn = 0x400000000
Jun 11 09:48:06 plablinux02 kernel: MTRR default type: uncachable
Jun 11 09:48:06 plablinux02 kernel: MTRR fixed ranges enabled:
Jun 11 09:48:06 plablinux02 kernel: 00000-9FFFF write-back
Jun 11 09:48:06 plablinux02 kernel: A0000-DFFFF uncachable
Jun 11 09:48:06 plablinux02 kernel: E0000-FFFFF write-back
Jun 11 09:48:06 plablinux02 kernel: MTRR variable ranges enabled:
Jun 11 09:48:06 plablinux02 kernel: 0 base 00000000000 mask FFF00000000 write-back
Jun 11 09:48:06 plablinux02 kernel: 1 base 00100000000 mask FF00000000 write-back
Jun 11 09:48:06 plablinux02 kernel: 2 disabled
administrator@plablinux02: ~ ^C
```

Figure 1.13 Screenshot of PLABLINUX02: Showing the output of a specific boot.

Step 6

Clear the screen by entering the following command:

```
clear
```

To view the events in the kernel log, which stores the booting events, type the following command:

```
cat /var/log/syslog
```

Press **Enter**.

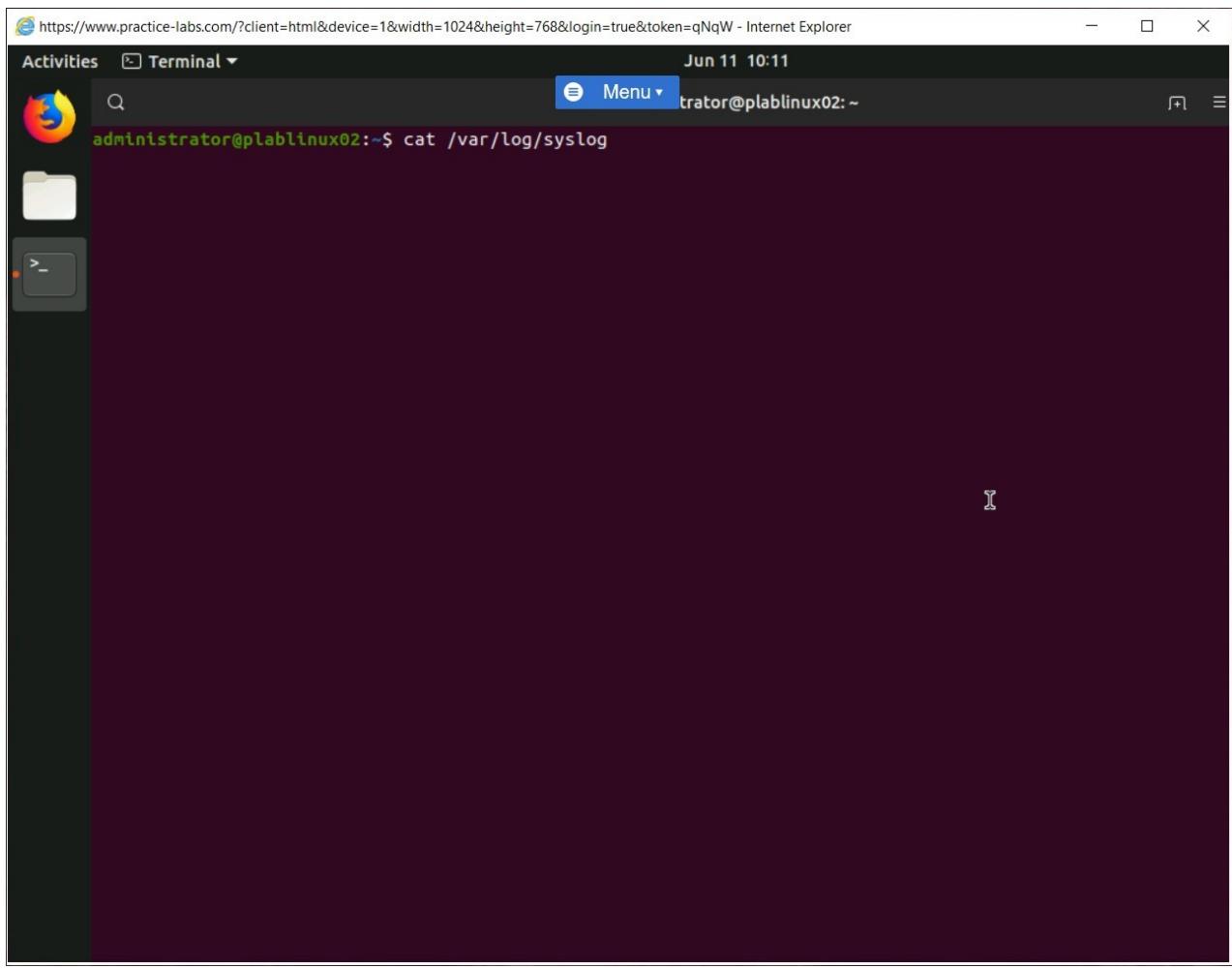
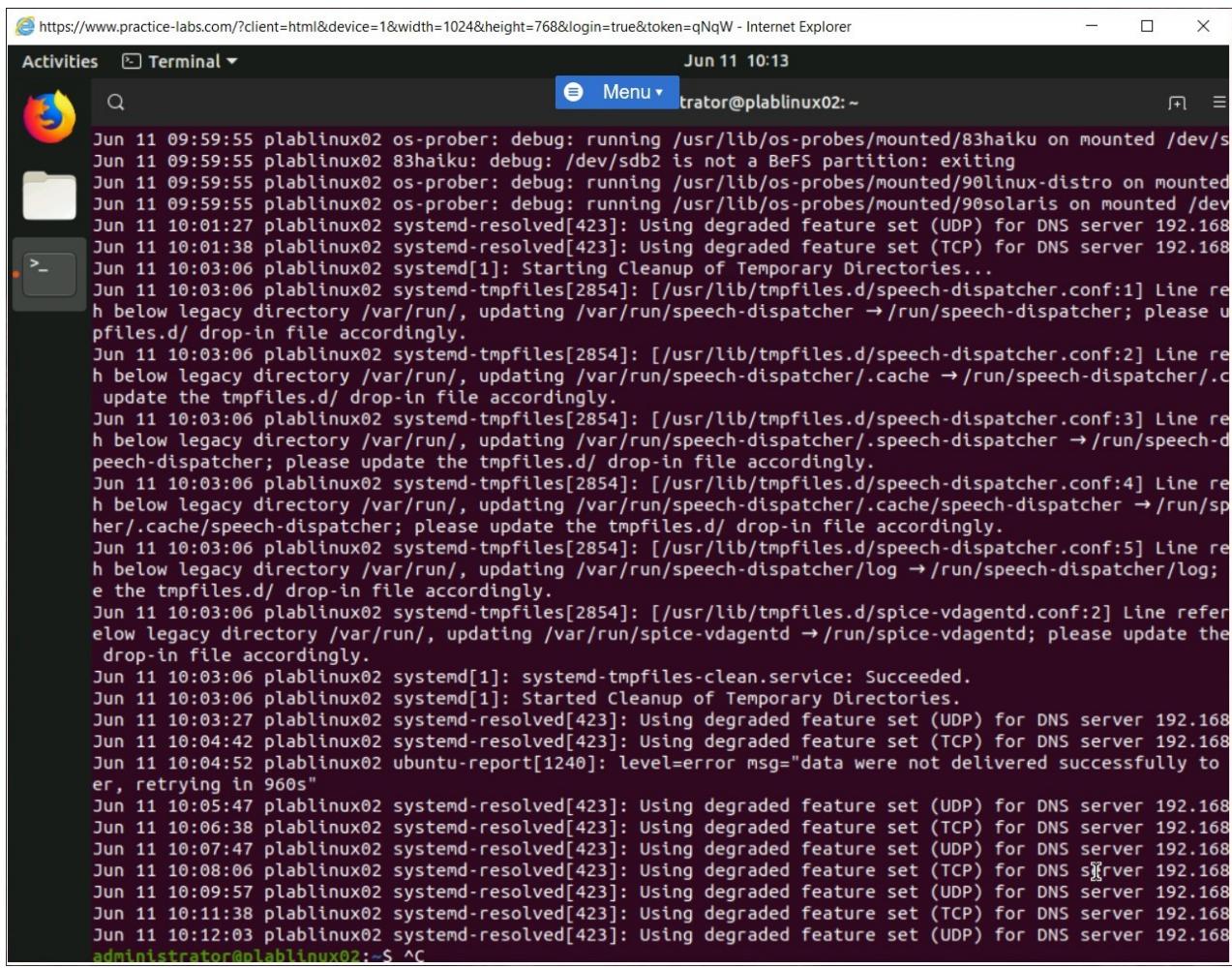


Figure 1.14 Screenshot of PLABLINUX02: Viewing the events in the kernel log.

