

Perform Memory Monitoring and Configuration

- **Introduction**
 - **Lab Topology**
 - **Exercise 1 - Perform Memory Monitoring**
 - **Review**
-

Introduction

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

Memory Monitoring

Configuration

Out of Memory killer

Vmstat

Learning Outcomes

In this module, you will complete the following exercise:

- Exercise 1 - Perform Memory Monitoring

After completing this lab, you will be able to:

- View virtual memory statistics using vmstat
- Verify the free and use memory for both physical and swap memory
- Use the swapon and swapoff commands
- Configure the Out of Memory killer

Exam Objectives

The following exam objectives are covered in this lab:

- **CompTIA:** 4.1 Given a scenario, analyze system properties and remediate accordingly.

***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.



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 - Perform Memory Monitoring

Each server can have a limited amount of memory. With various applications and processes utilizing the memory, it can run short and therefore, causing a major performance impact. It is critical for the administrator to monitor memory performance. There are various tools that can be used for this purpose.

In this exercise, you will learn to perform memory monitoring

Learning Outcomes

After completing this exercise, you will be able to:

- Log into a Linux System
- View virtual memory statistics using vmstat
- Verify the free and use memory for both physical and swap memory
- Use the swapon and swapoff commands
- Configure the Out of Memory killer

Your Devices

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

- **PLABLINUX01** (CentOS Server)



Task 1 - View Virtual Memory Statistics Using vmstat

The vmstat or virtual memory statistics tool is primarily used for collecting information on memory. It is also capable of collecting information on the CPU.

In this task, you will learn to view virtual memory statistics using `vmstat`. To view virtual memory statistics using `vmstat`, perform the following steps:

Step 1

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

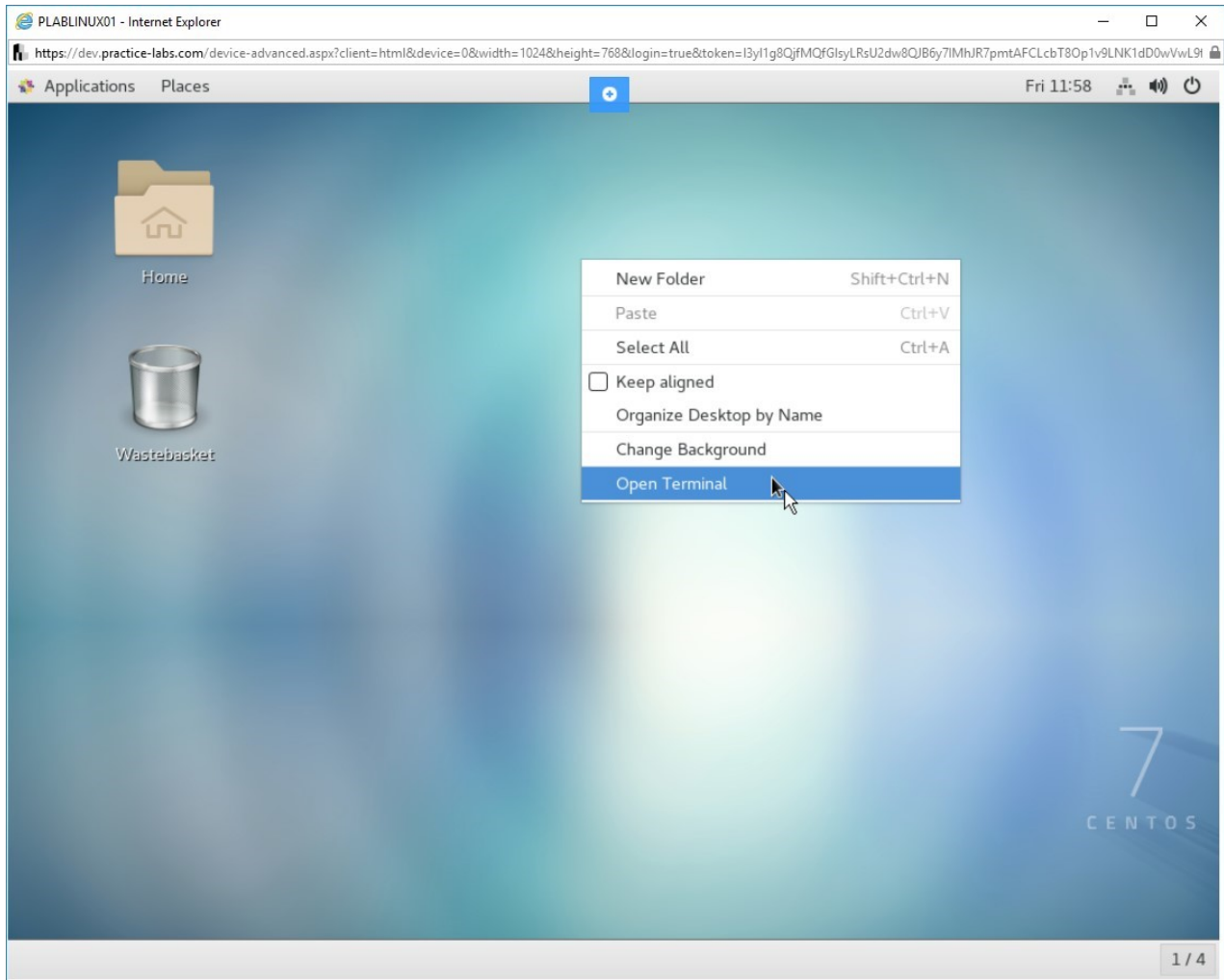


Figure 1.1 Screenshot of PLABLINUX01: Selecting the Open Terminal option from the context menu.

Step 2

The terminal window is displayed. Type the following command:

```
vmstat
```

Press **Enter**. Notice that the command displays memory, swap, io, system, and CPU statistics.

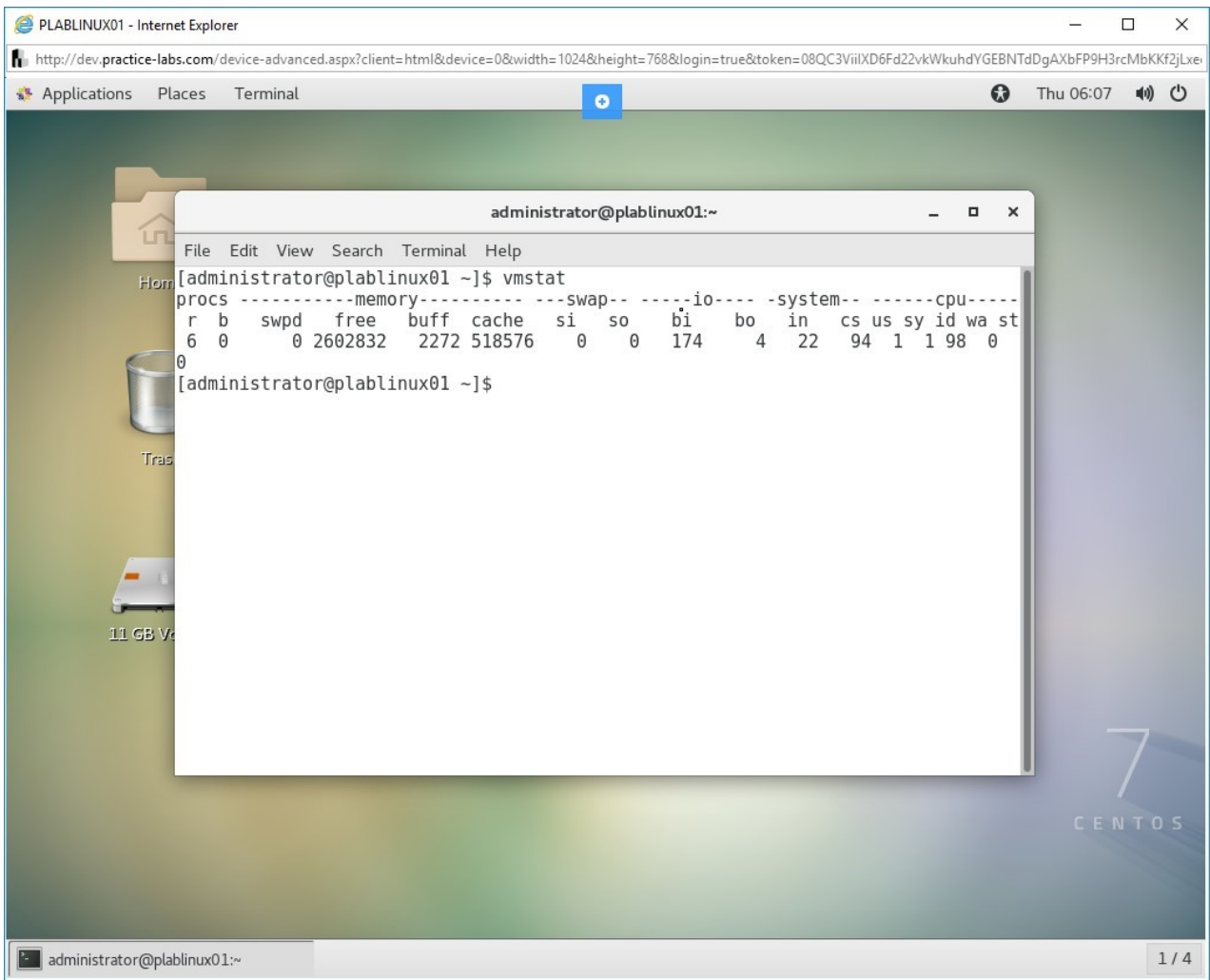


Figure 1.2 Screenshot of PLABLINUX01: Displaying the output of the vmstat command.

Step 3

You can also display active and inactive memory using the vmstat command with the -a parameter. Type the following command:

```
vmstat -a
```

Press **Enter**. Notice under the memory column. The free, active, and inactive memory are displayed.

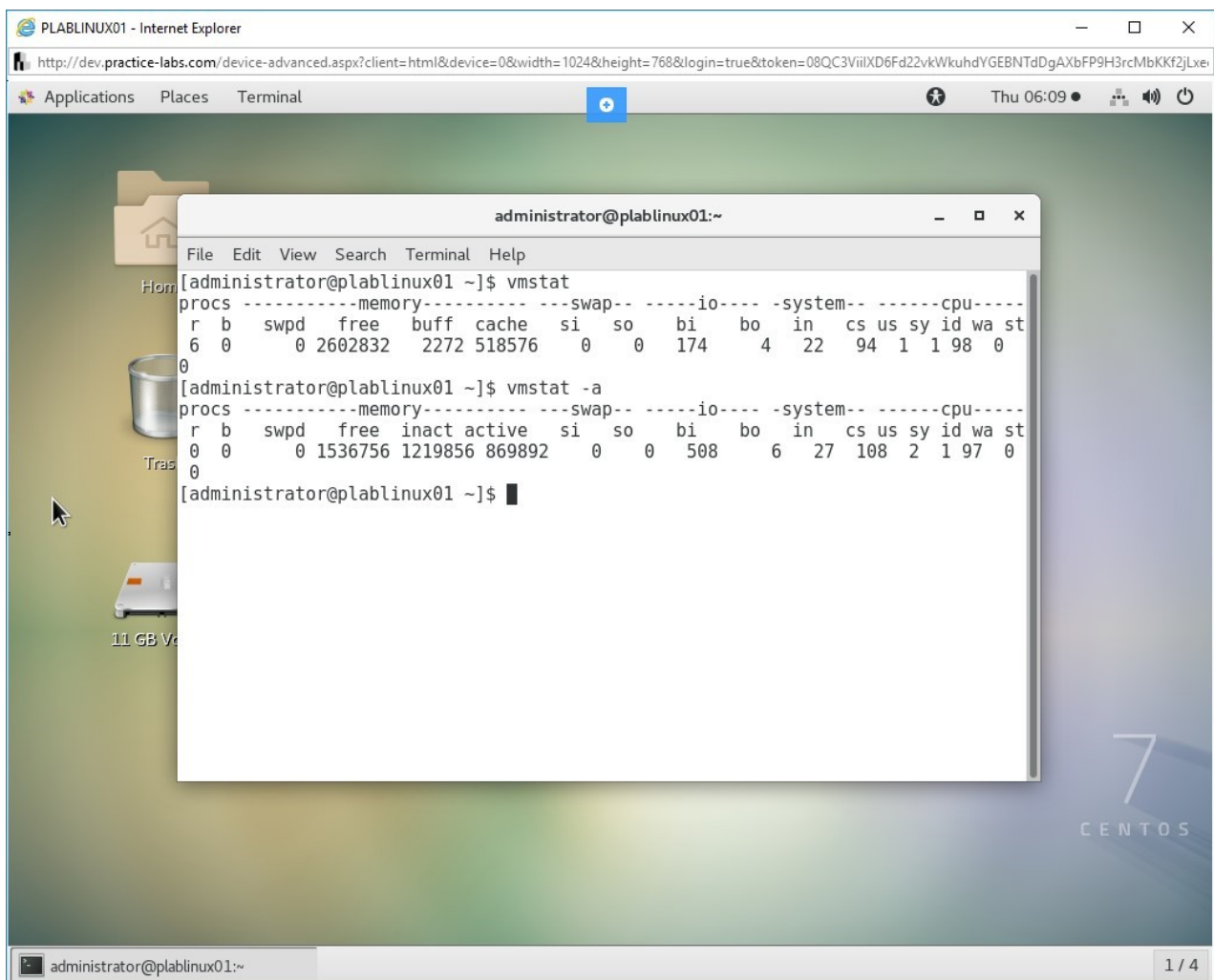


Figure 1.3 Screenshot of PLABLINUX01: Displaying the output of the vmstat -a command.

