CompTIA Linux+

Manage File and Directory Permissions

Introduction

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

Directory
Permissions
Files

Learning Outcomes

In this module, you will complete the following exercise:

- Exercise 1 - Manage File and Directory Permissions

After completing this lab, you will be able to:

- Set Access Modes
- Work with Immutable Files

Exam Objectives

The following exam objectives are covered in this lab:

- **LPI:** 104.5 Manage file permissions and ownership
- **CompTIA:** 4.3 Given a scenario, analyze and troubleshoot user issues.

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.

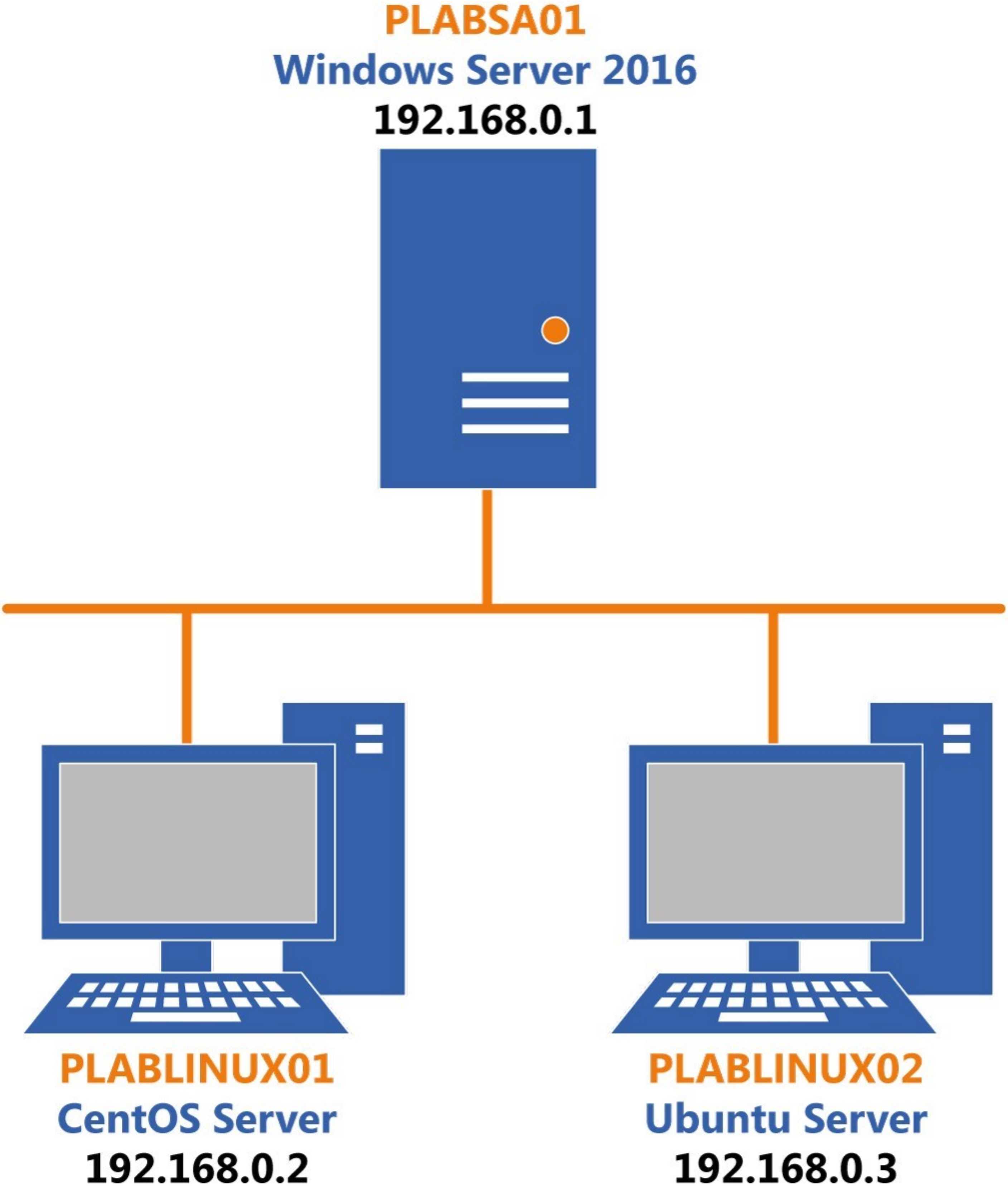
Help and Support

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 - Manage File and Directory Permissions

When a user logs in a Linux system, a new shell process starts, which runs with the user's user and group IDs. Each user account has permissions that can access only certain files and the files the user creates. The user cannot access files that either belongs to other users or they are system files. The applications that a user starts, it inherits the user id and therefore, has access only to the files and objects on which the user has access. Any object on which the user does not have access, the application, which the user is running, does not have access.

In this exercise, you will manage file and directory permissions.

Learning Outcomes

After completing this exercise, you will be able to:

- Log into a Linux System
- Set Access Modes
- Work with Immutable Files

Your Devices

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

- **PLABLINUX01** (CentOS Server)

Task 1 - Set Access Modes

Permissions in Linux have two special access modes:

- suid (set user id)
- sgid (set group id)

When an executable program has the suid access modes set, it will run as if it had been started by the file's owner, rather than by the user who really started it. Similarly, with the sgid access modes set, the program will run as if the initiating user belonged to the file's group rather than to his own group. Either or both access modes may be set.

In this task, you will set access modes.

To set access modes, perform the following steps:

Step 1

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

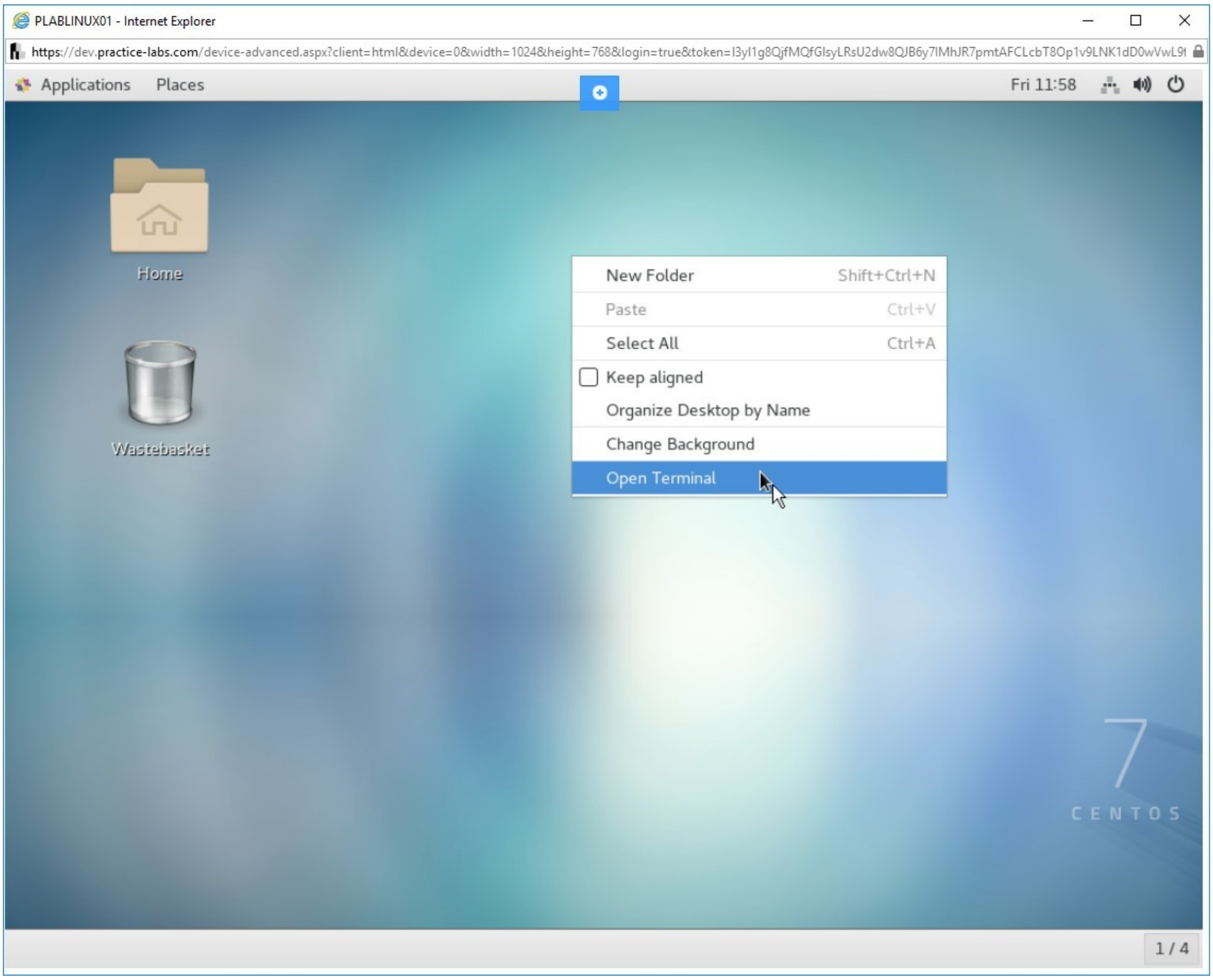

PLABLINUX01 - Internet Explorer
https://dev.practice-labs.com/device-advanced.aspx?client=html&device=0&width=1024&height=768&login=true&token=I3yl1g8QjfMQfGlsyLRsU2dw8QJB6y7IMhJR7pmtAFCLcbT8Op1v9LNK1dD0wVwL9t
Applications
Places
Fri 11:58
Home
Wastebasket
New Folder Shift+Ctrl+N
Paste Ctrl+V
Select All Ctrl+A
Keep aligned
Organize Desktop by Name
Change Background
Open Terminal
7
CENTOS
1 / 4