Step 7

The output of this command is displayed.



The screenshot shows a terminal window titled "Terminal" with the URL "https://www.practice-labs.com/?client=html&device=1&width=1024&height=768&login=true&token=qNqW - Internet Explorer". The terminal window displays a continuous stream of kernel log messages from the system. The messages include various system startup and configuration logs, such as "os-prober" and "systemd-resolved" entries, along with several "Jun 11 10:03:06" log entries related to "tmpfiles" and "systemd-tmpfiles". The log concludes with the command "administrator@plablinux02:~\$ ^C".

```
Jun 11 09:59:55 plablinux02 os-prober: debug: running /usr/lib/os-probes/mounted/83haiku on mounted /dev/s
Jun 11 09:59:55 plablinux02 83haiku: debug: /dev/sdb is not a BeFS partition: exiting
Jun 11 09:59:55 plablinux02 os-prober: debug: running /usr/lib/os-probes/mounted/90linux-distro on mounted
Jun 11 09:59:55 plablinux02 os-prober: debug: running /usr/lib/os-probes/mounted/90solaris on mounted /dev
Jun 11 10:01:27 plablinux02 systemd-resolved[423]: Using degraded feature set (UDP) for DNS server 192.168
Jun 11 10:01:38 plablinux02 systemd-resolved[423]: Using degraded feature set (TCP) for DNS server 192.168
Jun 11 10:03:06 plablinux02 systemd[1]: Starting Cleanup of Temporary Directories...
Jun 11 10:03:06 plablinux02 systemd-tmpfiles[2854]: [/usr/lib/tmpfiles.d/speech-dispatcher.conf:1] Line re
h below legacy directory /var/run/, updating /var/run/speech-dispatcher → /run/speech-dispatcher; please u
pfiles.d/ drop-in file accordingly.
Jun 11 10:03:06 plablinux02 systemd-tmpfiles[2854]: [/usr/lib/tmpfiles.d/speech-dispatcher.conf:2] Line re
h below legacy directory /var/run/, updating /var/run/speech-dispatcher/.cache → /run/speech-dispatcher/.c
update the tmpfiles.d/ drop-in file accordingly.
Jun 11 10:03:06 plablinux02 systemd-tmpfiles[2854]: [/usr/lib/tmpfiles.d/speech-dispatcher.conf:3] Line re
h below legacy directory /var/run/, updating /var/run/speech-dispatcher/.speech-dispatcher → /run/speec
h-dispatcher; please update the tmpfiles.d/ drop-in file accordingly.
Jun 11 10:03:06 plablinux02 systemd-tmpfiles[2854]: [/usr/lib/tmpfiles.d/speech-dispatcher.conf:4] Line re
h below legacy directory /var/run/, updating /var/run/speech-dispatcher/.cache/speech-dispatcher → /run/s
her/.cache/speech-dispatcher; please update the tmpfiles.d/ drop-in file accordingly.
Jun 11 10:03:06 plablinux02 systemd-tmpfiles[2854]: [/usr/lib/tmpfiles.d/speech-dispatcher.conf:5] Line re
h below legacy directory /var/run/, updating /var/run/speech-dispatcher/log → /run/speech-dispatcher/log;
e the tmpfiles.d/ drop-in file accordingly.
Jun 11 10:03:06 plablinux02 systemd-tmpfiles[2854]: [/usr/lib/tmpfiles.d/spice-vdagentd.conf:2] Line refer
elow legacy directory /var/run/, updating /var/run/spice-vdagentd → /run/spice-vdagentd; please update the
drop-in file accordingly.