Step 4

Clear the screen by entering the following command:

```
clear
```

You can also display the number of forks since you last booted the system. To do this, type the following command:

```
vmstat -f
```

Press **Enter**.

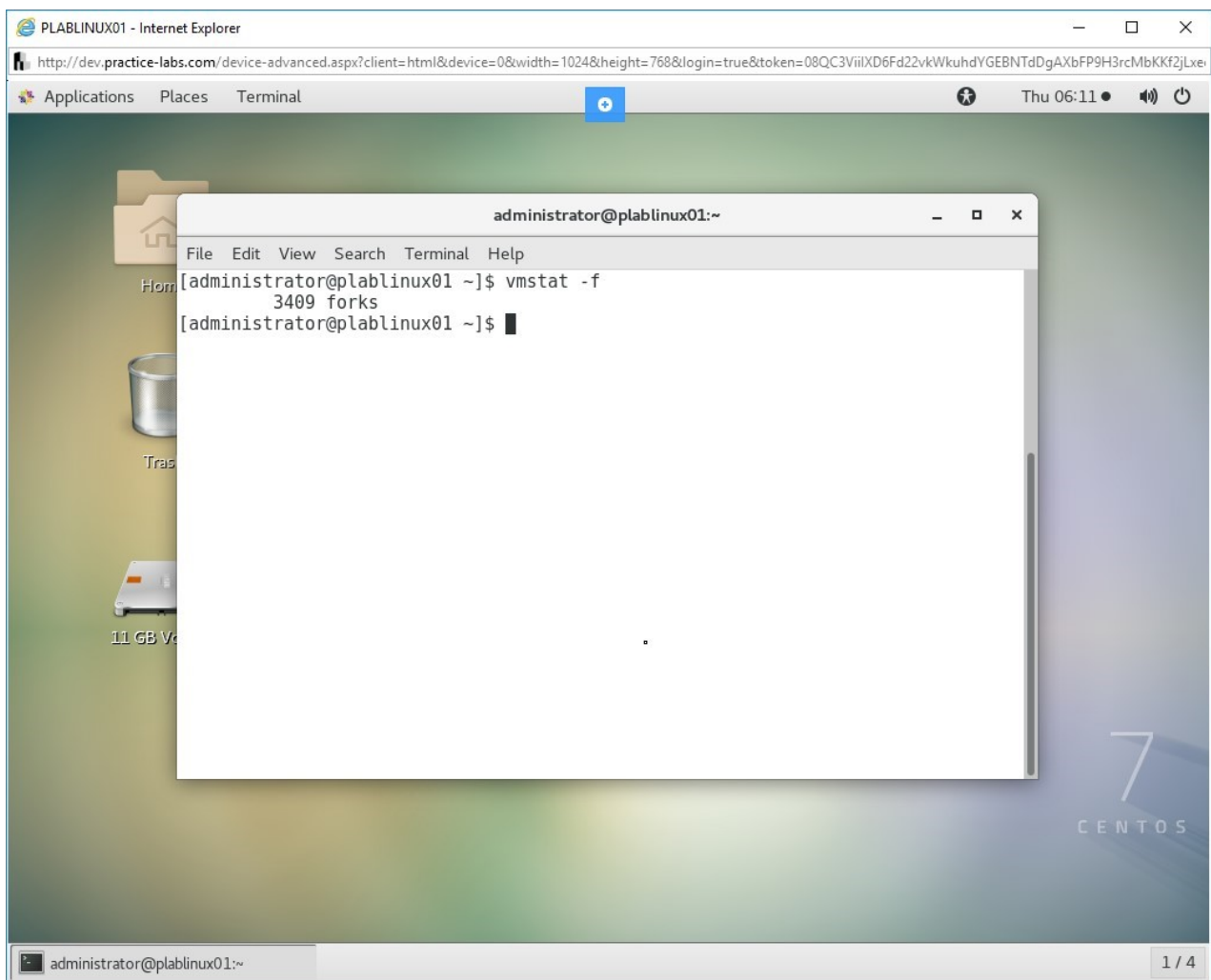


Figure 1.4 Screenshot of PLABLINUX01: Displaying the output of the vmstat -f command.

Step 5

Clear the screen by entering the following command:

```
clear
```

You can also get the information about various components, such as memory and CPU, after every certain number of seconds. To do this, type the following command:

```
vmstat 2
```


Press **Enter**. You will notice that statistics are being displayed after every two seconds. Press Ctrl + C to break the command.

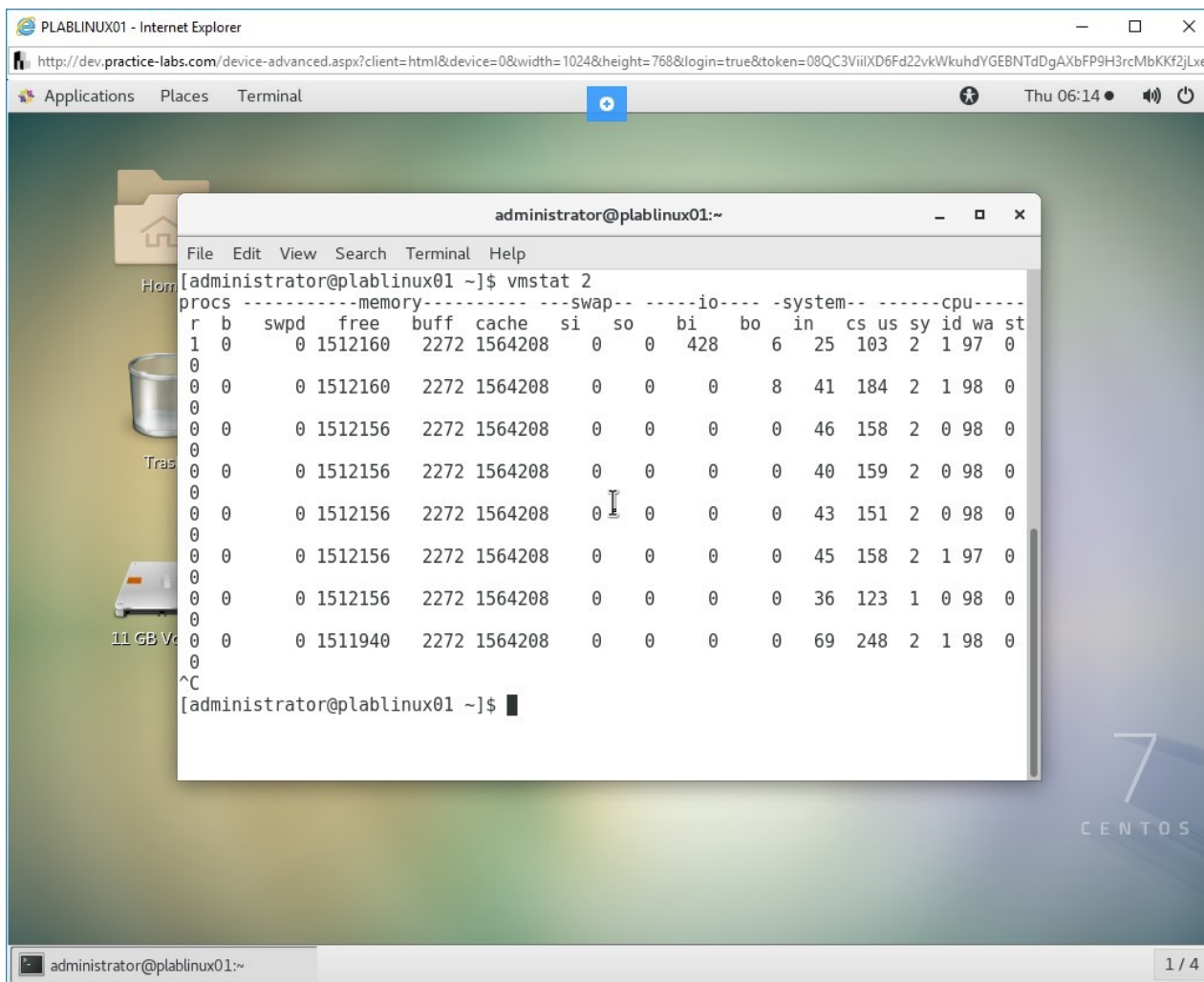


Figure 1.5 Screenshot of PLABLINUX01: Displaying the output of the vmstat 2 command.

Step 6

Clear the screen by entering the following command:

```
clear
```

You can also get the information about various components, such as memory and CPU, after every certain number of seconds for a specific number of times. To do this, type the following command:

```
vmstat 2 10
```

Press **Enter**. You will notice that statistics are being displayed after every two seconds. After 10 entries, the command will abort itself.

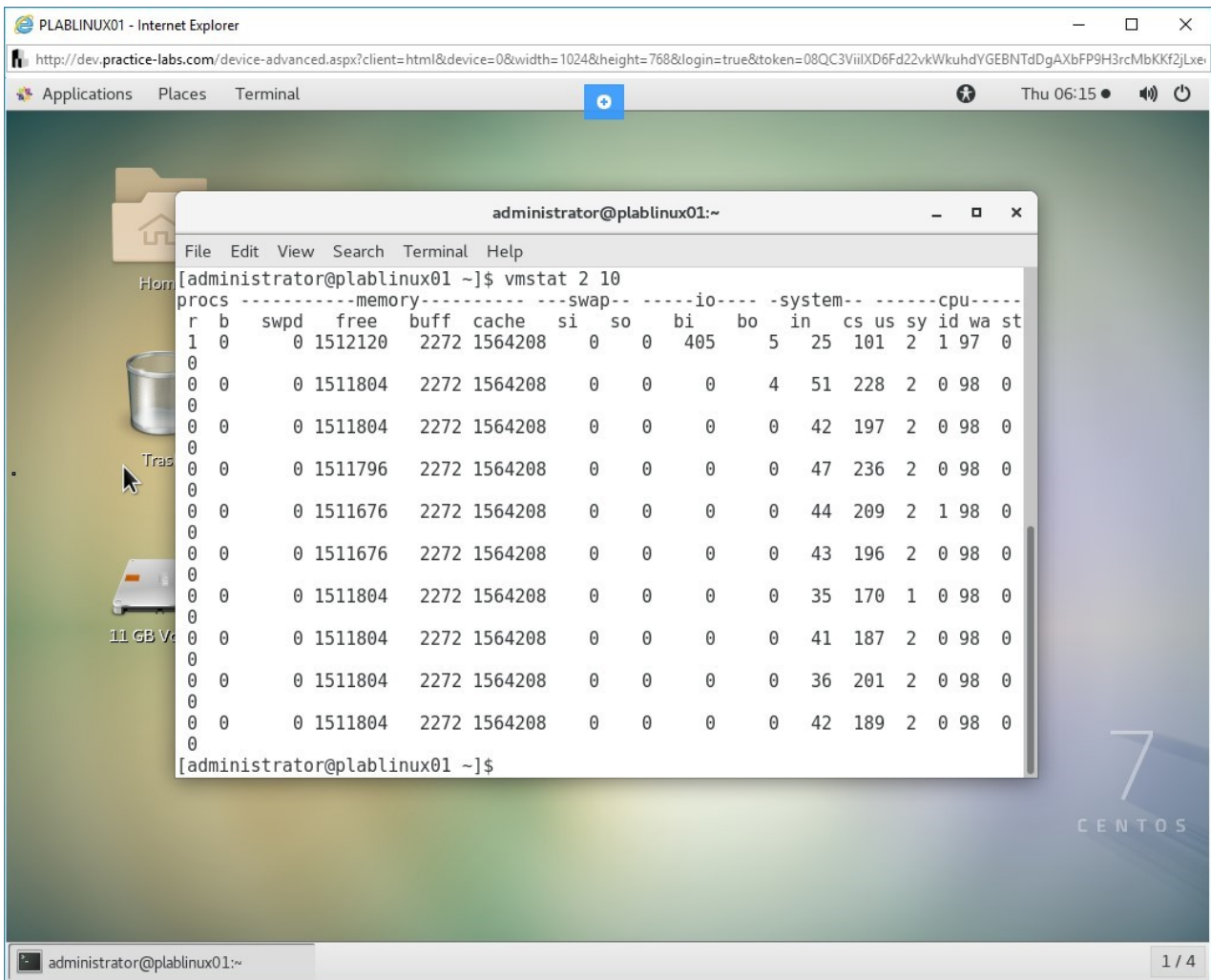


Figure 1.6 Screenshot of PLABLINUX01: Displaying the output of the vmstat -2 10 command.

Step 7

Clear the screen by entering the following command:

```
clear
```

When you want to monitor the memory usage on an ongoing basis, it would be good to use the timestamp for each entry. To do this, type the following command:

```
vmstat -t 2 10
```

Press **Enter**. Notice that this time the timestamp for each entry is also displayed.