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

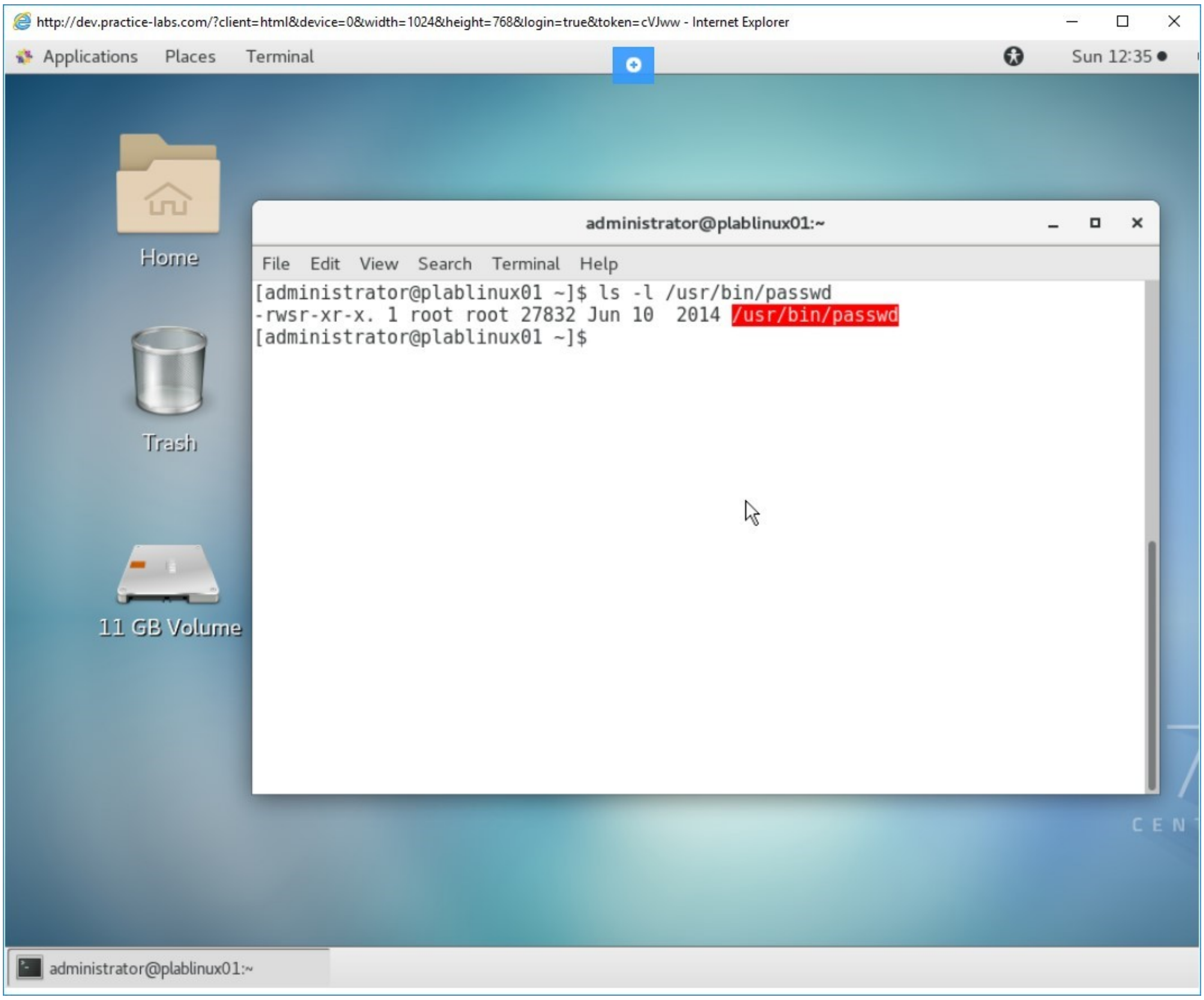
Step 2

The terminal window is displayed.

To list the **suid** access mode on **/usr/bin/passwd**, type the following command:

```
ls -l /usr/bin/passwd
```

Press **Enter**. Notice that the user permissions do not contain the **execute** (**x**) permission. Rather, there is an **s**, which indicates that the **suid** and **executable** bits are defined for this executable. When a user needs to run **passwd**, it executes as if the **root** user had executed it.



http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=cVJww - Internet Explorer
Applications
Places
Terminal
Sun 12:35
Home
Trash
11 GB Volume
administrator@plablinux01:~
File
Edit
View
Search
Terminal
Help
administrator@plablinux01:~

```
[administrator@plablinux01 ~]$ ls -l /usr/bin/passwd
-rwsr-xr-x. 1 root root 27832 Jun 10  2014 /usr/bin/passwd
[administrator@plablinux01 ~]$
```

Figure 1.2 Screenshot of PLABLINUX01: Listing the suid mode on the /usr/bin/passwd file.

Step 3

You can set the **suid** and **sgid** bits. This is done by adding the **s**.

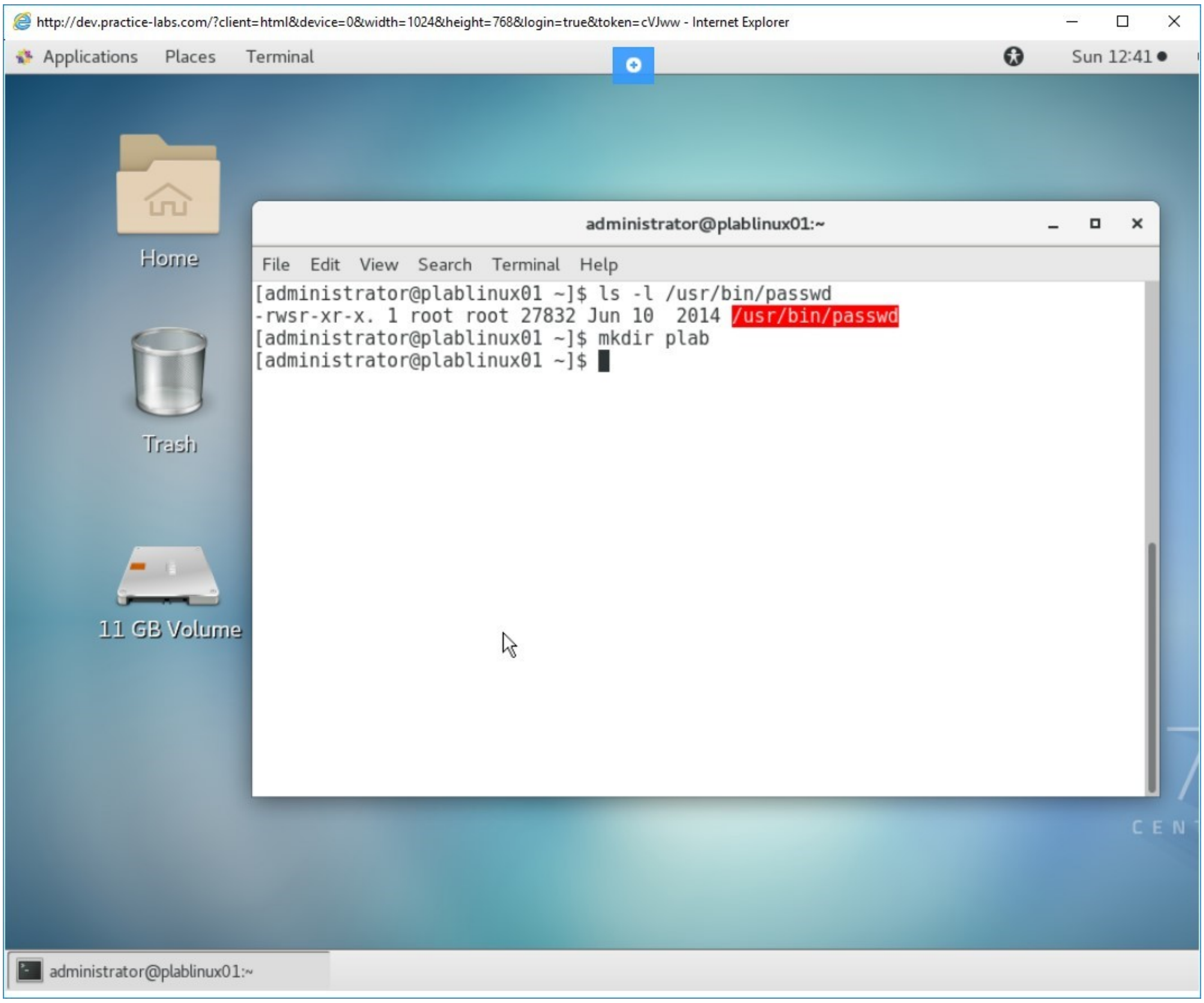
> ***Note:*** *suid has the value 4 and sgid has the value 2.*

Any directory that has sgid mode enabled, all files and subdirectories will inherit the group ID of the directory.

Let’s first create a directory. Type the following command:

```
mkdir plab
```

Press **Enter**.



http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=cVJww - Internet Explorer
Applications
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Trash
11 GB Volume
administrator@plablinux01:~
File
Edit
View
Search
Terminal
Help
administrator@plablinux01:~

```
[administrator@plablinux01 ~]$ ls -l /usr/bin/passwd
-rwsr-xr-x. 1 root root 27832 Jun 10  2014 /usr/bin/passwd
[administrator@plablinux01 ~]$ mkdir plab
[administrator@plablinux01 ~]$ 
```

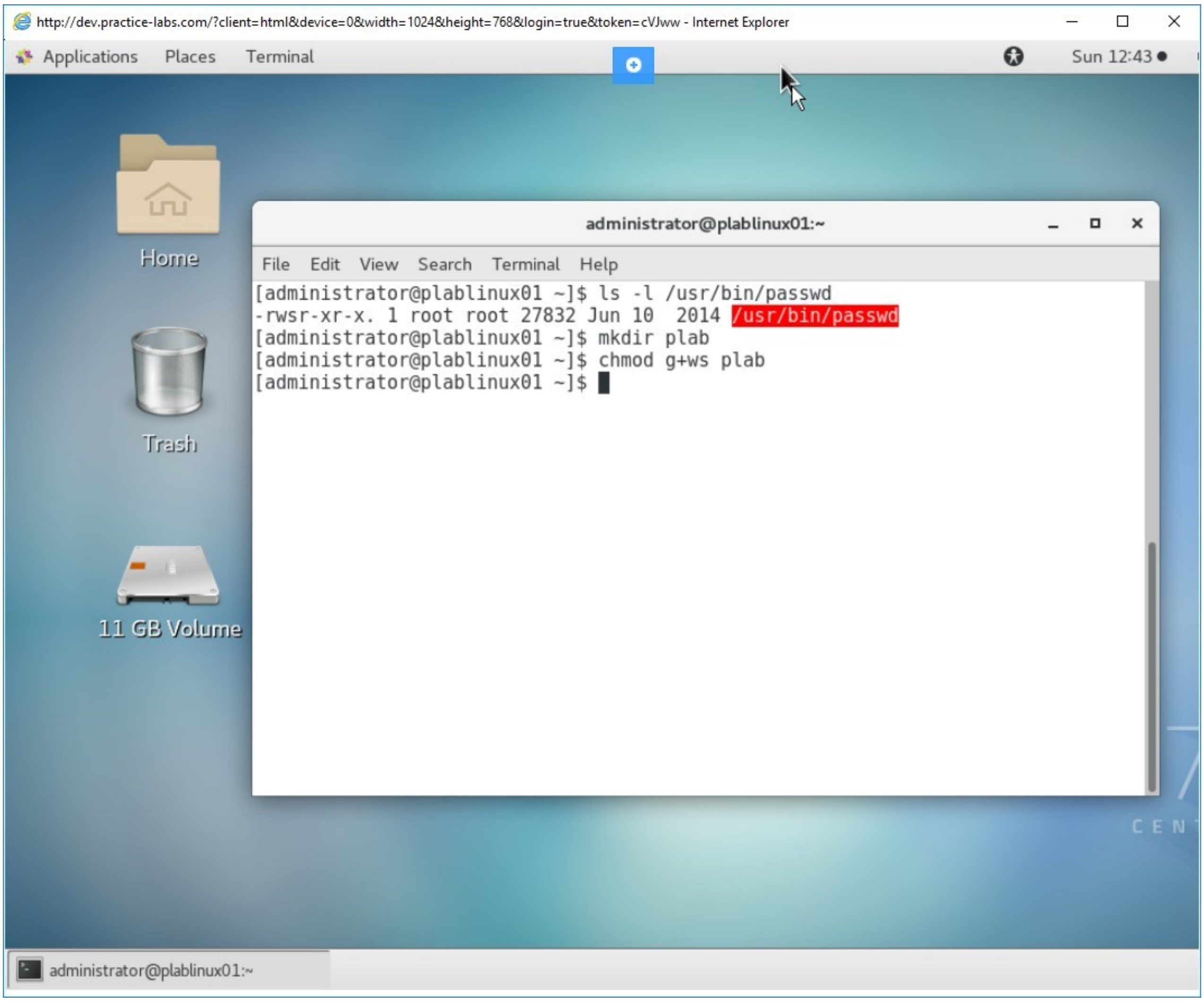
Figure 1.3 Screenshot of PLABLINUX01: Creating a new directory.