Jun 11 10:03:06 plablinux02 systemd[1]: systemd-tmpfiles-clean.service: Succeeded.
Jun 11 10:03:06 plablinux02 systemd[1]: Started Cleanup of Temporary Directories.
Jun 11 10:03:27 plablinux02 systemd-resolved[423]: Using degraded feature set (UDP) for DNS server 192.168
Jun 11 10:04:42 plablinux02 systemd-resolved[423]: Using degraded feature set (TCP) for DNS server 192.168
Jun 11 10:04:52 plablinux02 ubuntu-report[1240]: level=error msg="data were not delivered successfully to
er, retrying in 960s"
Jun 11 10:05:47 plablinux02 systemd-resolved[423]: Using degraded feature set (UDP) for DNS server 192.168
Jun 11 10:06:38 plablinux02 systemd-resolved[423]: Using degraded feature set (TCP) for DNS server 192.168
Jun 11 10:07:47 plablinux02 systemd-resolved[423]: Using degraded feature set (UDP) for DNS server 192.168
Jun 11 10:08:06 plablinux02 systemd-resolved[423]: Using degraded feature set (TCP) for DNS s
rver 192.168
Jun 11 10:09:57 plablinux02 systemd-resolved[423]: Using degraded feature set (UDP) for DNS server 192.168
Jun 11 10:11:38 plablinux02 systemd-resolved[423]: Using degraded feature set (TCP) for DNS server 192.168