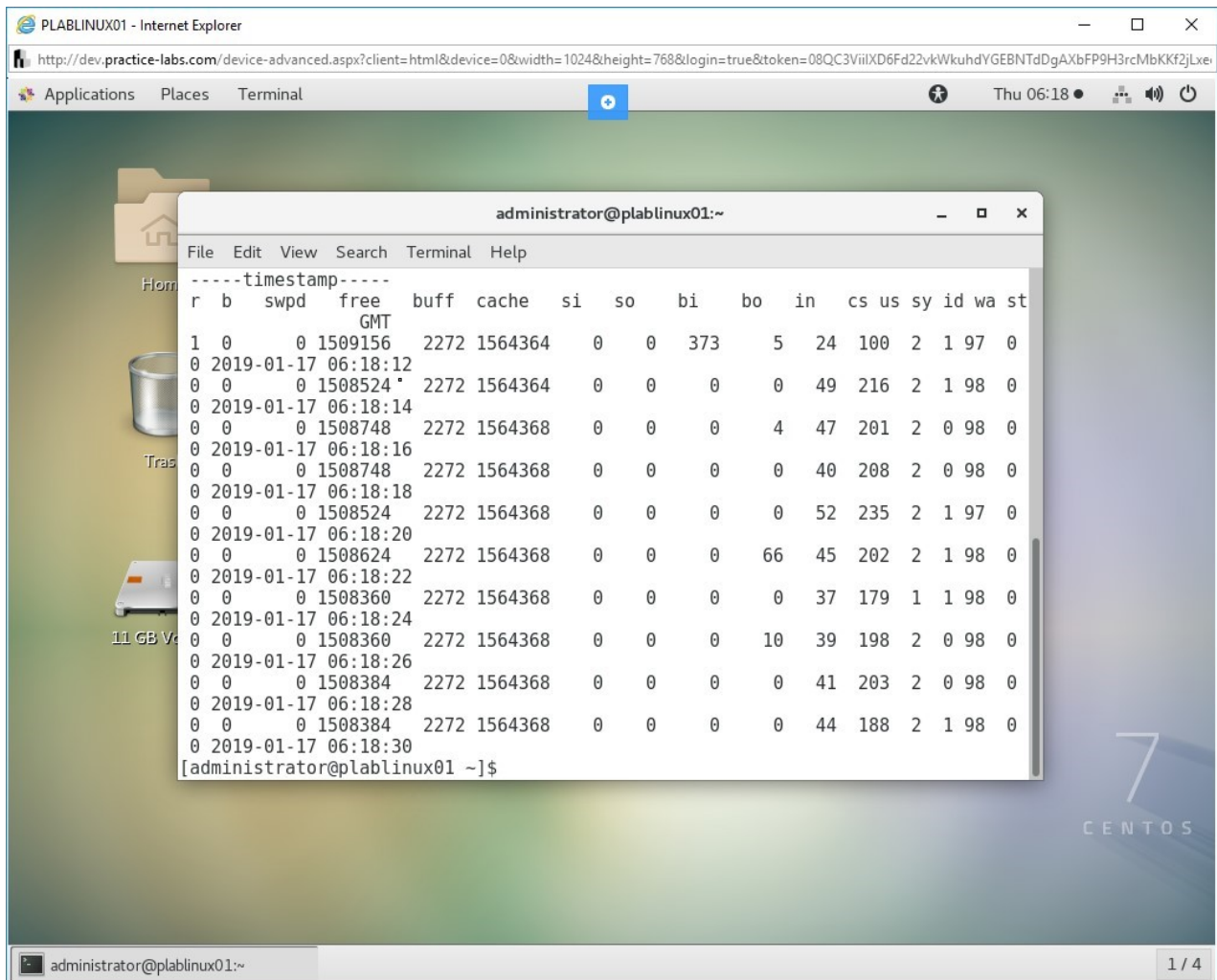


Figure 1.7 Screenshot of PLABLINUX01: Displaying the output of the vmstat command with the timestamp.

Step 8

Clear the screen by entering the following command:

```
clear
```

You can also display the slab information. To do this, type the following command:

```
sudo vmstat -m
```

Press **Enter**.

When prompted, type the following password:

Passw0rd

Press **Enter**.

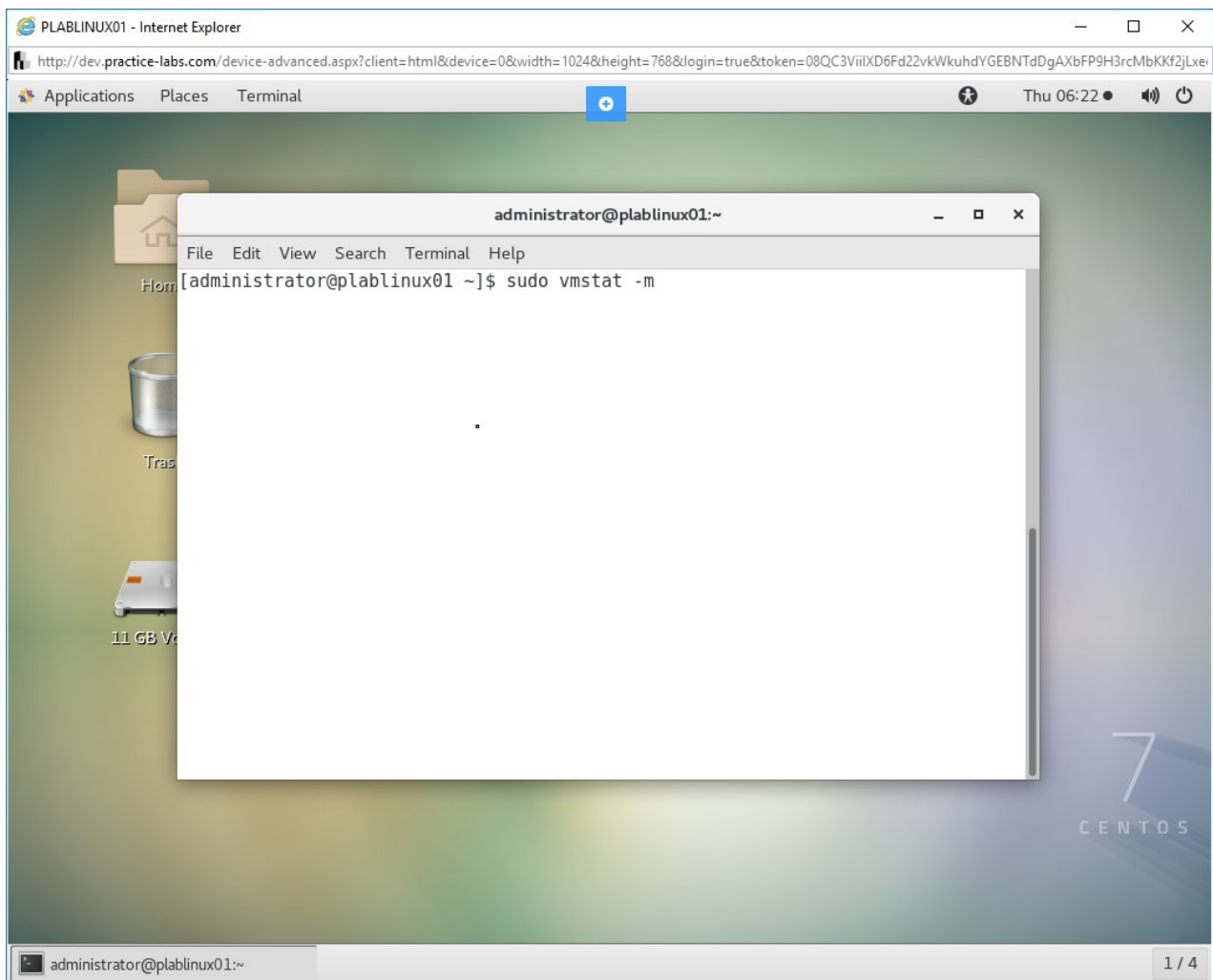


Figure 1.8 Screenshot of PLABLINUX01: Executing the `vmstat -m` command to display the slab information.

Step 9

The output of the **vmstat -m** command is displayed.

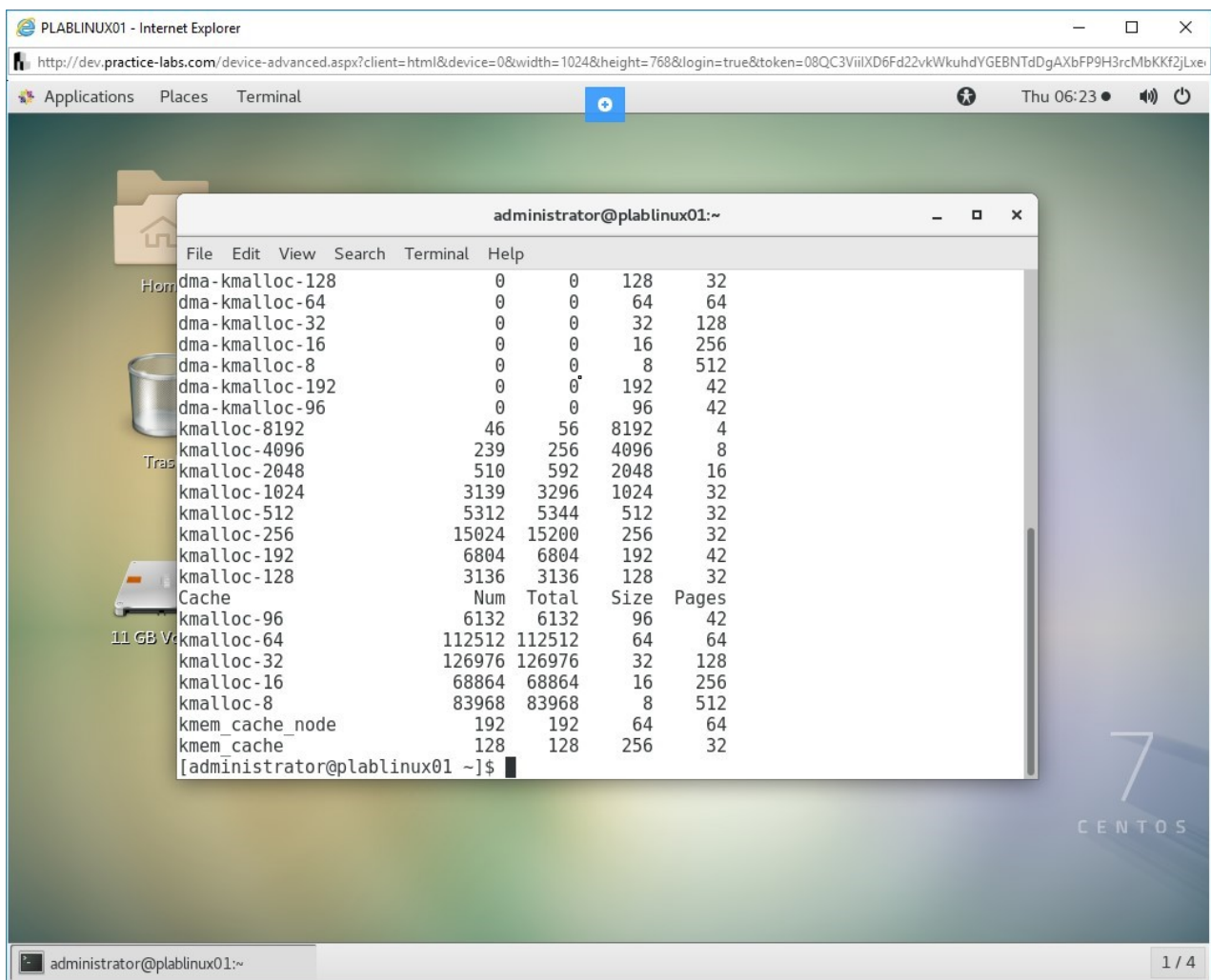


Figure 1.9 Screenshot of PLABLINUX01: Displaying the output of the vmstat -m command to display the slab information.

Step 10

Clear the screen by entering the following command:

```
clear
```

You can also display various statistics in a tabular format. To do this, type the following command:

```
vmstat -s
```

Press **Enter**.

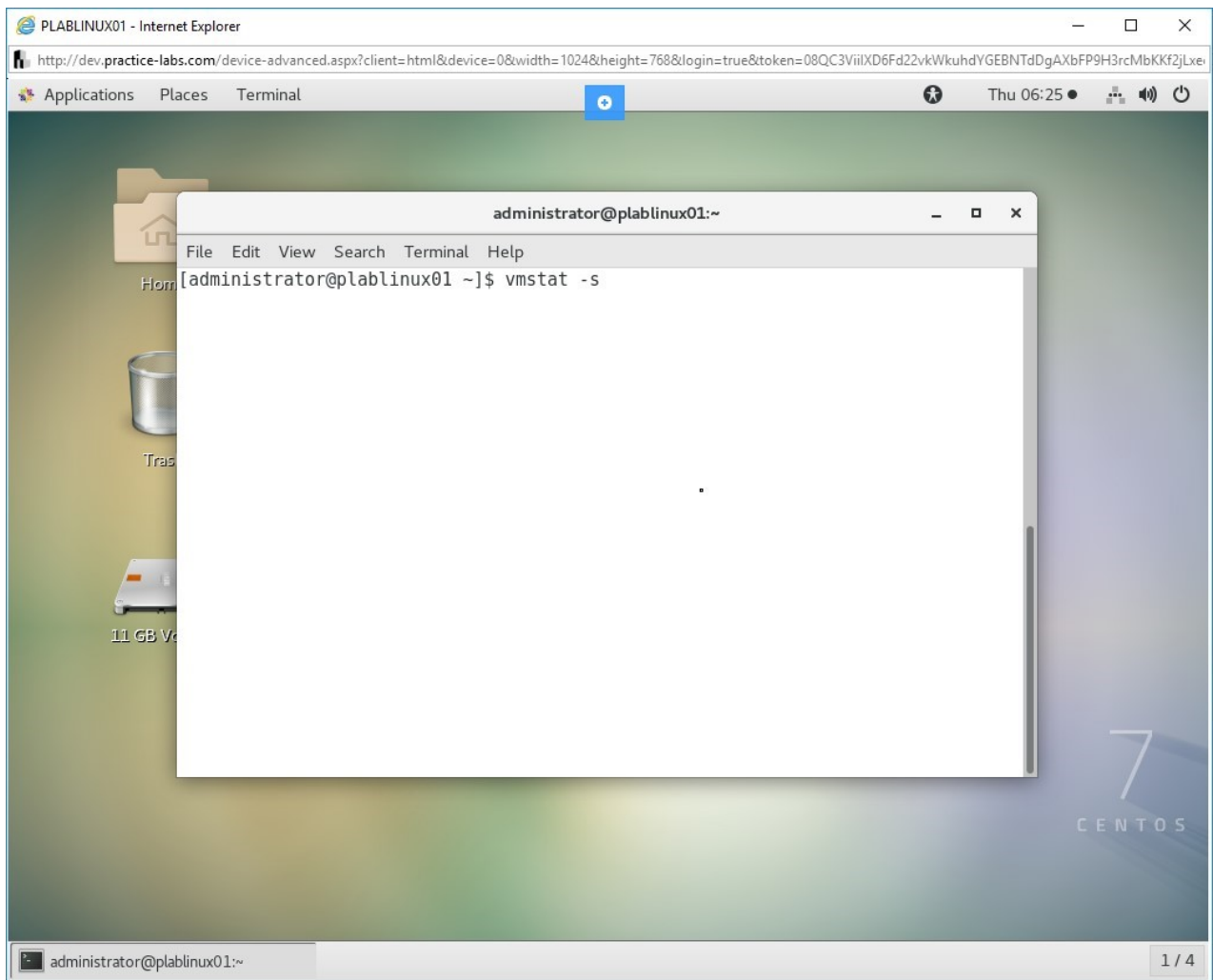


Figure 1.10 Screenshot of PLABLINUX01: Executing the `vmstat -s` command.