Step 4

To assign **sgid**, type the following command:

```
chmod g+ws plab
```

Press **Enter**.



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Applications
Places
Terminal
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Home
Trash
11 GB Volume
administrator@plablinux01:~
File
Edit
View
Search
Terminal
Help
administrator@plablinux01:~

```
[administrator@plablinux01 ~]$ ls -l /usr/bin/passwd
-rwsr-xr-x. 1 root root 27832 Jun 10  2014 /usr/bin/passwd
[administrator@plablinux01 ~]$ mkdir plab
[administrator@plablinux01 ~]$ chmod g+ws plab
[administrator@plablinux01 ~]$ 
```

Figure 1.4 Screenshot of PLABLINUX01: Assigning the sgid on the newly created directory.

Step 5

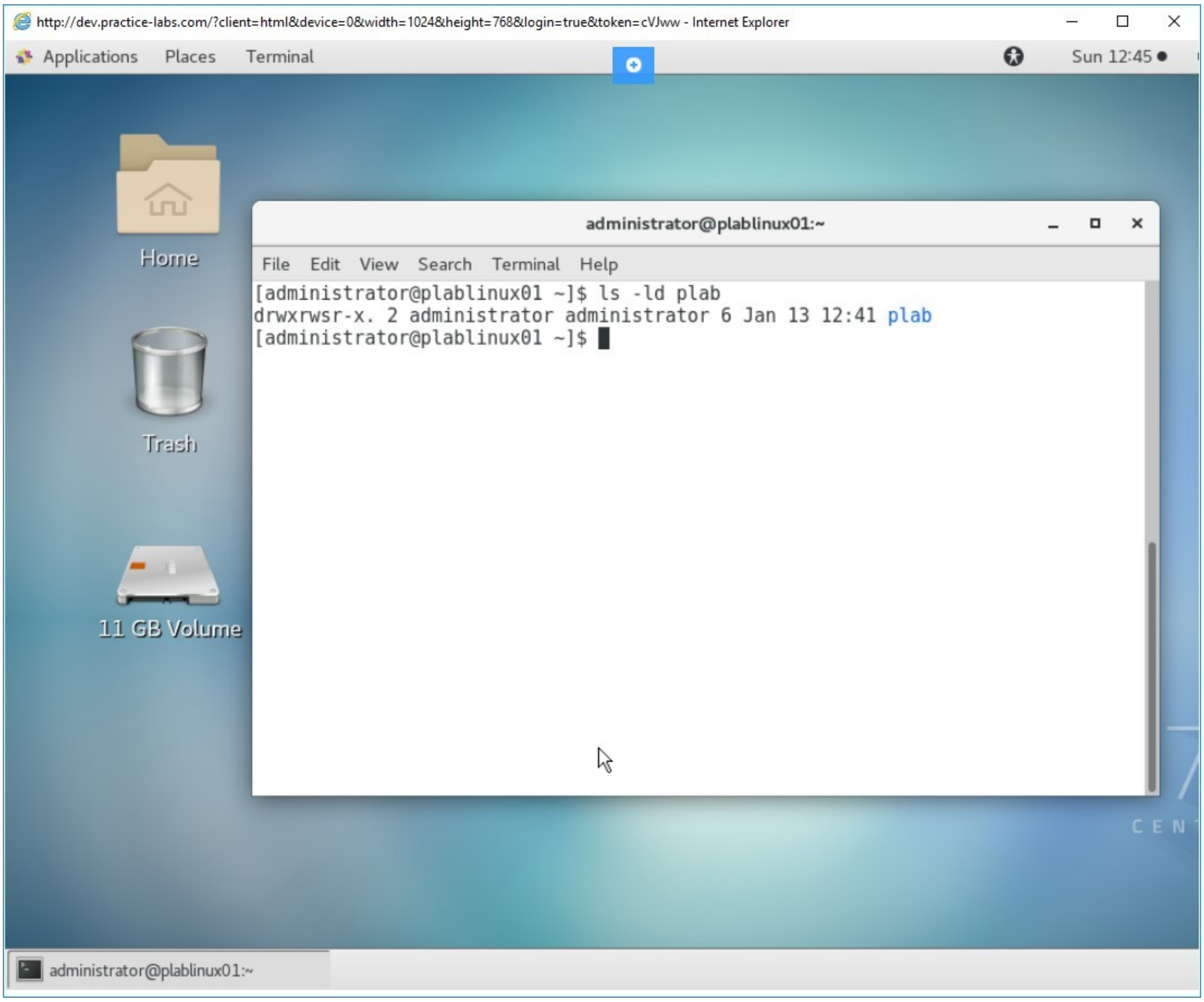
Clear the screen by entering the following command:

```
clear
```

To view the assigned **sgid**, type the following command:

```
ls -ld plab
```

Press **Enter**.


http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=cVJww - Internet Explorer
Applications
Places
Terminal
Sun 12:45
Home
Trash
11 GB Volume
administrator@plablinux01:~
File
Edit
View
Search
Terminal
Help
administrator@plablinux01:~

```
[administrator@plablinux01 ~]$ ls -ld plab
drwxrwsr-x. 2 administrator administrator 6 Jan 13 12:41 plab
[administrator@plablinux01 ~]$
```

Figure 1.5 Screenshot of PLABLINUX01: Viewing the assigned sgid on the directory.

Step 6

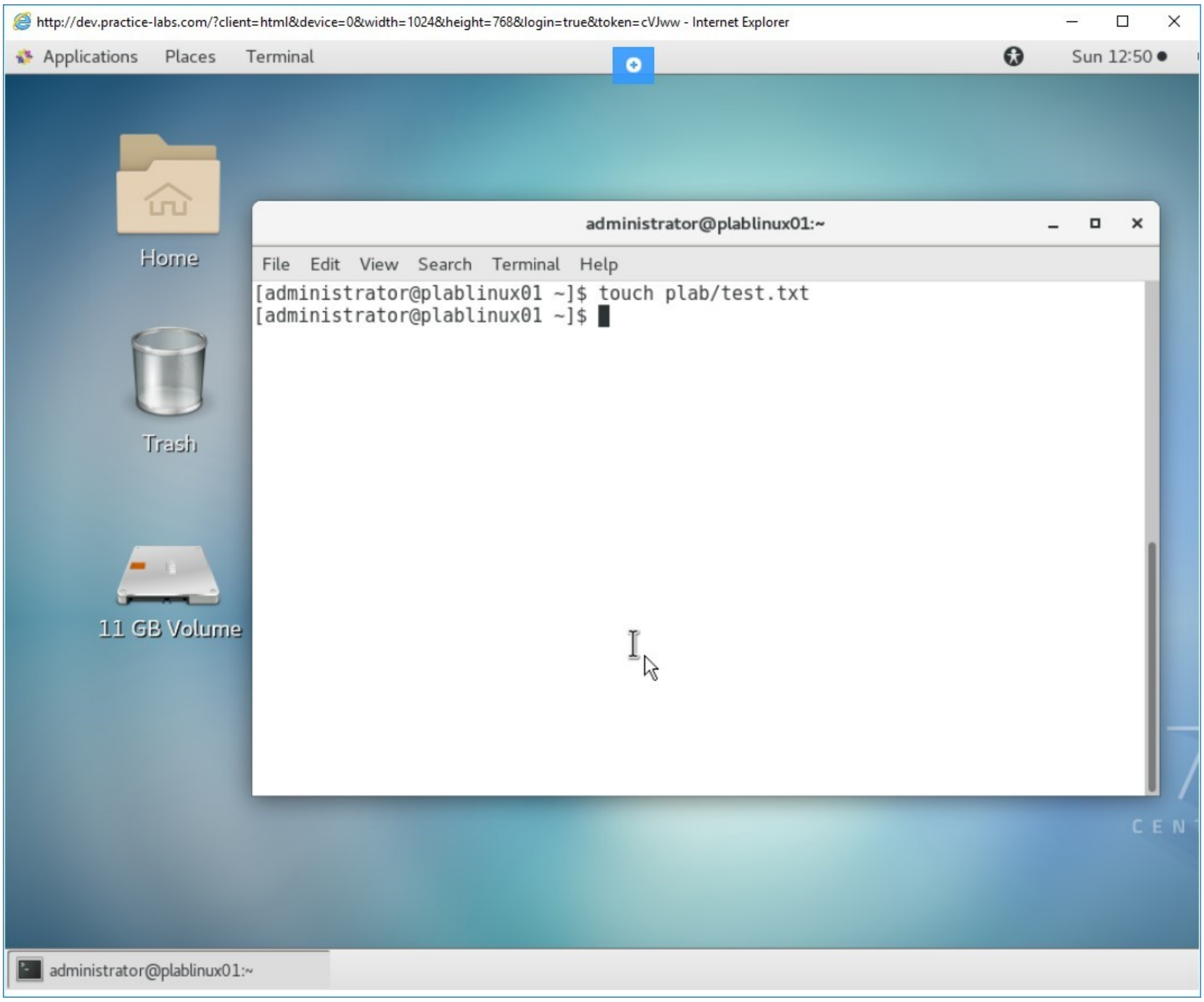
Clear the screen by entering the following command:

```
clear
```

To create a file, type the following command:

```
touch plab/test.txt
```

Press **Enter**.


http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=cVJww - Internet Explorer
Applications
Places
Terminal
Sun 12:50
Home
Trash
11 GB Volume
administrator@plablinux01:~
File
Edit
View
Search
Terminal
Help
administrator@plablinux01:~

```
[administrator@plablinux01 ~]$ touch plab/test.txt
[administrator@plablinux01 ~]$ 
```

Figure 1.6 Screenshot of PLABLINUX01: Creating a file in the plab directory.