Jun 11 10:12:03 plablinux02 systemd-resolved[423]: Using degraded feature set (UDP) for DNS server 192.168
administrator@plablinux02:~$ ^C
```

Figure 1.15 Screenshot of PLABLINUX02: Listing the events in the kernel log.

Step 8

Clear the screen by entering the following command:

```
clear
```

You can also view the **dmesg** log to obtain information about the system hardware. The **dmesg** can be useful when you are trying to troubleshoot a system hardware issue.

To view the **dmesg** log, type the following command:

```
dmesg
```

Press **Enter**.

Note: Executing the **dmesg** displays all the kernel messages. The long list of messages appears with a big vertical scroll. To view all the messages page-by-page, you can use the piping method (less command).

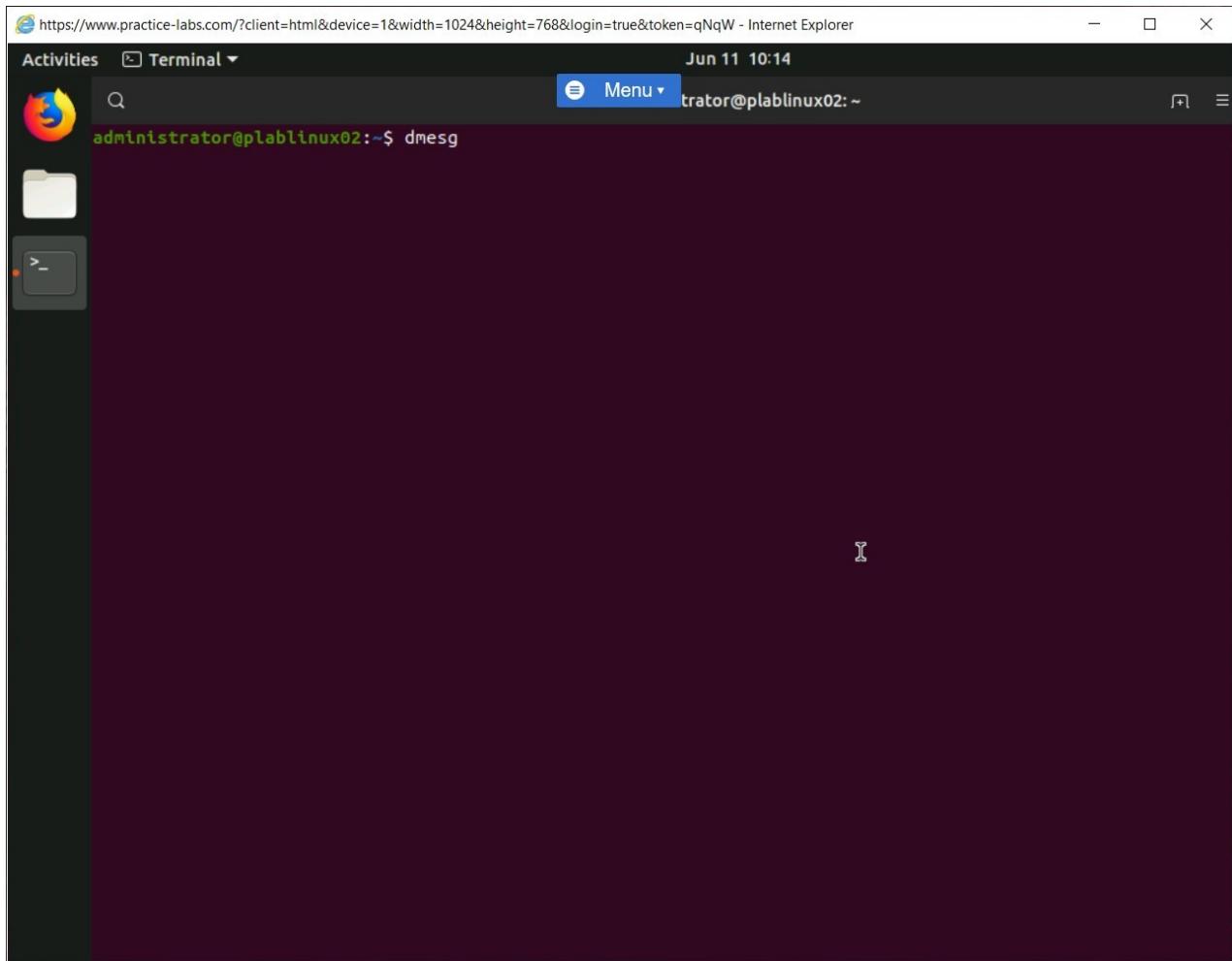
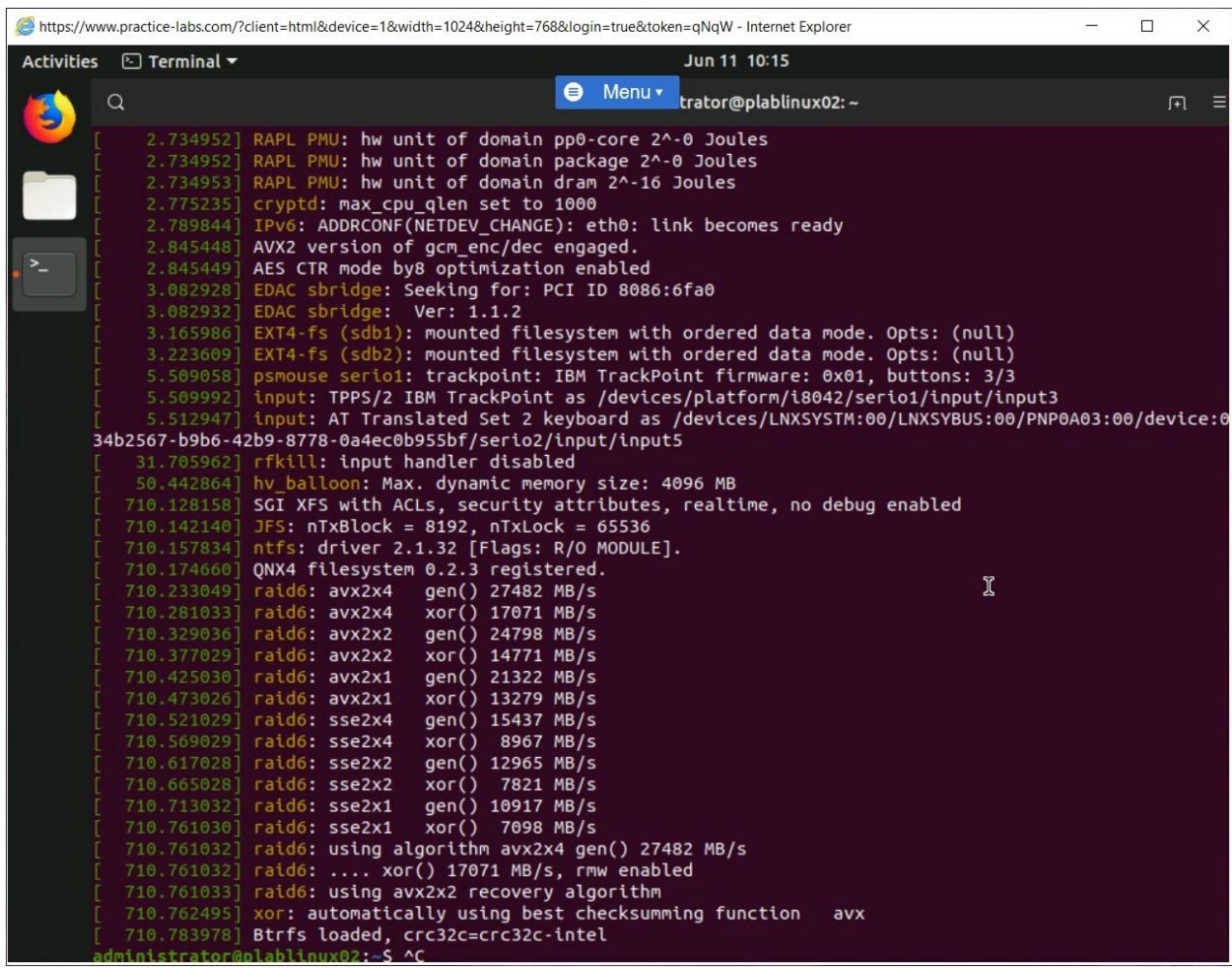


Figure 1.16 Screenshot of PLABLINUX02: Executing the dmesg command.

Step 9

The output of this command is displayed.



```
[ 2.734952] RAPL PMU: hw unit of domain pp0-core 2^-0 Joules
[ 2.734952] RAPL PMU: hw unit of domain package 2^-0 Joules
[ 2.734953] RAPL PMU: hw unit of domain dram 2^-16 Joules