Step 11

The output of the **vmstat -s** command is displayed.

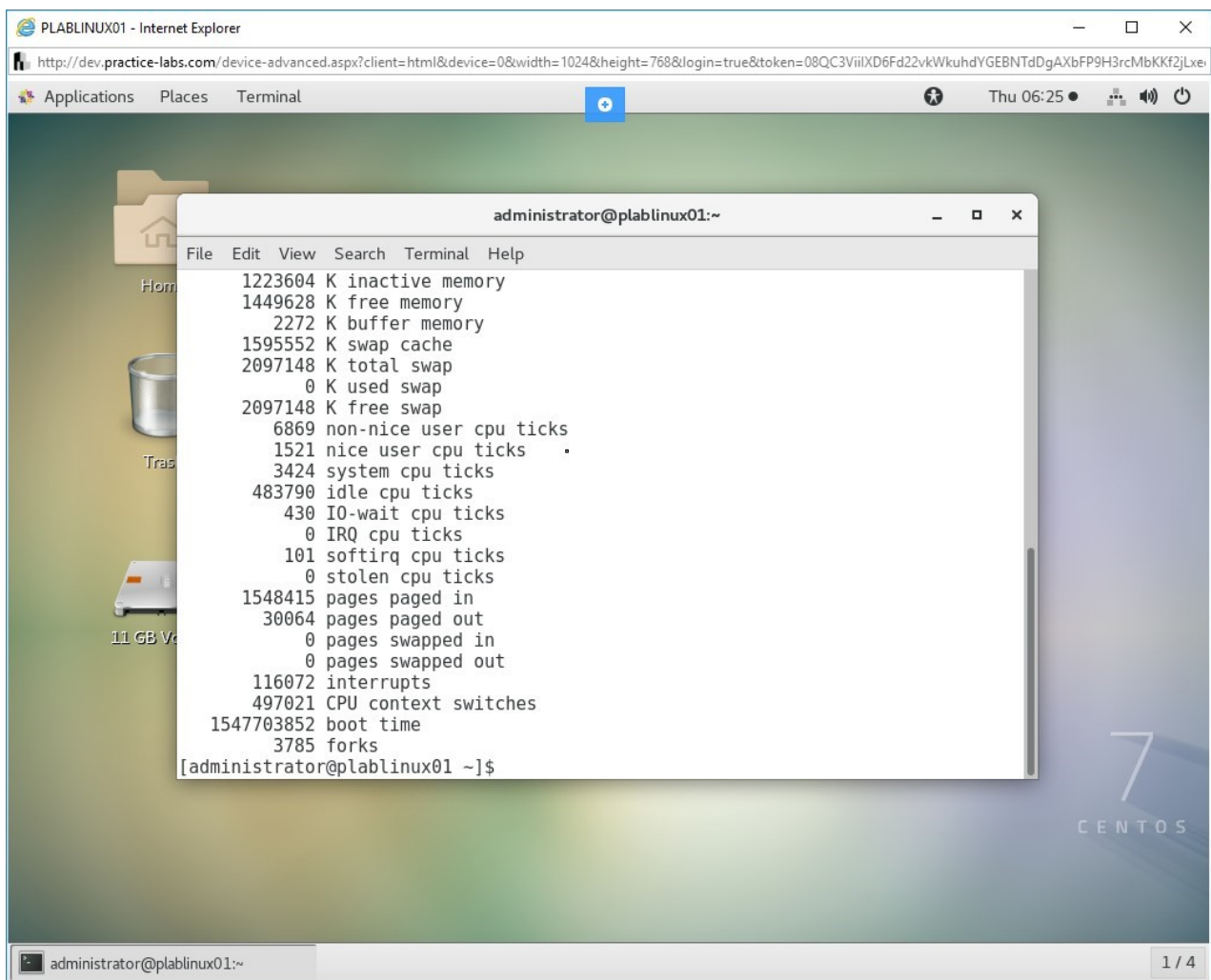


Figure 1.11 Screenshot of PLABLINUX01: Displaying the output of the `vmstat -s` command.

Task 2 - Verify the free and used memory for both physical and swap memory

The `free` command provides free and used memory. It also displays the information about the buffers that are used by the kernel in CentOS. In this task, you will learn to use the `free` command to get information about free and used memory for both physical and swap memory. To use the `free` command, perform the following steps:

Step 1

Clear the screen by entering the following command:

```
Clear
```

To display the system memory in KB, type the following command:

free

Press **Enter**. You will also receive the same output if you use the **-k** parameter.

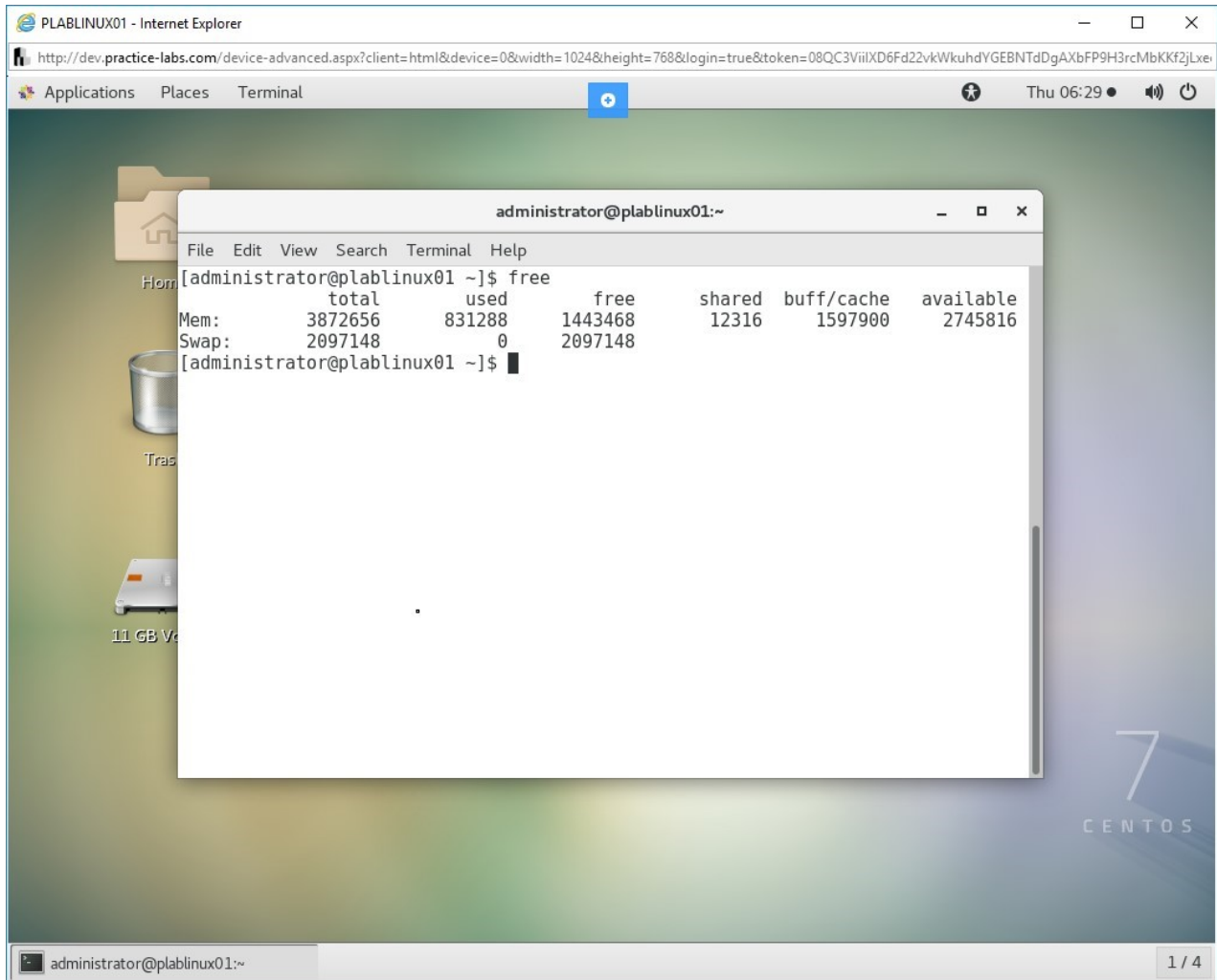


Figure 1.12 Screenshot of PLABLINUX01: Displaying the output of the free command.

Step 2

To display the system memory in bytes, type the following command:

free -b

Press **Enter**.

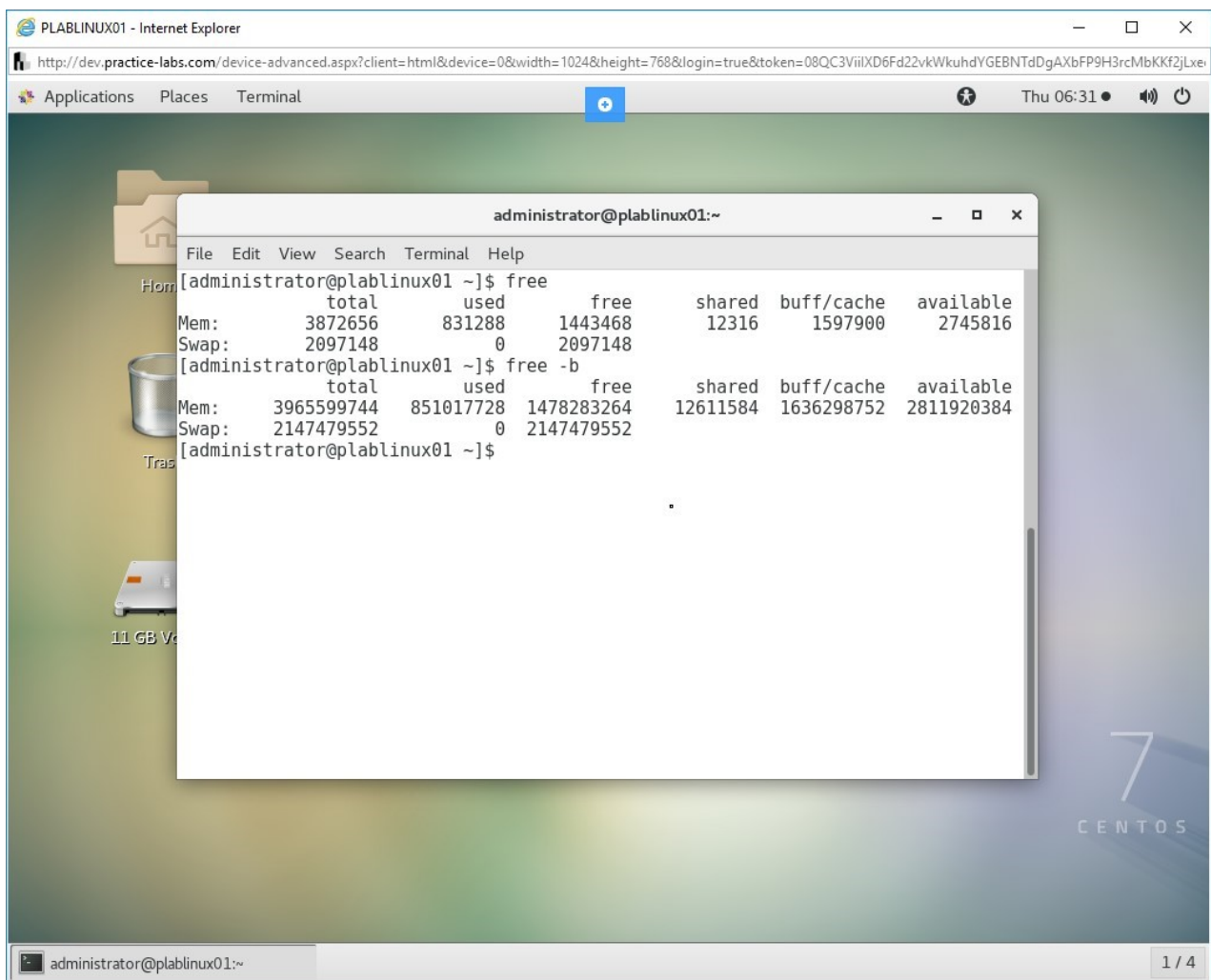


Figure 1.13 Screenshot of PLABLINUX01: Displaying the output of the free -b command.