Step 7

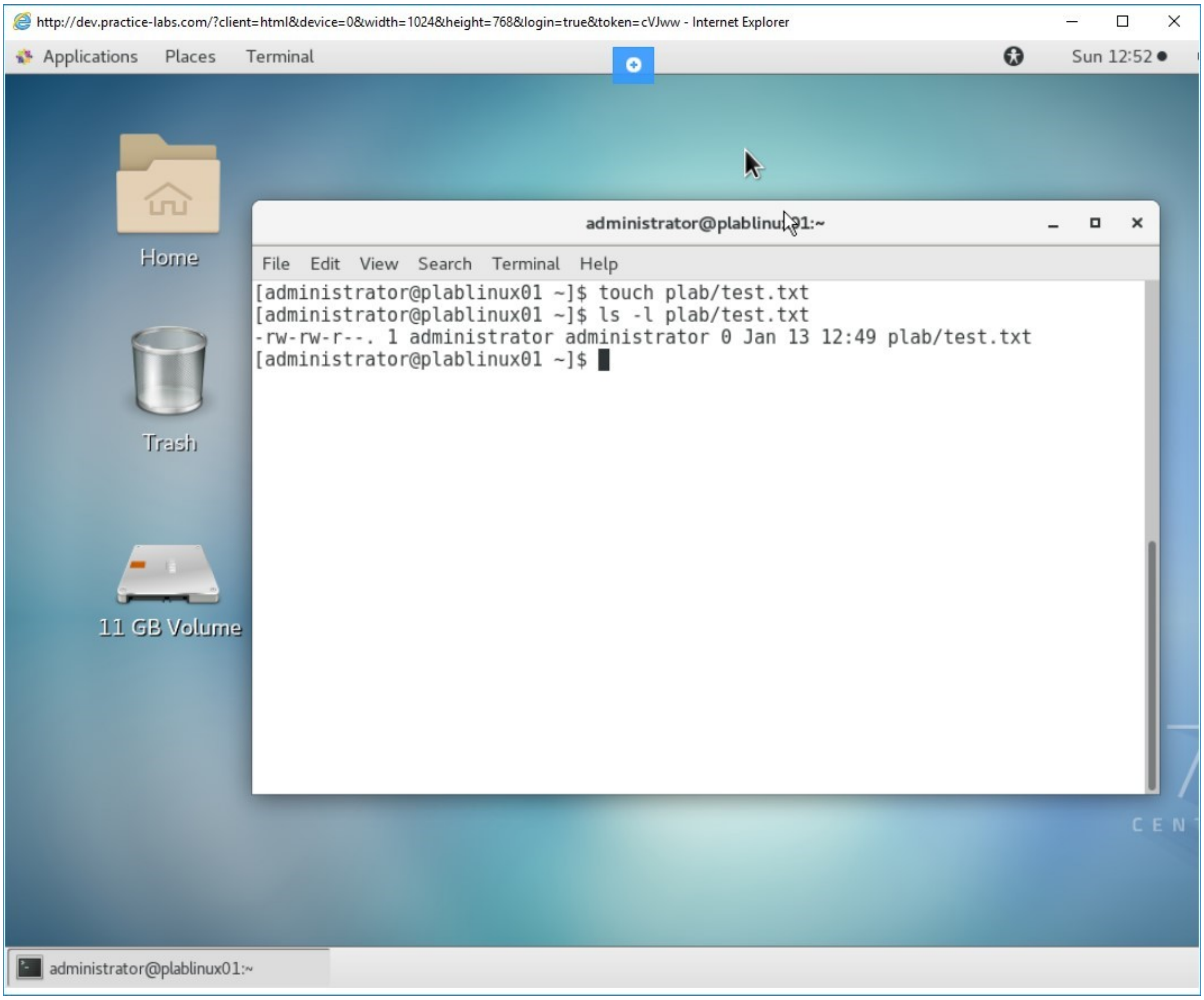
Clear the screen by entering the following command:

```
clear
```

To verify the permissions of the file, type the following command:

```
ls -l plab/test.txt
```

Press **Enter**.



http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=cVJww - Internet Explorer
Applications
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Terminal
Sun 12:52 ●
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Trash
11 GB Volume
administrator@plablinux01:~
File
Edit
View
Search
Terminal
Help
administrator@plablinux01:~

```
[administrator@plablinux01 ~]$ touch plab/test.txt
[administrator@plablinux01 ~]$ ls -l plab/test.txt
-rw-rw-r--. 1 administrator administrator 0 Jan 13 12:49 plab/test.txt
[administrator@plablinux01 ~]$
```

Figure 1.7 Screenshot of PLABLINUX01: Verifying the permissions of the newly created file.

Step 8

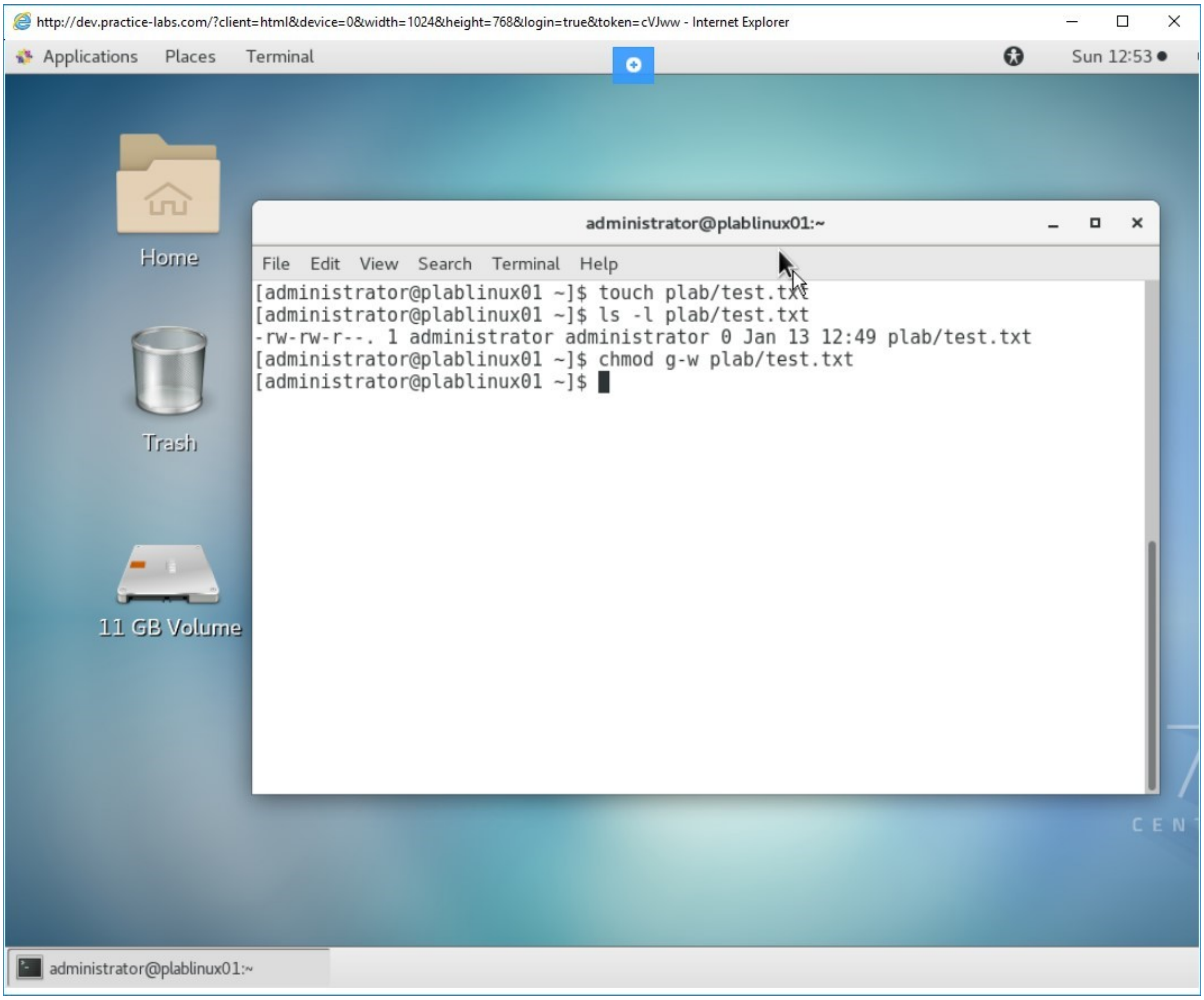
Clear the screen by entering the following command:

```
clear
```

To remove the write permissions for the group, type the following command:

```
chmod g-w plab/test.txt
```

Press **Enter**.



http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=cVJww - Internet Explorer
Applications
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Trash
11 GB Volume
administrator@plablinux01:~
File
Edit
View
Search
Terminal
Help
administrator@plablinux01:~

```
[administrator@plablinux01 ~]$ touch plab/test.txt
[administrator@plablinux01 ~]$ ls -l plab/test.txt
-rw-rw-r--. 1 administrator administrator 0 Jan 13 12:49 plab/test.txt
[administrator@plablinux01 ~]$ chmod g-w plab/test.txt
[administrator@plablinux01 ~]$ 
```

Figure 1.8 Screenshot of PLABLINUX01: Removing the permission for the group.

Step 9

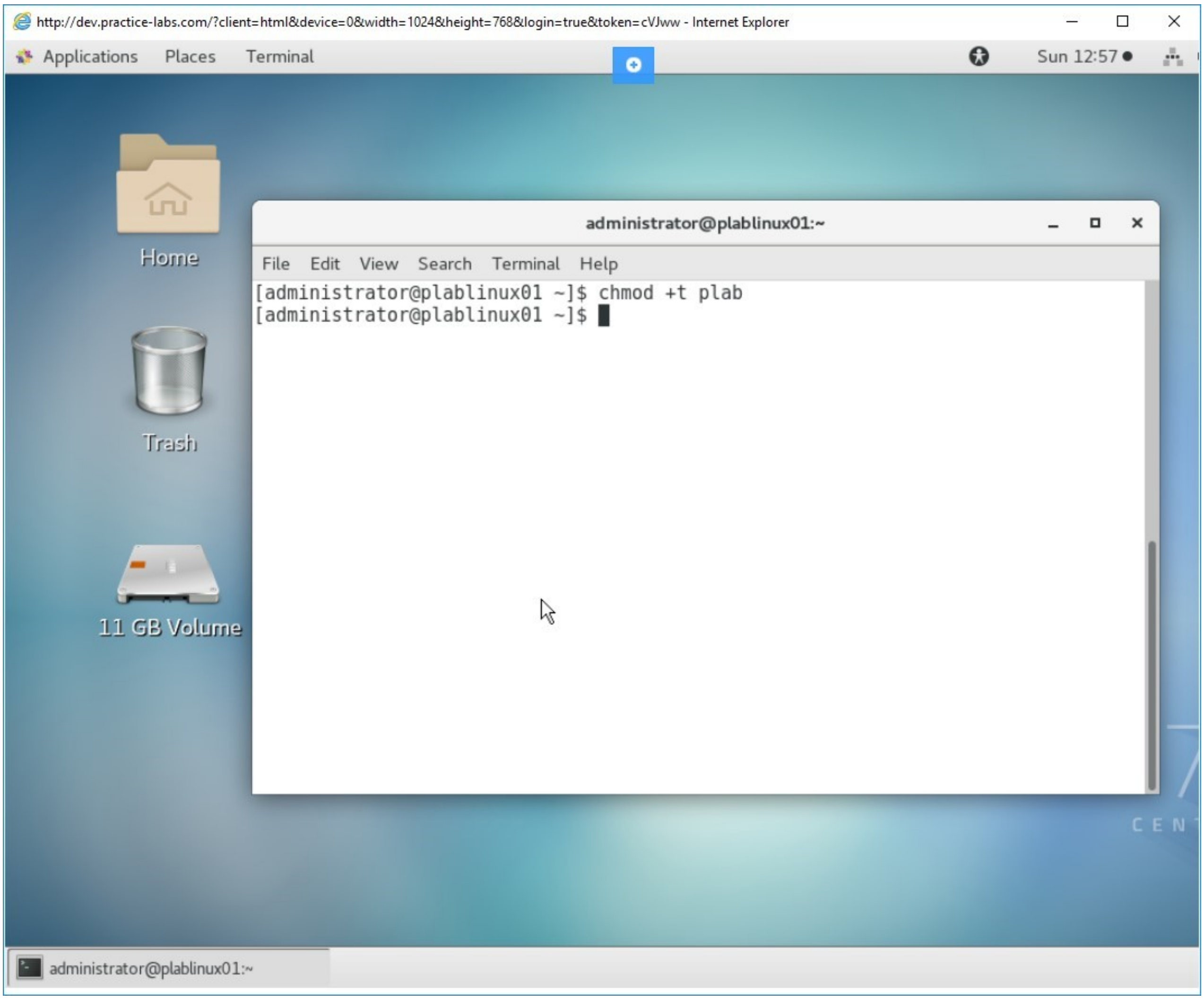
Clear the screen by entering the following command:

```
clear
```