[ 2.775235] cryptd: max_cpu_qlen set to 1000
[ 2.789844] IPv6: ADDRCONF(NETDEV_CHANGE): eth0: link becomes ready
[ 2.845448] AVX2 version of gcm_enc/dec engaged.
[ 2.845449] AES CTR mode by8 optimization enabled
[ 3.082928] EDAC sbridge: Seeking for: PCI ID 8086:6fa0
[ 3.082932] EDAC sbridge: Ver: 1.1.2
[ 3.165986] EXT4-fs (sdb1): mounted filesystem with ordered data mode. Opts: (null)
[ 3.223609] EXT4-fs (sdb2): mounted filesystem with ordered data mode. Opts: (null)
[ 5.509058] psmouse serio1: trackpoint: IBM TrackPoint firmware: 0x01, buttons: 3/3
[ 5.509992] input: TPPS/2 IBM TrackPoint as /devices/platform/i8042/serio1/input/input3
[ 5.512947] input: AT Translated Set 2 keyboard as /devices/LNXSYSTM:00/LNKSYBUS:00/PNP0A03:00/device:0
34b2567-b9b6-42b9-8778-0a4ec0b955bf/serio2/input/input3
[ 31.705962] rfkill: input handler disabled
[ 50.442864] hv_balloon: Max. dynamic memory size: 4096 MB
[ 710.128158] SGI XFS with ACLs, security attributes, realtime, no debug enabled
[ 710.142140] JFS: nTxBlock = 8192, nTxLock = 65536
[ 710.157834] ntfs: driver 2.1.32 [Flags: R/O MODULE].
[ 710.174660] QNX4 filesystem 0.2.3 registered.