Step 3

To display the system memory in MB, type the following command:

```
free -m
```

Press **Enter**.

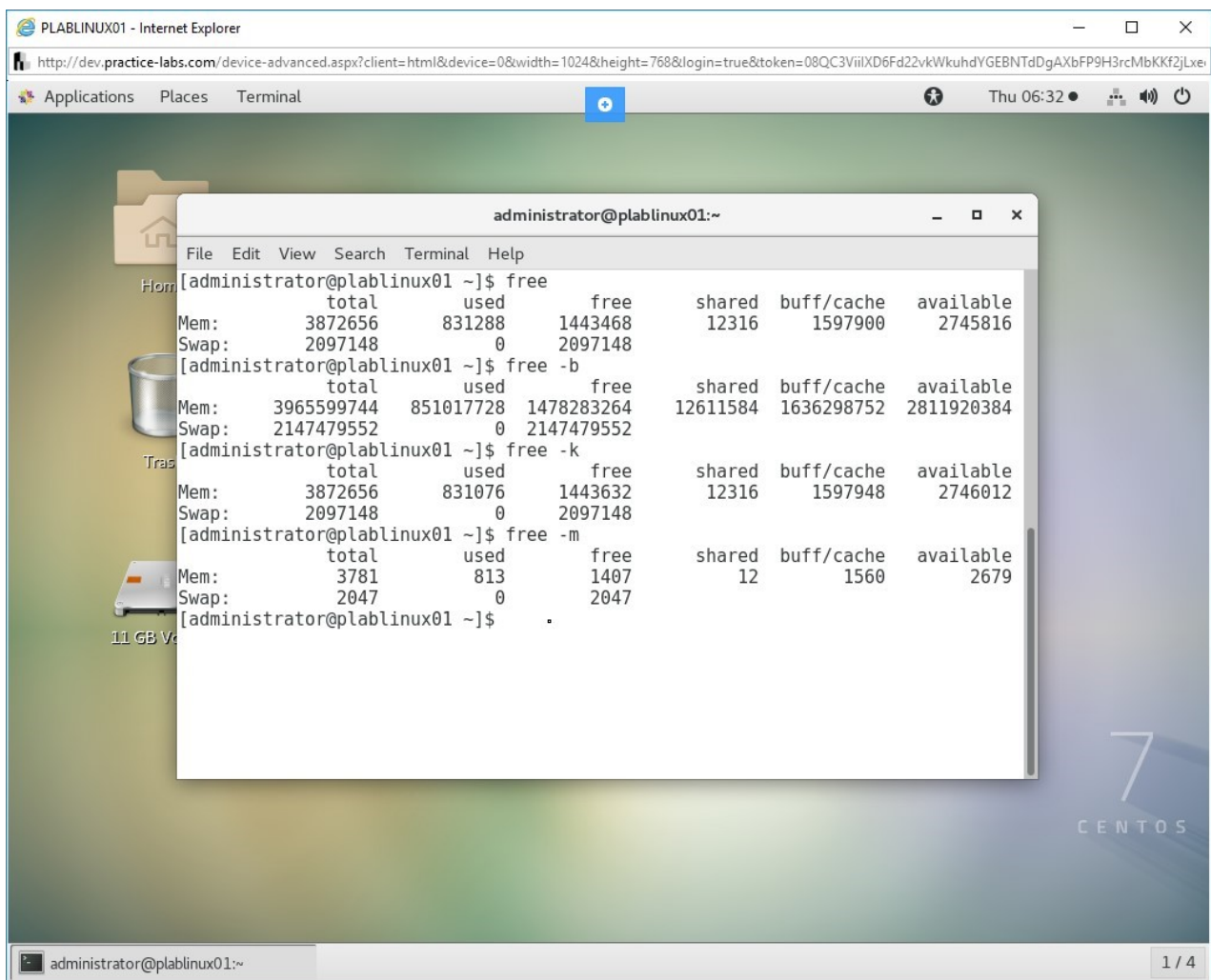


Figure 1.14 Screenshot of PLABLINUX01: Displaying the output of the free -m command.

Step 4

Clear the screen by entering the following command:

```
clear
```

To display the system memory in GB, type the following command:

```
free -g
```

Press **Enter**.

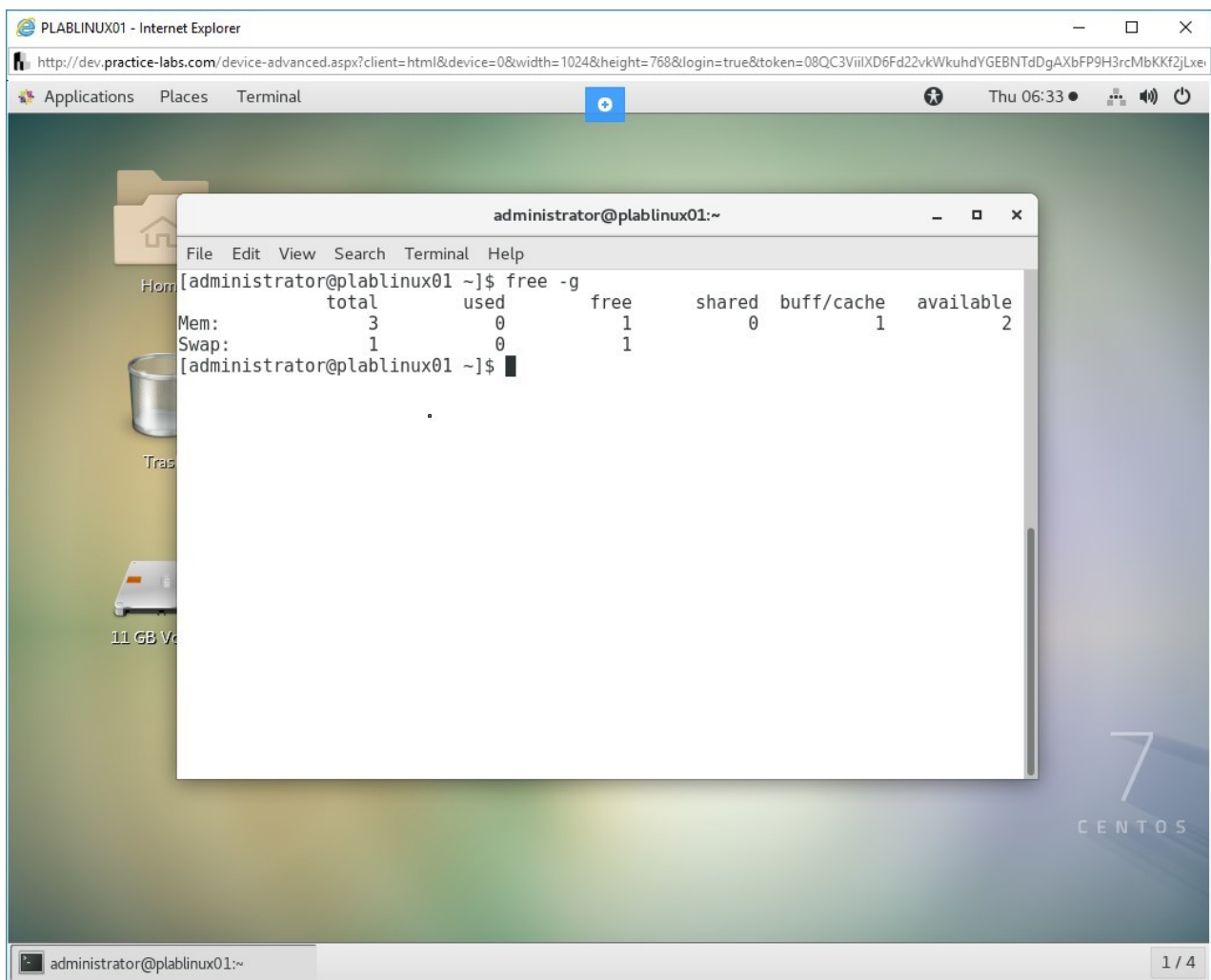


Figure 1.15 Screenshot of PLABLINUX01: Displaying the output of the free -g command.

Step 5

Clear the screen by entering the following command:

```
clear
```

To display the total of memory and swap, type the following command:

```
free -t
```

Press **Enter**. Notice that total is displayed for the following columns: total, used, and free.

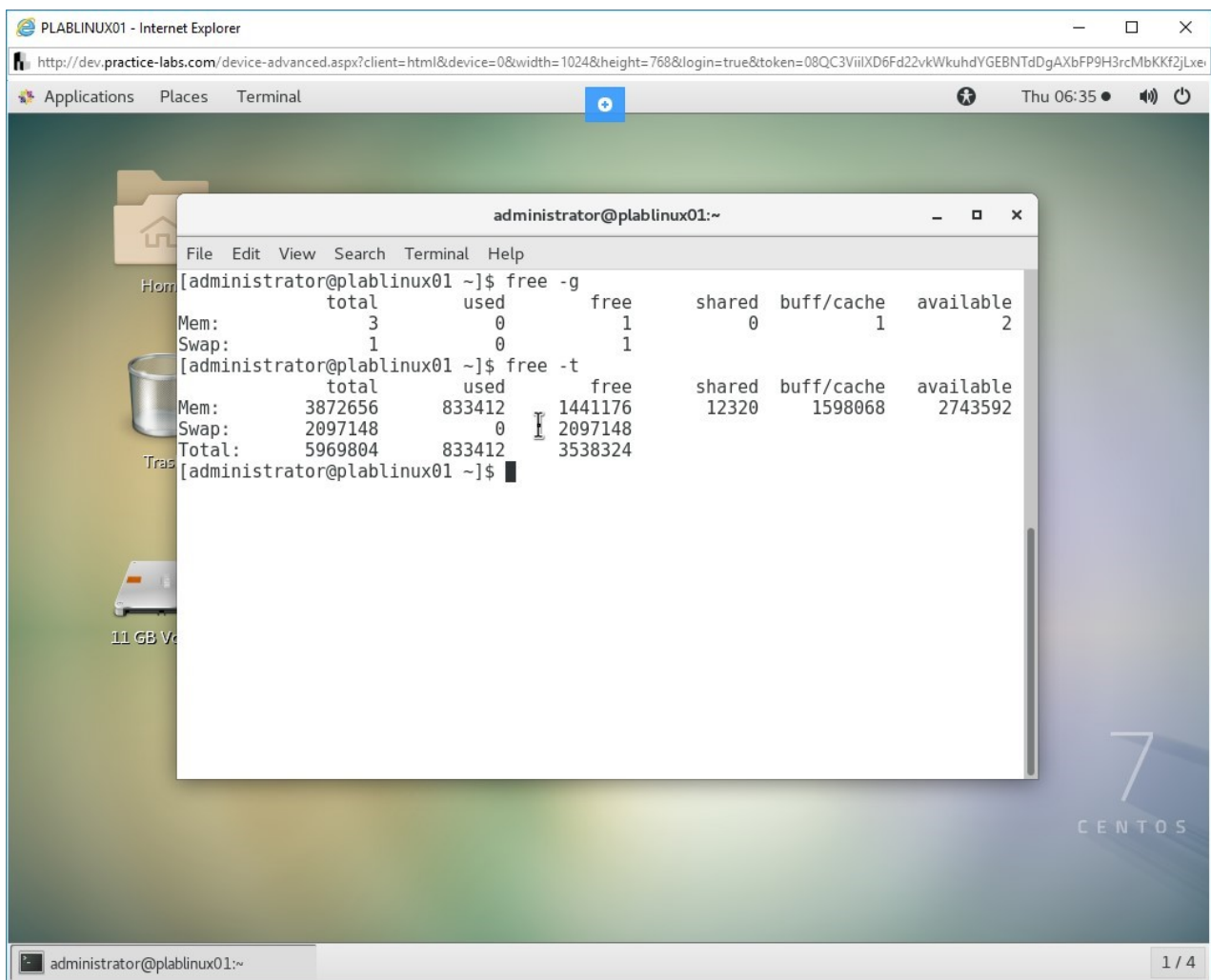


Figure 1.16 Screenshot of PLABLINUX01: Displaying the output of the free -t command.

Step 6

Clear the screen by entering the following command:

```
clear
```

To display the memory statistics every two seconds, type the following command:

```
free -s 4
```

Press **Enter**. You will notice that statistics are being displayed after every two seconds. Press Ctrl + C to break the command.