To assign a sticky bit, type the following command:

```
chmod +t plab
```

Press **Enter**.



http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=cVJww - Internet Explorer
Applications
Places
Terminal
Sun 12:57 ●
Home
Trash
11 GB Volume
administrator@plablinux01:~
File
Edit
View
Search
Terminal
Help
administrator@plablinux01:~

```
[administrator@plablinux01 ~]$ chmod +t plab
[administrator@plablinux01 ~]$
```

Figure 1.9 Screenshot of PLABLINUX01: Assigning the sticky bit on the directory.

Step 10

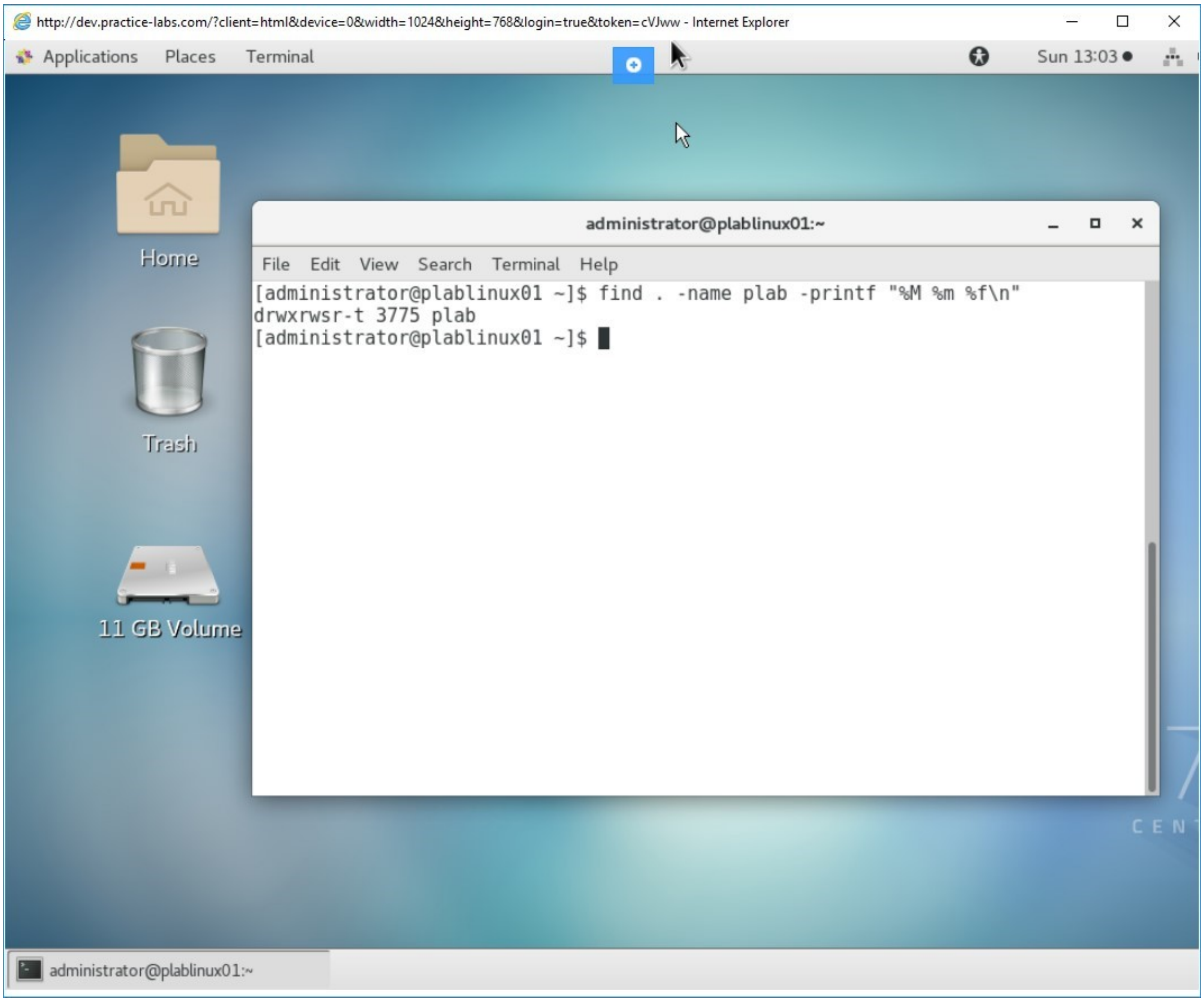
Each of the access modes is represented by symbolic and octal values:

Access mode	Symbolic	Octal
suid	s with u	4000
sgid	s with g	2000
sticky	t	1000

To print the symbolic and octal values, type the following command:

```
find . -name plab -printf “%M %m %f\n”
```

Press **Enter**.


http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=cVJww - Internet Explorer
Applications
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Terminal
Sun 13:03 ●
Home
Trash
11 GB Volume
administrator@plablinux01:~
File
Edit
View
Search
Terminal
Help
administrator@plablinux01:~

```
[administrator@plablinux01 ~]$ find . -name plab -printf "%M %m %f\n"
drwxrwsr-t 3775 plab
[administrator@plablinux01 ~]$
```

Figure 1.10 Screenshot of PLABLINUX01: Viewing the symbolic and octal values of the directory.

Task 2 - Work with Immutable files

Even though access modes and permissions provide great control over files and directories, however, they cannot prevent the accidental deletion of files by the root user. You can set the immutable attribute on files and directories. When this attribute is set, even the root user cannot delete these files and folders.

To set the immutable attribute, perform the following steps:

Step 1

Ensure the terminal window on **PLABLINUX01** is open.

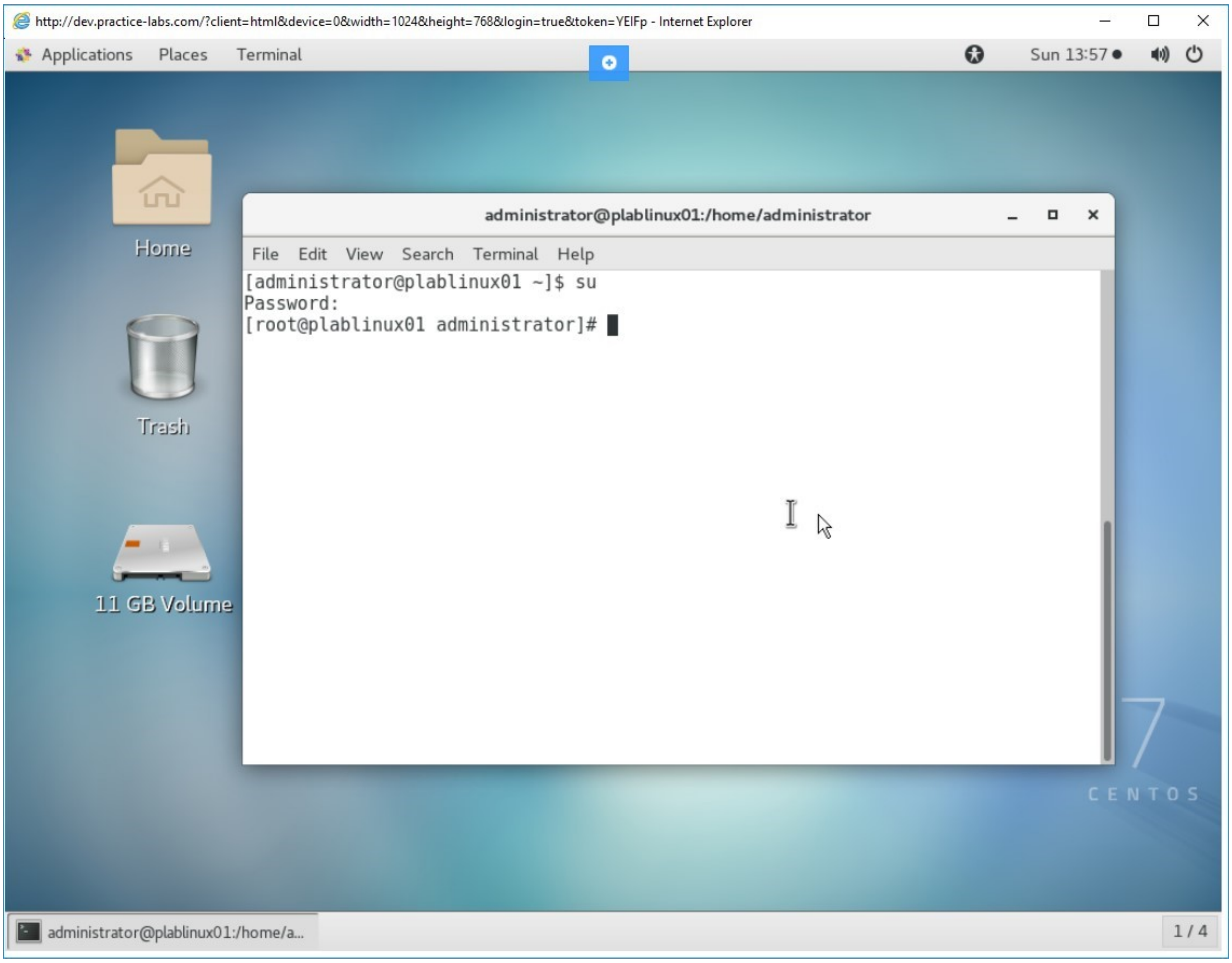
Change to the root user. Type the following command:

```
su
```