[ 710.233049] raid6: avx2x4 gen() 27482 MB/s
[ 710.281033] raid6: avx2x4 xor() 17071 MB/s
[ 710.329036] raid6: avx2x2 gen() 24798 MB/s
[ 710.377029] raid6: avx2x2 xor() 14771 MB/s
[ 710.425030] raid6: avx2x1 gen() 21322 MB/s
[ 710.473026] raid6: avx2x1 xor() 13279 MB/s
[ 710.521029] raid6: sse2x4 gen() 15437 MB/s
[ 710.569029] raid6: sse2x4 xor() 8967 MB/s
[ 710.617028] raid6: sse2x2 gen() 12965 MB/s
[ 710.665028] raid6: sse2x2 xor() 7821 MB/s
[ 710.713032] raid6: sse2x1 gen() 10917 MB/s
[ 710.761030] raid6: sse2x1 xor() 7098 MB/s
[ 710.761032] raid6: using algorithm avx2x4 gen() 27482 MB/s
[ 710.761032] raid6: .... xor() 17071 MB/s, rmw enabled
[ 710.761033] raid6: using avx2x2 recovery algorithm
[ 710.762495] xor: automatically using best checksumming function avx
[ 710.783978] Btrfs loaded, crc32c=crc32c-intel
administrator@plablinux02:~
```

Figure 1.17 Screenshot of PLABLINUX02: Showing the output of the dmesg command.

Step 10

Clear the screen by entering the following command:

```
clear
```

You can also capture specific information using the **dmesg** command. For example, if you want to capture the serial port specific message, enter the following command:

```
dmesg | grep -i tty
```

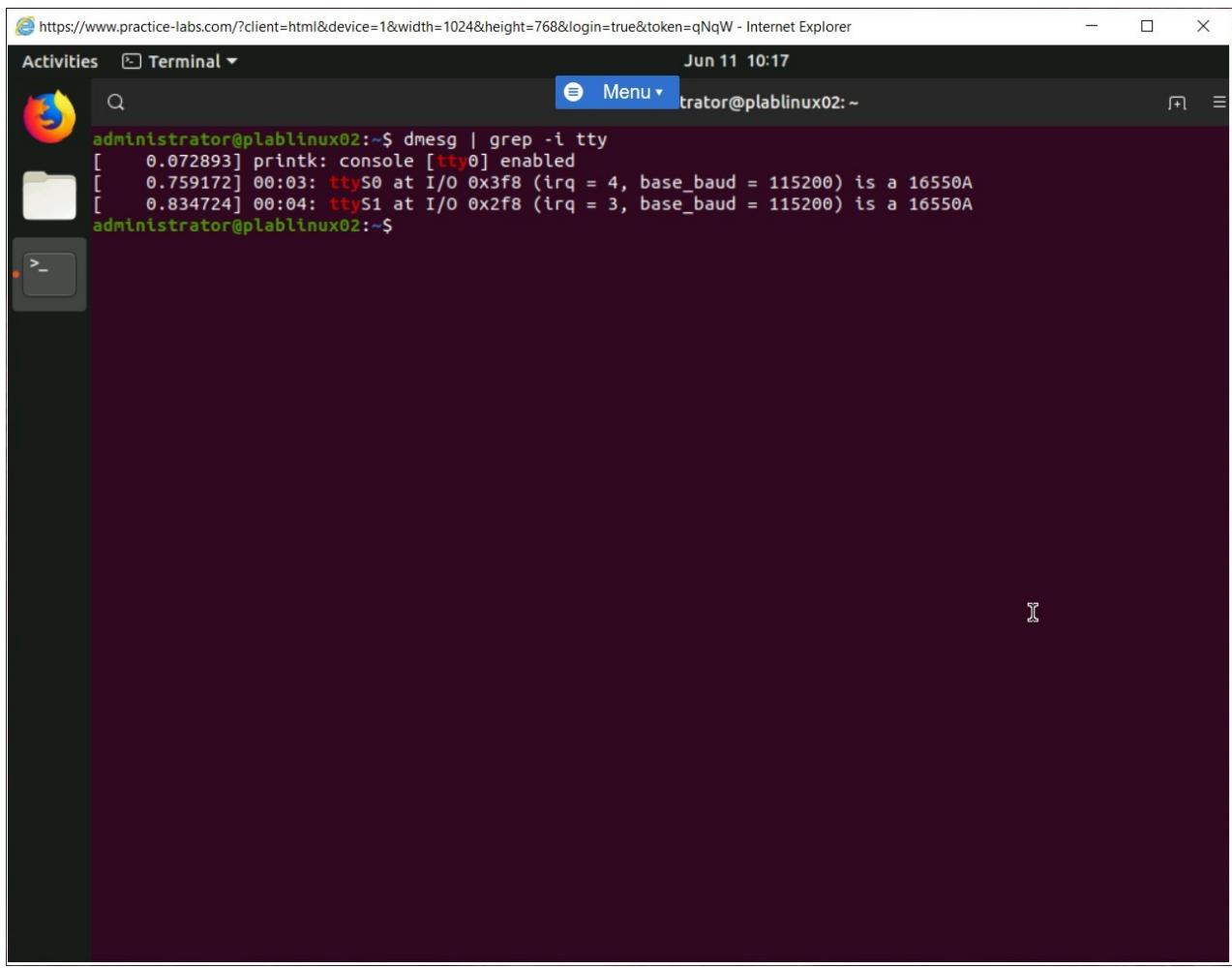


Figure 1.18 Screenshot of PLABLINUX02: Capturing specific information using the dmesg command.