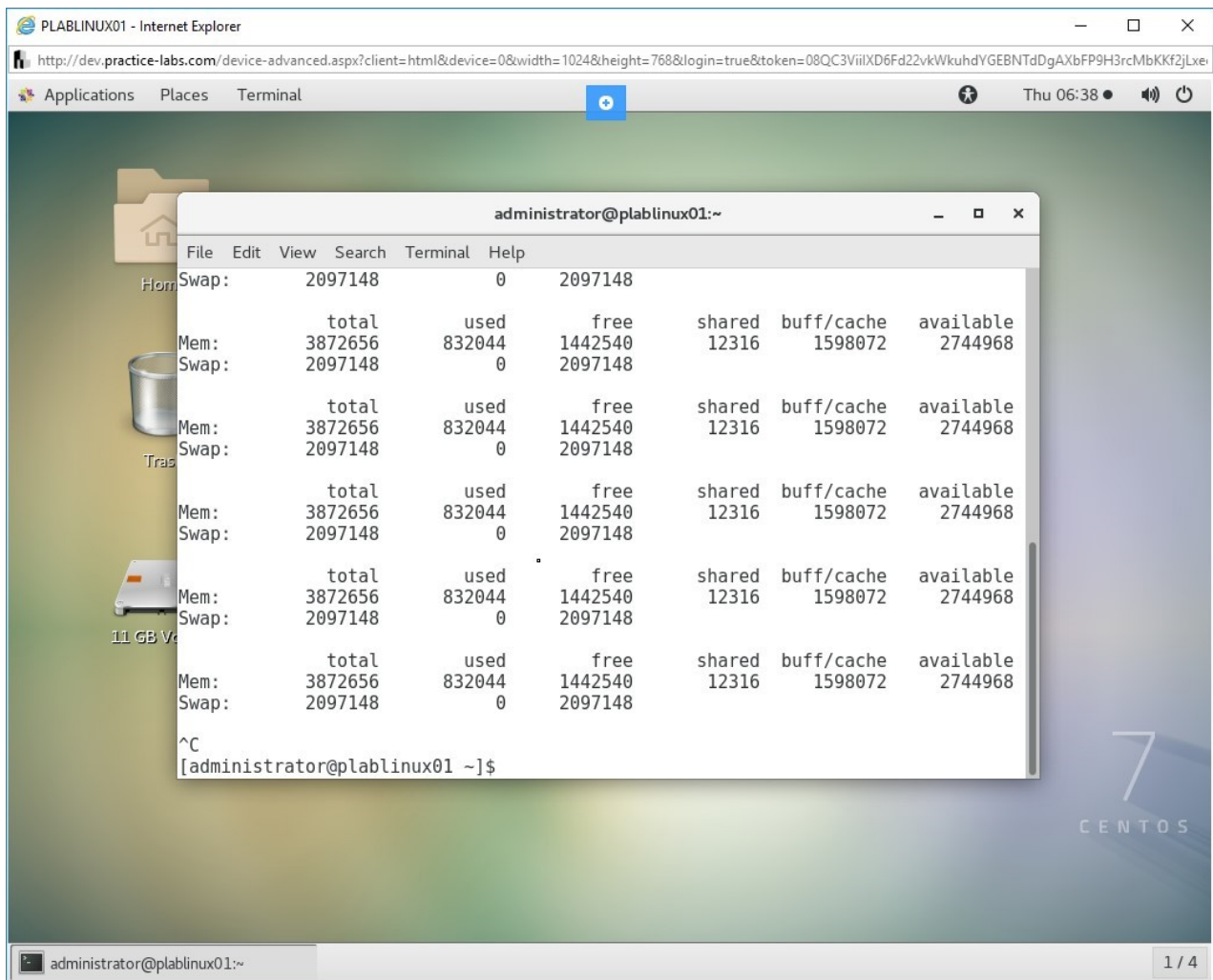


Figure 1.17 Screenshot of PLABLINUX01: Displaying the memory statistics every two seconds using the free command.

Step 7

Clear the screen by entering the following command:

```
clear
```

To display the high and low memory statistics, type the following command:

```
free -l
```

Press **Enter**. Notice that high and low statistics are displayed

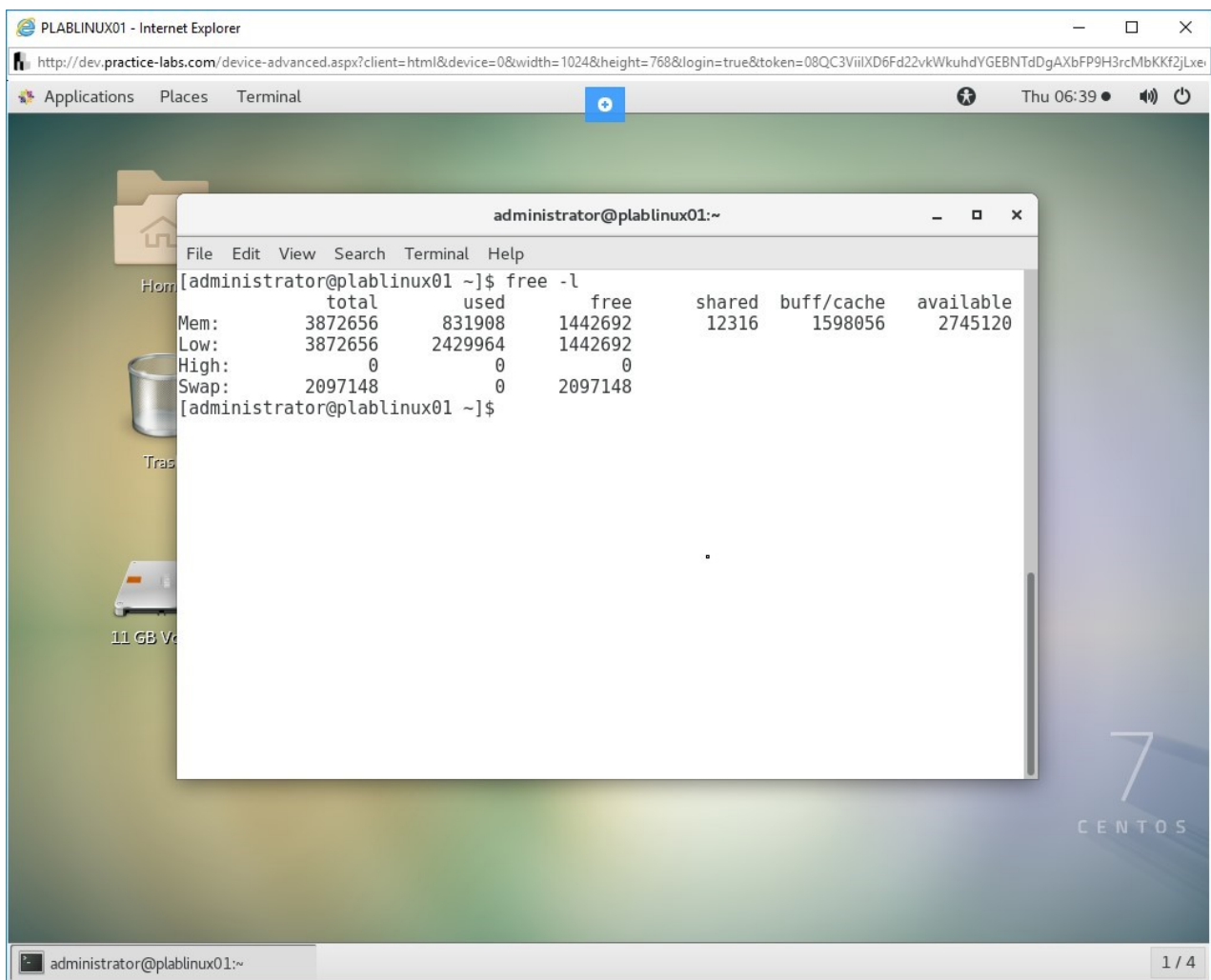


Figure 1.18 Screenshot of PLABLINUX01: Displaying the high and low memory statistics using the free command.

Step 8

Clear the screen by entering the following command:

```
clear
```

To display the current memory usage, type the following command:

```
watch free
```

Press **Enter**. Notice that current memory usage is displayed. Press Ctrl + C to break the command.

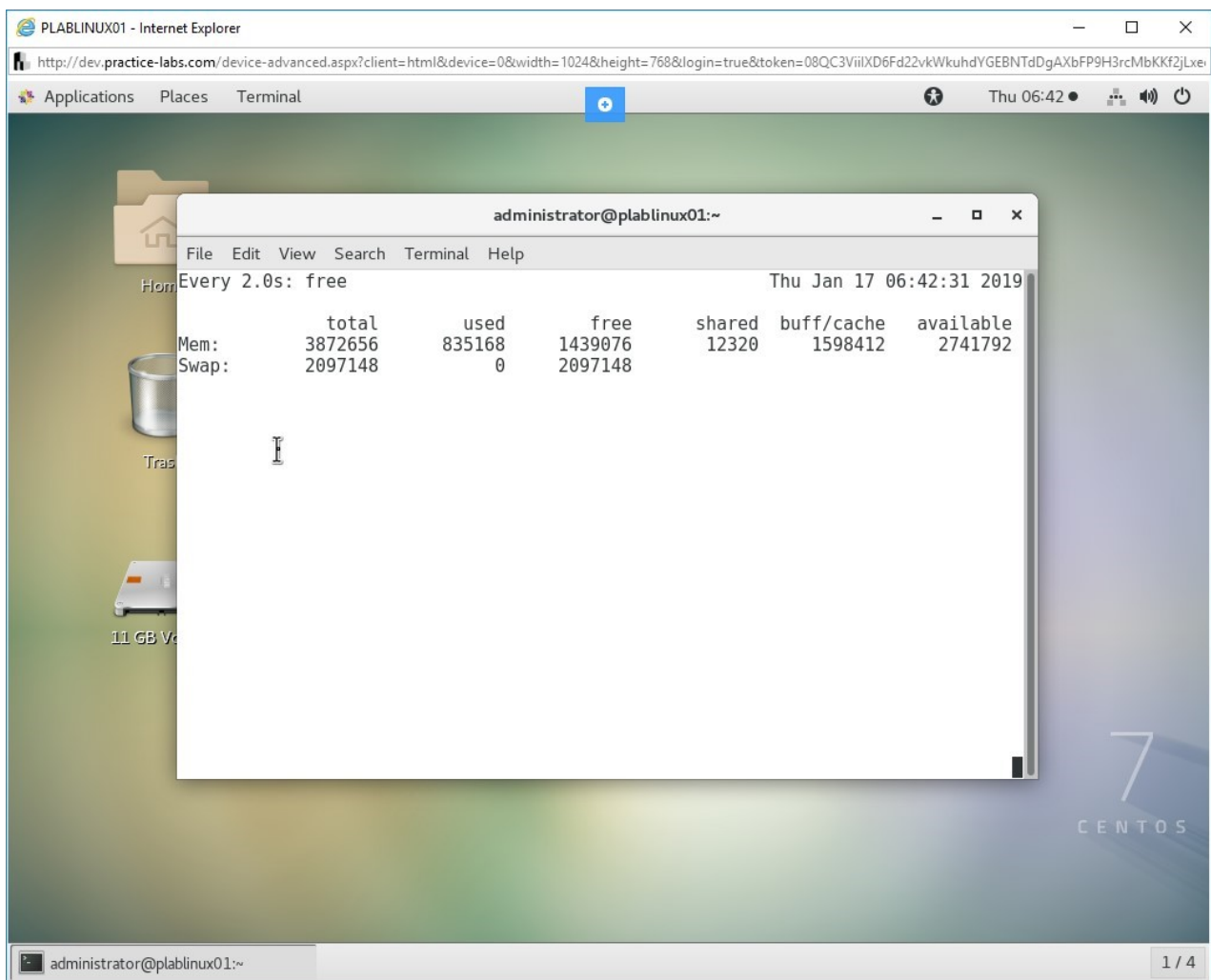


Figure 1.19 Screenshot of PLABLINUX01: Displaying the current memory usage.

Task 3 - Use the swapon and swapoff Commands

Memory issues are likely to arise in any server. Linux is no different. There will be programs that are memory hungry and eat up the server memory. You can clear the RAM cache.

In this task, you will learn to use swap on and swap off. To do this, perform the following steps:

Step 1

Clear the screen by entering the following command:

```
clear
```

The command prompt window is displayed. Type the following command:

```
su -
```

Press **Enter**.

At the **Password** prompt, type the following password:

Passw0rd

Press **Enter**.

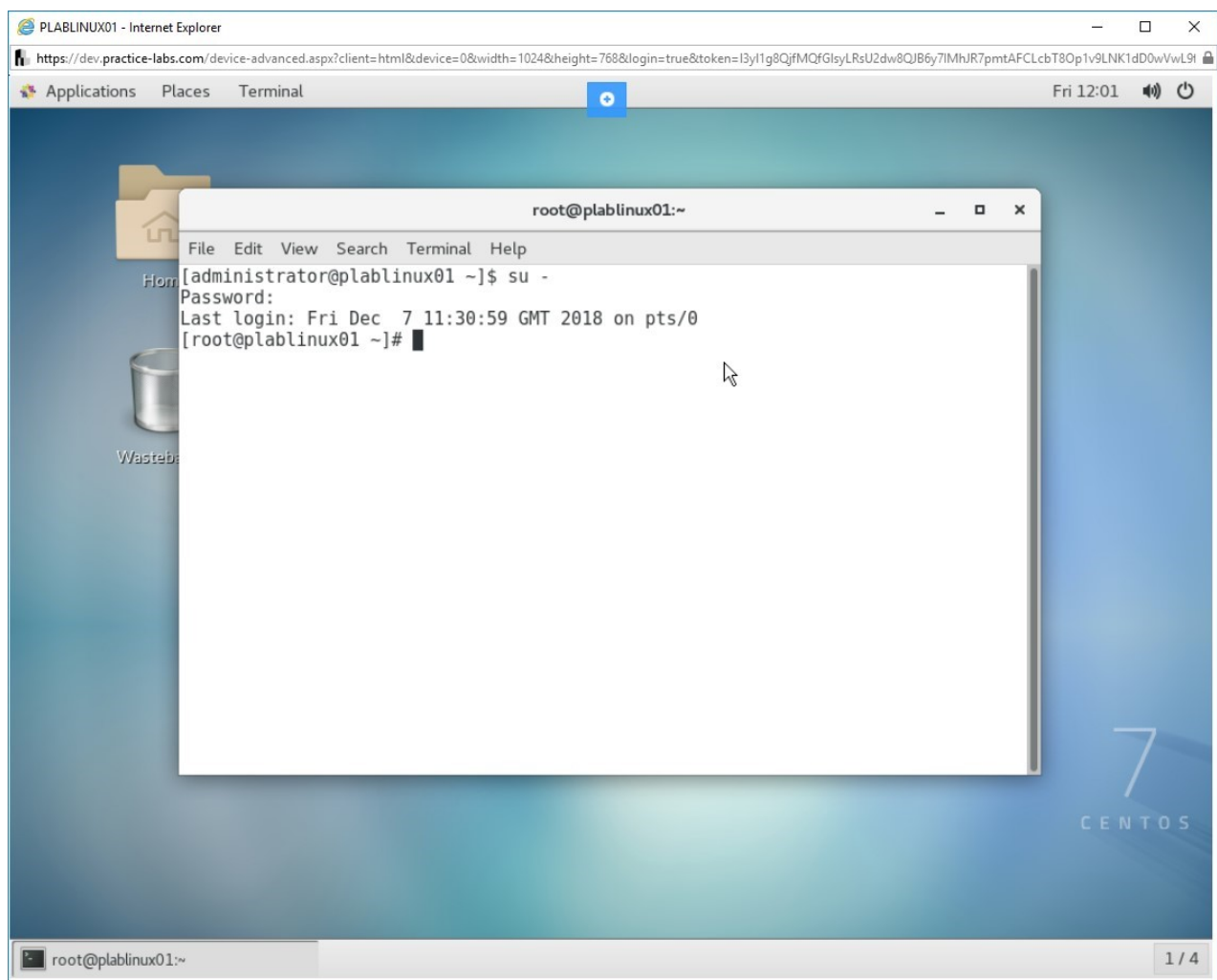


Figure 1.20 Screenshot of PLABLINUX01: Changing the account to the root account with the su command.