Press **Enter**. When prompted, type the following password:

`Passw0rd`

Press **Enter**.



http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=YElFp - Internet Explorer
Applications
Places
Terminal
Sun 13:57 ●
Home
Trash
11 GB Volume
administrator@plablinux01:/home/administrator
File
Edit
View
Search
Terminal
Help
7
CENTOS
administrator@plablinux01:/home/a...
1 / 4

```
[administrator@plablinux01 ~]$ su
Password:
[root@plablinux01 administrator]#
```

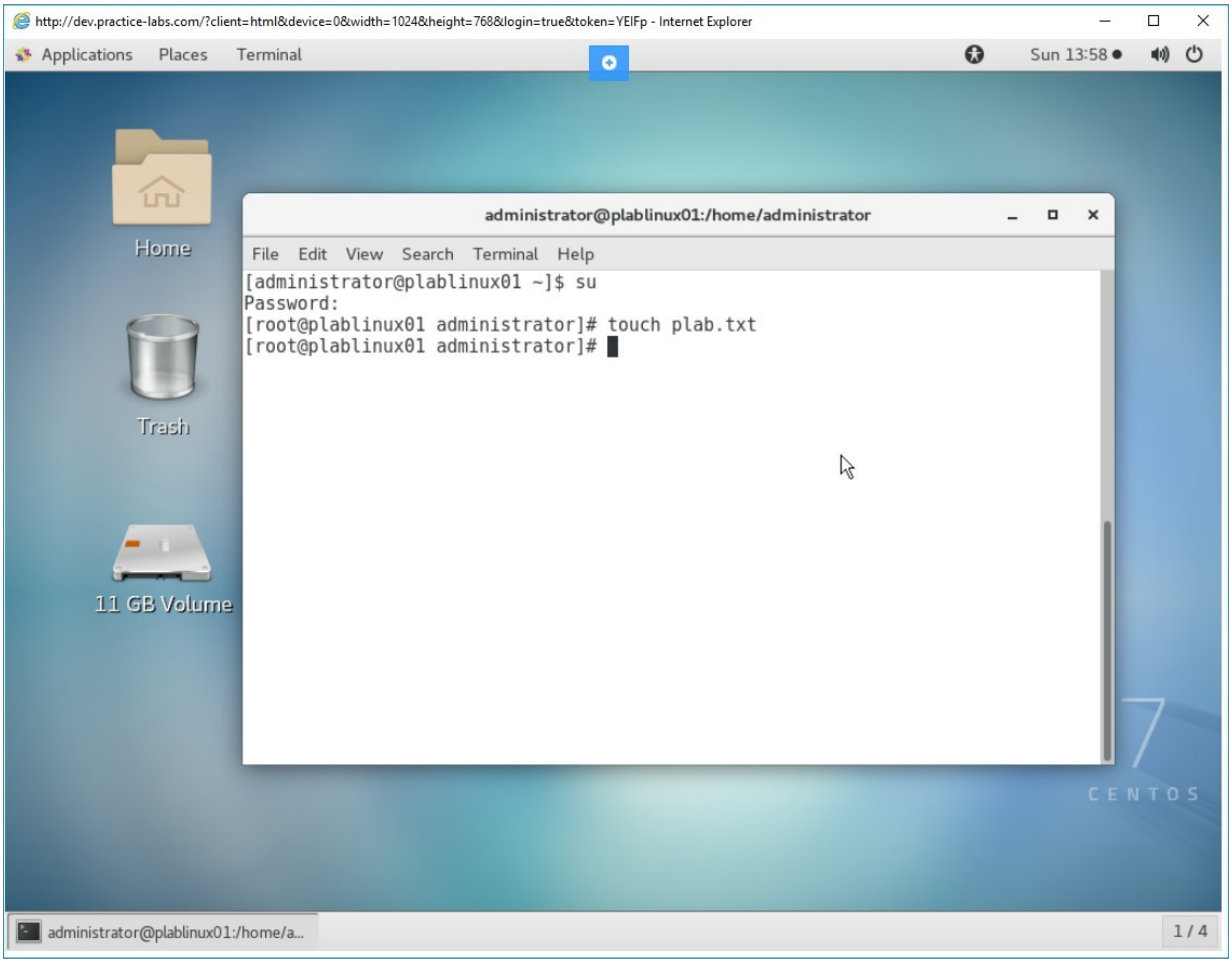
Figure 1.11 Screenshot of PLABLINUX01: Changing to the root user.

Step 2

You need first to create a file. Type the following command:

```
touch plab.txt
```

Press **Enter**.



http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=YEIFp - Internet Explorer
Applications
Places
Terminal
Sun 13:58 ●
Home
Trash
11 GB Volume
administrator@plablinux01:/home/administrator
File
Edit
View
Search
Terminal
Help
7
CENTOS
administrator@plablinux01:/home/a...
1 / 4

```
[administrator@plablinux01 ~]$ su
Password:
[root@plablinux01 administrator]# touch plab.txt
[root@plablinux01 administrator]# 
```

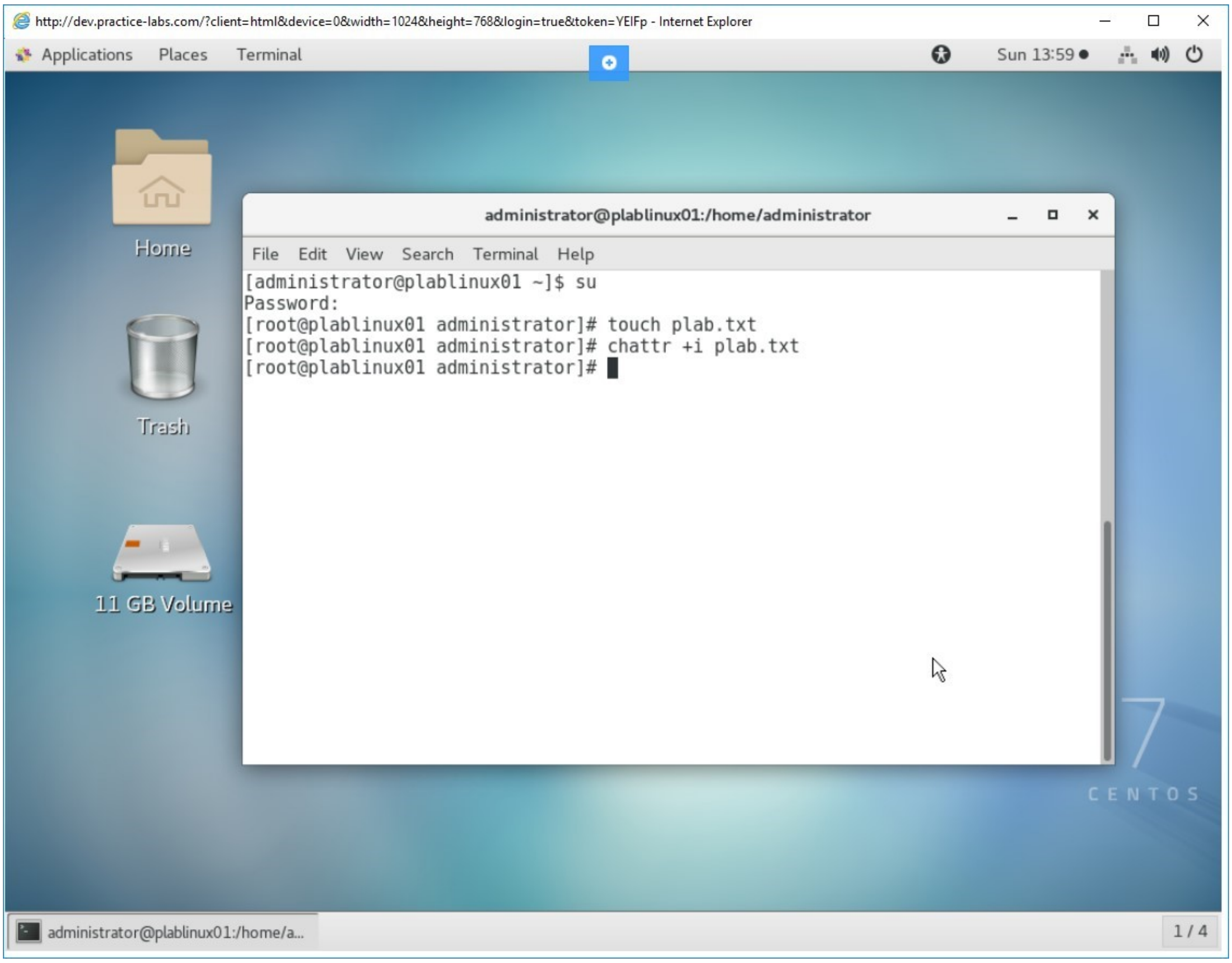
Figure 1.12 Screenshot of PLABLINUX01: Creating a new file named plab.txt.

Step 3

You need to set the immutable attribute on the **plab.txt** file. Type the following command:

```
chattr +i plab.txt
```

Press **Enter**.



http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=YElFp - Internet Explorer
Applications
Places
Terminal
Sun 13:59 ●
Home
Trash
11 GB Volume
administrator@plablinux01:/home/administrator
File
Edit
View
Search
Terminal
Help
7
CENTOS
administrator@plablinux01:/home/a...
1 / 4

```
[administrator@plablinux01 ~]$ su
Password:
[root@plablinux01 administrator]# touch plab.txt
[root@plablinux01 administrator]# chattr +i plab.txt
[root@plablinux01 administrator]#
```

