Exercise 1 - Perform Basic File Management

File management is one of the basic tasks to perform while using computers. Linux offers many commands to perform these operations. In this exercise, you will become familiar with these commands.

Learning Outcomes

After completing this exercise, you will be able to:

- Log into a Linux System
- Perform basic file management
- Use wildcards for advanced file operations
- Use wildcards to manipulate data in a file
- Use the find command
- Use the tar and cpio commands

Your Devices

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

- PLABLINUX01 (CentOS Server)

PLABLINUX01
CentOS Server
192.168.0.2

Task 1 - Perform Basic File Management

File management includes operations such as creating, saving, listing, copying, moving, and many other operations on files. In this task, you will use various commands to perform all these operations on CentOS.

To perform basic file operations on CentOS, perform the following steps:

Step 1

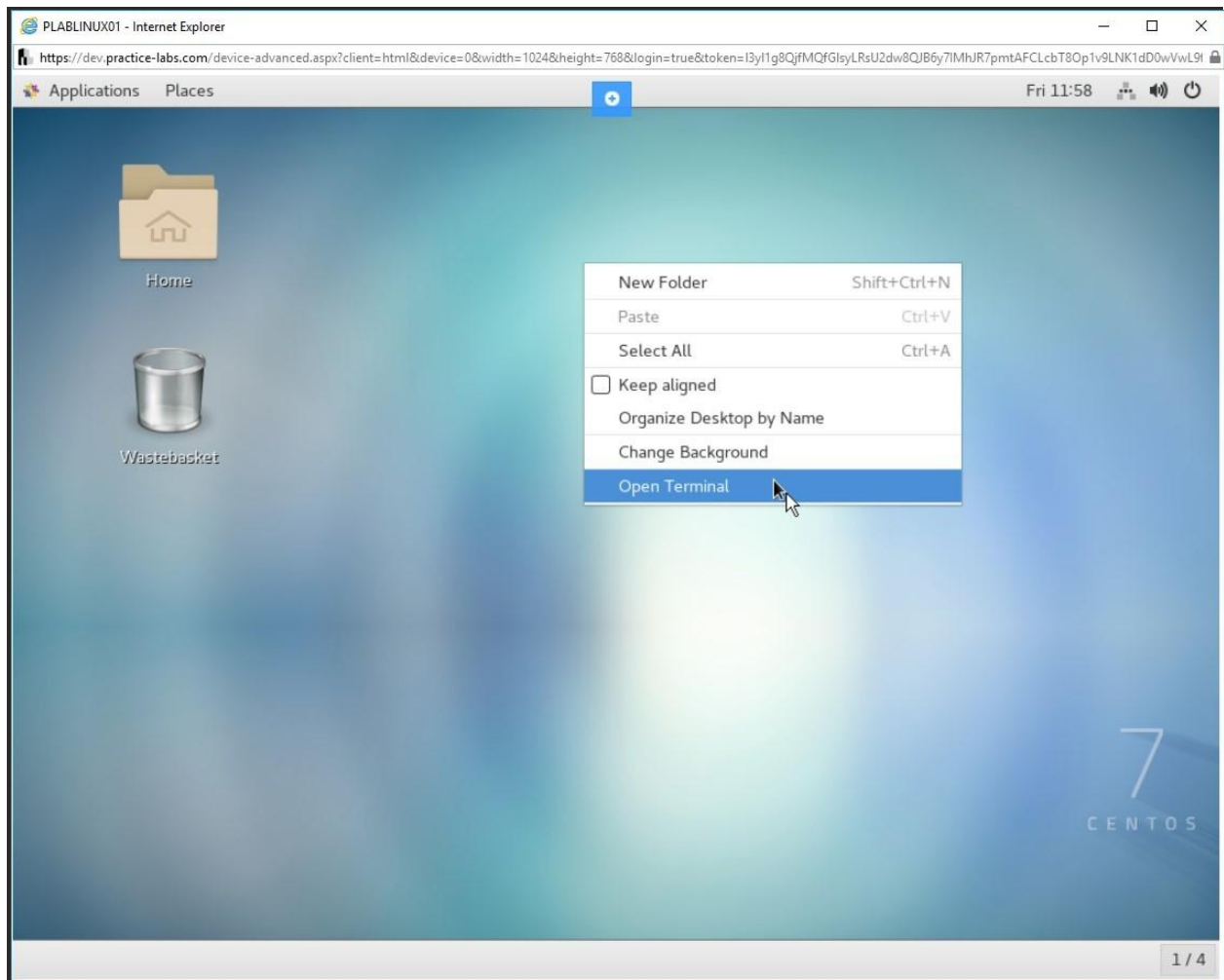On the desktop, right-click and select Open Terminal.

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

Step 2

The terminal window is displayed. You need to create a text file. To do this, type the following command:
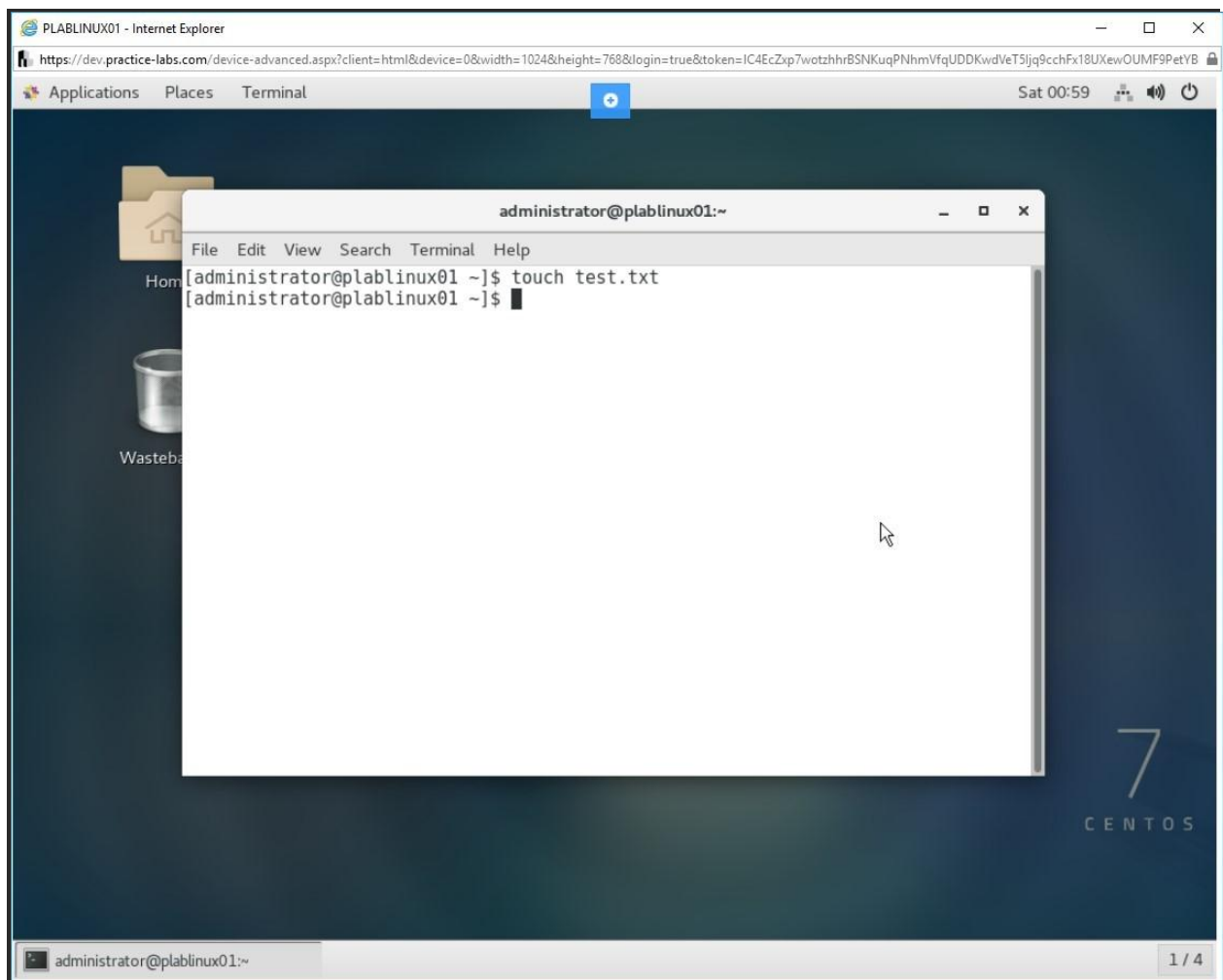
```
touch test.txt
```

Press Enter.

Figure 1.2 Screenshot of PLABLINUX01: Displaying the creation of a text file.

Step 3

To copy the test.txt file as new.txt, type the following command:

```
cp test.txt new.txt
```
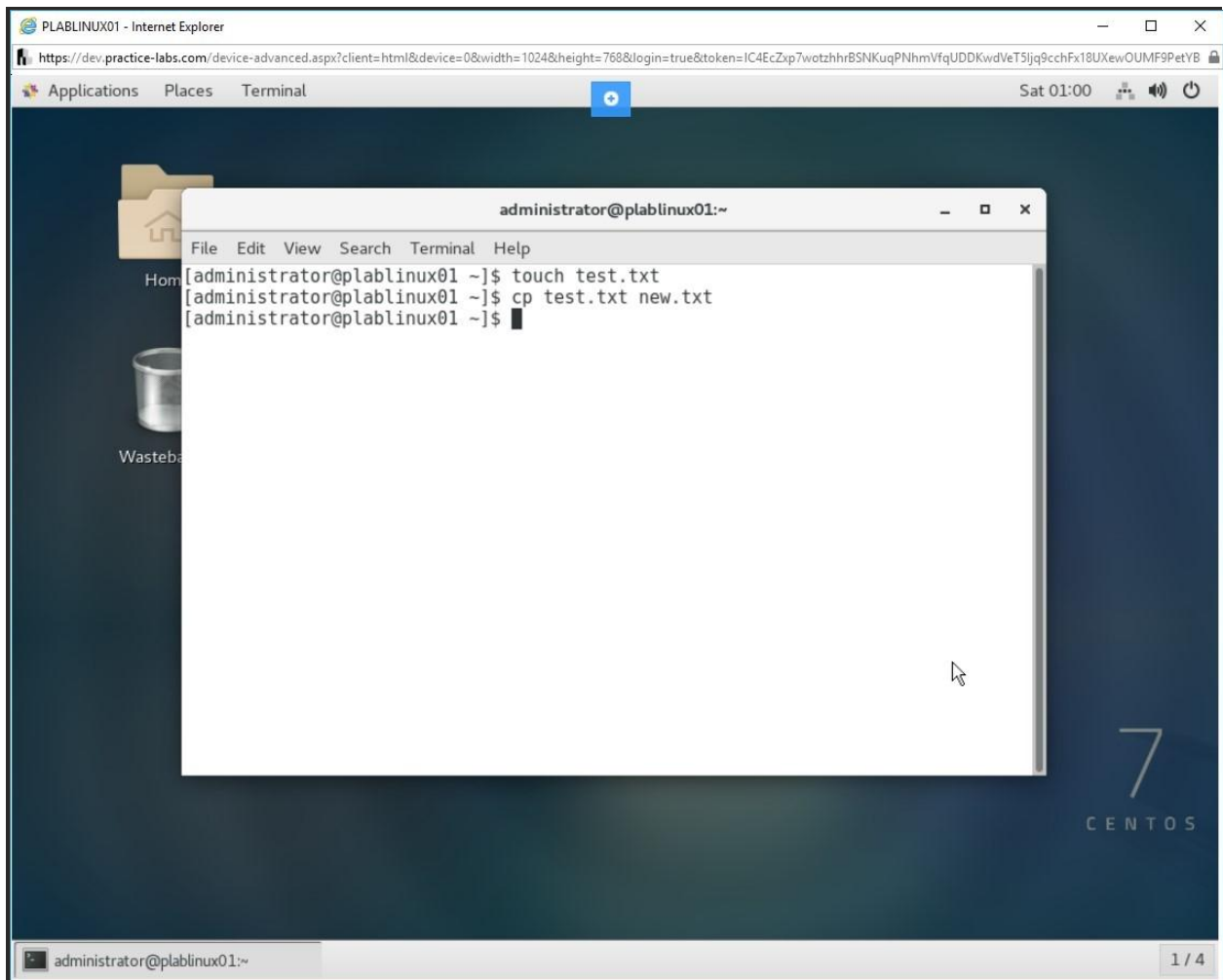
Press Enter.

Figure 1.3 Screenshot of PLABLINUX01: Displaying the output of the cp command to copy a file into another file.

Step 4

To list the directory contents to verify that the file is now copied, type the following command:
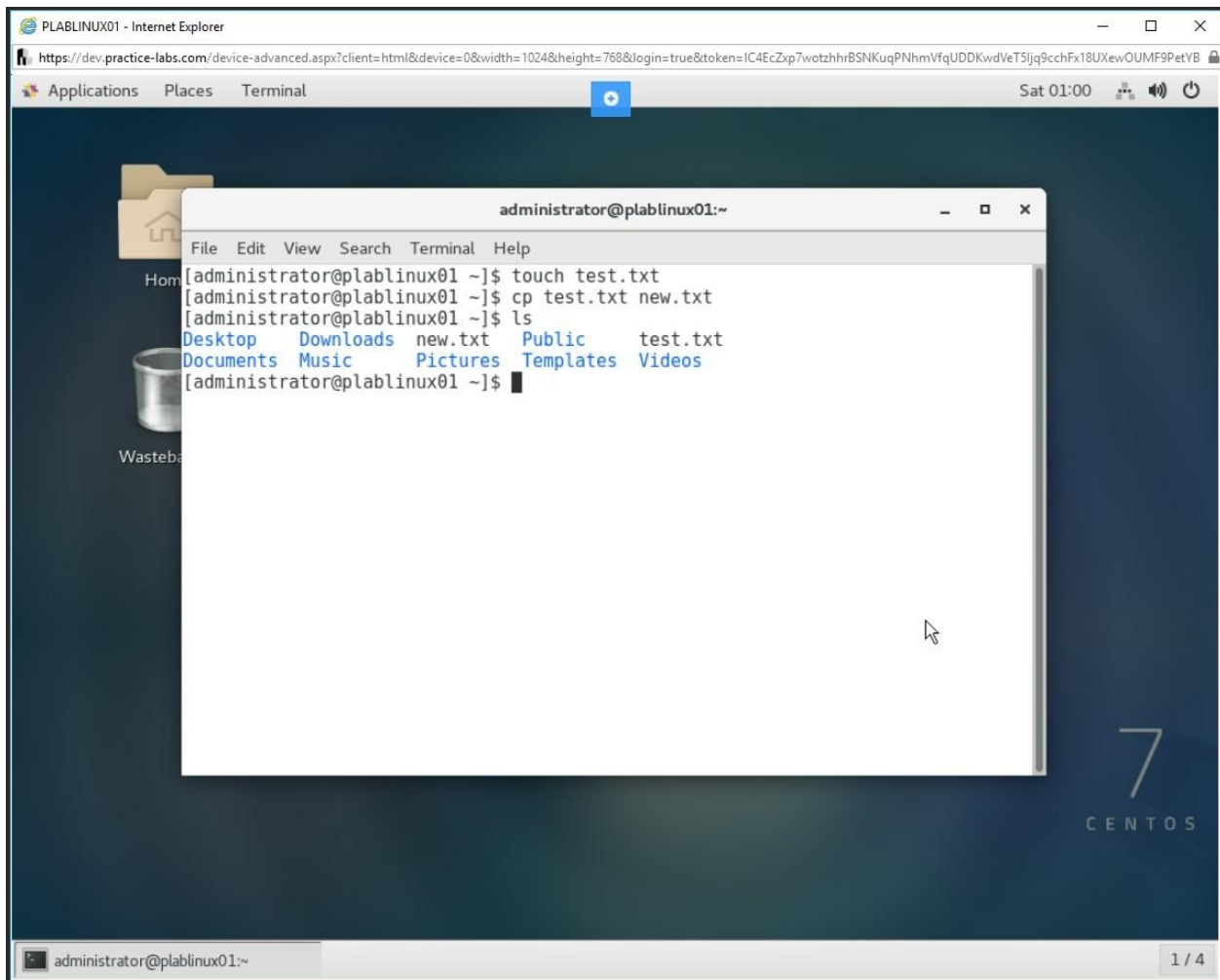
```
ls
```

Press Enter.

Figure 1.4 Screenshot of PLABLINUX01: Listing the contents of a directory.

Step 5

Clear the screen by entering the following command:

```
clear
```

Press Enter. You can also move files from one directory to another directory. You can use the mv command to perform such tasks. For example, to move new.txt to Downloads directory, type the following command:

```
mv new.txt Downloads
```

Press Enter.

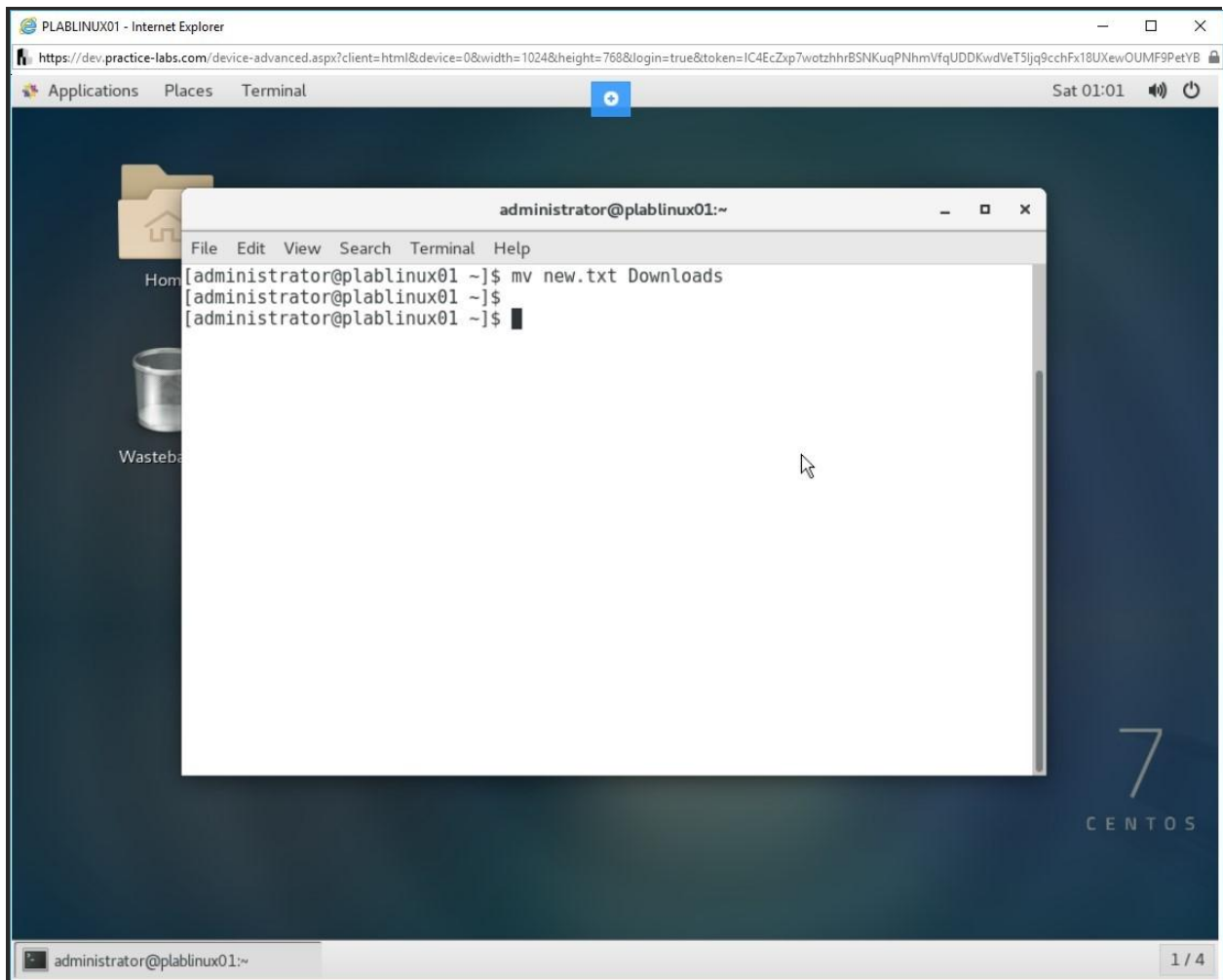Figure 1.5 Screenshot of PLABLINUX01: Moving the file to the Downloads directory.

Step 6

Check the directory where new.txt file was created. The file should not be present in this directory. Type the following command:
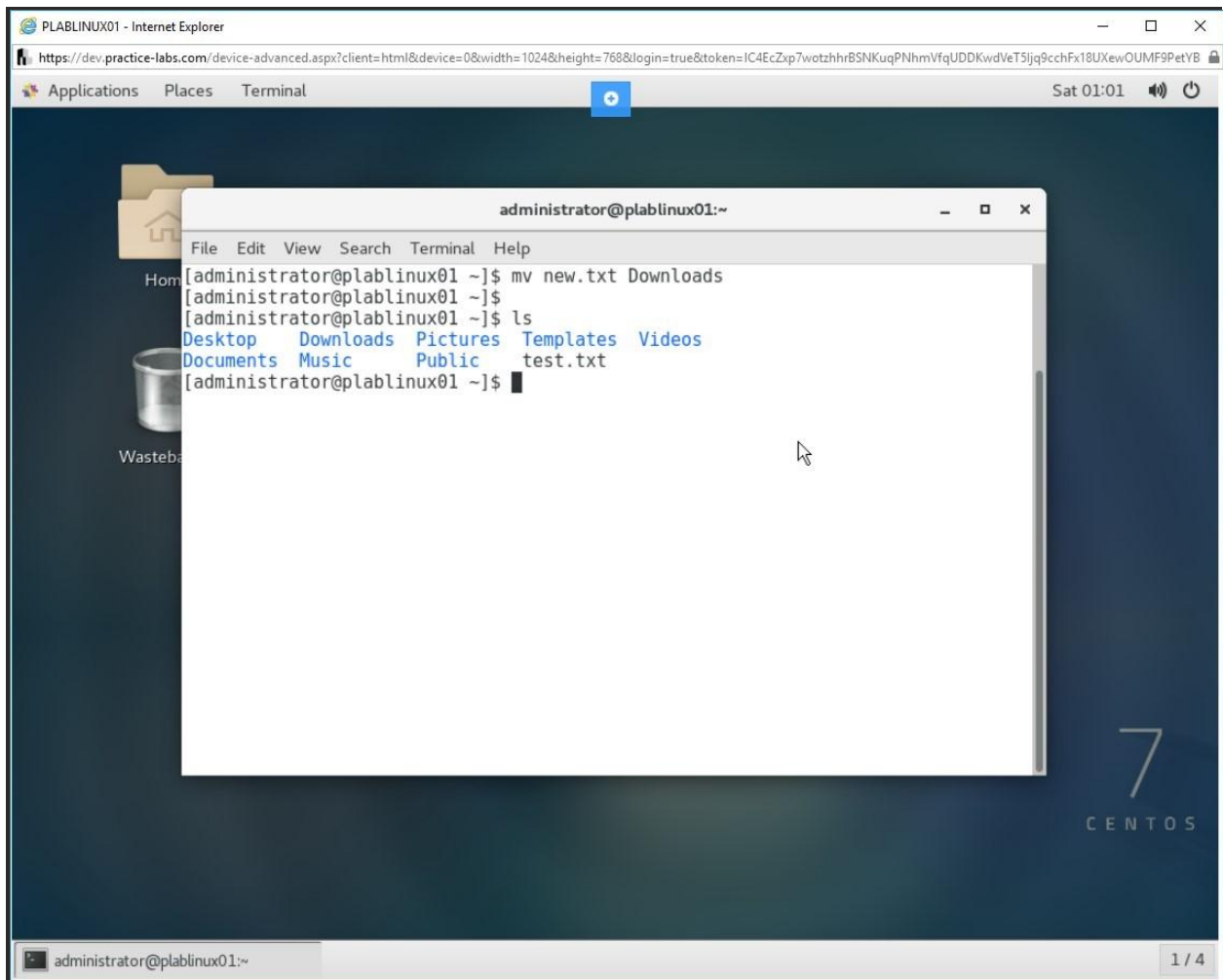
```
ls
```

Press Enter.

Figure 1.6 Screenshot of PLABLINUX01: Listing the contents of a directory.

Step 7

To view the contents of the Downloads directory, type the following command:

```
ls Downloads
```

Press Enter.