Step 2

Clear the screen by entering the following command:

clear

Type the following command to clear the PageCache:

```
sync; echo 1 > /proc/sys/vm/drop_caches
```

Press **Enter**. PageCache is now cleared. There is no output displayed.

Note: the *sync* command clears the filesystem buffer. The *echo 1* command clears the PageCache. The *echo 2* command clears the dentries and inodes. Avoid using the *echo 3* command as it clears PageCache, dentries, and inodes.

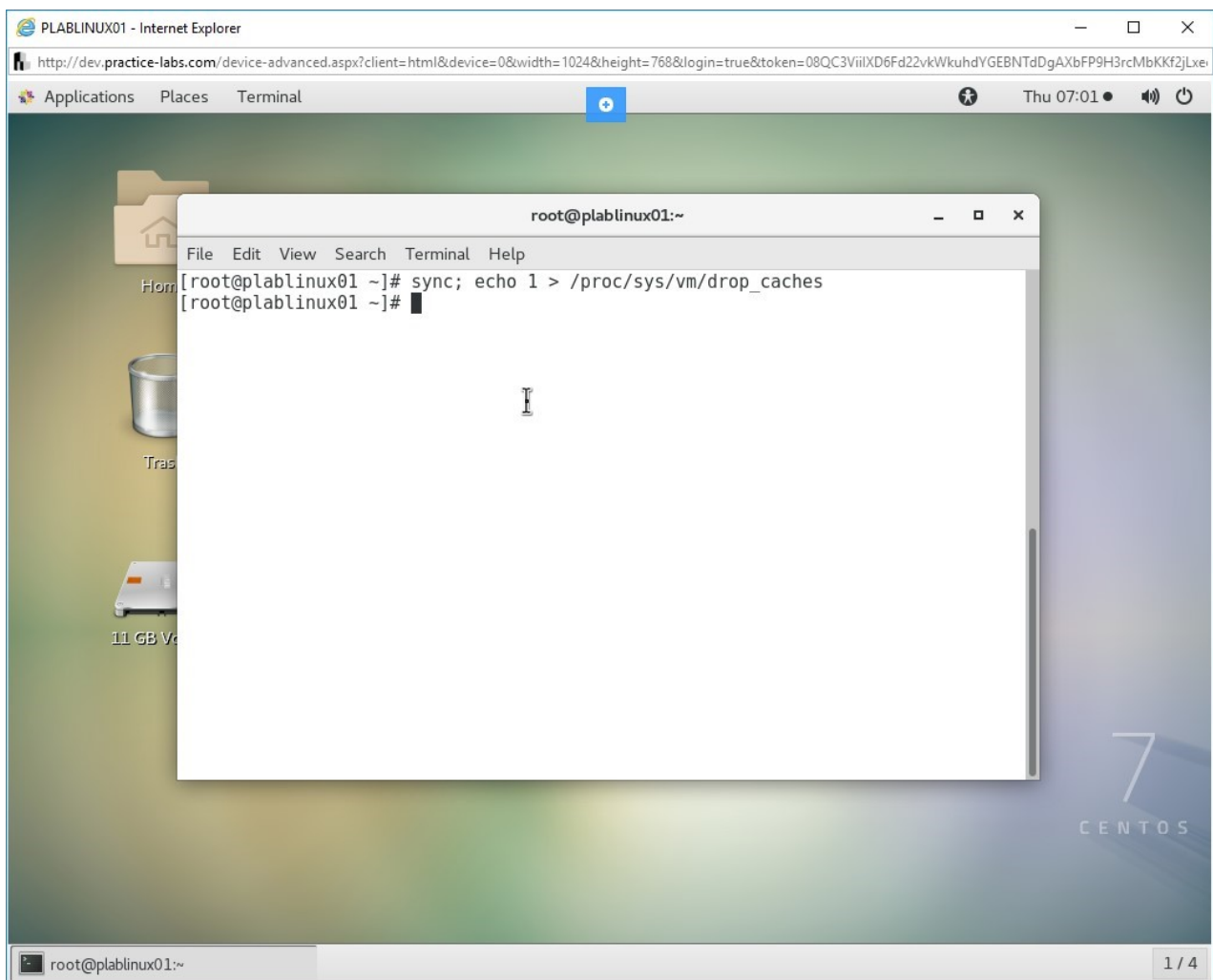


Figure 1.21 Screenshot of PLABLINUX01: Clearing the PageCache.

Step 3

Type the following command to clear the dentries and inodes:

```
sync; echo 2 > /proc/sys/vm/drop_caches
```

Press **Enter**. The dentries and inodes are now cleared. There is no output displayed.

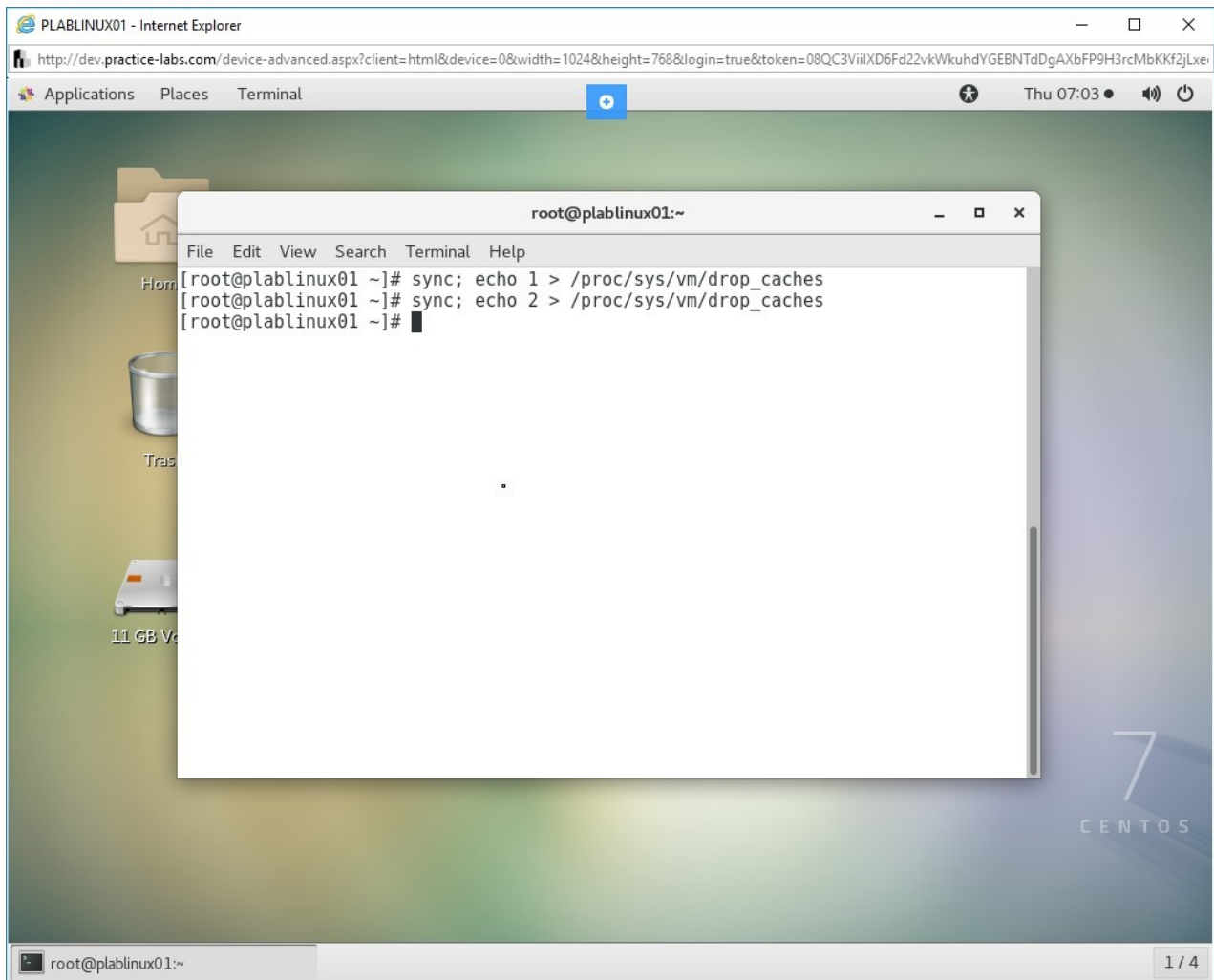


Figure 1.22 Screenshot of PLABLINUX01: Clearing the dentries and inodes.

Step 4

Type the following command to clear the PageCache, dentries, and inodes:

```
sync; echo 3 > /proc/sys/vm/drop_caches
```

Press **Enter**. The PageCache, dentries, and inodes are now cleared. There is no output displayed.

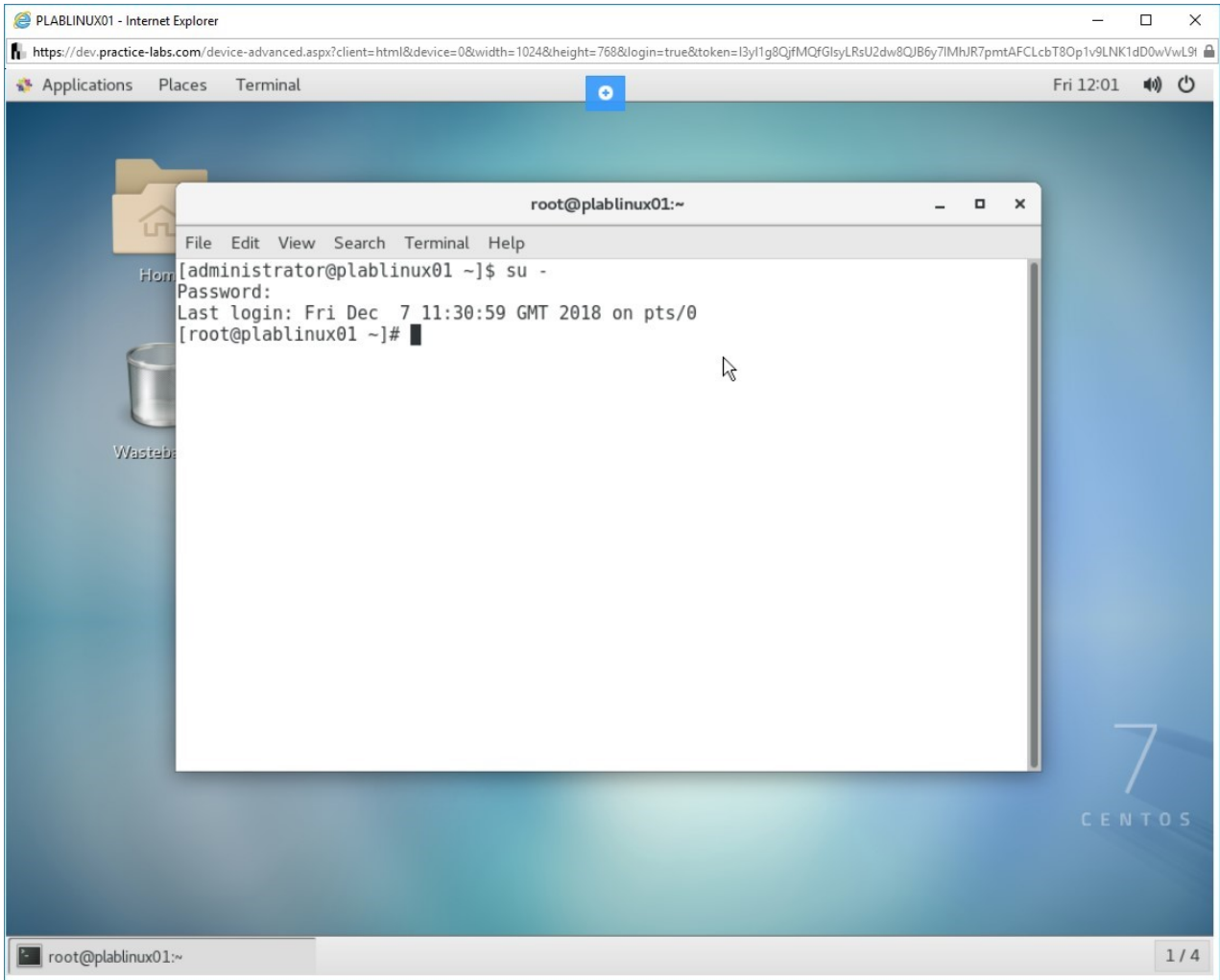


Figure 1.23 Screenshot of PLABLINUX01: Clearing the PageCache, dentries, and inodes.