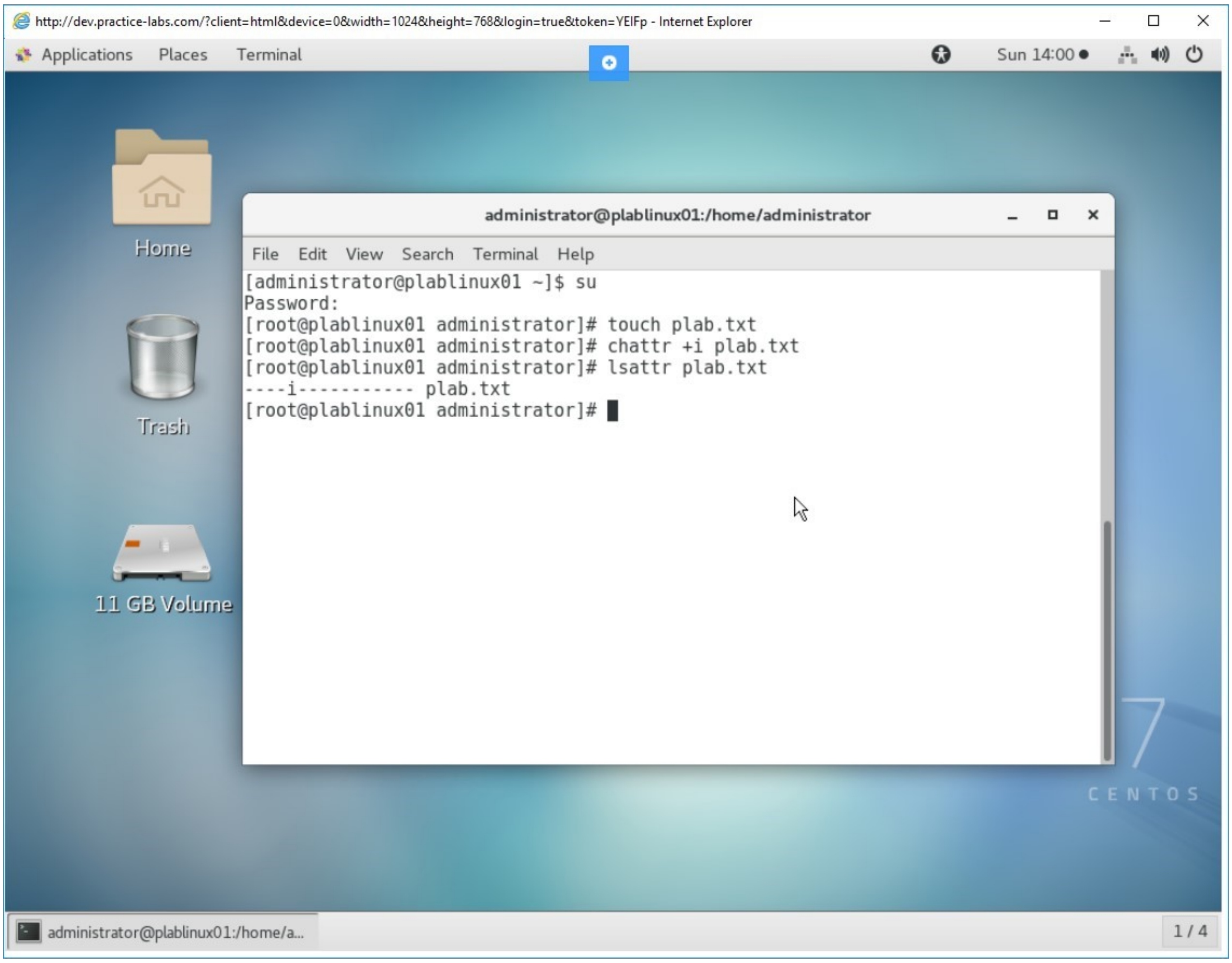
Figure 1.13 Screenshot of PLABLINUX01: Setting the immutable attribute on the plab.txt file.

Step 4

You need to verify now if the immutable attribute is set on the **plab.txt** file. Type the following command:

```
lsattr plab.txt
```

Press **Enter**.



http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=YElFp - Internet Explorer
Applications
Places
Terminal
Sun 14:00 ●
Home
Trash
11 GB Volume
administrator@plablinux01:/home/administrator
File
Edit
View
Search
Terminal
Help
7
CENTOS
administrator@plablinux01:/home/a...
1 / 4

```
[administrator@plablinux01 ~]$ su
Password:
[root@plablinux01 administrator]# touch plab.txt
[root@plablinux01 administrator]# chattr +i plab.txt
[root@plablinux01 administrator]# lsattr plab.txt
----i----------- plab.txt
[root@plablinux01 administrator]# 
```

Figure 1.14 Screenshot of PLABLINUX01: Verifying the immutable attribute on the plab.txt file.

Step 5

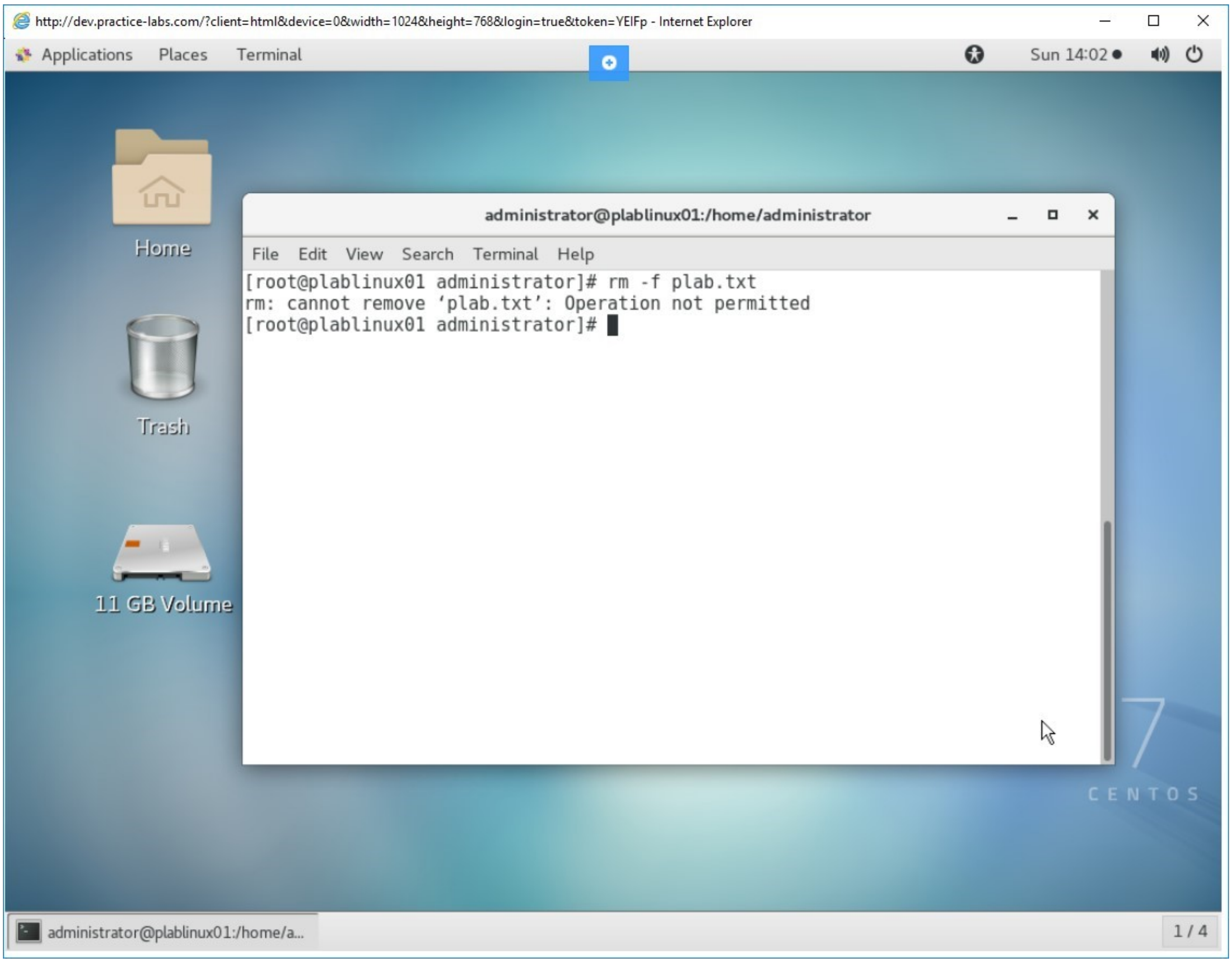
Clear the screen by entering the following command:

```
clear
```

You will now attempt to delete the **plab.txt** file. Type the following command:

```
rm -f plab.txt
```

Press **Enter**. Notice that this operation is not permitted even for the root user.



http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=YElFp - Internet Explorer
Applications
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Terminal
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Home
Trash
11 GB Volume
administrator@plablinux01:/home/administrator
File
Edit
View
Search
Terminal
Help
CENTOS
administrator@plablinux01:/home/a...
1 / 4

```
[root@plablinux01 administrator]# rm -f plab.txt
rm: cannot remove ‘plab.txt’: Operation not permitted
[root@plablinux01 administrator]# 
```

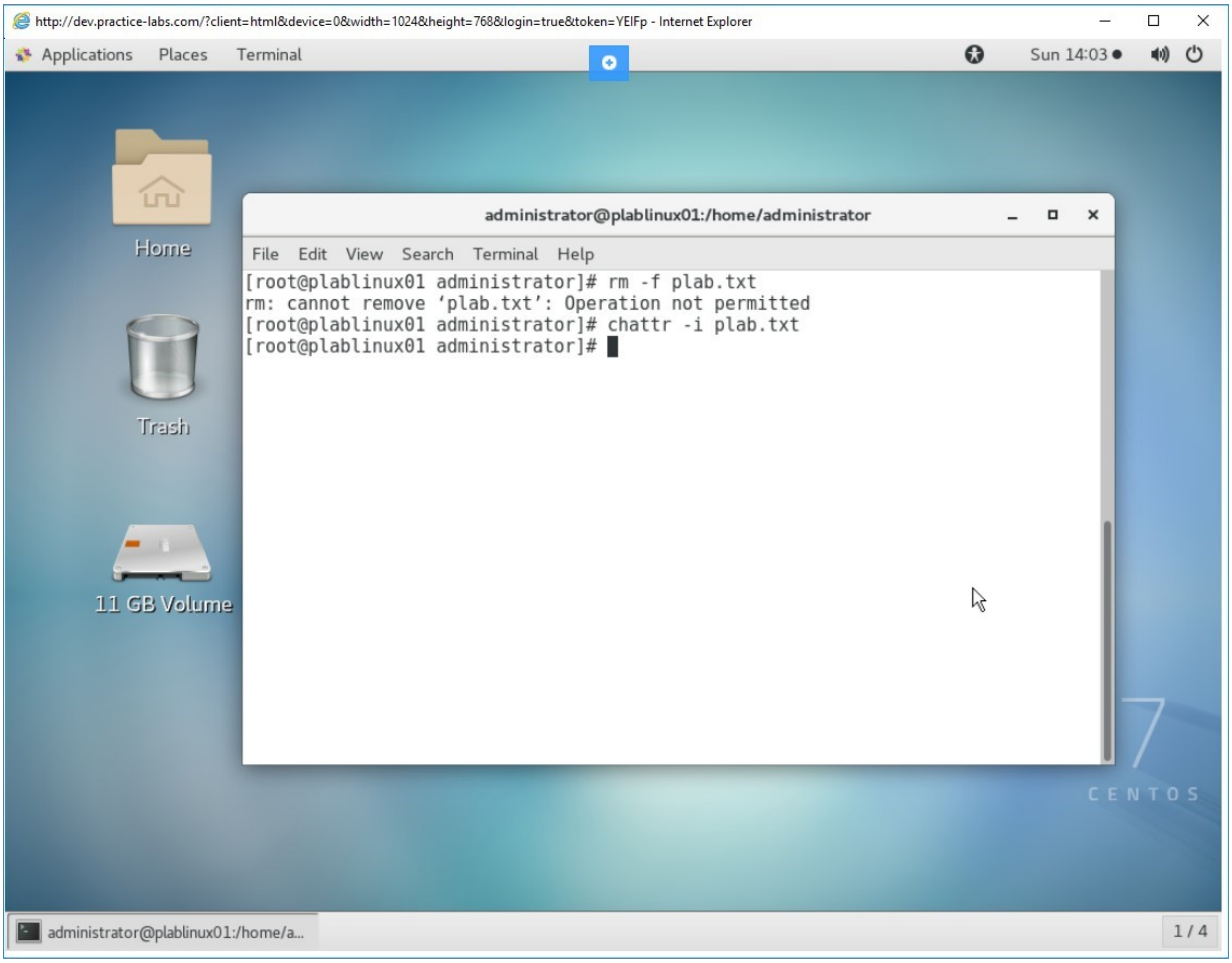
Figure 1.15 Screenshot of PLABLINUX01: Attempting to delete the plab.txt file.