Step 11

To find out the amount of physical memory in a system, type the following command:

```
dmesg | grep -i memory
```

Press **Enter**.

```
https://www.practice-labs.com/?client=html&device=1&width=1024&height=768&login=true&token=qNqW - Internet Explorer
Activities Terminal Jun 11 10:17
administrator@plablinux02:~$ dmesg | grep -i tty
[ 0.072893] printk: console [tty0] enabled
[ 0.759172] 00:03: ttyS0 at I/O 0x3f8 (irq = 4, base_baud = 115200) is a 16550A
[ 0.834724] 00:04: ttyS1 at I/O 0x2f8 (irq = 3, base_baud = 115200) is a 16550A
administrator@plablinux02:~$ dmesg | grep -i memory
[ 0.007726] check: Scanning 1 areas for low memory corruption
[ 0.007728] Base memory trampoline at [(____ptrval____)] 99000 size 24576
[ 0.008263] Early memory node ranges
[ 0.031466] PM: Registered nosave memory: [mem 0x00000000-0x0000ffff]
[ 0.031467] PM: Registered nosave memory: [mem 0x0009f000-0x0009ffff]
[ 0.031468] PM: Registered nosave memory: [mem 0x000a0000-0x000dffff]
[ 0.031468] PM: Registered nosave memory: [mem 0x000e0000-0x000fffff]
[ 0.031469] PM: Registered nosave memory: [mem 0xf7ff0000-0xf7fffffe]
[ 0.031470] PM: Registered nosave memory: [mem 0xf7fff000-0xf7ffffff]
[ 0.031470] PM: Registered nosave memory: [mem 0xf8000000-0xffffffff]
[ 0.055781] Memory: 3976352K/4193848K available (14339K kernel code, 2334K rwdta, 4292K rodata, 2576K bss, 217496K reserved, 0K cma-reserved)
[ 0.107054] Freeing SMP alternatives memory: 36K
[ 0.109017] x86/mm: Memory block size: 128MB
[ 0.645014] Freeing initrd memory: 40404K
[ 0.645212] check: Scanning for low memory corruption every 60 seconds
[ 1.269324] Freeing unused decrypted memory: 2040K
[ 1.270035] Freeing unused kernel image memory: 2576K
[ 1.281735] Freeing unused kernel image memory: 2016K
[ 1.282260] Freeing unused kernel image memory: 1852K
[ 2.348529] hv_balloon: Using Dynamic Memory protocol version 2.0
[ 50.442864] hv_balloon: Max. dynamic memory size: 4096 MB
administrator@plablinux02:~$
```

Figure 1.19 Screenshot of PLABLINUX02: Finding out the amount of physical memory in a system.

Keep all devices in their current state and proceed to the next exercise.

Review

Well done, you have completed the **Boot the System** Practice Lab.

Summary

You completed the following exercise:

- Exercise 1 - Boot the System

You should now be able to:

- Configure boot menu in Ubuntu

- Check boot events in the log files

Feedback

Shutdown all virtual machines used in this lab. Alternatively, you can log out of the lab platform.