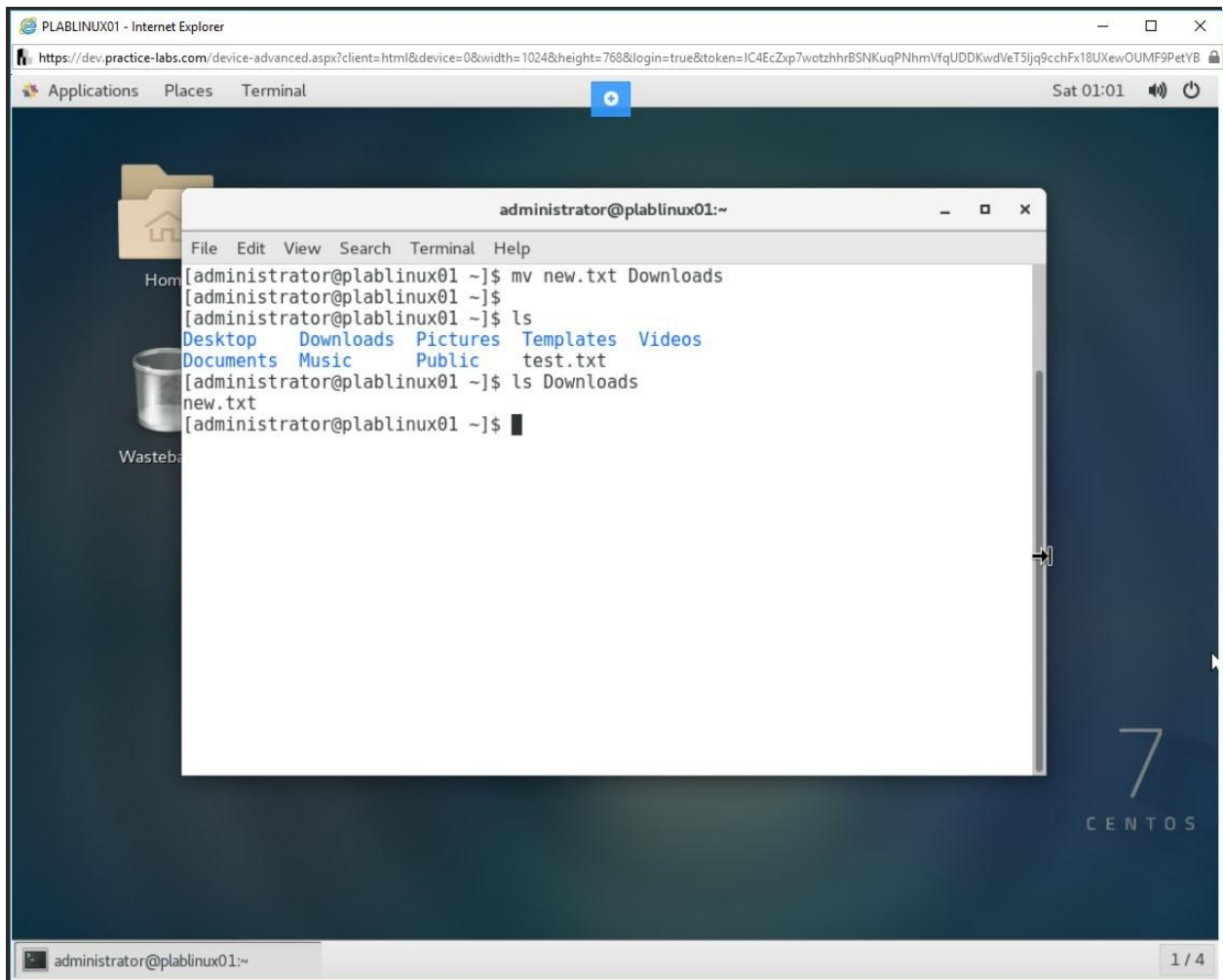Notice that new.txt is now present in the Downloads directory.

Figure 1.7 Screenshot of PLABLINUX01: Listing the contents of the Downloads directory.

Step 8

To remove a file, you can use the rm command. For example, to remove the test.txt file, type the following command:
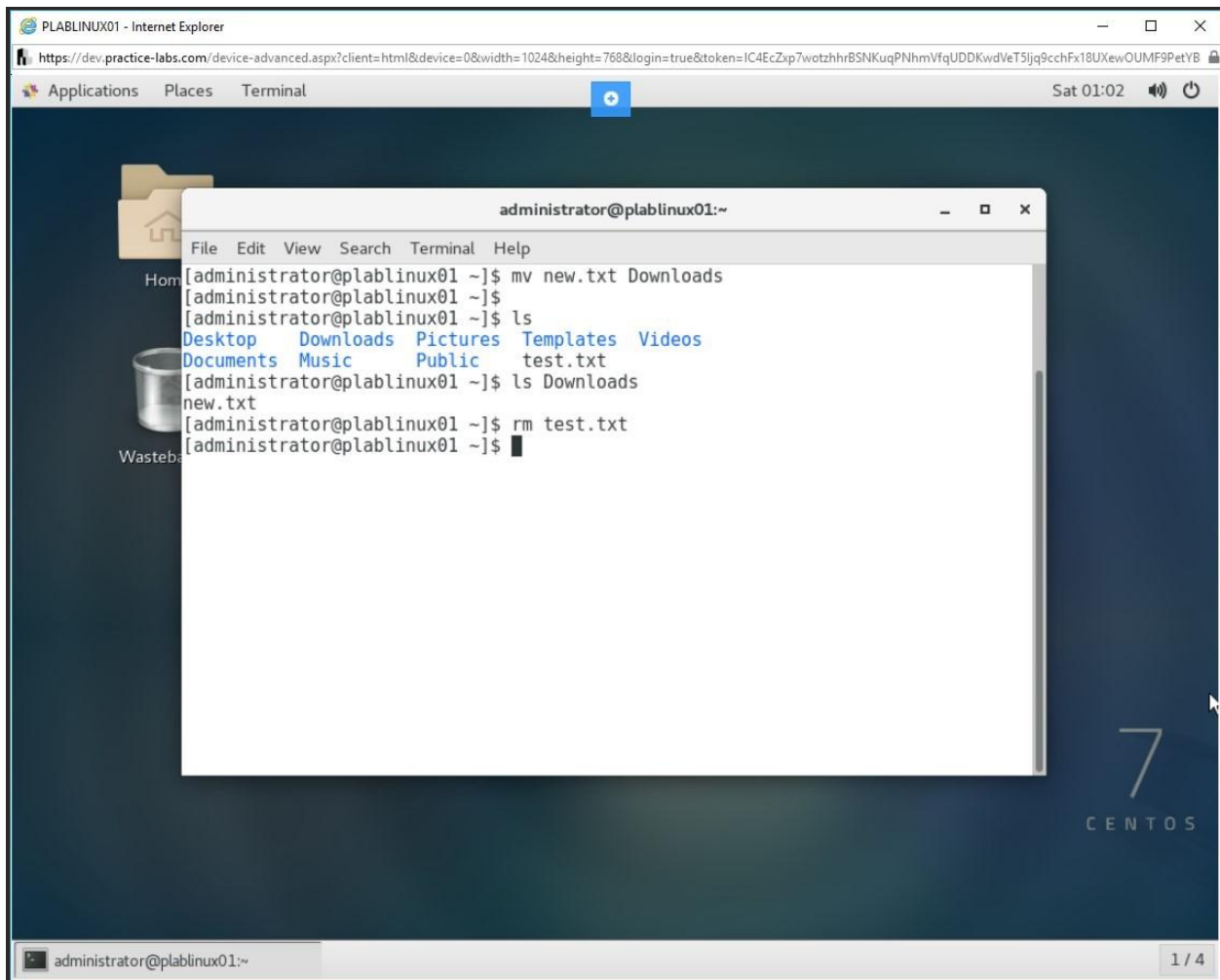
```
rm test.txt
```

Press Enter.

Figure 1.8 Screenshot of PLABLINUX01: Removing a file using the rm command.

Step 9

To view the contents of the directory, type the following command:

```
ls
```
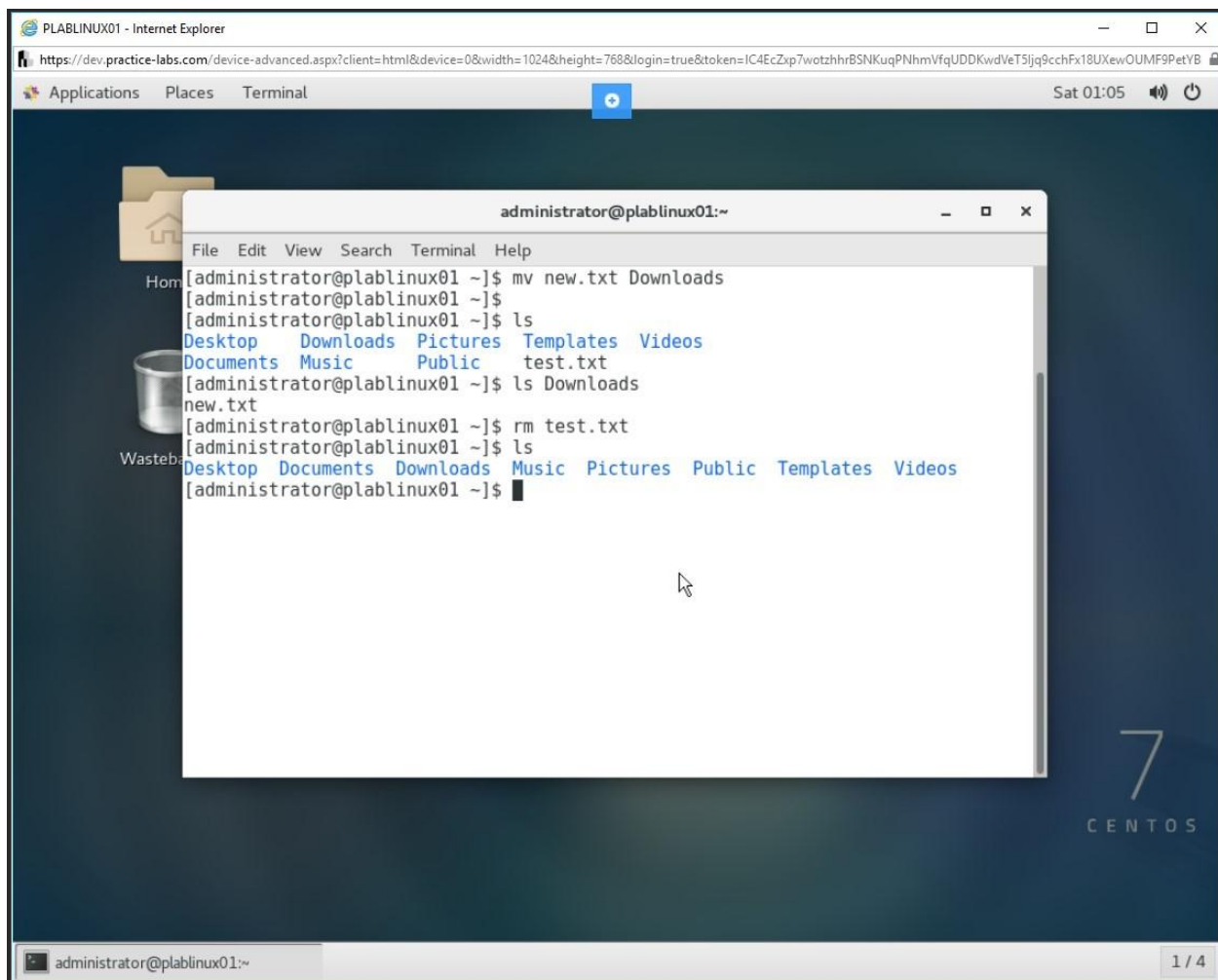
Notice that the file is now removed.

Figure 1.9 Screenshot of PLABLINUX01: Listing the contents of a directory.

Step 10

Clear the screen by entering the following command:

```
clear
```

Press Enter. To create a new directory, type the following command:
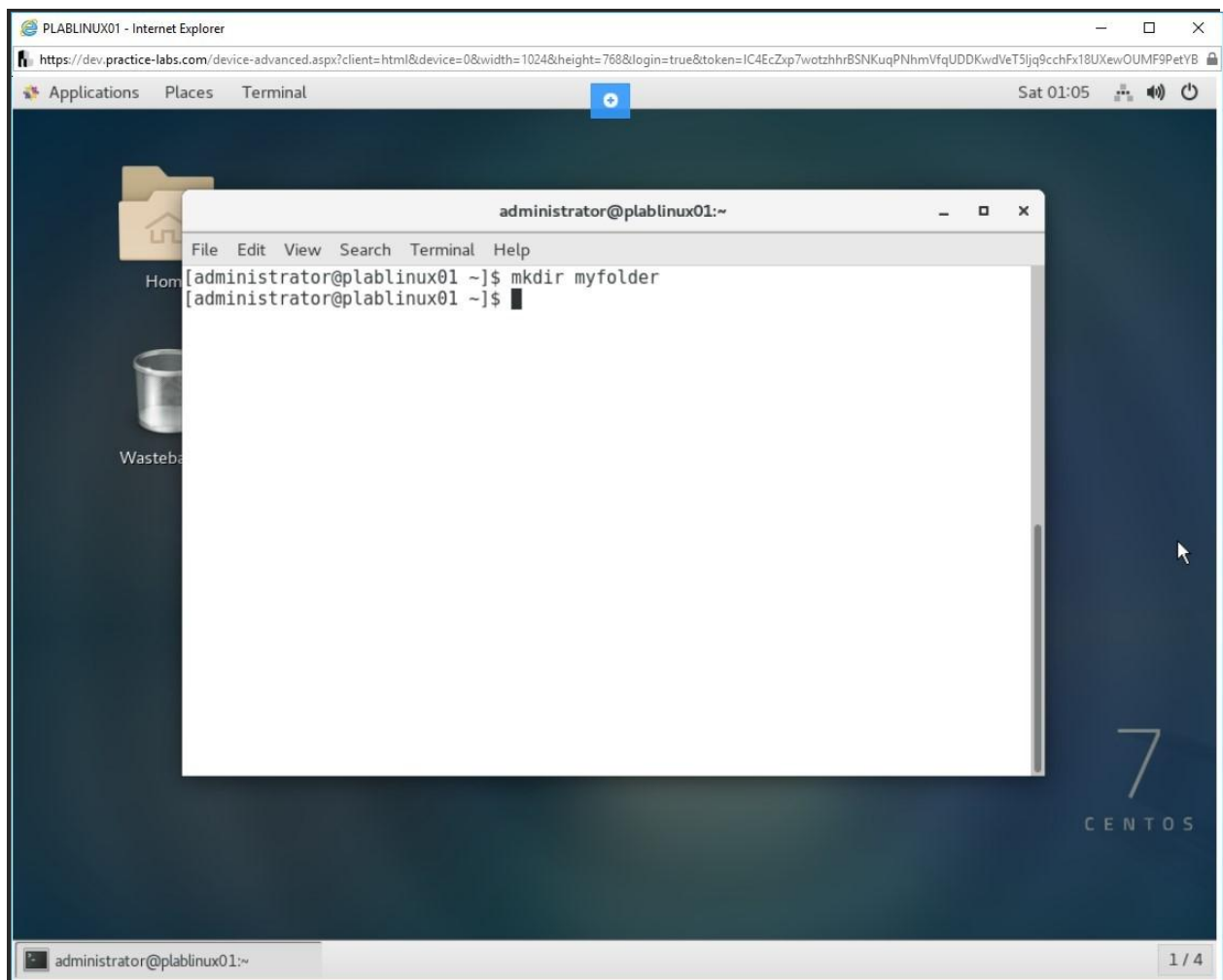
```
mkdir myfolder
```

Press Enter.

Figure 1.10 Screenshot of PLABLINUX01: Creating a new directory with the mkdir command.

Step 11

To view the contents of the present working directory, type the following command:

```
ls
```

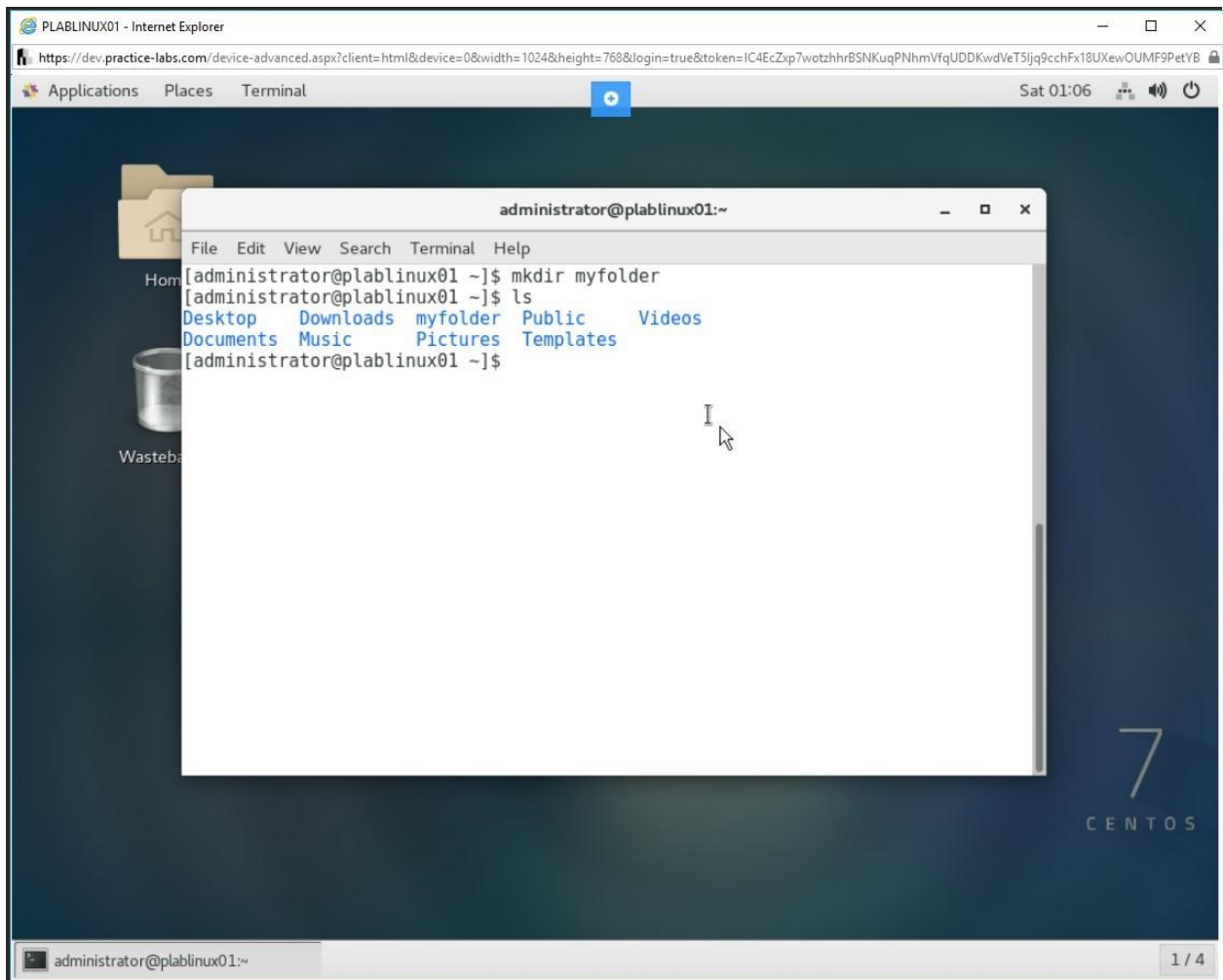Notice the directory has been created.

Figure 1.11 Screenshot of PLABLINUX01: Listing the contents of a directory.

Step 12

To create a subdirectory within a directory, type the following command:

```
mkdir myfolder/mydocs
```
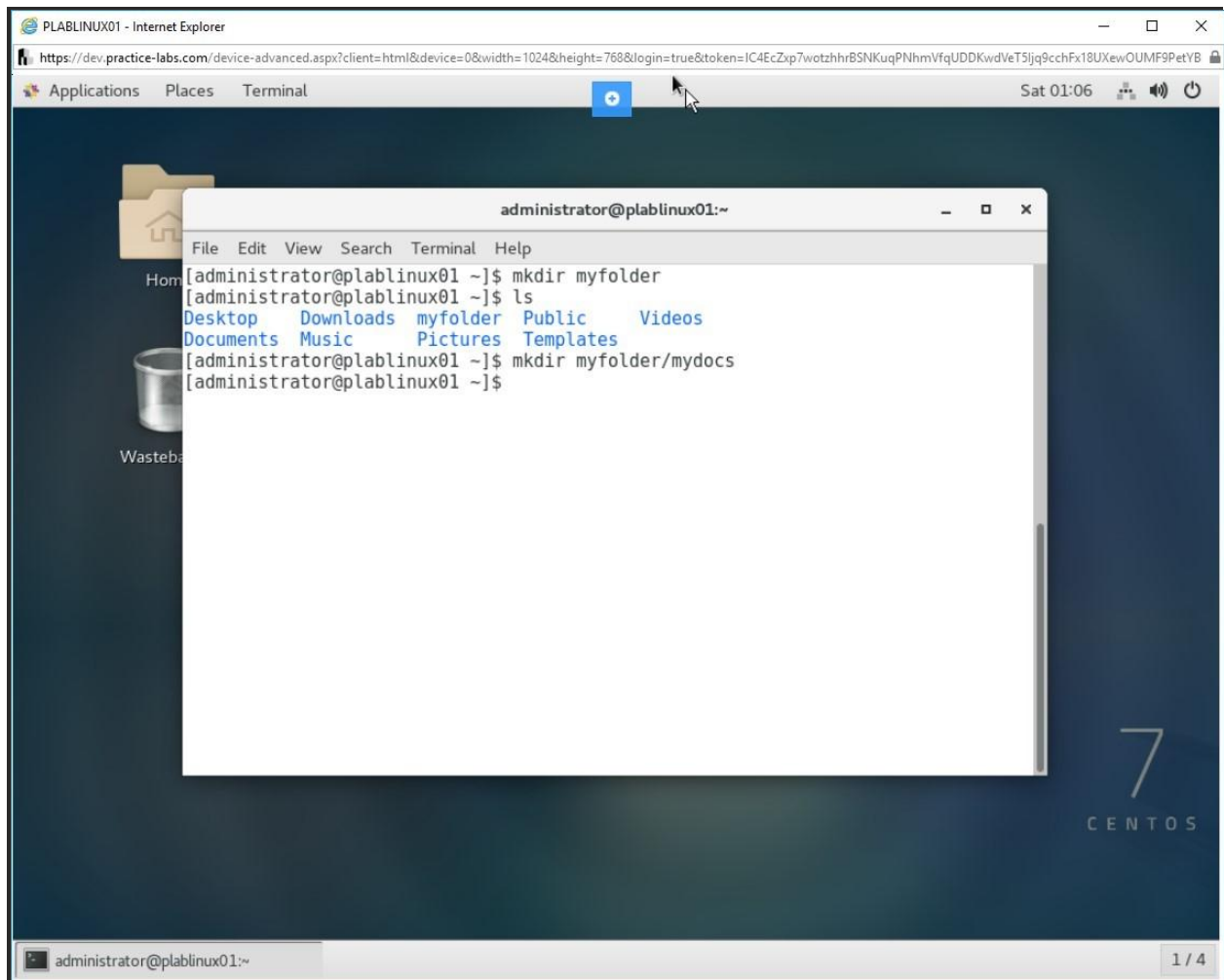
Press Enter.

Figure 1.12 Screenshot of PLABLINUX01: Creating a subdirectory with the mkdir command.

Step 13

To verify that the directory and its subdirectory is created, type the following command:
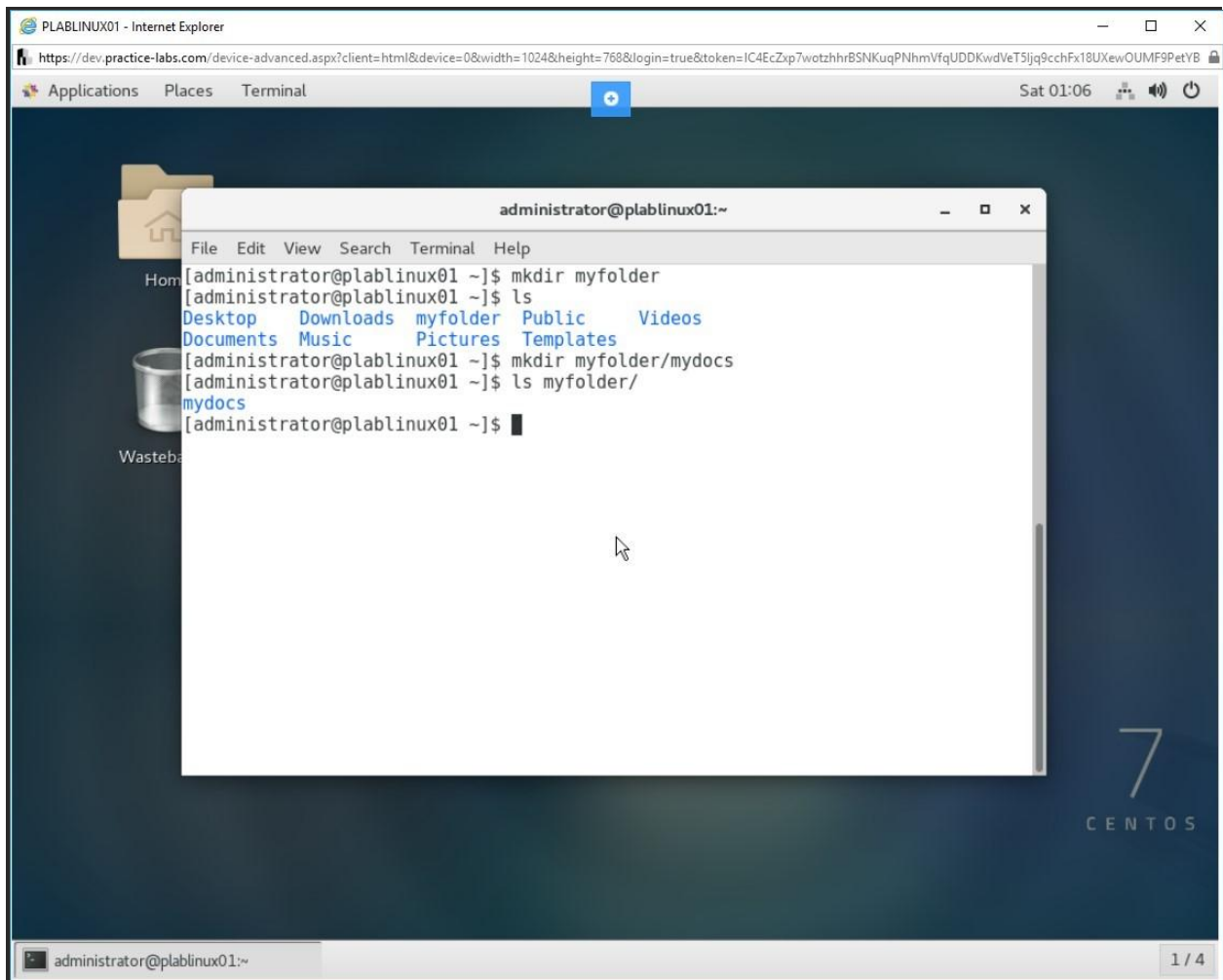
```
ls myfolder/
```

Press Enter.