Step 6

You need to remove the immutable attribute now. Type the following command:

```
chattr -i plab.txt
```

Press **Enter**.



http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=YElFp - Internet Explorer
Applications
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Terminal
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11 GB Volume
administrator@plablinux01:/home/administrator
File
Edit
View
Search
Terminal
Help
7
CENTOS
administrator@plablinux01:/home/a...
1 / 4

```
[root@plablinux01 administrator]# rm -f plab.txt
rm: cannot remove 'plab.txt': Operation not permitted
[root@plablinux01 administrator]# chattr -i plab.txt
[root@plablinux01 administrator]# 
```

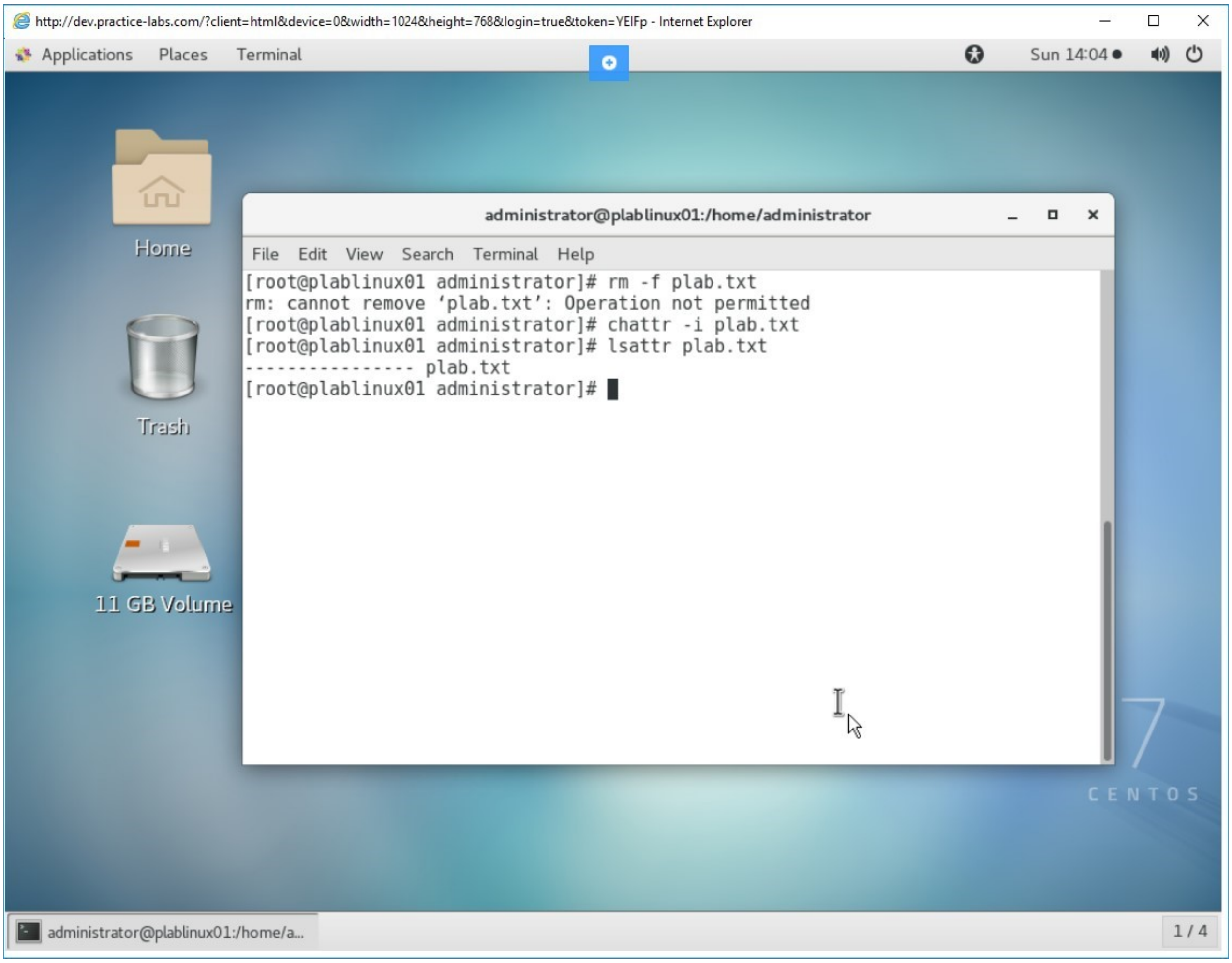
Figure 1.16 Screenshot of PLABLINUX01: Removing the immutable attribute.

Step 7

Verify if the immutable attribute is removed. Type the following command:

```
lsattr plab.txt
```

Press **Enter**. Notice that attribute is no longer present.



http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=YEIFp - Internet Explorer
Applications
Places
Terminal
Sun 14:04 ●
Home
Trash
11 GB Volume
administrator@plablinux01:/home/administrator
File
Edit
View
Search
Terminal
Help
administrator@plablinux01:/home/a...
1 / 4
7
CENTOS

```
[root@plablinux01 administrator]# rm -f plab.txt
rm: cannot remove ‘plab.txt’: Operation not permitted
[root@plablinux01 administrator]# chattr -i plab.txt
[root@plablinux01 administrator]# lsattr plab.txt
---------------- plab.txt
[root@plablinux01 administrator]# 
```

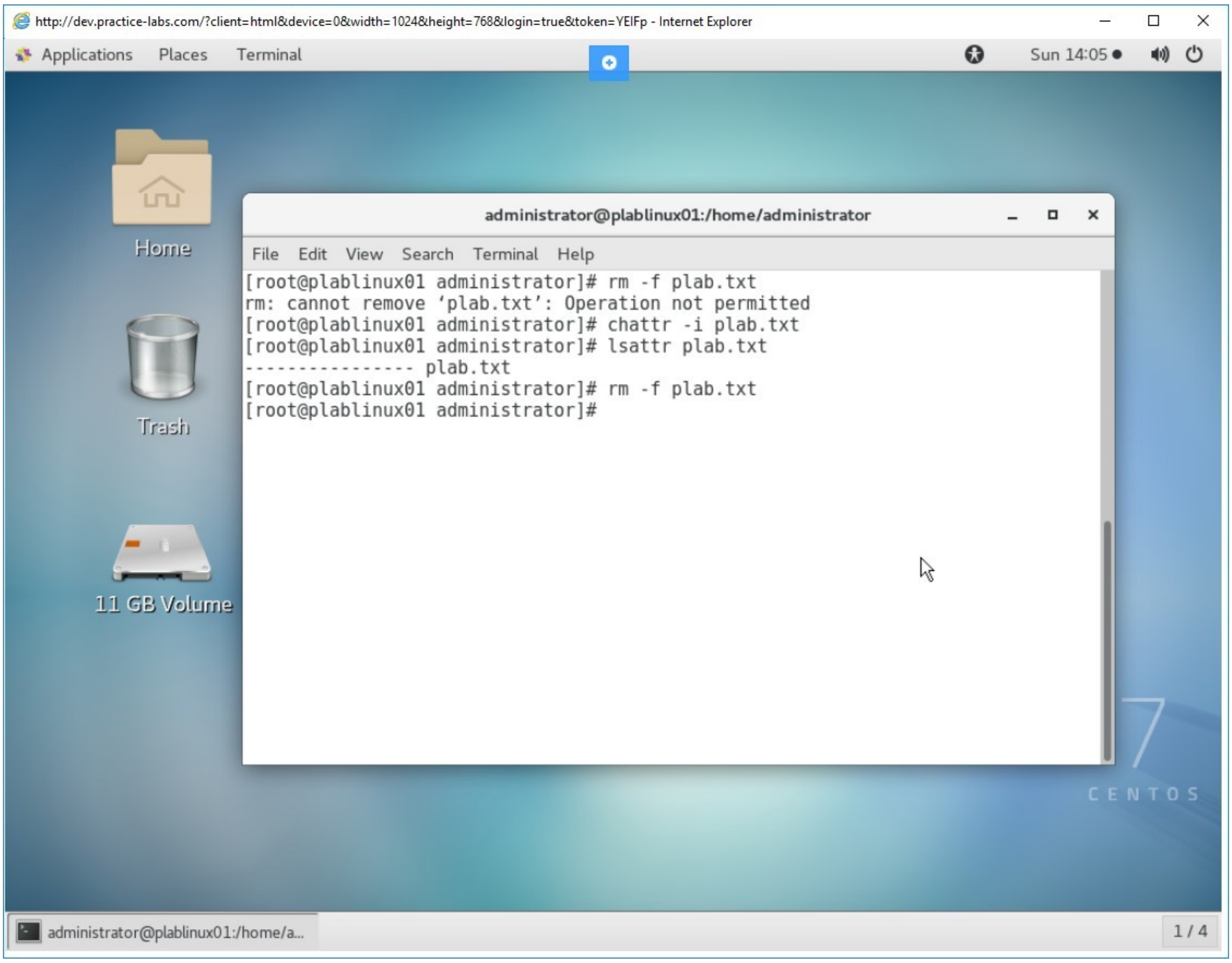
Figure 1.17 Screenshot of PLABLINUX01: Verifying the removal of the immutable attribute.

Step 8

Attempt to remove the **plab.txt** file. Type the following command:

```
rm -f plab.txt
```

Press **Enter**. Notice that file is deleted, and no error is displayed.


http://dev.practice-labs.com/?client=html&device=0&width=1024&height=768&login=true&token=YEIFp - Internet Explorer
Applications
Places
Terminal
Sun 14:05
Home
Trash
11 GB Volume
administrator@plablinux01:/home/administrator
File
Edit
View
Search
Terminal
Help
administrator@plablinux01:/home/a...
1 / 4
7
CENTOS

```
[root@plablinux01 administrator]# rm -f plab.txt
rm: cannot remove ‘plab.txt’: Operation not permitted
[root@plablinux01 administrator]# chattr -i plab.txt
[root@plablinux01 administrator]# lsattr plab.txt
---------------- plab.txt
[root@plablinux01 administrator]# rm -f plab.txt
[root@plablinux01 administrator]#
```

Figure 1.18 Screenshot of PLABLINUX01: Attempting to remove the file.

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

Review

Well done, you have completed the **Manage File and Directory Permissions** Practice Lab.

Summary

You completed the following exercise:

- Exercise 1 - Manage File and Directory Permissions

You should now be able to:

- Set Access Modes

- Work with Immutable Files

Feedback

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