Step 5

Type the following command to clear the swap space:

```
swapoff -a && swapon -a
```

Press **Enter**.

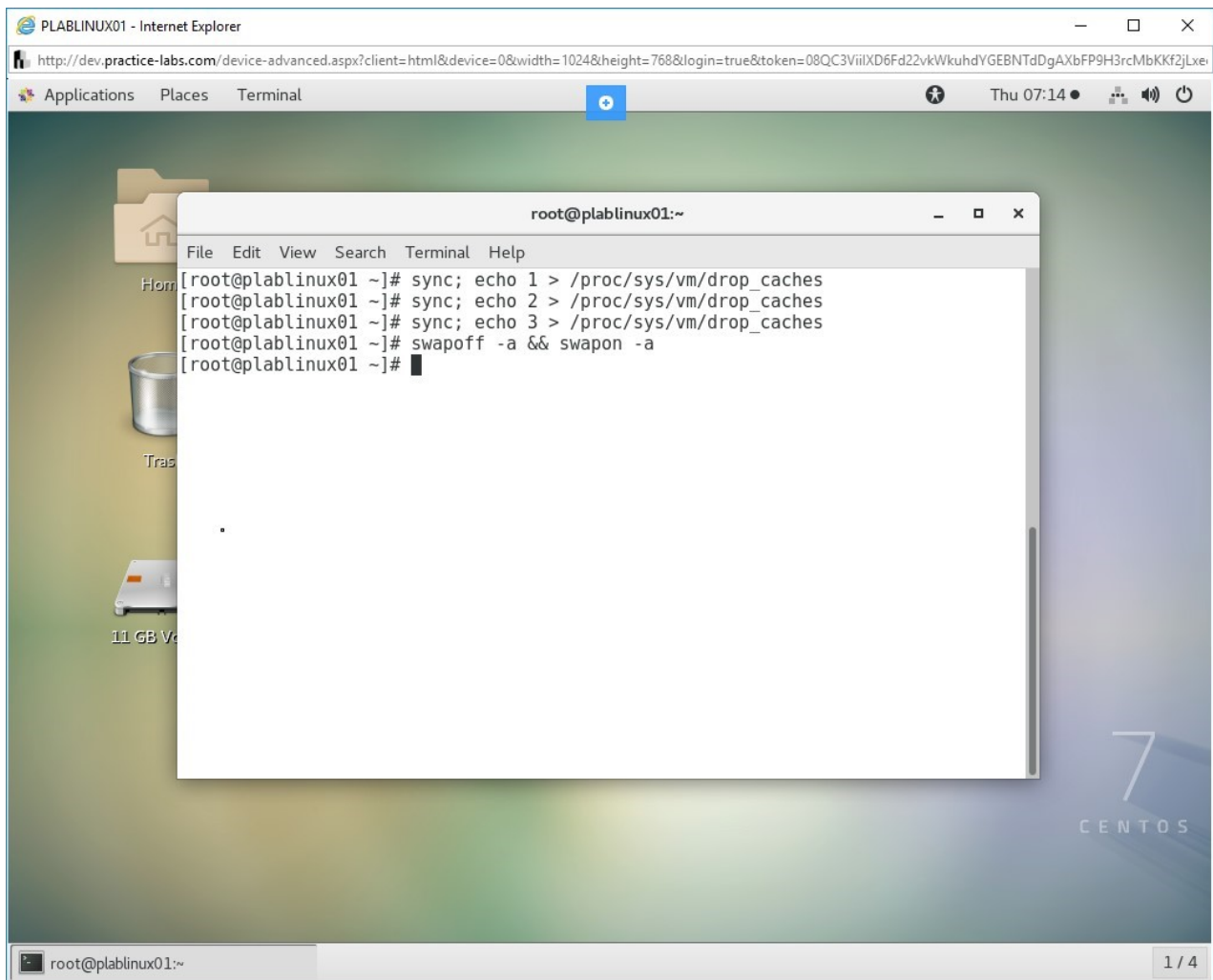


Figure 1.24 Screenshot of PLABLINUX01: Clearing the swap space.

Task 4 - Configure the Out of Memory Killer

In a Linux system, the kernel is responsible for allocating memory based on the demands received from the applications. The Linux kernel overcommits the memory across applications. For example, if the server has 4 GB of memory, the Linux kernel will overcommit much more than the actual memory. In a scenario, where applications start using their committed memory, The overcommitted memory is much

In this task, you will learn to configure the Out of Memory (OOM) Killer. To configure OOM Killer, perform the following steps:

Step 1

Clear the screen by entering the following command:

```
clear
```

Type the following commands:

```
sysctl vm.panic_on_oom=1
sysctl kernel.panic=5
echo "vm.panic_on_oom=1" >> /etc/sysctl.conf
echo "kernel.panic=5" >> /etc/sysctl.conf
```

Press **Enter** after each command. The **sysctl** commands will set it in real time. The settings will be appended to the **sysctl.conf** file. The **kernel.panic** setting defines the number of seconds before the system can reboot.

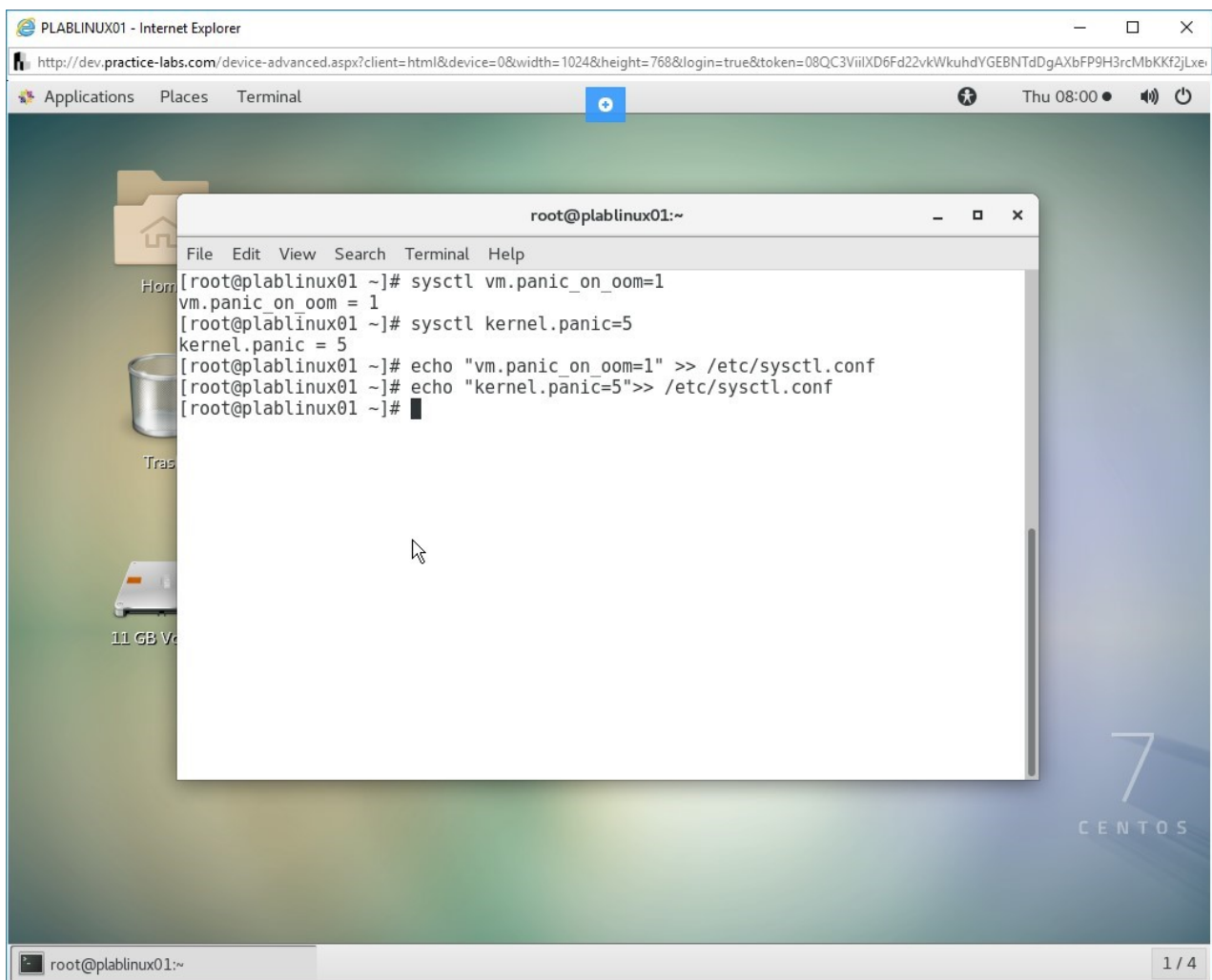


Figure 1.25 Screenshot of PLABLINUX01: Configuring OOM.

Step 2

Clear the screen by entering the following command:

clear

To disable OOM, type the following commands:

```
sysctl vm.overcommit_memory=2  
echo "vm.overcommit_memory=2" >> /etc/sysctl.conf
```

Press **Enter** after each command.

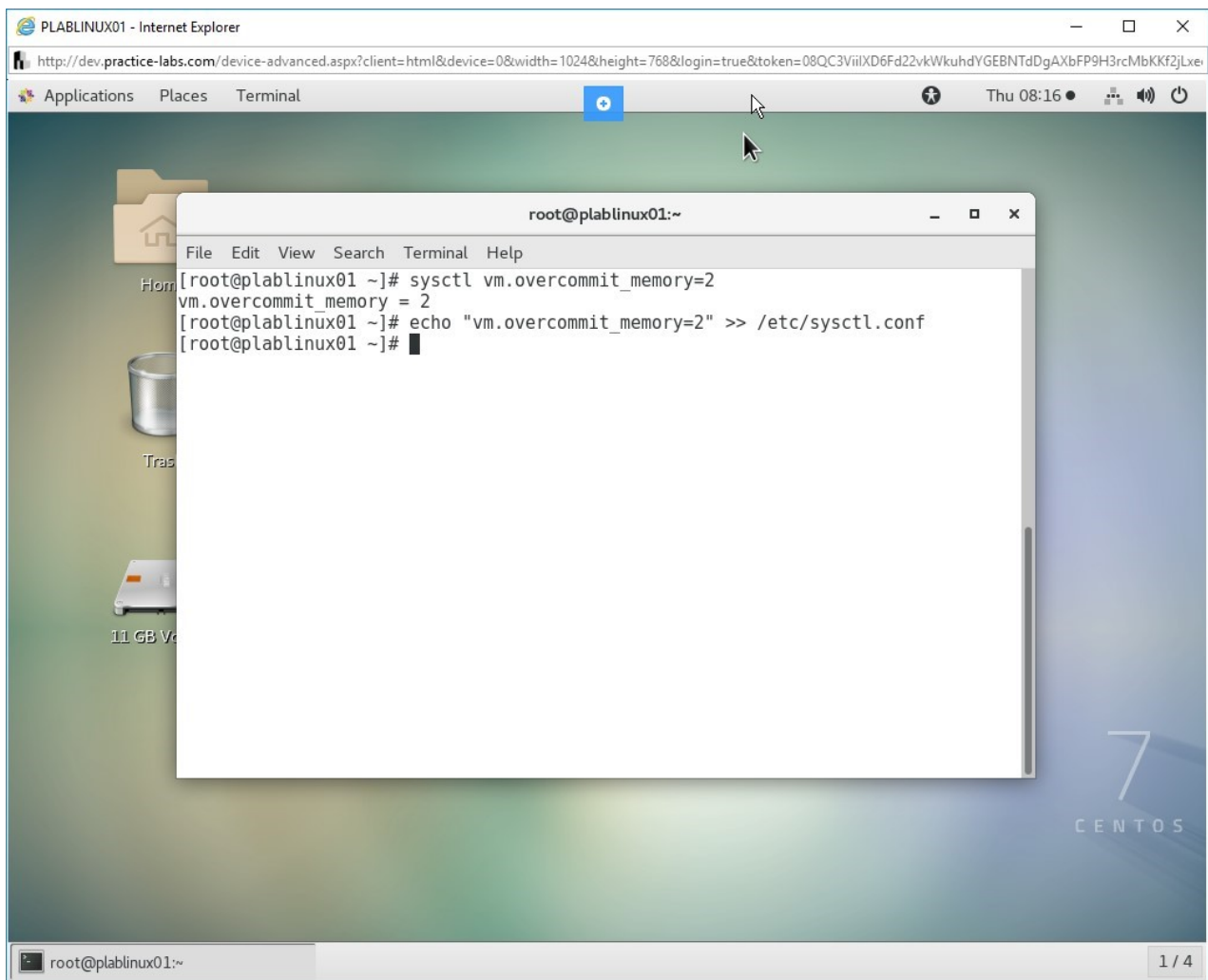


Figure 1.26 Screenshot of PLABLINUX01: Disabling OOM.

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

Review

Well done, you have completed the **Perform Memory Monitoring and Configuration** Practice Lab.

Summary

You completed the following exercise:

- Exercise 1 - Perform Memory Monitoring

You should now be able to:

- View virtual memory statistics using vmstat
- Verify the free and use memory for both physical and swap memory
- Use the swapon and swapoff commands
- Configure the Out of Memory killer

Feedback

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