Figure 1.13 Screenshot of PLABLINUX01: Listing the contents of the myfolder directory.

Step 14

To move a directory from one directory to another directory, type the following command:

```
mv myfolder/mydocs Downloads
```

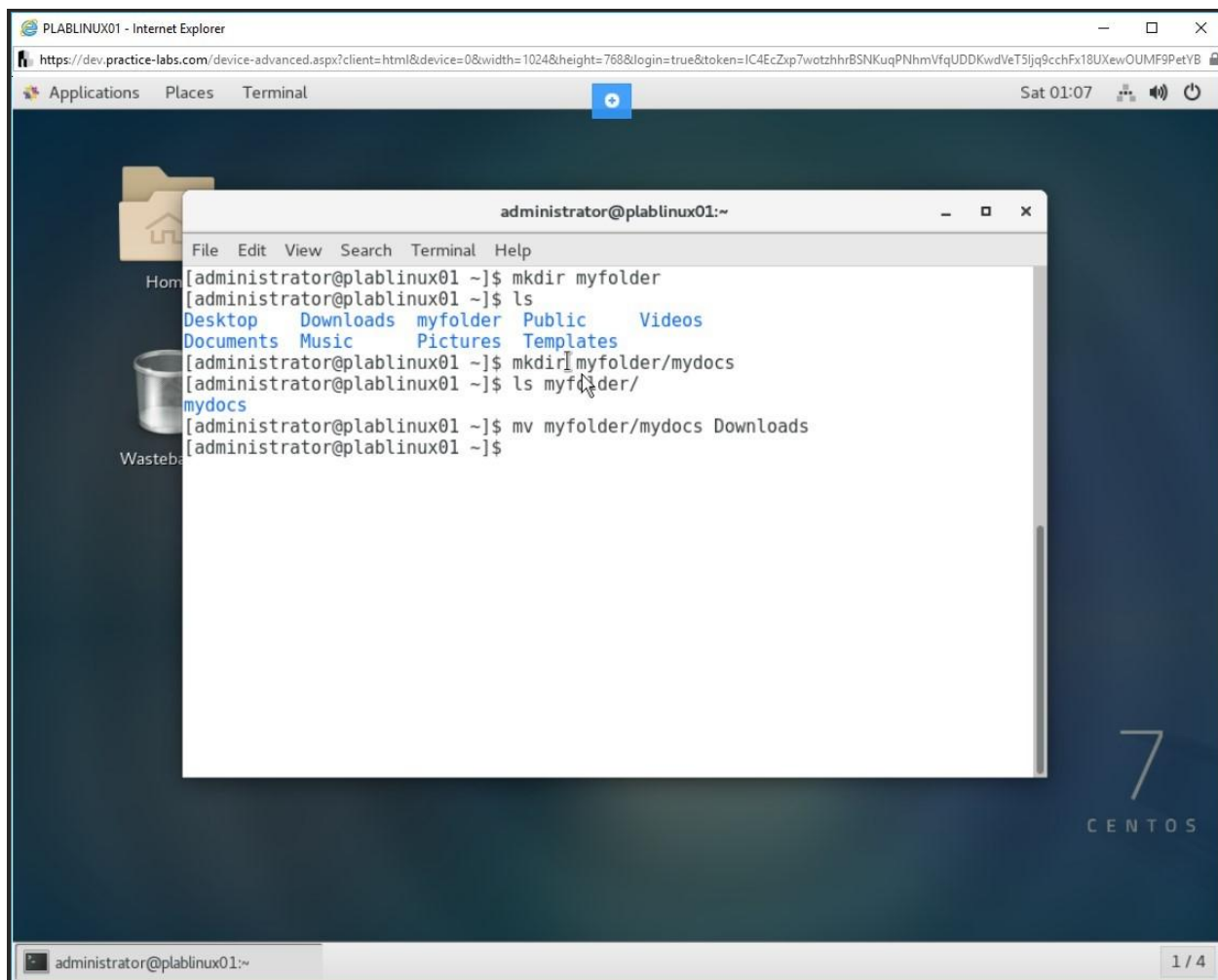Press Enter.

Figure 1.14 Screenshot of PLABLINUX01: Moving the myfolder/mydocs subdirectory to the Downloads directory.

Step 15

To list the contents of the Downloads directory, type the following command:
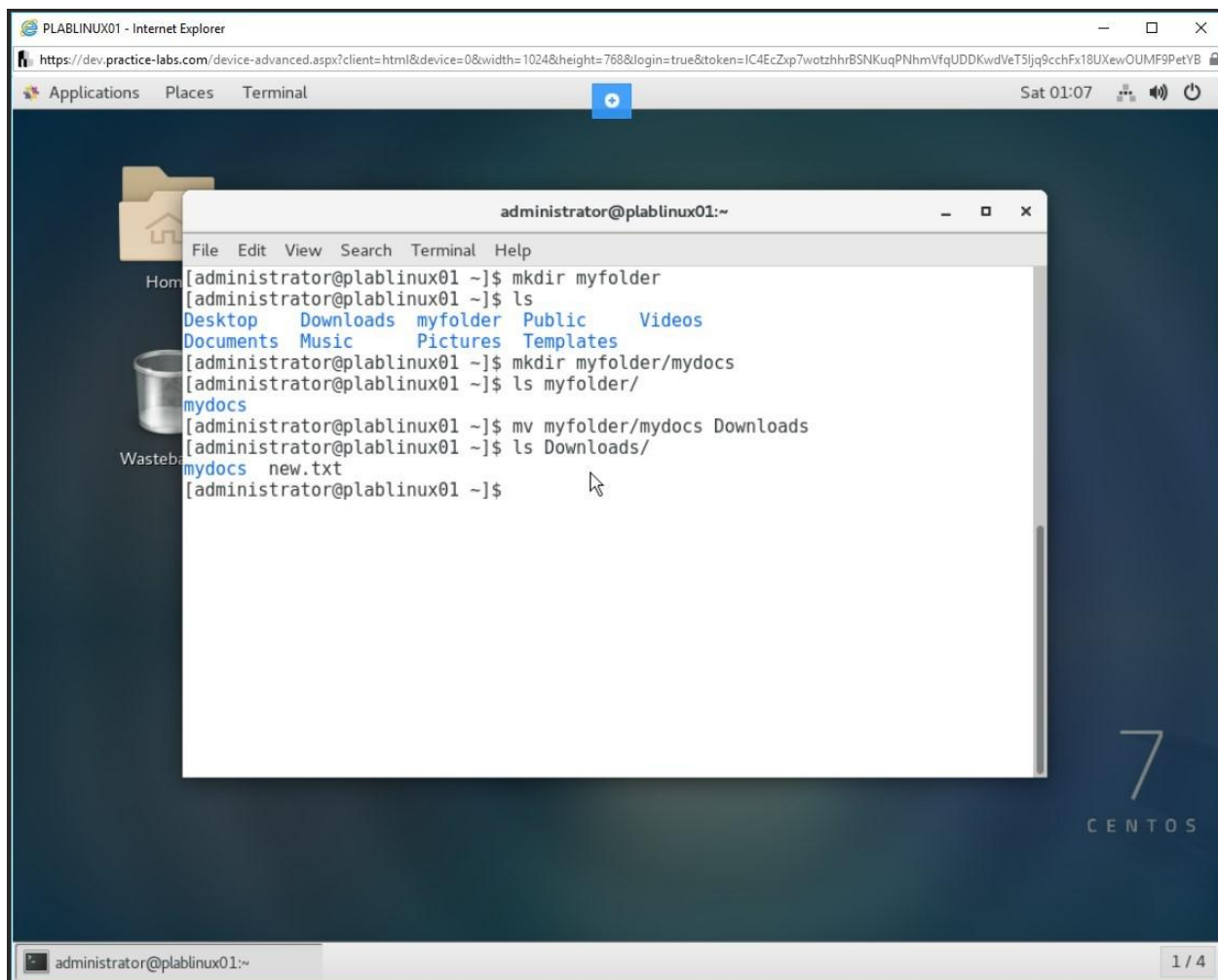
```
ls Downloads/
```

Press Enter.

Figure 1.15 Screenshot of PLABLINUX01: Listing the contents of the Downloads directory.

Step 16

To remove a directory, type the following command:

```
rm myfolder
```

Press Enter.

You are flagged that this is a directory.

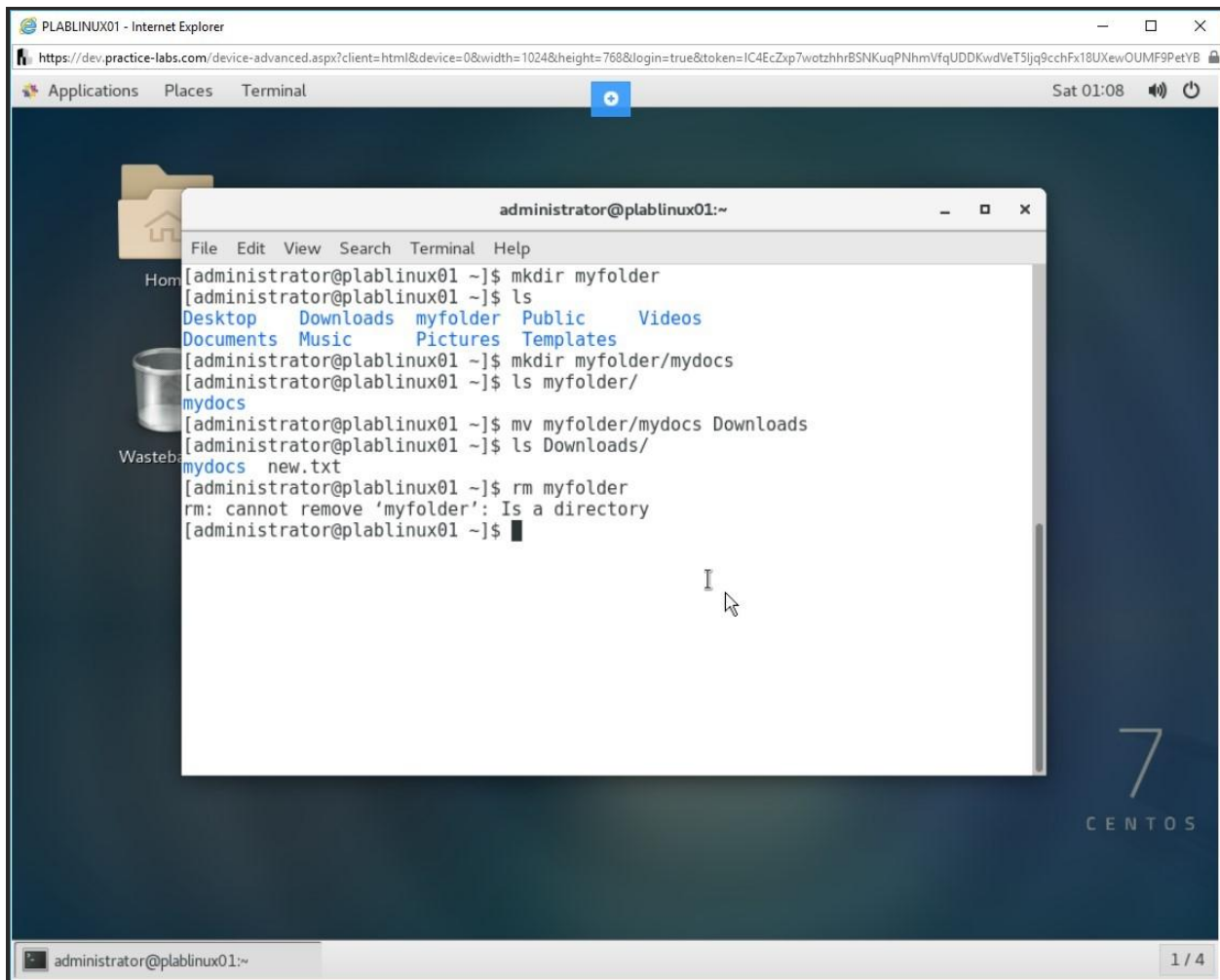Figure 1.16 Screenshot of PLABLINUX01: Attempting to remove the myfolder directory using the rm command.

Step 17

Clear the screen by entering the following command:

```
clear
```

Press Enter.

Note: To remove the directory, enter the same command with the -r switch. You can use the following command: rm -r myfolder.

However, for this task, you should not delete this folder.

Step 18

Before proceeding to the next step, move the mydocs directory back to the myfolder directory. Type the following command:

```
mv Downloads/mydocs myfolder
```
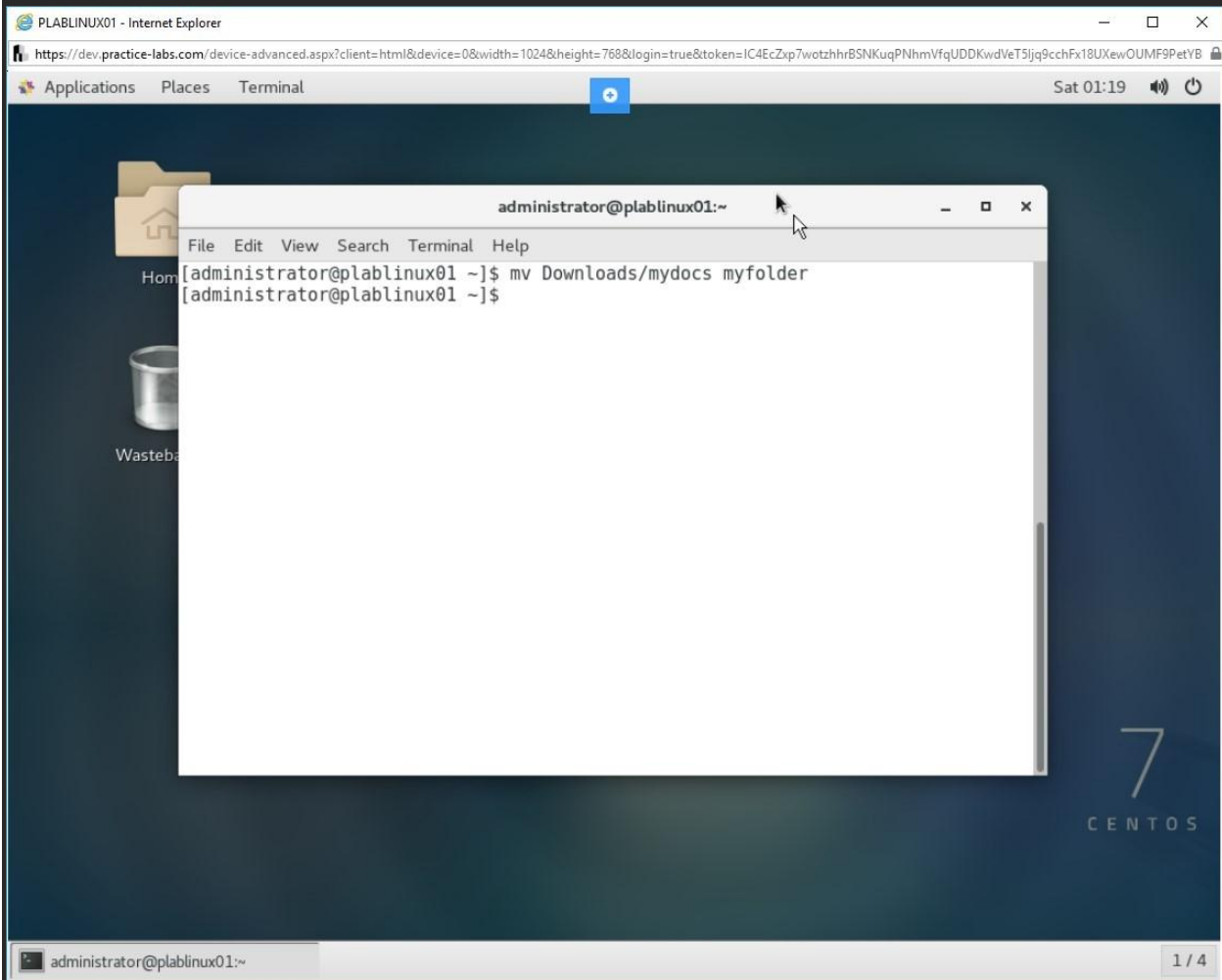
Press Enter.

Figure 1.17 Screenshot of PLABLINUX01: Moving the Download/mydocs subdirectory to the myfolder directory.

Step 19

You can also use the rmdir command to delete a directory. For example, to delete mydocs from myfolder, enter the following command:

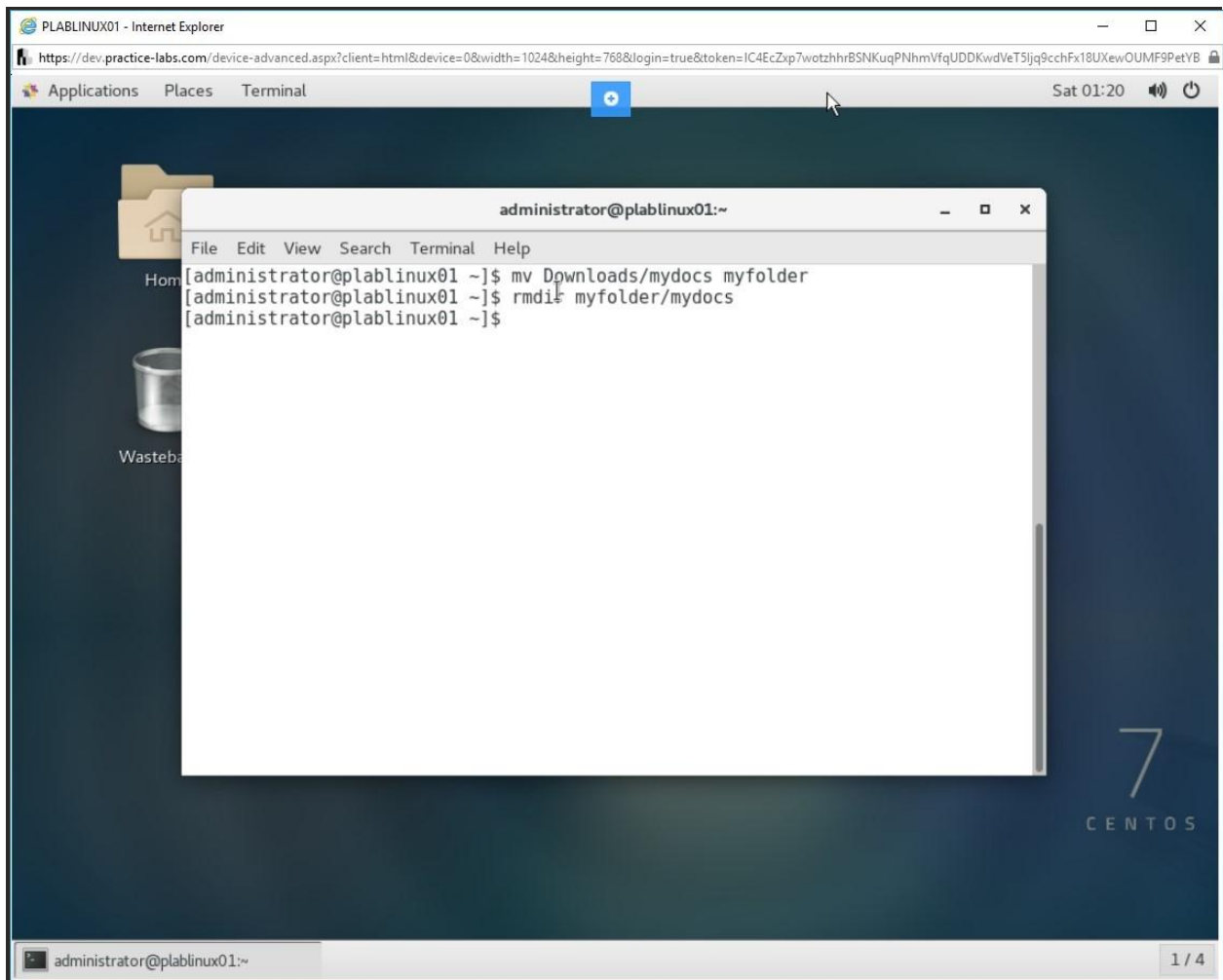```
rmdir myfolder/mydocs
```

Press Enter.

Figure 1.18 Screenshot of PLABLINUX01: Removing the myfolder/mydocs subdirectory.

## Step 20

Type the following command to verify that the directory is now removed:
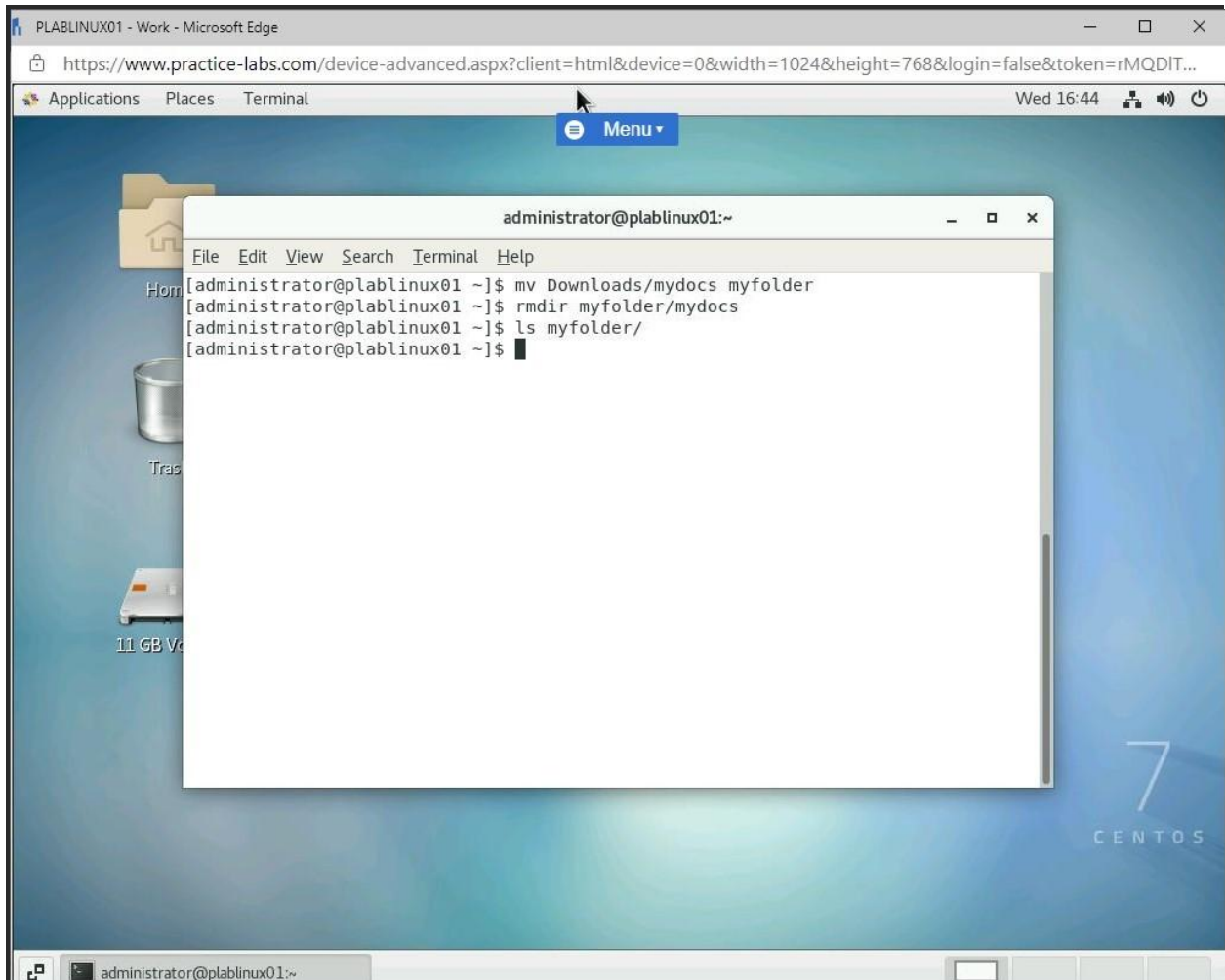
```
ls myfolder/
```

Press Enter.

Figure 1.19 Screenshot of PLABLINUX01: Listing the contents of the myfolder directory.

# Task 2 - Use Wildcards for Advanced File Operations

Linux uses many special characters, known as wildcards that help perform advanced file operations. Examples of such wildcards include special characters such as "*", "?", "[]", "~", and many more. Advanced file operations can be copying a directory and the contained files, removing a directory and the contained files, and other such operations. Normally, these operations would need recursive commands, using the wildcards, you can perform these operations with a single command.

To use simple and advanced wildcards in commands, perform the following steps:

## Step 1

Clear the screen by entering the following command:

clear

Press Enter. To create a directory named test, type the following command:

```
mkdir test
```
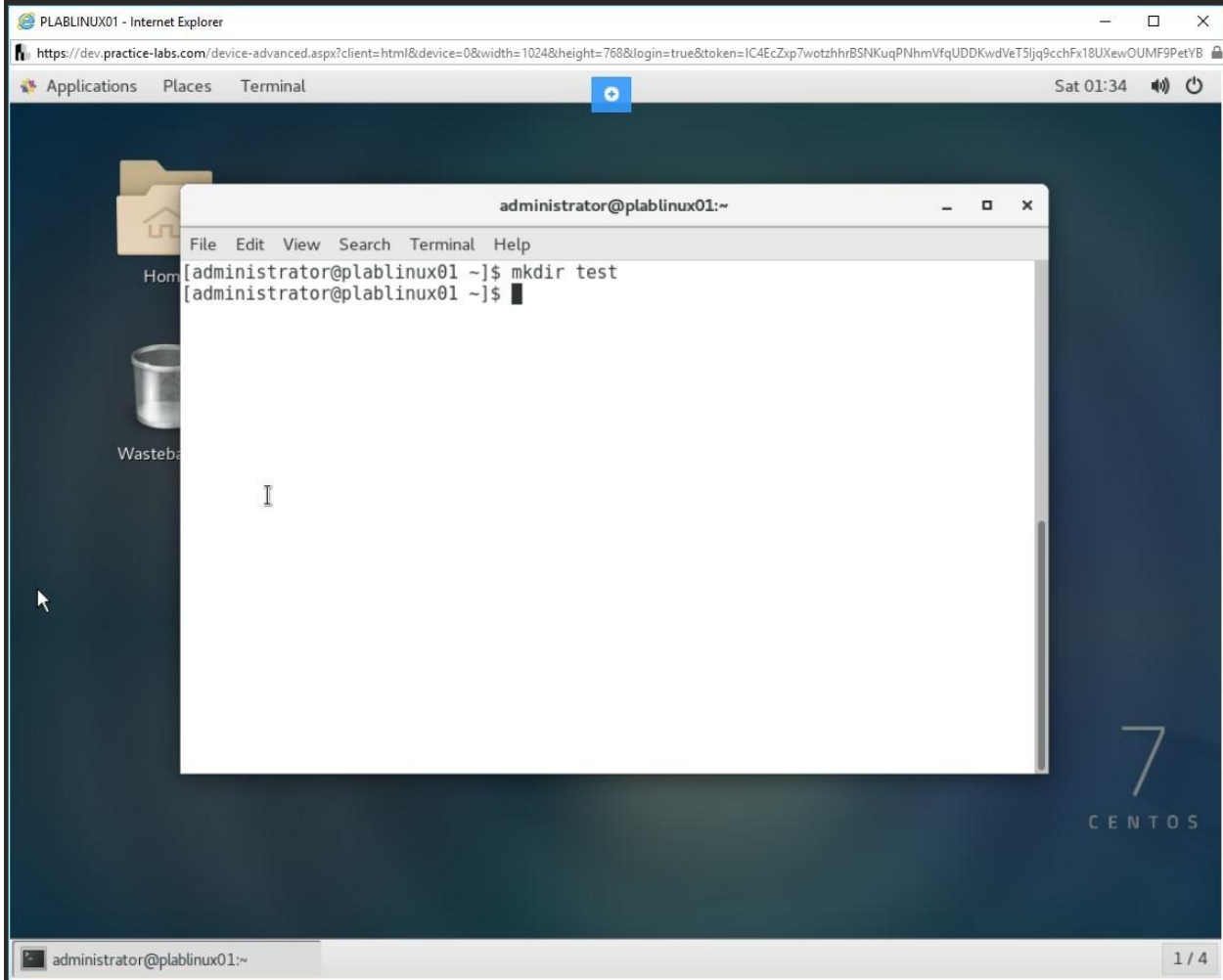
Press Enter.



Figure 1.20 Screenshot of PLABLINUX01: Creating a new directory named test.

## Step 2

Create two files with the names 1.txt and 2.txt. Type the following commands:

```
touch 1.txt
touch 2.txt
```
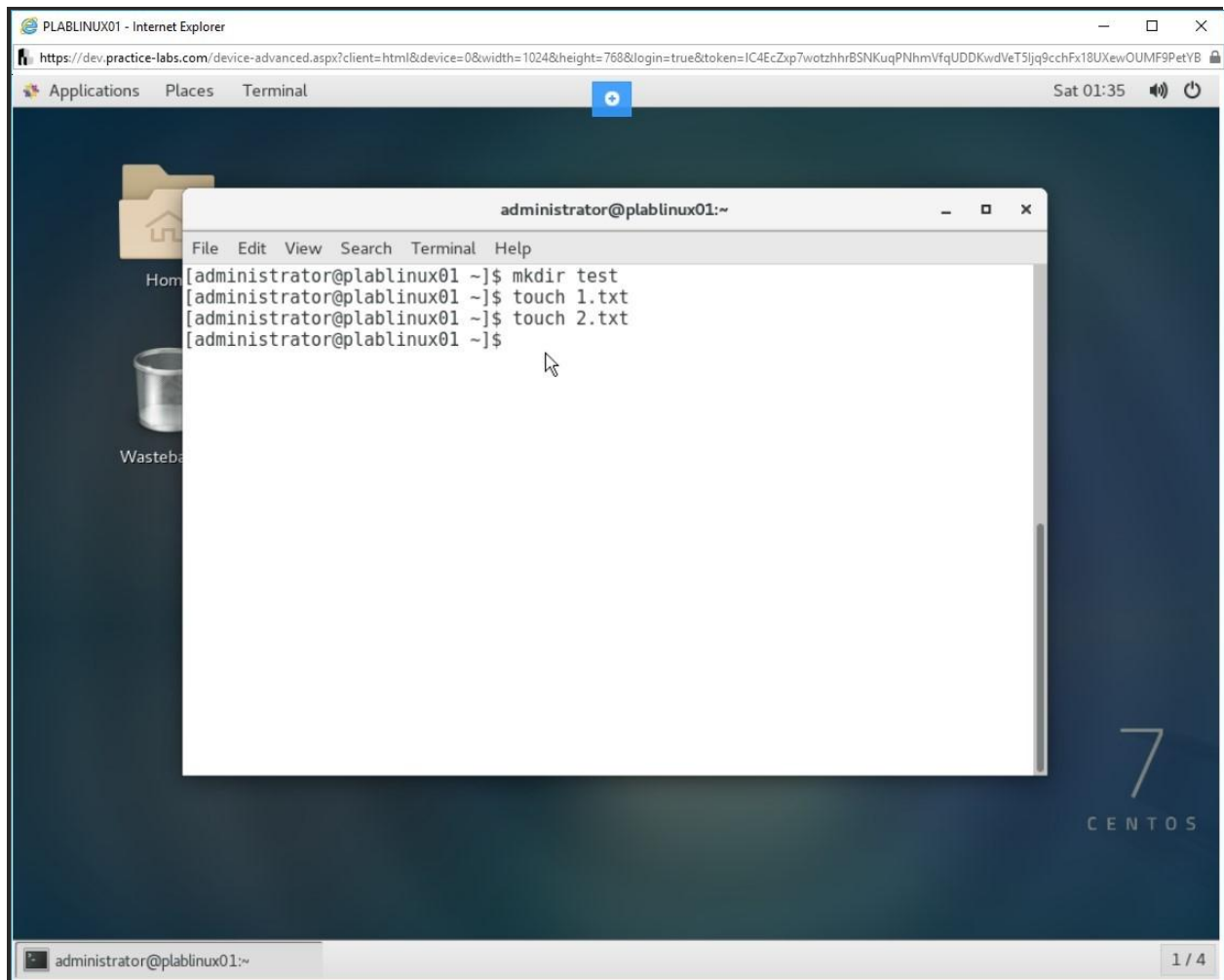
Press Enter.

Figure 1.21 Screenshot of PLABLINUX01: Creating two text files with the touch command.

## Step 3

To verify that the directory and both files have been created, type the following command:
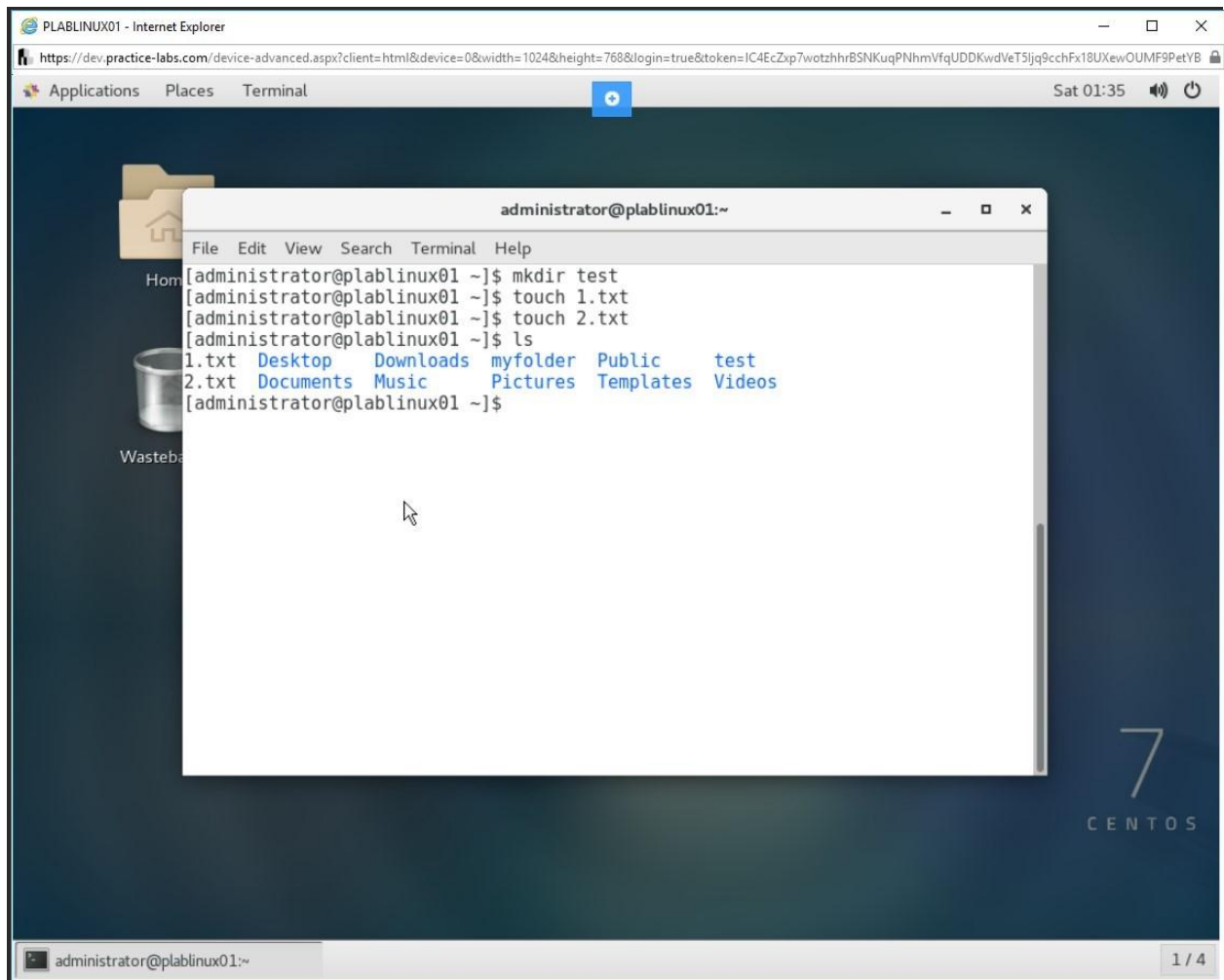
```
ls
```

Press Enter.

Figure 1.22 Screenshot of PLABLINUX01: Listing the contents of the directory.

*Step 4*

Move both the text files to the test directory. Type the following commands:

```
mv 1.txt test/
mv 2.txt test/
```

Press Enter.

To verify that both the files have been moved from the parent directory, type the following command:
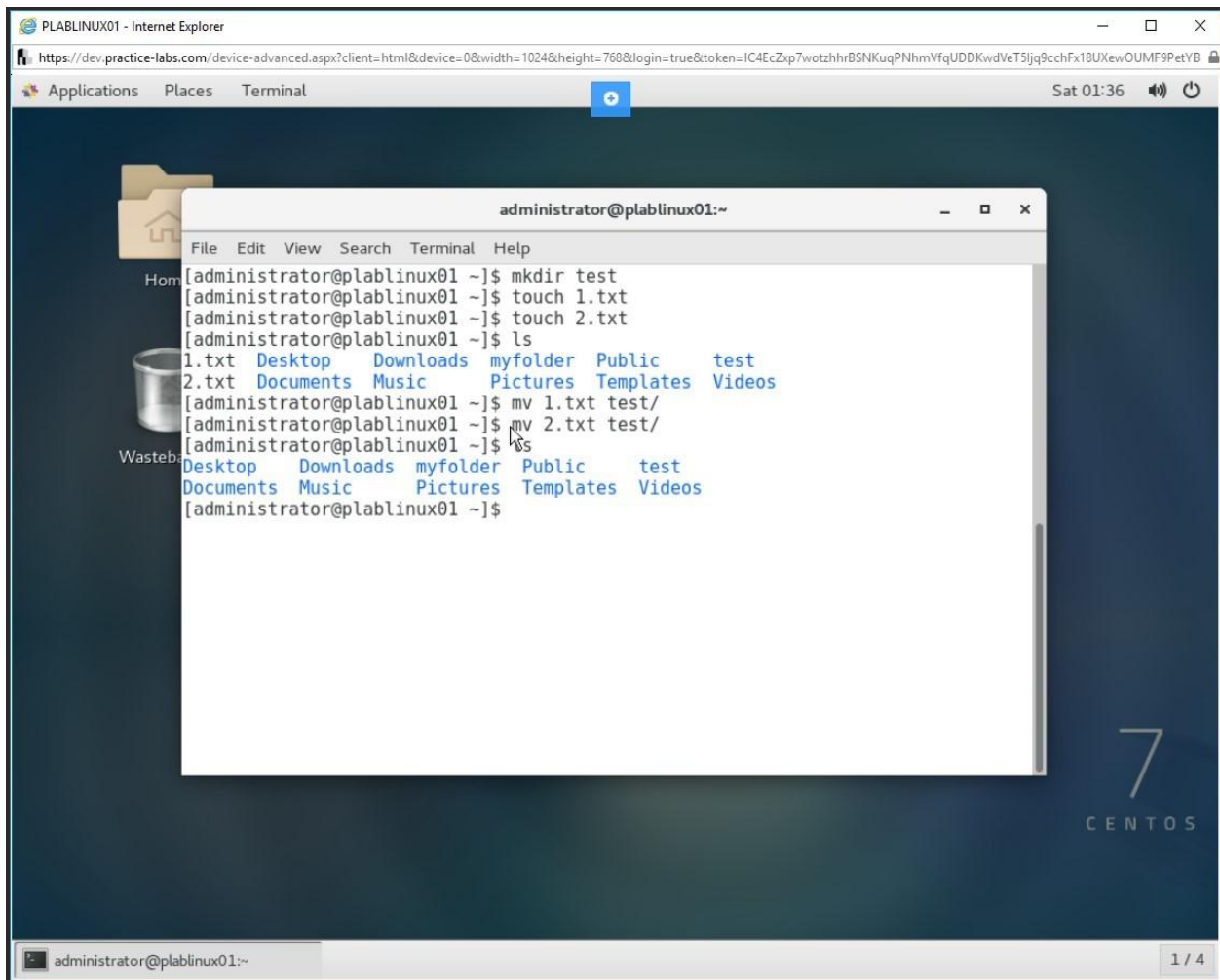
```
ls
```

Figure 1.23 Screenshot of PLABLINUX01: Moving the text files to the test directory, and the listing the content of the test directory.

Step 5

Clear the screen by entering the following command:

```
clear
```

Press Enter. You can create a copy of the test directory with both the files. To do this, you need to use the cp command with the source and destination directory. Type the following command:

```
cp test newtest
```

Press Enter.
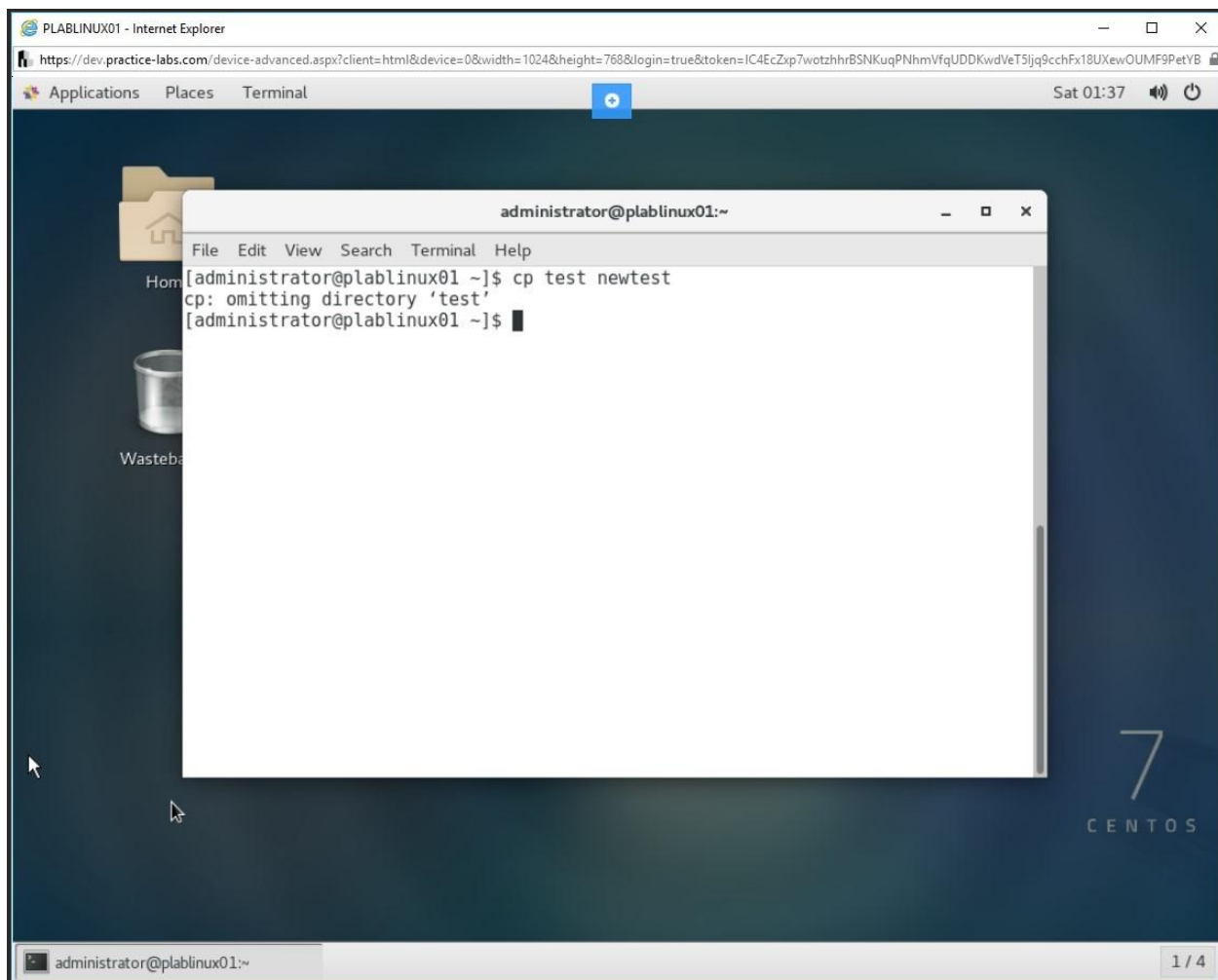
Notice that the command fails.

Figure 1.24 Screenshot of PLABLINUX01: Attempting to copy the test directory and its contents to the newtest directory.

Step 6

To copy a directory and the files contained in it to another directory, use the -r switch along with the cp command. Type the following command:

```
cp -r test newtest
```

Press Enter.

Notice that -r here is the parameter being used. The -r switch enables the advanced file operation of copying a directory, along with the contained files, using a single command and describes a recursive action.
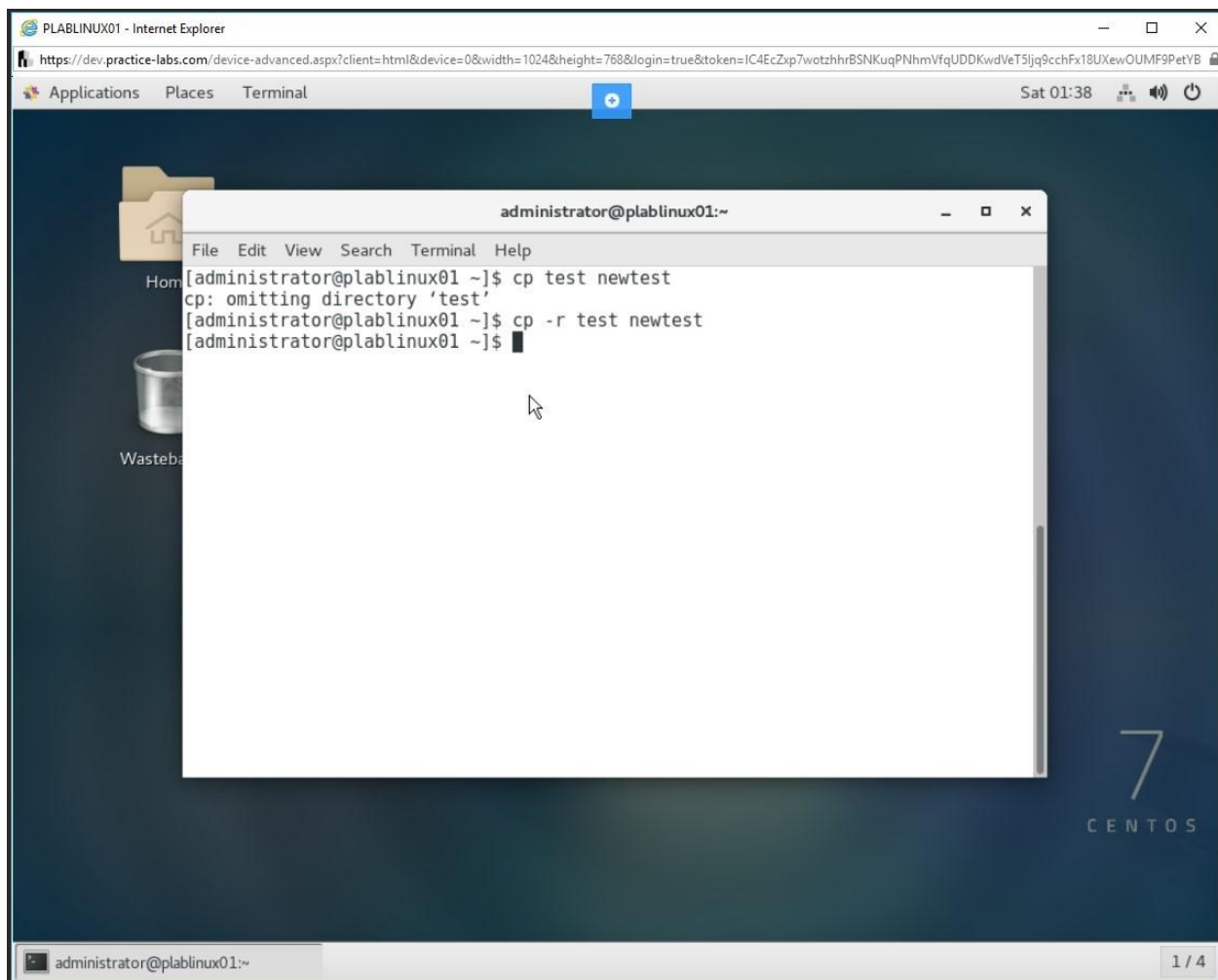
Figure 1.25 Screenshot of PLABLINUX01: Copying the test directory and its contents to the newtest director with the -r switch.

Step 7

Use the following command to verify that the directory is now copied:
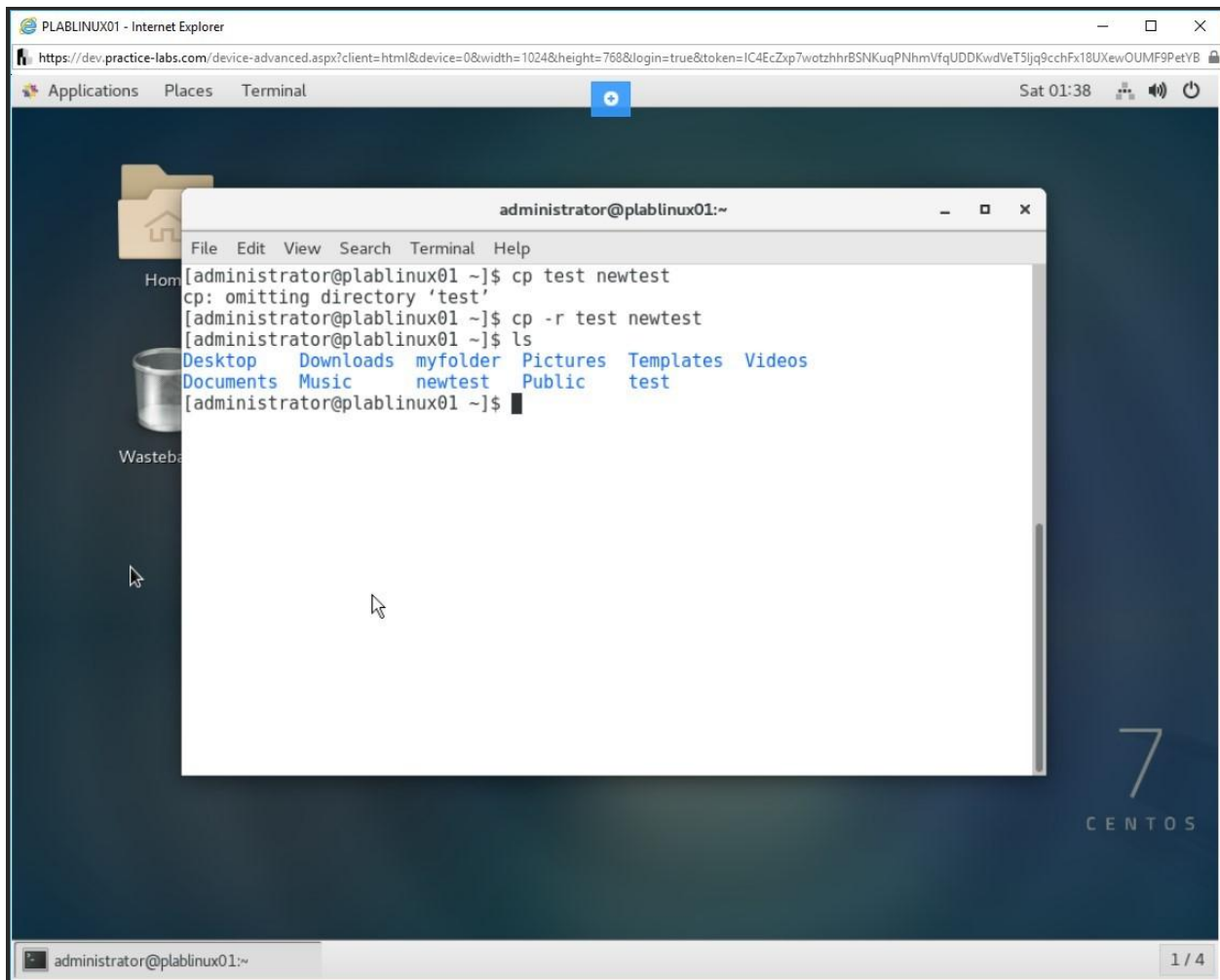
```
ls
```

Press Enter.

Figure 1.26 Screenshot of PLABLINUX01: Listing the contents of the directory.

Step 8

Verify both the files are also in the new directory named newtest. Type the following command:

```
ls newtest/
```

Press Enter.

Notice that both the files are present in the new directory as well.
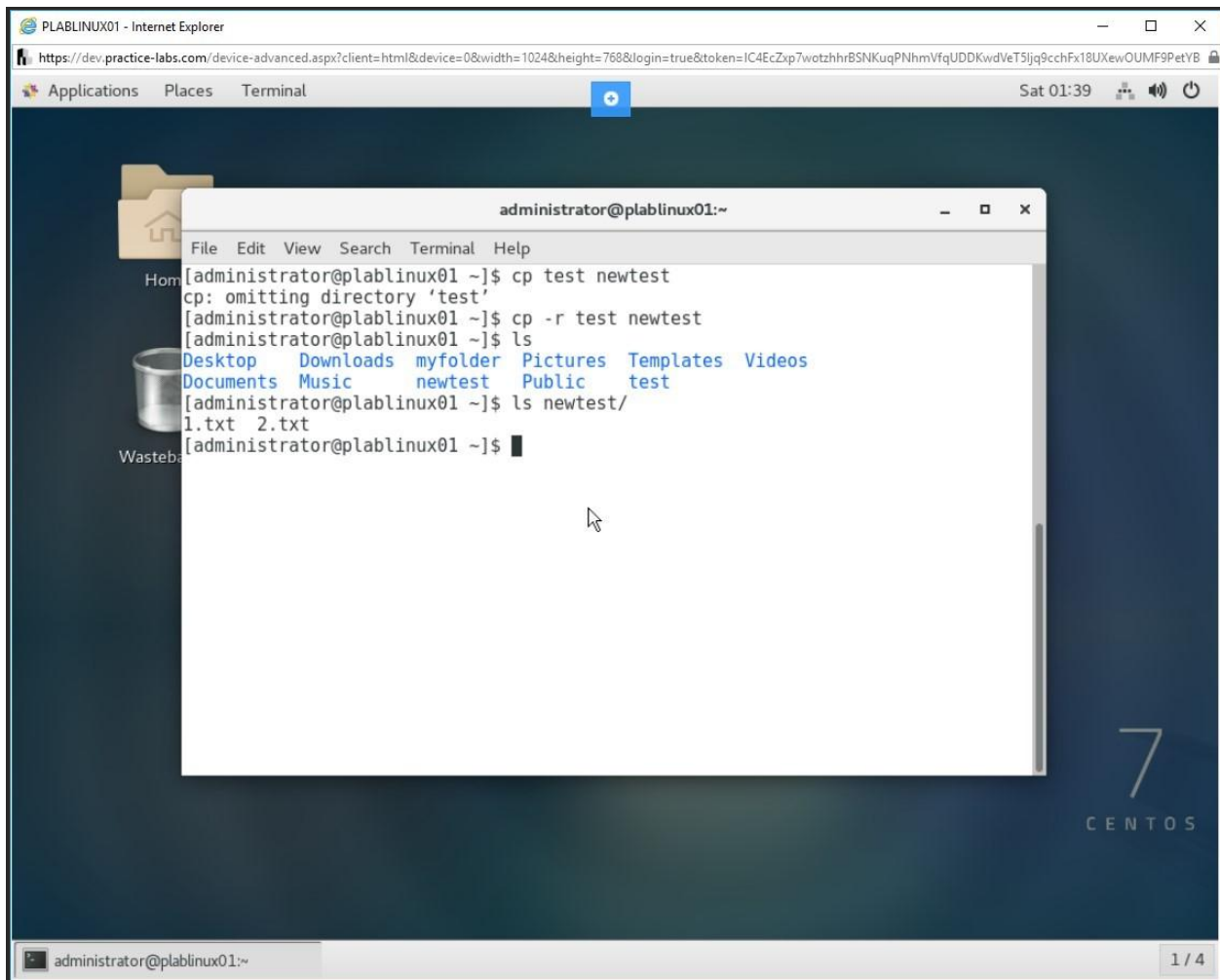
Figure 1.27 Screenshot of PLABLINUX01: Listing the contents of the newtest directory.

Step 9

Clear the screen by entering the following command:

```
clear
```

Press Enter. To remove all the files from a directory, type the following command:

```
rm -rf ./test/*
```

Press Enter.

Notice that the "*" is a wildcard here that removes all the files with one command, saving the effort and time of repeating the command for each file.
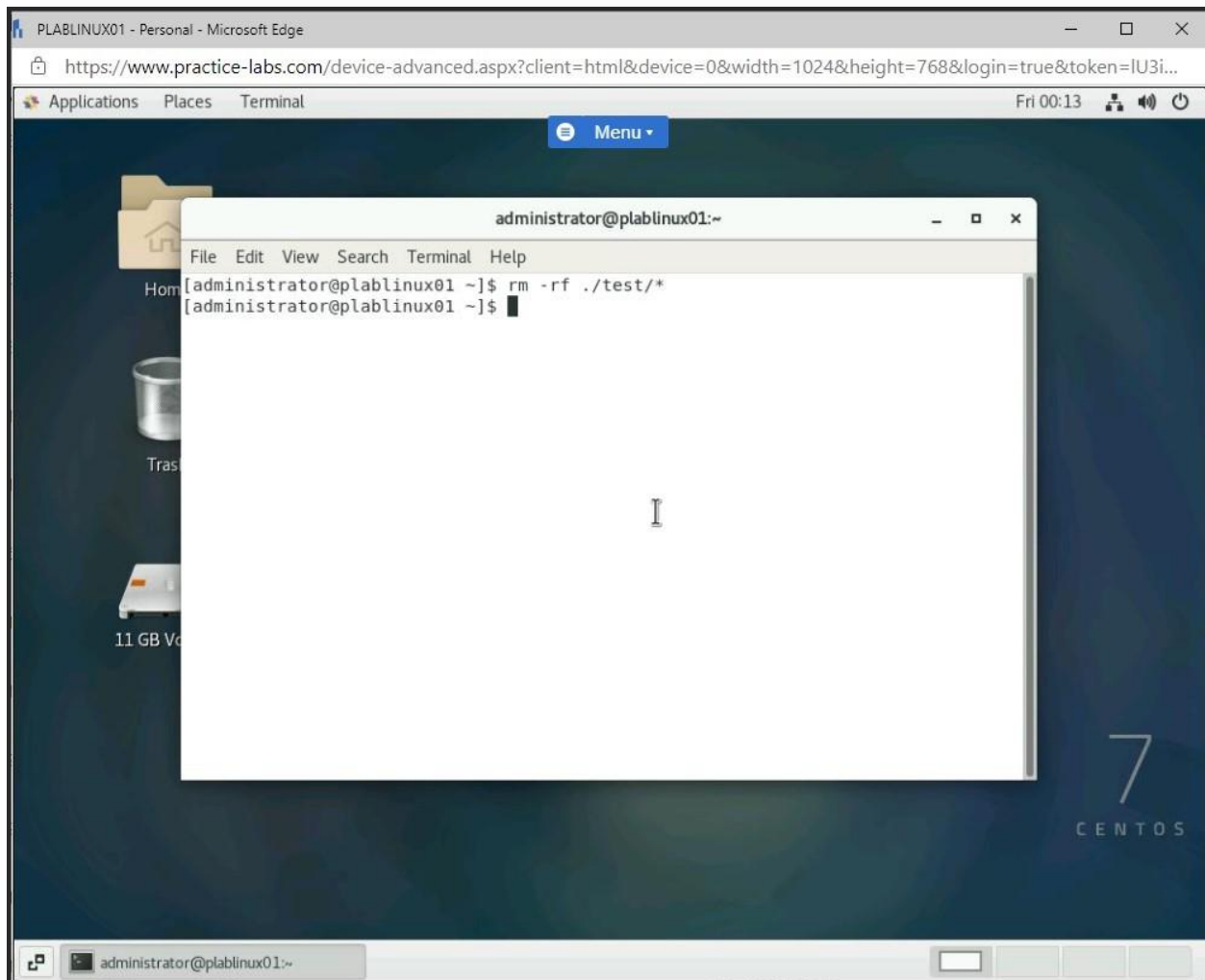
Figure 1.28 Screenshot of PLABLINUX01: Removing all files from the test directory.

Step 10

To remove a directory including the files, type the following command:
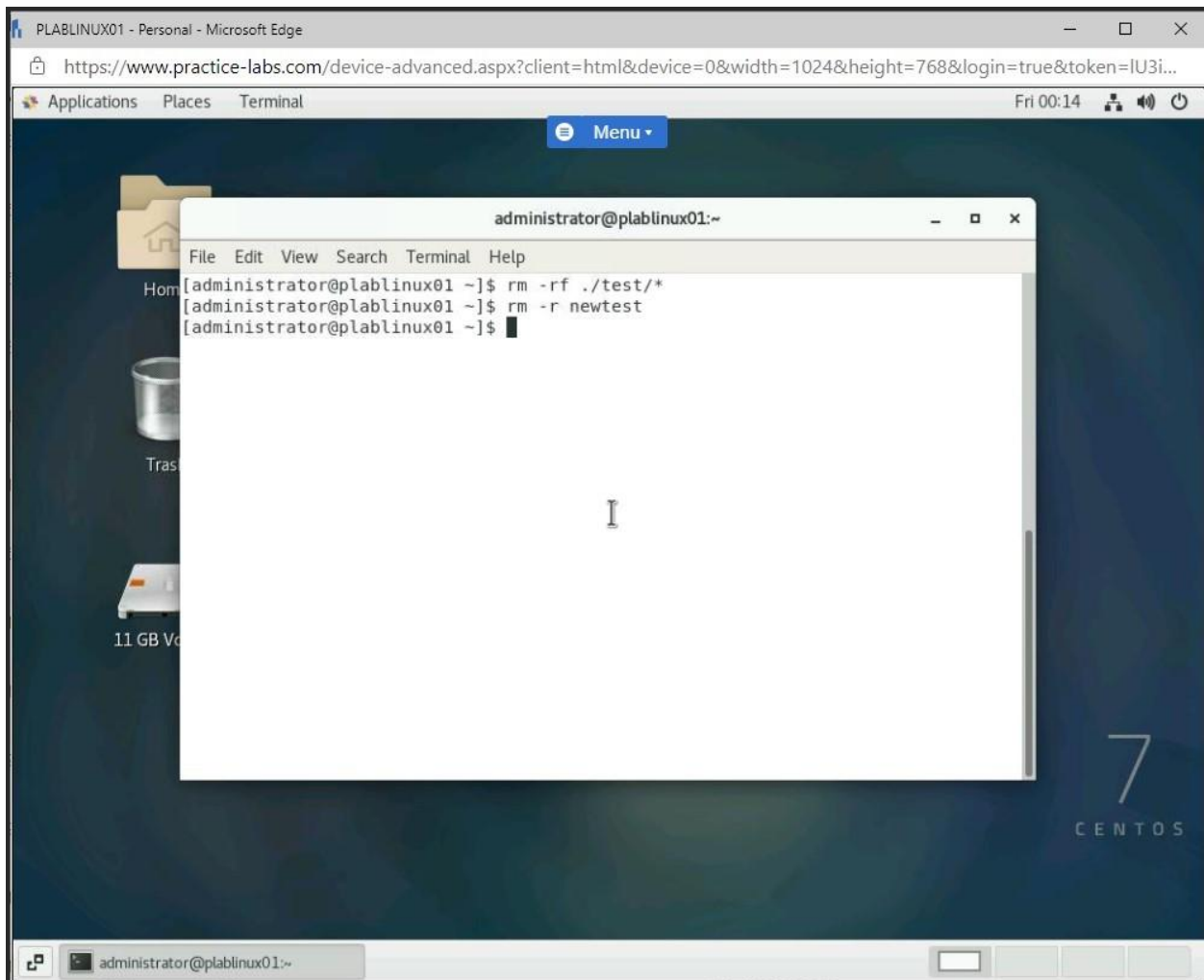
```
rm -r newtest
```

Press Enter.

Figure 1.29 Screenshot of PLABLINUX01: Removing a directory with the files with the -r switch.

Task 3 - Use Wildcards to Manipulate Data in a File

You can use different wildcards to access and manage multiple files at a time. In this task, you will use the "*", the "?", and the "[ ]" wildcards to manipulate data.

To use wildcards to manipulate data in a file, perform the following steps:

Step 1

Clear the screen by entering the following command:

```
clear
```

Press Enter. To replace any number or combination of characters, you use the * wildcard. For example, to list all the files in directories with names starting with b, type the following command:

```
ls -l /dev/b*
```

Press Enter.

Notice that all the file in directories with names starting with the alphabet "b" are displayed using a single command and without the need to specify the individual names.
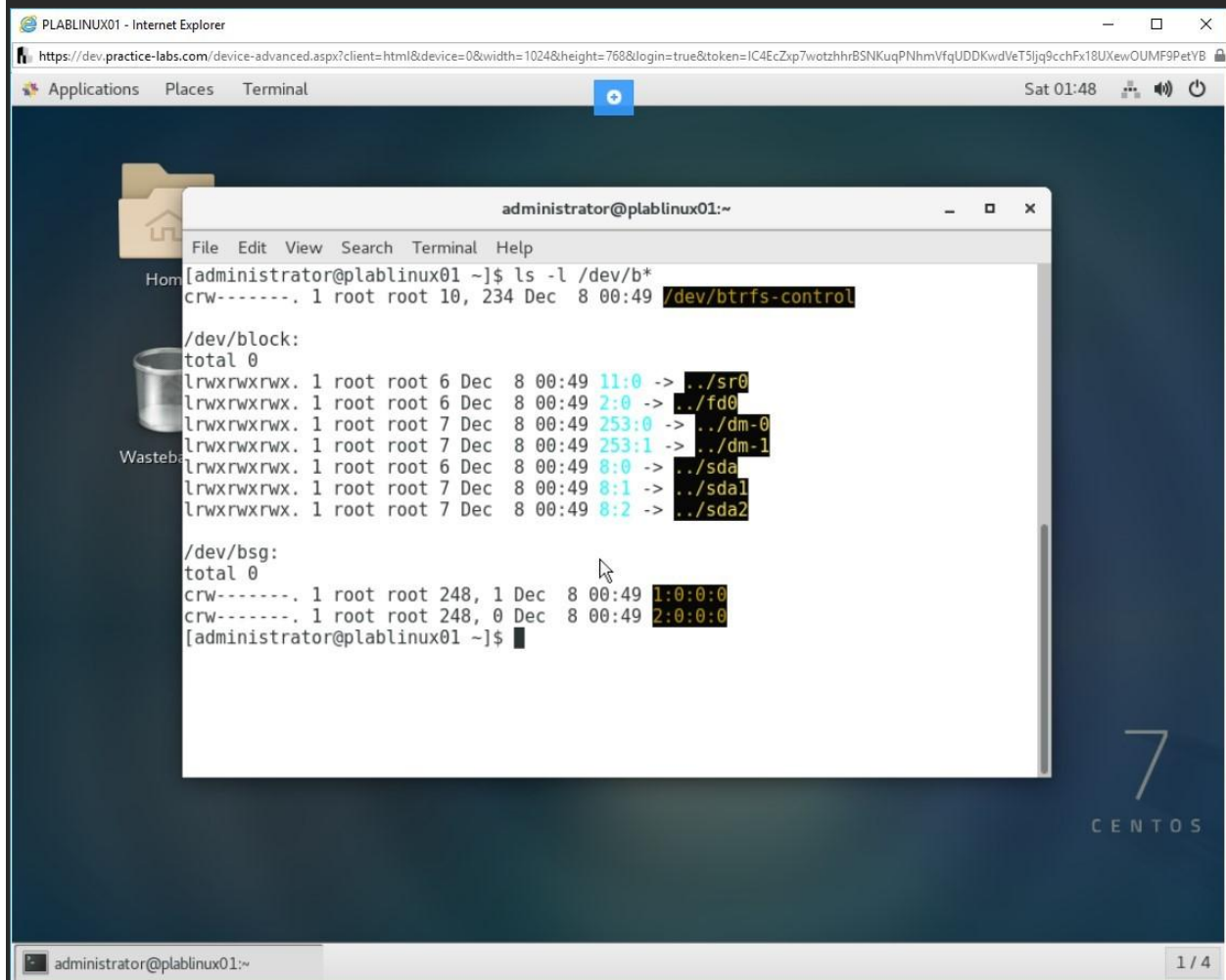

Figure 1.30 Screenshot of PLABLINUX01: Listing a file with name starting with b.

Step 2

Clear the screen by entering the following command:

```
clear
```

Press Enter. To replace only one character, use ?

For example, to list the files from the dev directory, that have names starting with r, type the following command:
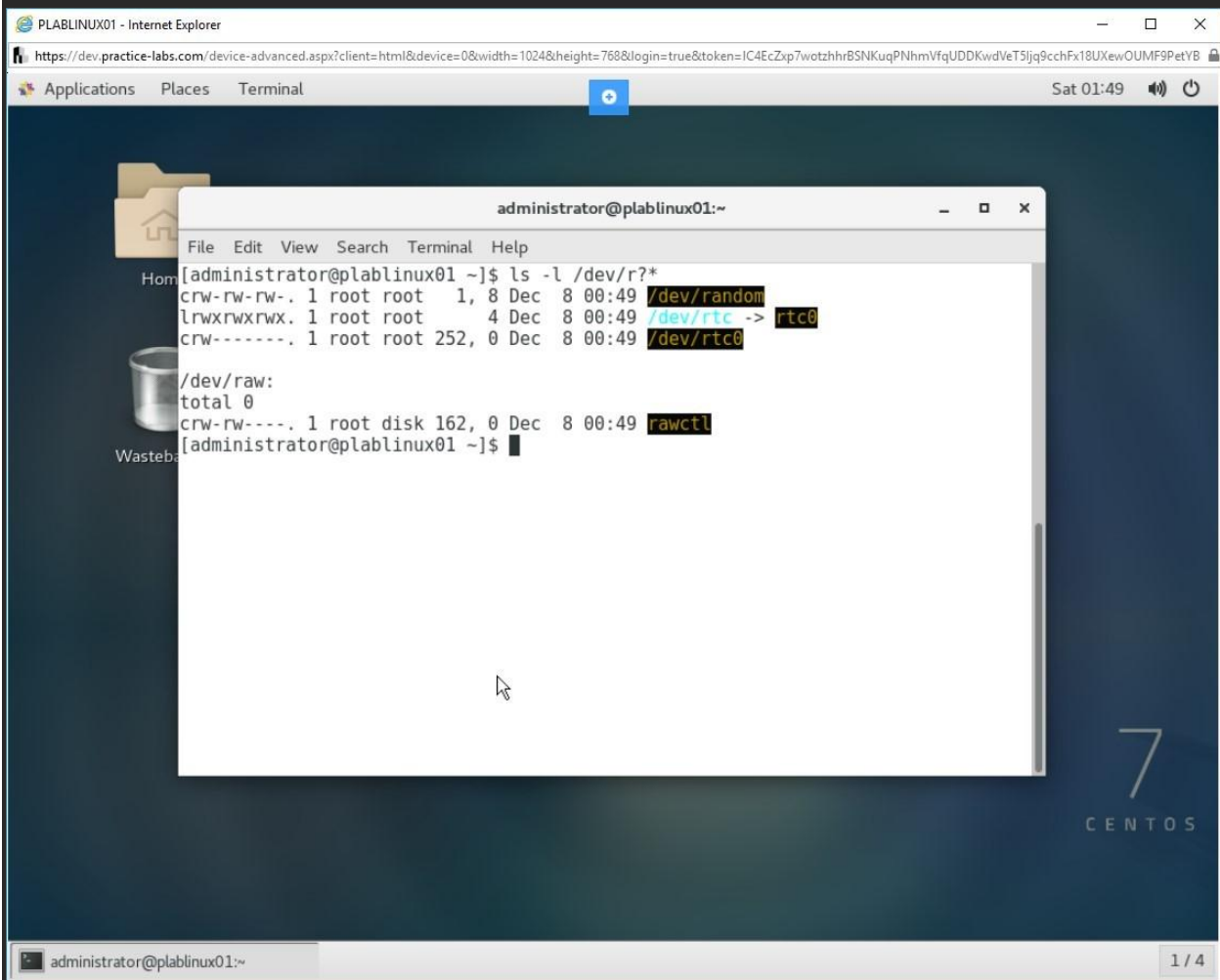
```
ls -l /dev/r?*
```

Press Enter.

Figure 1.31 Screenshot of PLABLINUX01: List all files from the dev directory that have names starting with r.

Step 3

Clear the screen by entering the following command:

```
clear
```

Press Enter. To find a range of values, use [ ]. Examples where the range needs to be determined include:

- To list all files starting with an 'a' and have a digit in second position.
- To list all files that don't start with an 'a' or an 'A'
- To list the files in directory names starting with 'b'

Let's list all files that don't start with an 'a' or an 'A'. Type the following command:
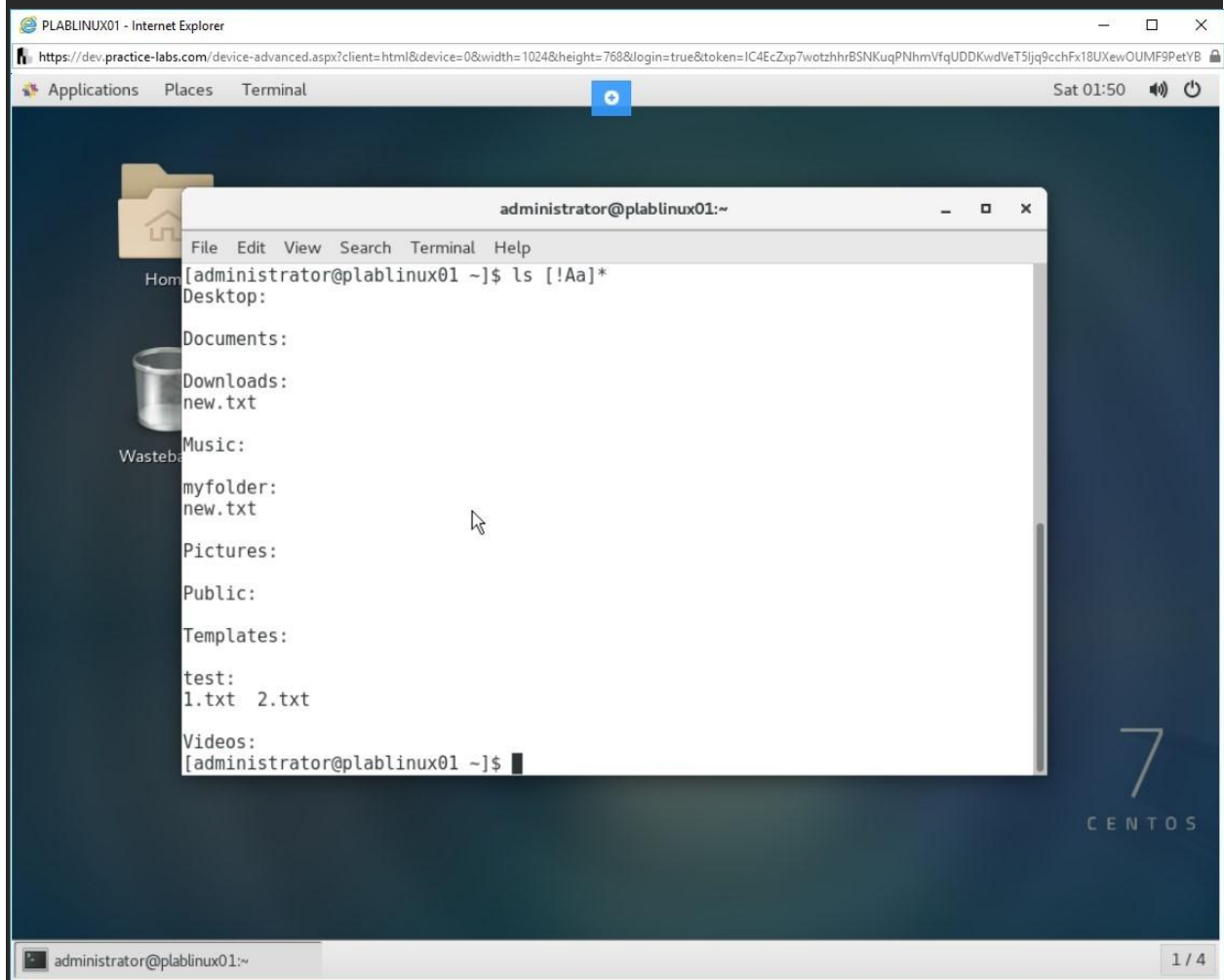
```
ls [!Aa]*
```

Press Enter.

Figure 1.32 Screenshot of PLABLINUX01: Listing all files that don't start with an 'a' or an 'A'.

Step 4

Clear the screen by entering the following command:

```
clear
```

Press Enter. To find directories with a specific name, you can provide the range between the [ ] Type the following command:

```
ls D[eo]*
```

Press Enter.

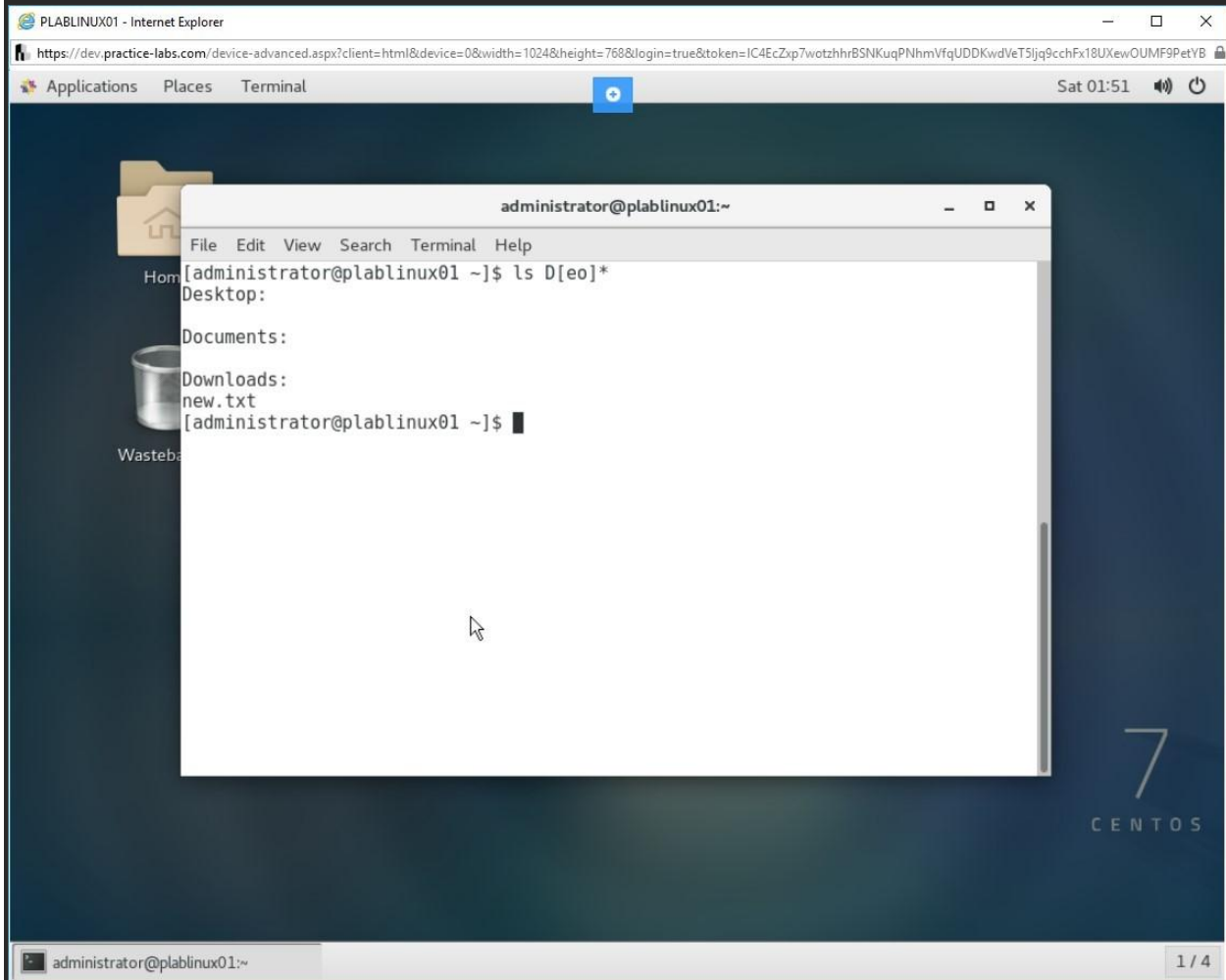Notice that the output lists all the files that have names starting with "De" or "Do".

Figure 1.33 Screenshot of PLABLINUX01: Finding files and directories that have names starting with De or Do.

Task 4 - Use the Find Command

Linux provides a find command that you can use to locate and manipulate multiple files supporting common values for criteria such as name, type, size, or timestamp. In this task, you will use the find command to locate files based on specified criteria for name, type, size, and time.

To use the find command, perform the following steps:

Step 1

Clear the screen by entering the following command:

```
clear
```

Press Enter. You can use the find command to find files based on specific criteria. Some of these criteria are listed below:

- -type: specifies the type of file
- -name: name of the file (can include wildcards)
- -user: user owner
- -atime, ctime, mtime: access, creation and modified times (multiples of 24 hrs)
- -amin, cmin, mmin: access, creation and modified times (multiples of 1 min)
- -newer FILE: files newer than FILE

In the command below, you will find files starting with gnome owned by the user named root. To find these files, type the following command:

```
find / -user root -name "gnome*"
```
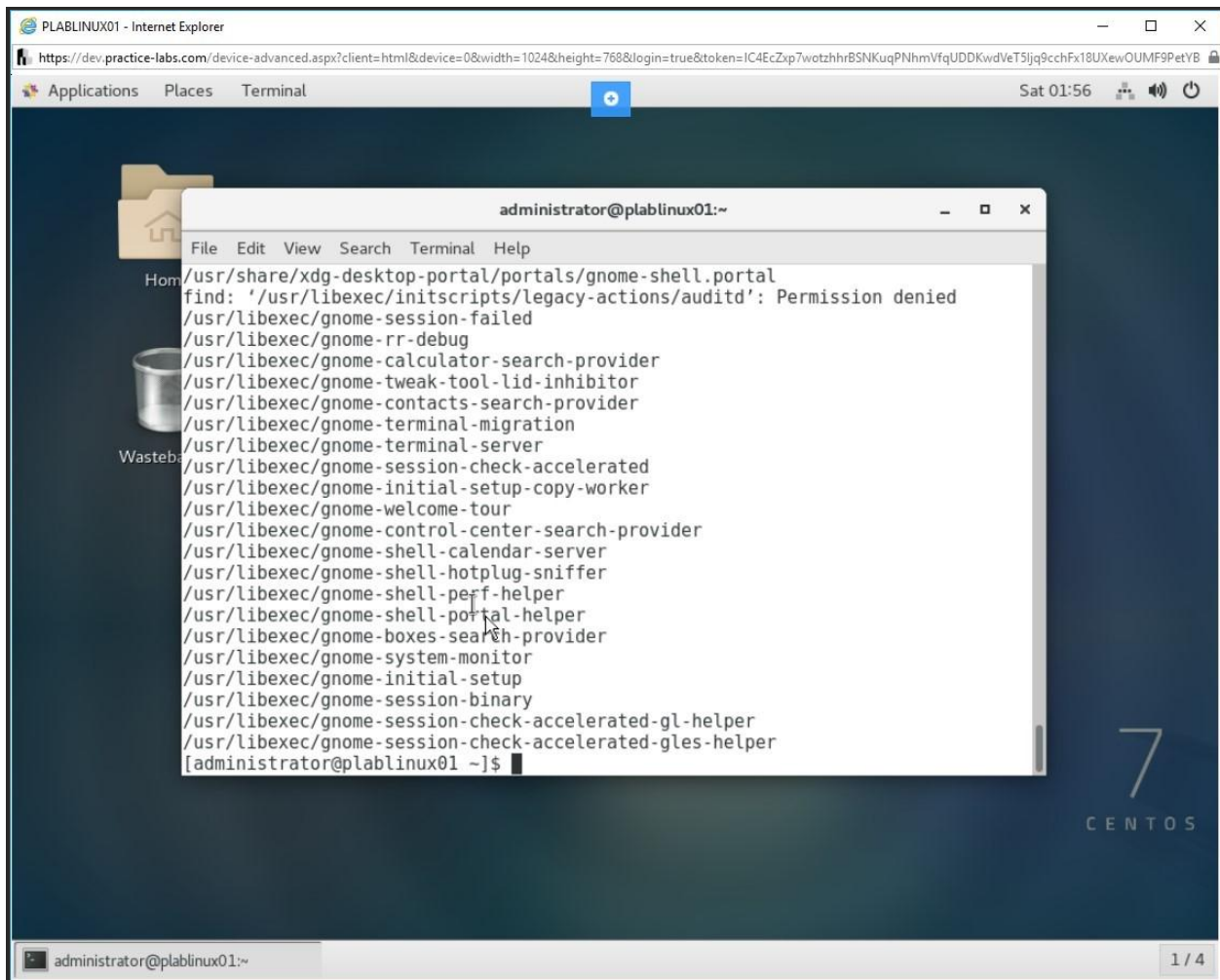
Press Enter.

Figure 1.34 Screenshot of PLABLINUX01: Finding files starting with gnome for a user named root.

Step 2

Clear the screen by entering the following command:

```
clear
```

Press Enter. To find a specific type of file owned by a user (who in this case is root), type the following command:

```
find / -user root -type f
```
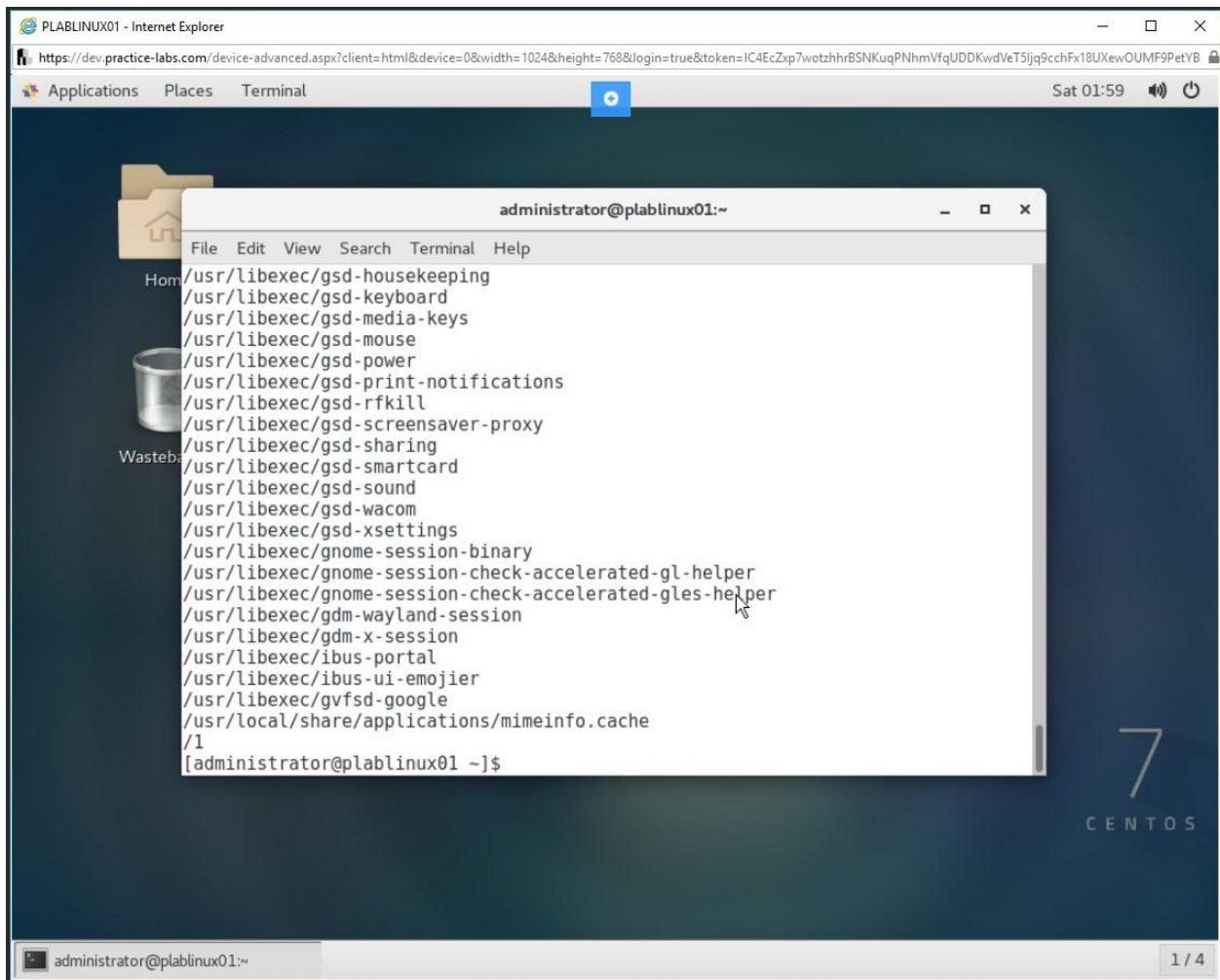
Press Enter.

Figure 1.35 Screenshot of PLABLINUX01: Finding a specific type of file owned by a user.

Step 3

Clear the screen by entering the following command:

```
clear
```

Press Enter. To find files that were modified a number of days ago, type the following command:

```
find . -mtime +60
```
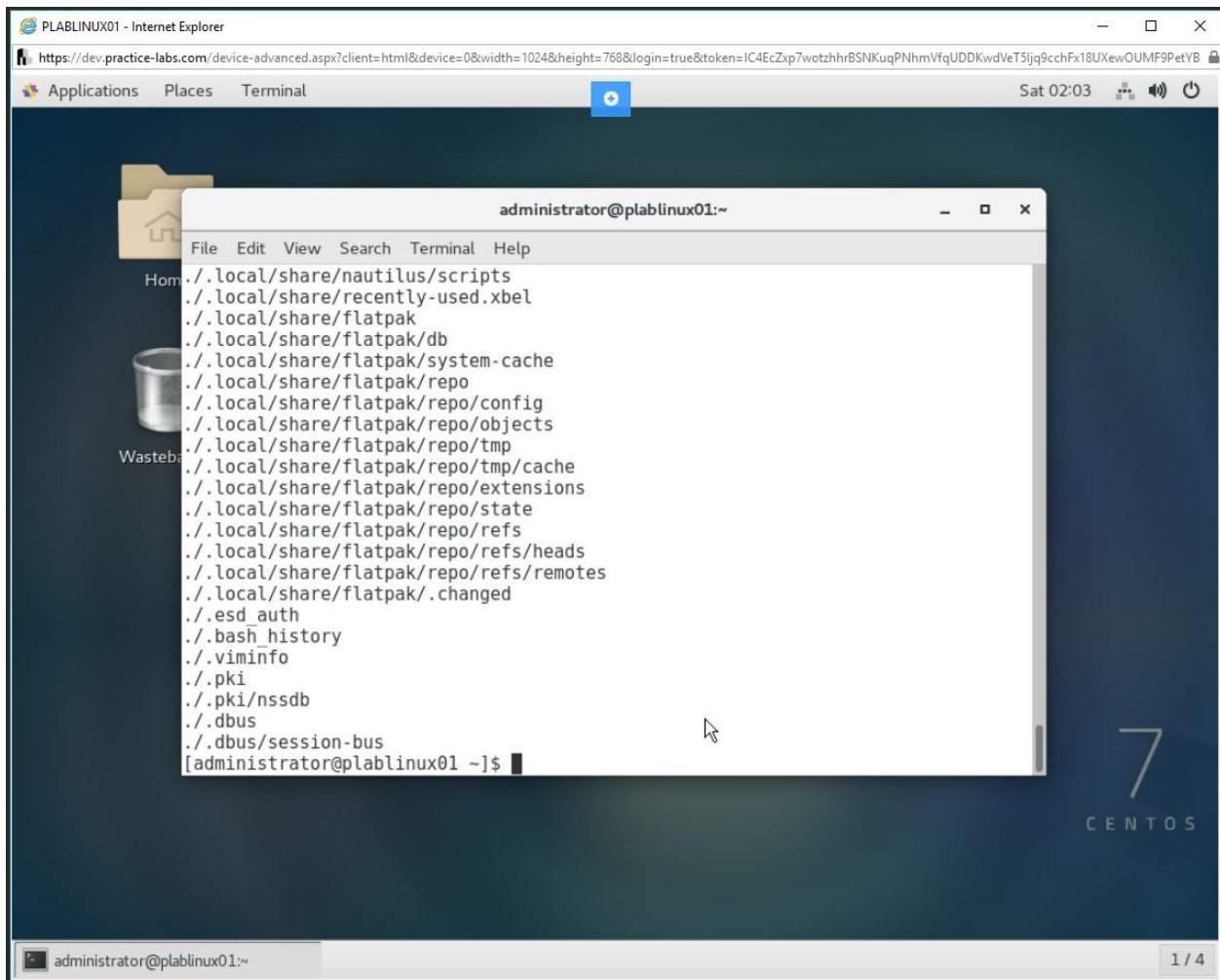
Press Enter.

Figure 1.36 Screenshot of PLABLINUX01: Finding files that were modified a number of days ago.

Step 4

Clear the screen by entering the following command:

```
clear
```

Press Enter. To list all files over 2MB in the current directory and subdirectories, , type the following command:

```
find . -size +2M
```
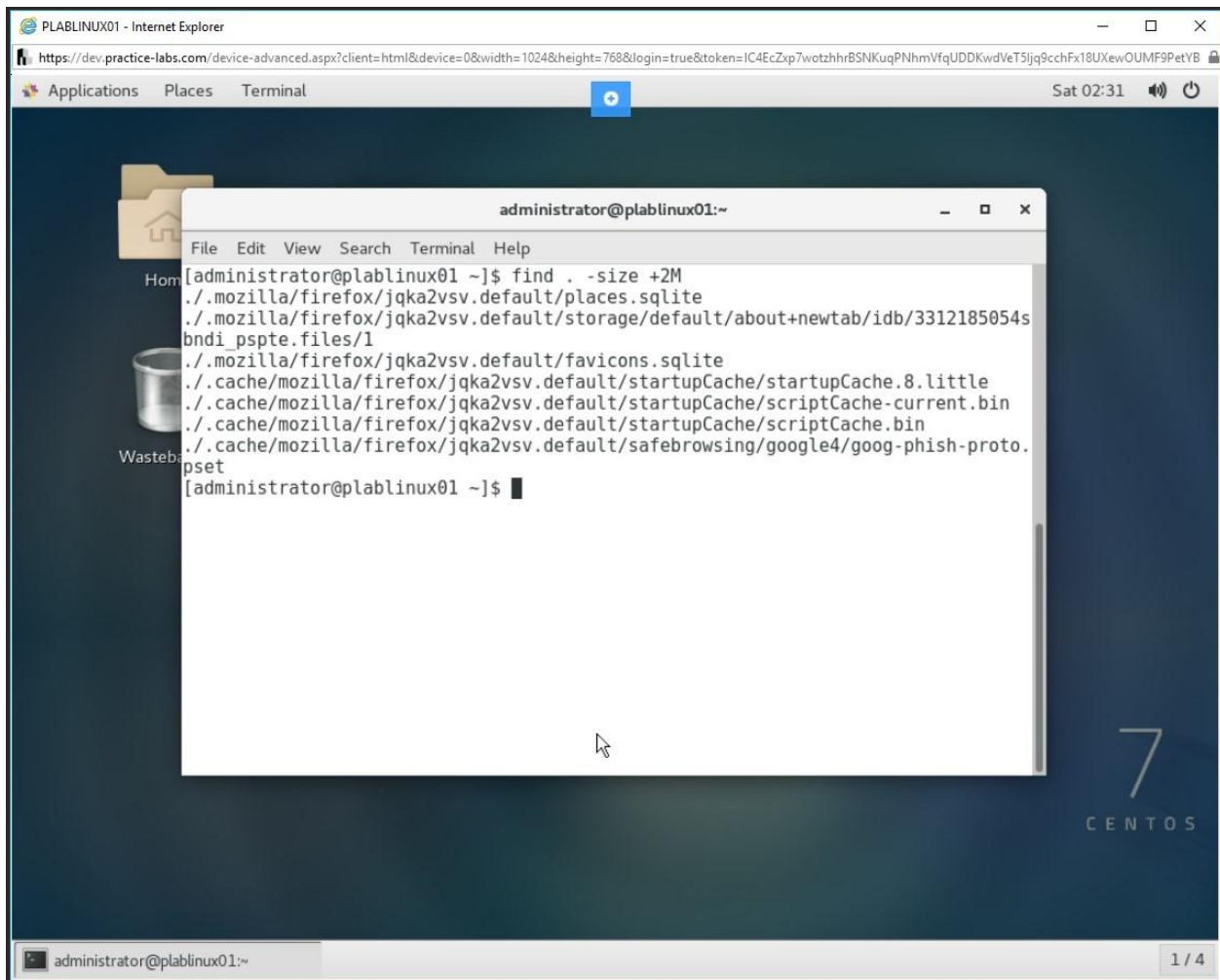
Press Enter.

Figure 1.37 Screenshot of PLABLINUX01: Listing all files over 2MB in the current directory and subdirectories.

Task 5 - Use the tar and cpio Commands

Linux offers tools to help you manage your files and data. tar, cpio and dd are examples of such tools. You can use these tools to create archives, to extract the files from an archive, or create an iso image from a CDROM.

To use tar, cpio and dd commands, perform the following steps:

Step 1

Clear the screen by entering the following command:

```
clear
```

Press Enter. Create multiple txt files using the touch command. For the demonstration purpose, three files are created: output.txt, 1.txt, and 2.txt. Type the following command to create 1.txt:

```
touch 1.txt
```

Press Enter.

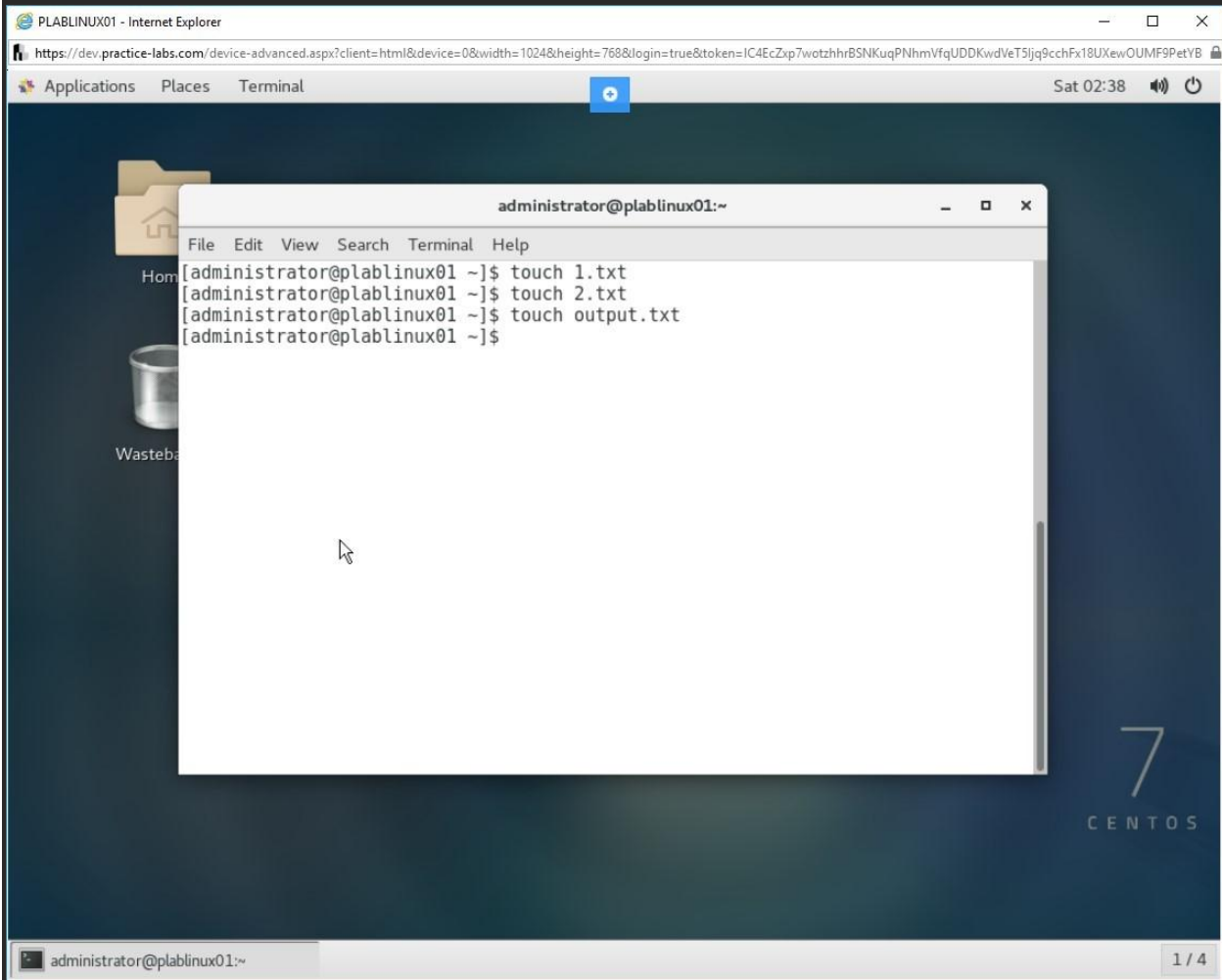Similarly, create 2.txt and output.txt.

Figure 1.38 Screenshot of PLABLINUX01: Creating text files with the touch command.

Further, create an archive file using the tar command. Enter the following command:

```
tar -cvjf test.tar.bz *.txt
```

The switches used with the tar command:

- c - to create the archive
- v - to display the verbose output during archive creation
- j - to compress the archive with bzip compression. You can use the 'z' switch to use gzip compression
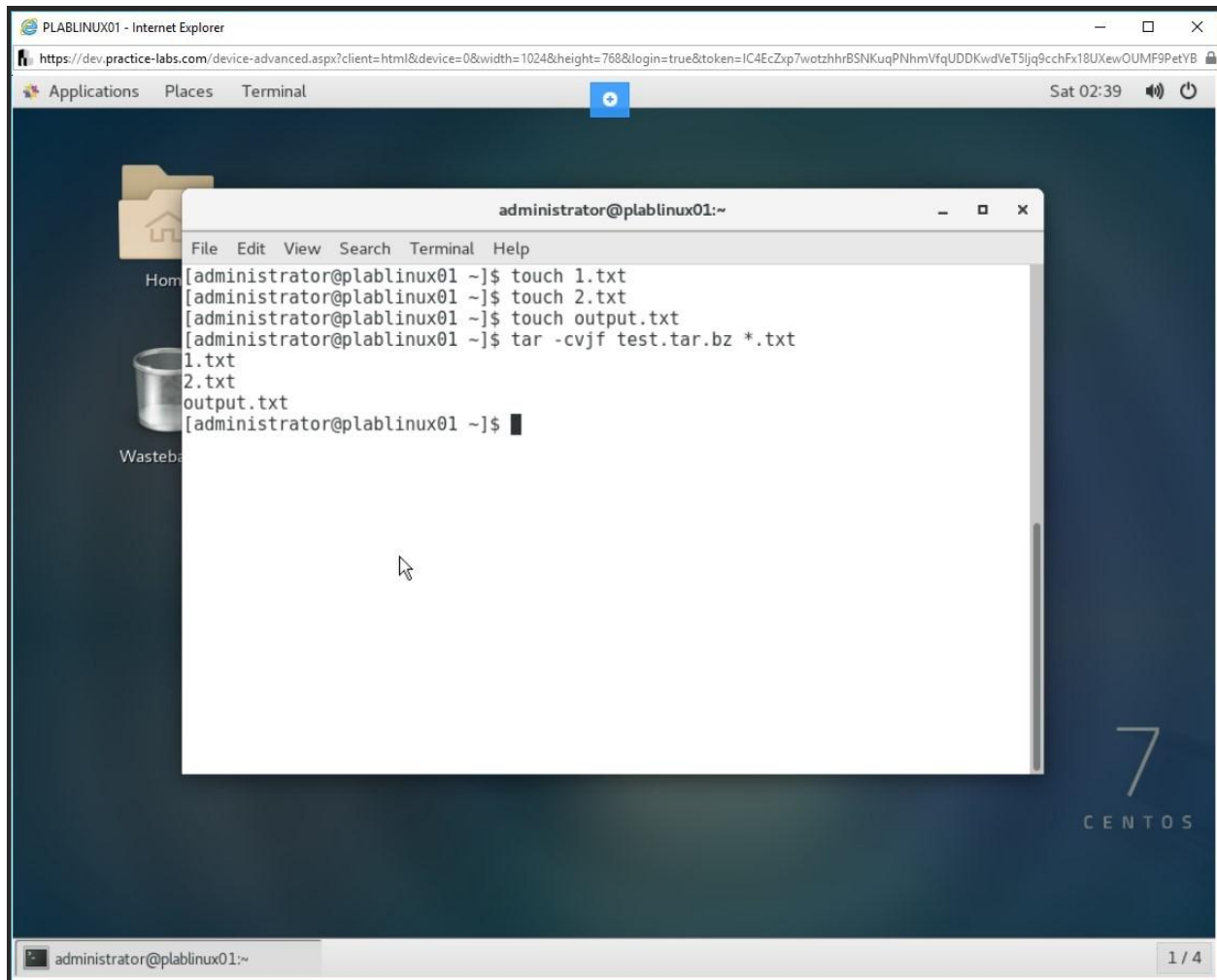- f - to name the file that is being created

Figure 1.39 Screenshot of PLABLINUX01: Creating an archive file using the tar command.

Step 2

Type the following command to verify that the archive file now exists:

```
ls
```

Press Enter.

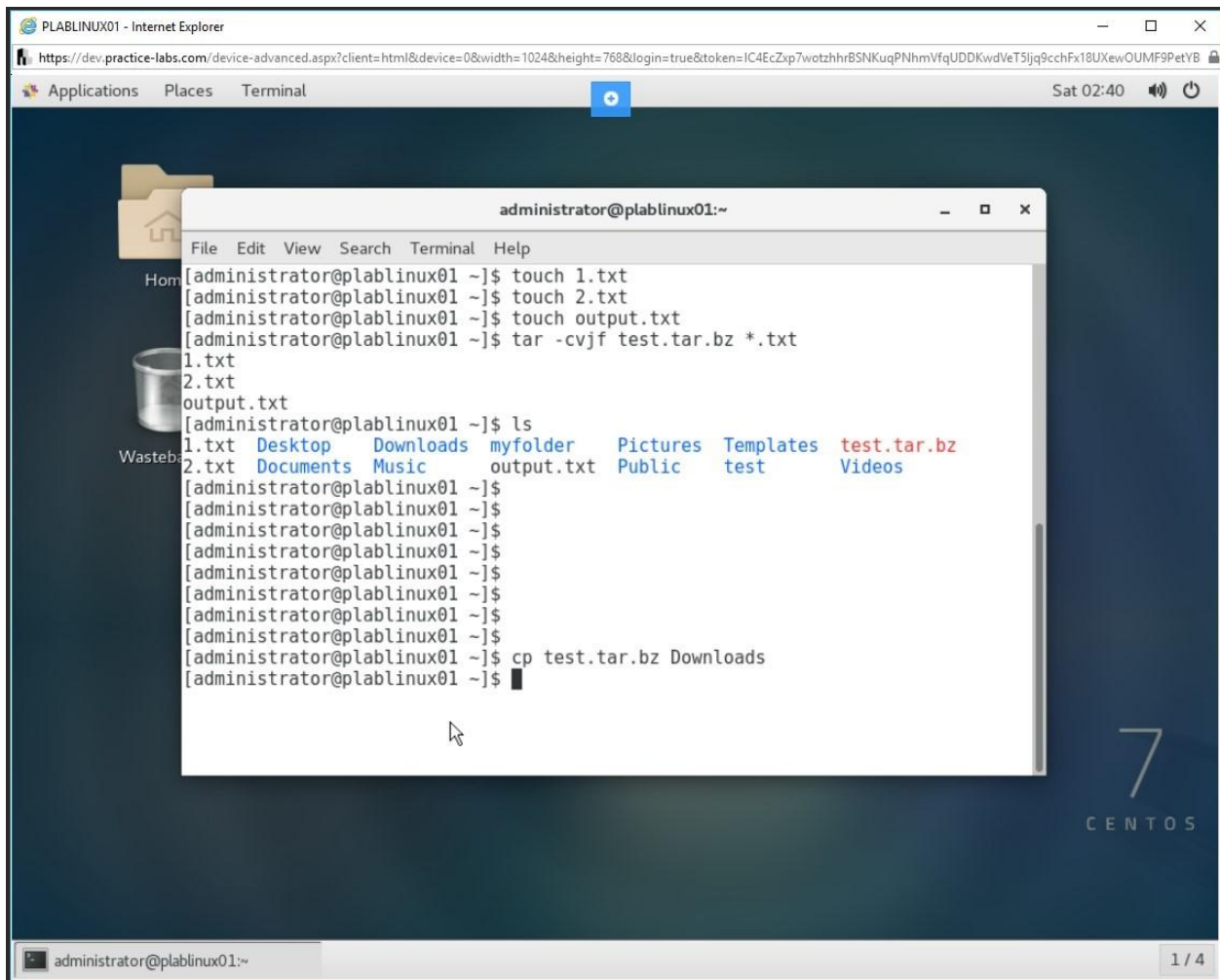Figure 1.40 Screenshot of PLABLINUX01: Listing the contents of the directory.

Step 3

After you have created the file, you can extract it as well using the tar command. Let's first copy the archive file into a different directory. Type the following command:

```
cp test.tar.bz Downloads
```

Press Enter.

Figure 1.41 Screenshot of PLABLINUX01: Copying the archive file into the Downloads directory.

Step 4

Clear the screen by entering the following command:

```
clear
```

Press Enter. Verify that the test.tar.bz file exists in the Downloads directory. Type the following command:
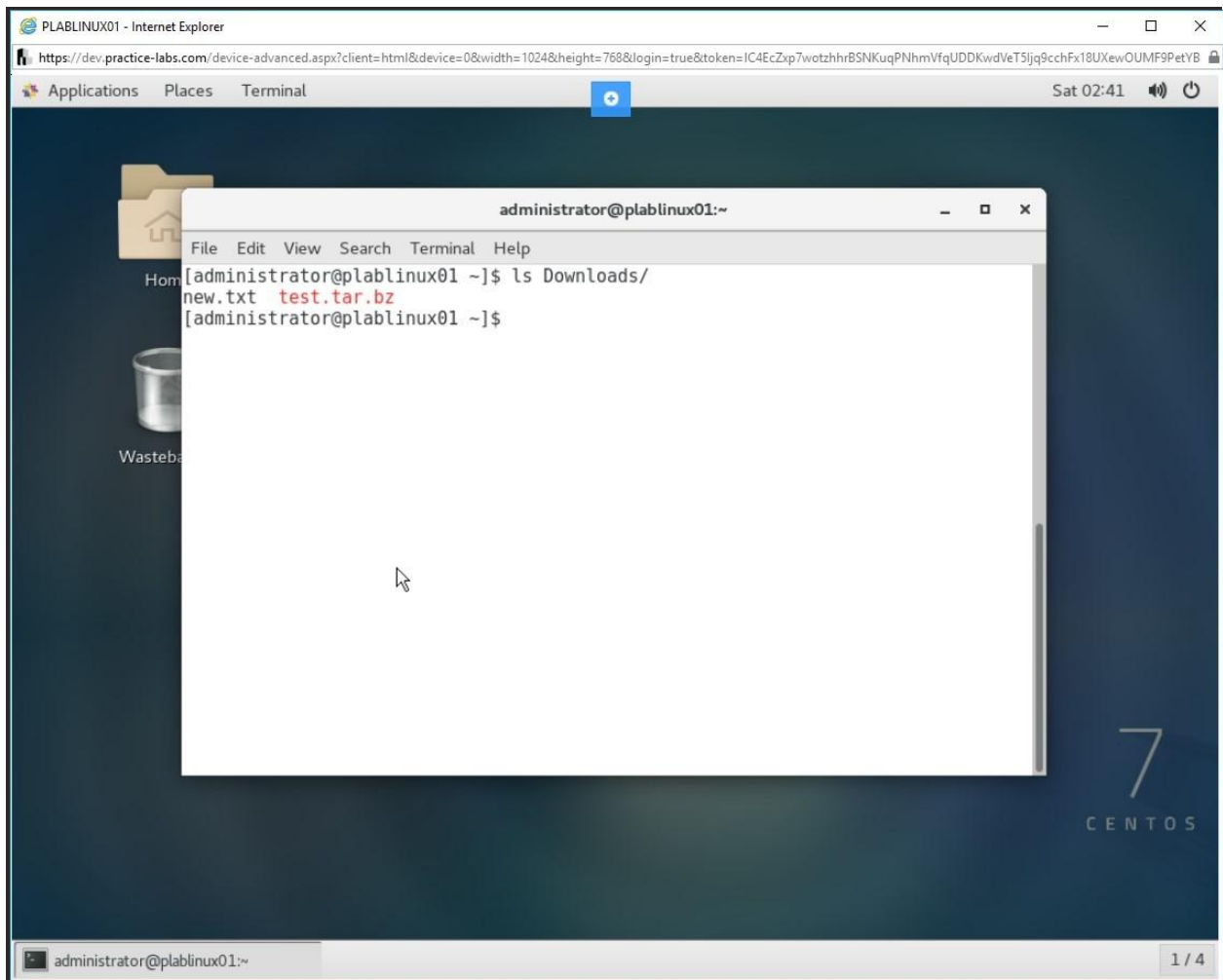
```
ls Downloads/
```

Press Enter.

Figure 1.42 Screenshot of PLABLINUX01: Listing the contents of the Downloads directory.

Step 5

Navigate to the Downloads directory using the following command:

```
cd Downloads
```

To extract the archive file, type the following command:

```
tar -xvjf test.tar.bz
```

Press Enter.

Notice that the three files tarred in the earlier step are now extracted into the specified directory.
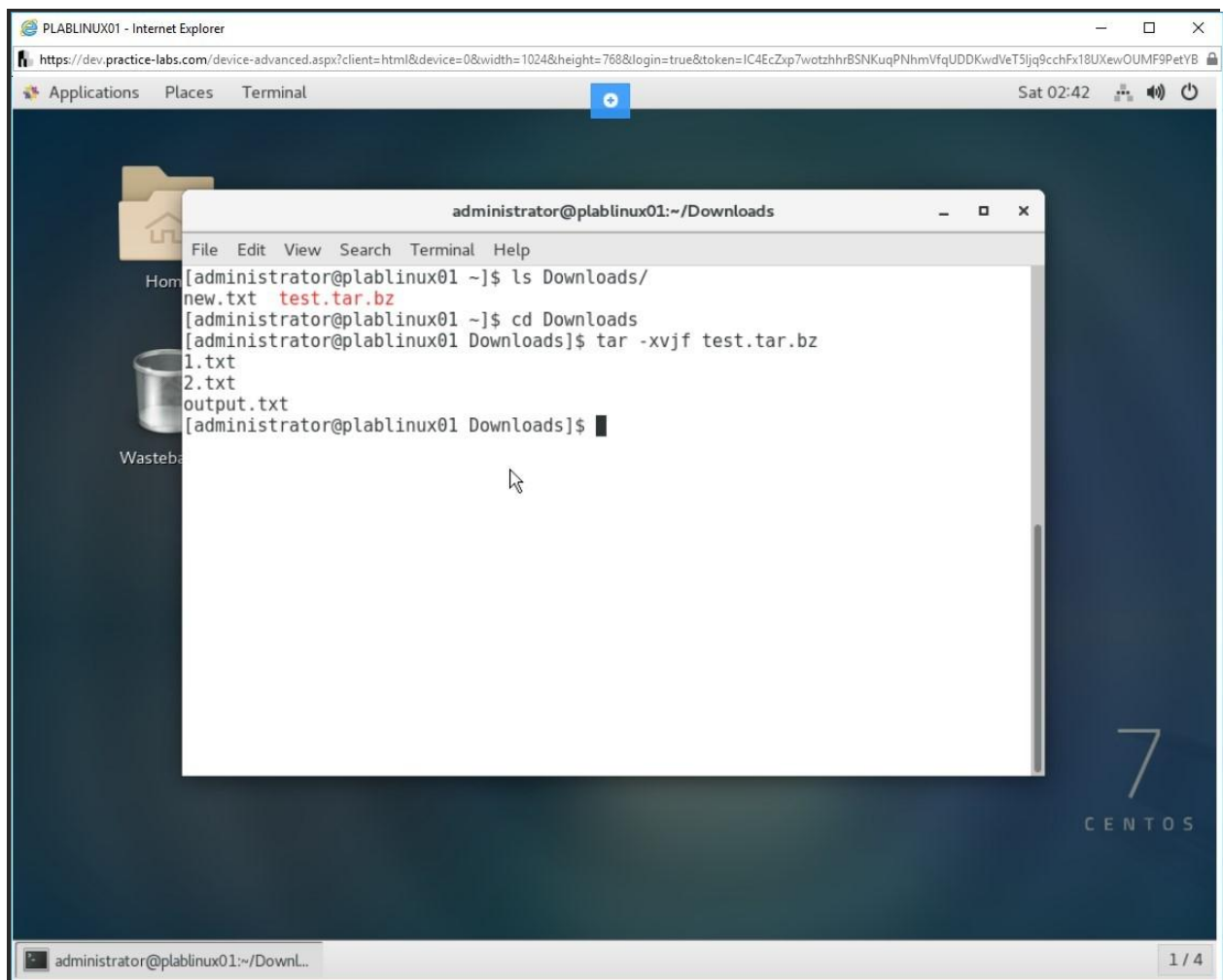
Figure 1.43 Screenshot of PLABLINUX01: Extracting the archive file with the tar command.

Step 6

To list the files in the Downloads directory to verify that the files have been extracted, type the following command:
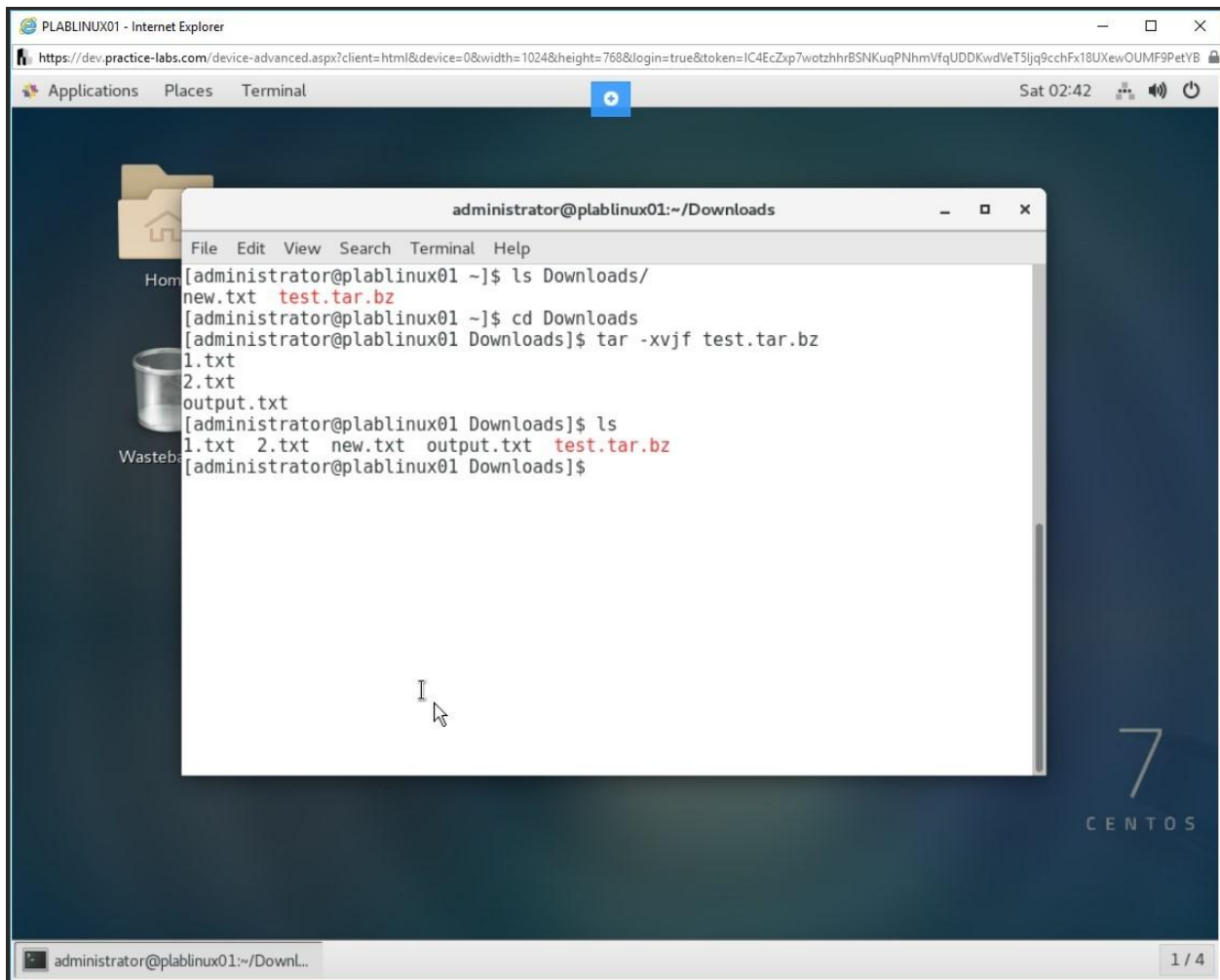
```
ls
```

Press Enter.

Figure 1.44 Screenshot of PLABLINUX01: Listing the contents of the directory.

Step 7

Clear the screen by entering the following command:

```
clear
```

Press Enter. You can also list the contents of the archive file without extracting it. To list the contents, type the following command:
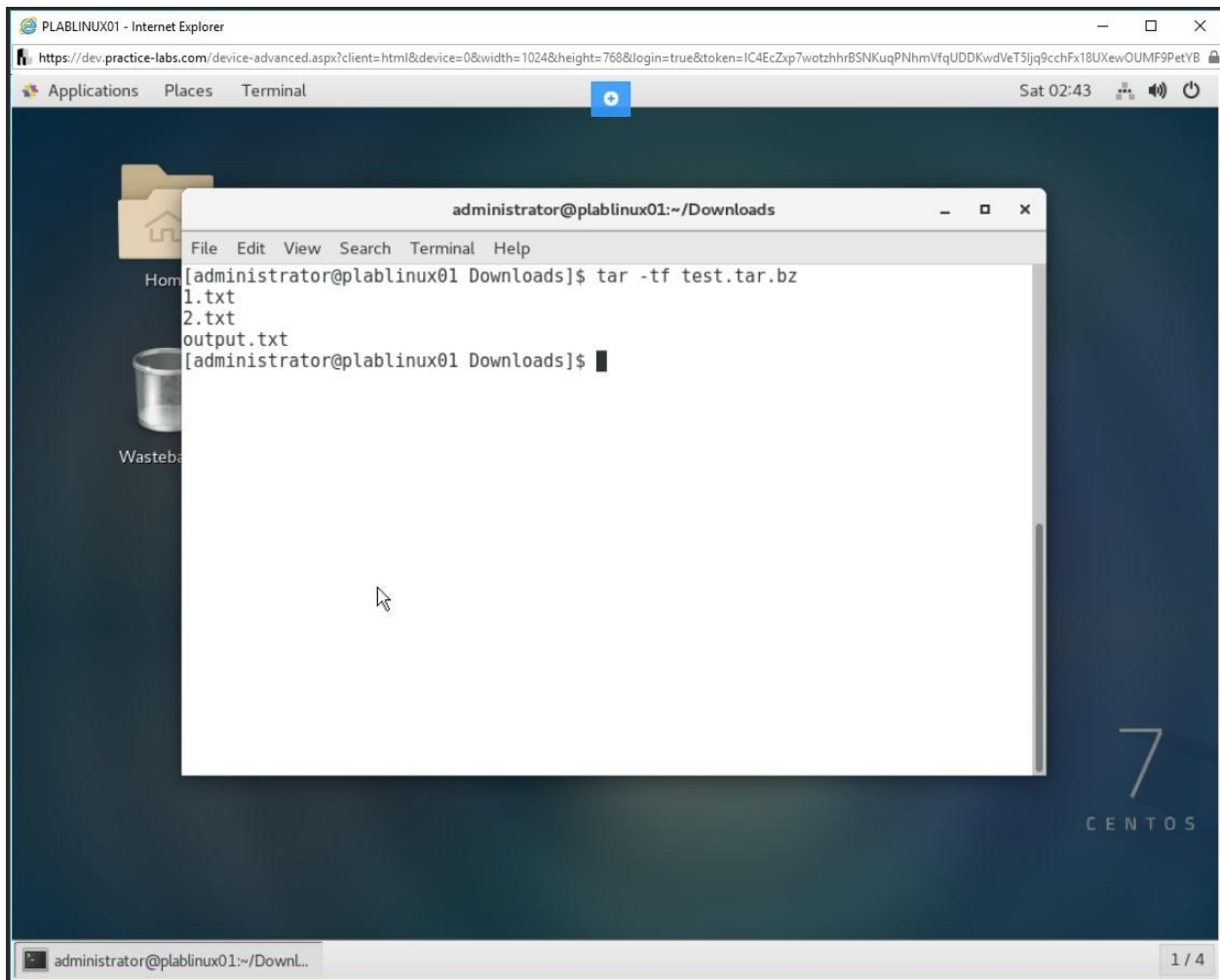
```
tar -tf test.tar.bz
```

Press Enter.

Figure 1.45 Screenshot of PLABLINUX01: Viewing the contents of the archive file without extracting it.

Step 8

Clear the screen by entering the following command:

```
clear
```

Press Enter. You can now create an archive file using the cpio command. Although, in the current scenario, the cpio command has been superseded by the tar command.

Type the following command:

```
ls | cpio -ov > text.cpio
```
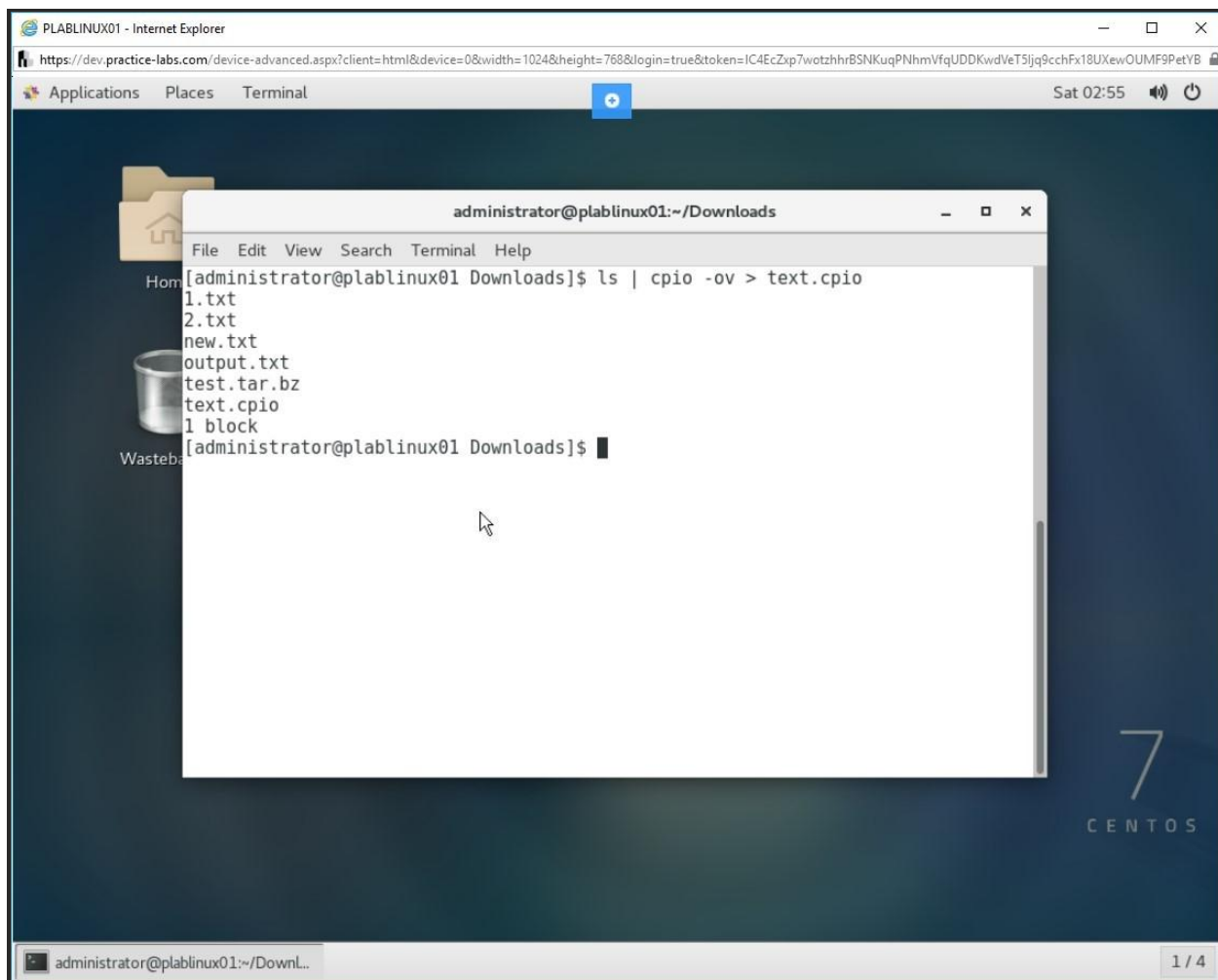
Press Enter.

Figure 1.46 Screenshot of PLABLINUX01: Creating an archive file with the cpio command.

Step 9

Create a new directory named test. Type the following command:
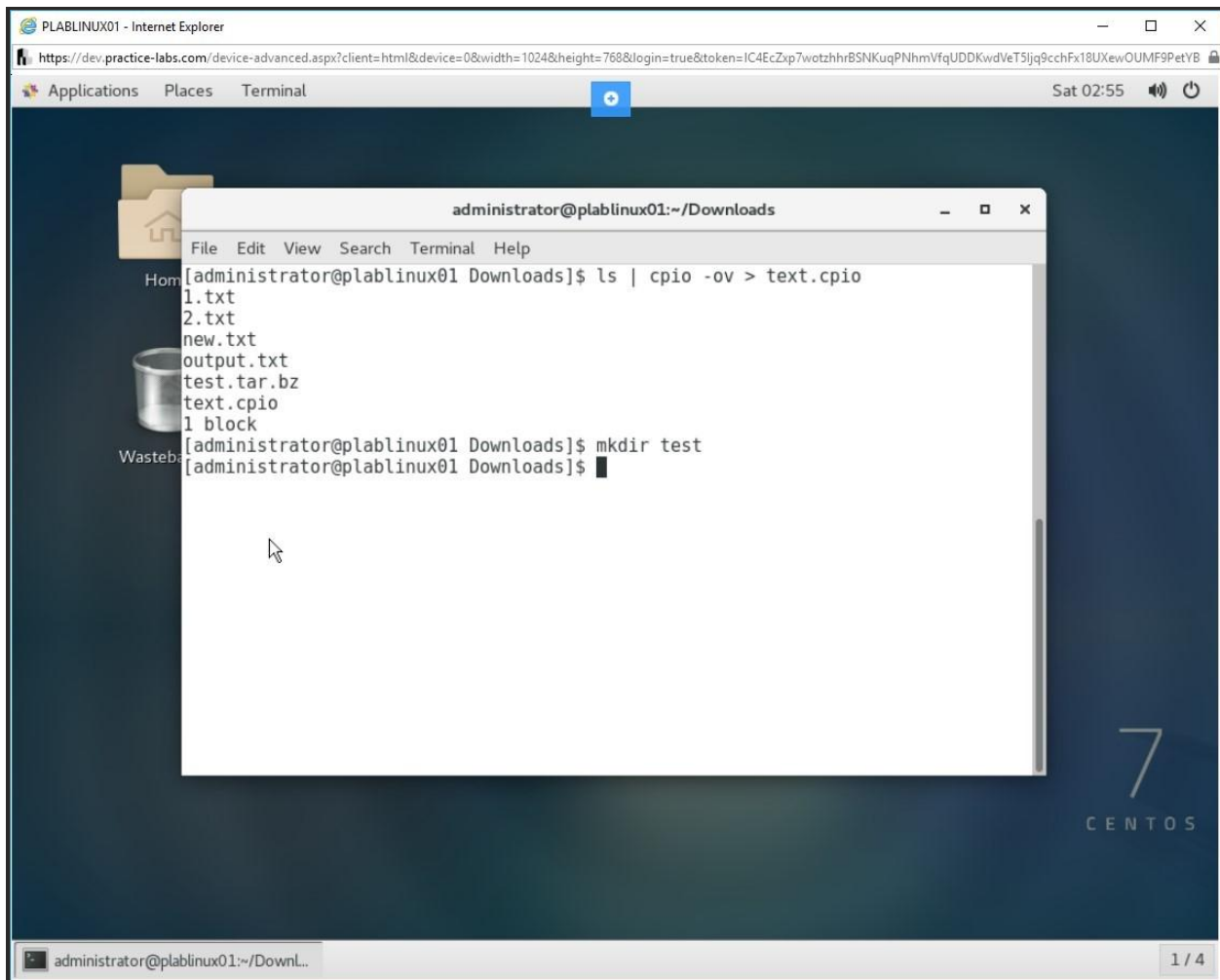
```
mkdir test
```

Press Enter.

Figure 1.47 Screenshot of PLABLINUX01: Creating a directory named test.

Step 10

Move the text.cpio file to the test directory using the following command:

```
mv text.cpio test/
```

To verify that the file has now moved to the test directory, type the following command:
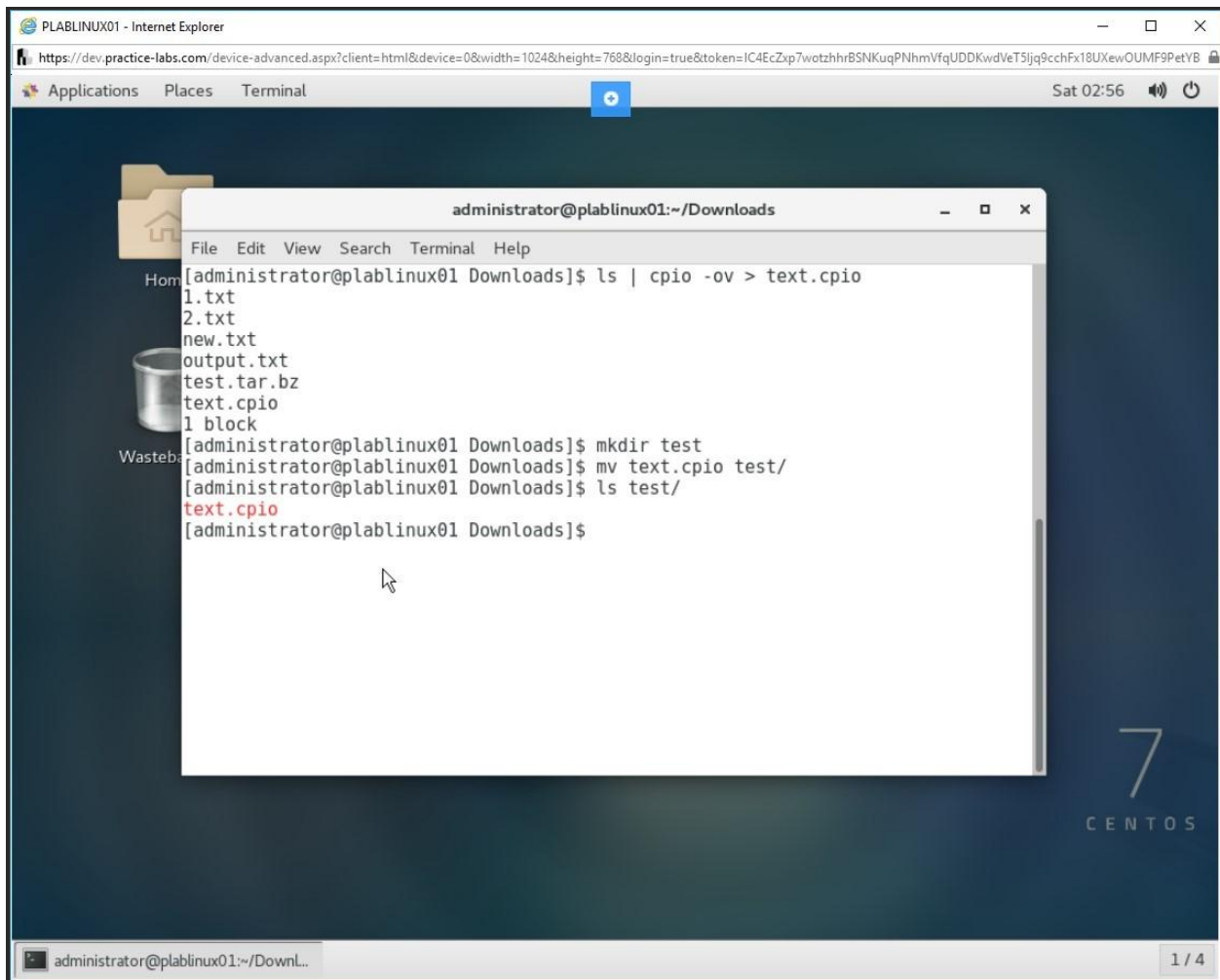
```
ls test/
```

Press Enter.

Figure 1.48 Screenshot of PLABLINUX01: Moving the archive file into the test directory and then listing its content.

Step 11

To navigate to the test directory, type the following command:
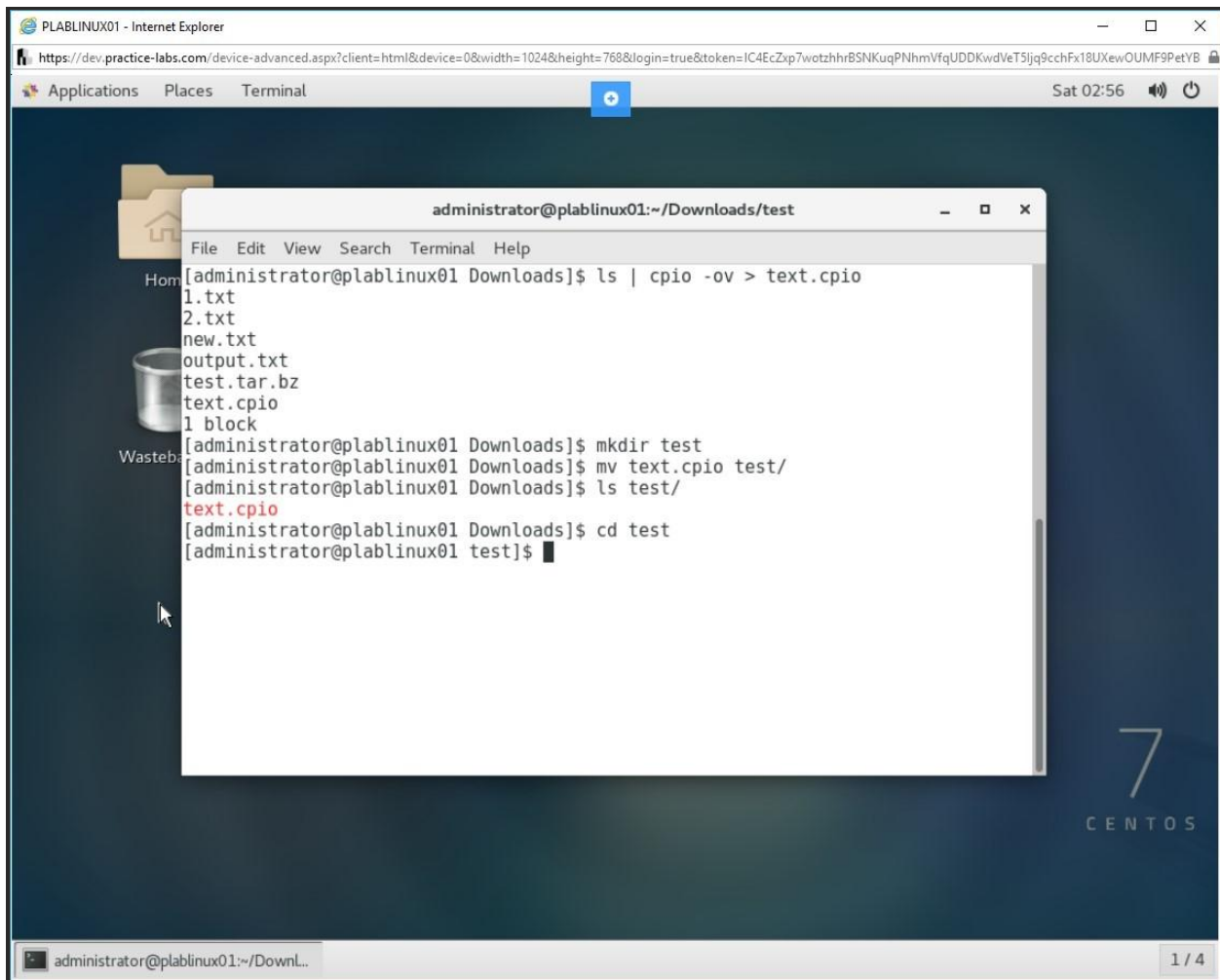
```
cd test
```

Press Enter.

Figure 1.49 Screenshot of PLABLINUX01: Navigating to the test directory.

Step 12

To extract, you need to use the -iv switches in place of the -ov switches used for creating the archive. The forward director (>) is replaced with a backward director (<).

To extract the files from a cpio archive, type the following command:

```
cpio -iv < text.cpio
```

Press Enter.

Note that if the directory to which you are extracting the cpio archive contains files with the same name as the files within the cpio archive, the files will not be extracted.
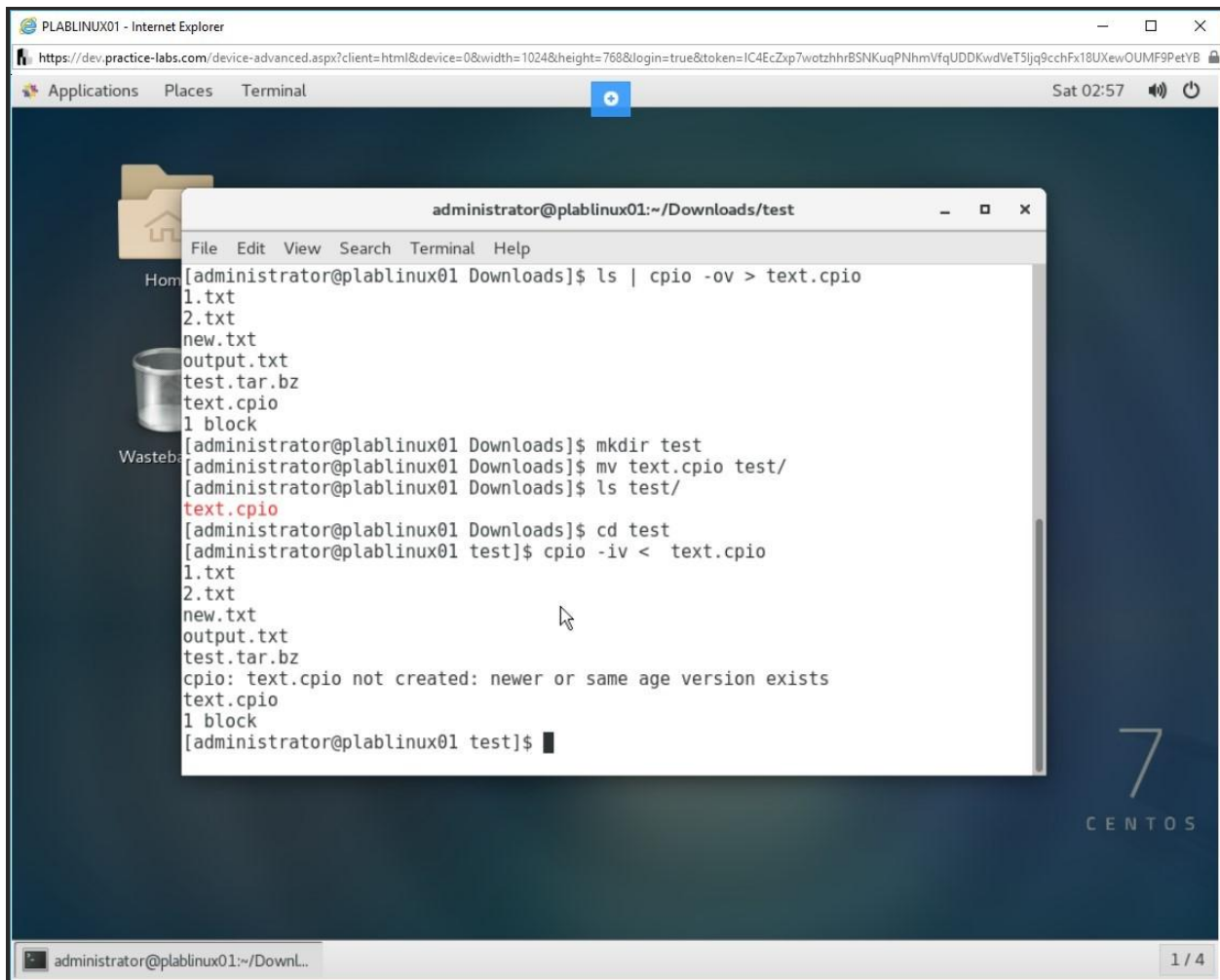
Figure 1.50 Screenshot of PLABLINUX01: Extracting the files from the archive using the cpio command.

Step 13

Clear the screen by entering the following command:

```
clear
```

Press Enter. To list the contents of the directory, type the following command:

```
ls
```

Press Enter.

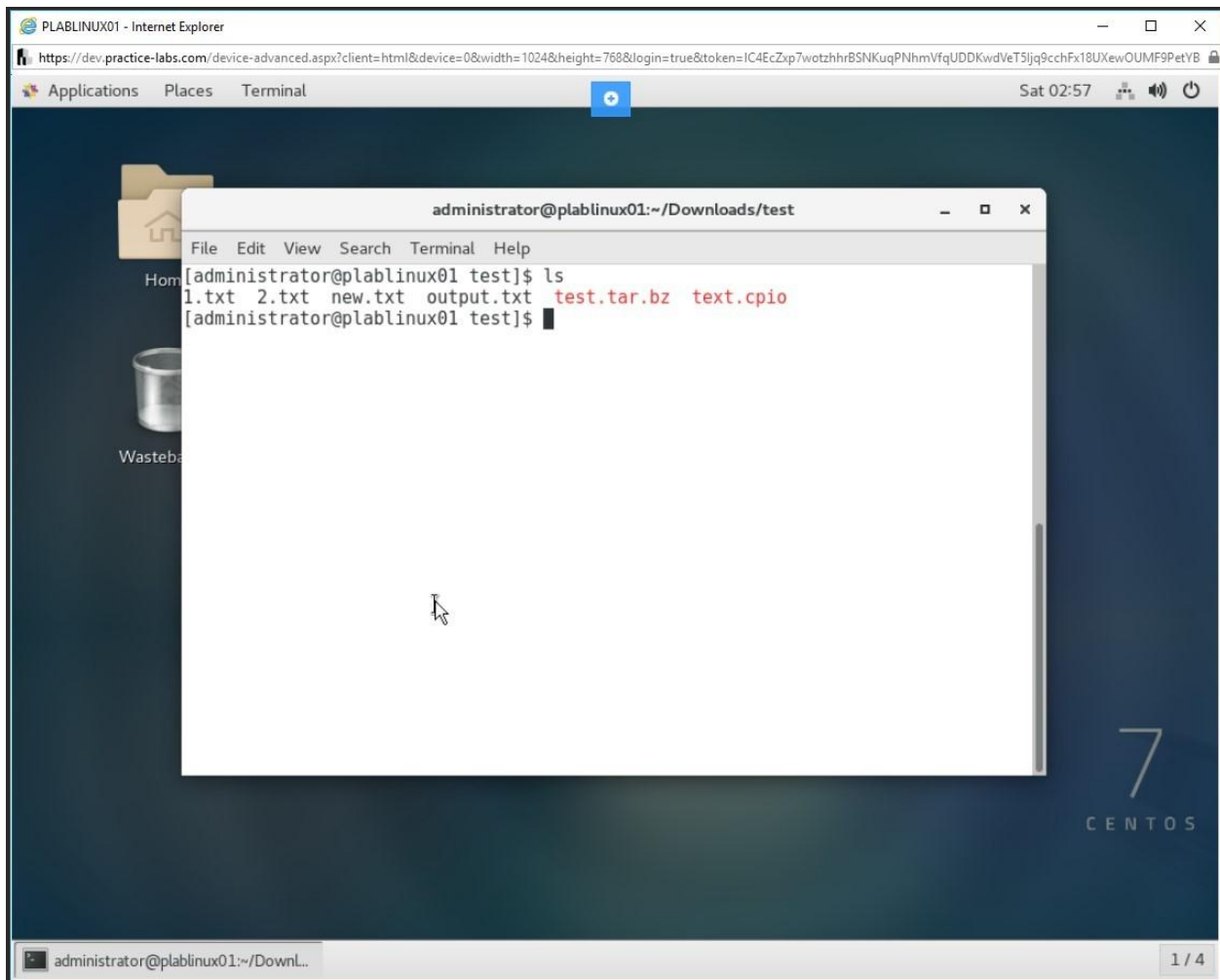Note that all files have been extracted.

Figure 1.51 Screenshot of PLABLINUX01: Listing the contents of the directory.

Note: The 'cp' and the 'dd' tool can both be used to copy portions of a device. Both these commands preserve the underlying filesystem. However, the 'cp' works only with the data and transfers it from one filesystem to another filesystem.