

Module 4: Linux Fundamentals for DevOps

Linux Commands

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Basic Linux Commands

Linux provides a **CLI** (Command Line Interface) to communicate with the OS. Here are the most basic of the Linux Commands.

To open a terminal, click **Show Applications** option in the left-hand side bar, and browse and open **Terminal**.

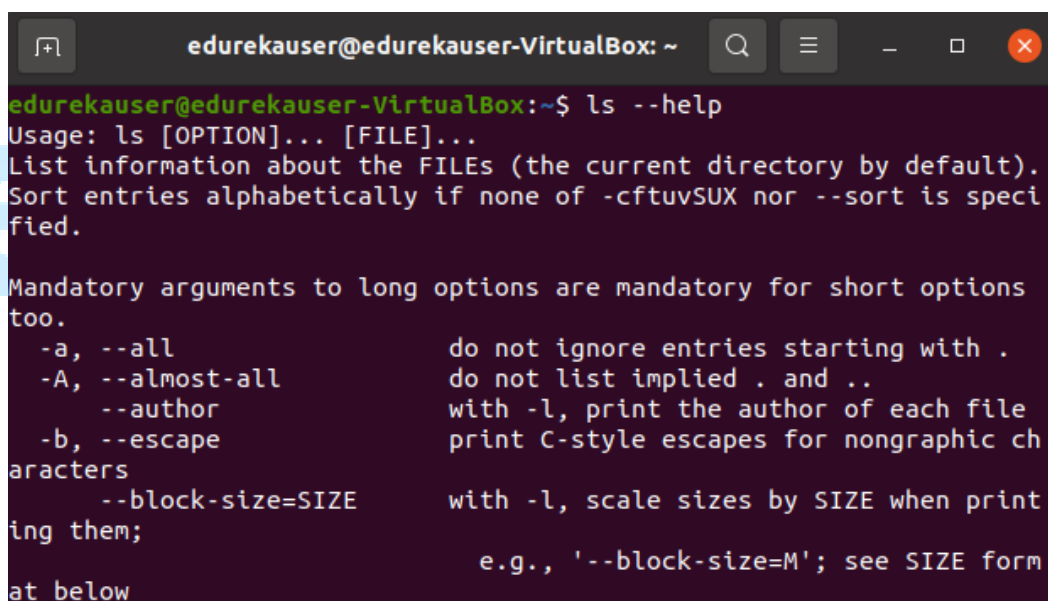
Note: Refer the document **Linux VM Setup Guide** under Setup Guides on LMS to install and run a Linux Virtual Machine on your local machine.

1. help

Displays the information on the usage of a command

syntax:

`$ <command> --help`



```
edurekauser@edurekauser-VirtualBox: ~$ ls --help
Usage: ls [OPTION]... [FILE]...
List information about the FILES (the current directory by default).
Sort entries alphabetically if none of -cftuvSUX nor --sort is speci-
fied.

Mandatory arguments to long options are mandatory for short options
too.
  -a, --all                do not ignore entries starting with .
  -A, --almost-all        do not list implied . and ..
      --author             with -l, print the author of each file
  -b, --escape             print C-style escapes for nongraphic ch-
aracters
      --block-size=SIZE    with -l, scale sizes by SIZE when print-
ing them;                  e.g., '--block-size=M'; see SIZE form
                           at below
```

2. ls

Lists all the contents in the current working directory.

syntax:

`$ ls <flag>`

```
edurekauser@edurekauser-VirtualBox:~$ ls
Desktop  Downloads  Pictures  Templates
Documents Music      Public    Videos
```

| Command | Explanation |
|------------------------------------|--|
| <i>ls <path name></i> | By specifying the path after ls, the content in that path will be displayed |
| <i>ls -l</i> | Using 'l' flag, lists all the contents along with its owner settings, permissions & time stamp (long format) |
| <i>ls -a</i> | Using 'a' flag, lists all the hidden contents in the specified directory |
| <i>ls -author</i> | Using '-author' flag, lists the contents in the specified directory along with its owner |
| <i>ls -s</i> | Using 's' flag, sorts and lists all the contents in the specified directory by size |
| <i>ls *.html</i> | Using '*' flag, lists only the contents in the directory of a particular format |
| <i>ls -ls > file.txt</i> | Using '>' flag, copies the result of preceding ls command into a text file |

3. mkdir

Creates a new directory.

syntax:

```
$ mkdir <flag> {directoryname} /pathname/
```

```
edurekauser@edurekauser-VirtualBox:~$ mkdir newdirectory
edurekauser@edurekauser-VirtualBox:~$ ls
Desktop  Downloads  newdirectory  Public  Videos
Documents Music      Pictures     Templates
```

| Command | Explanation |
|---|--|
| <i>mkdir -p</i> | Creates both a new parent directory and a sub-directory |
| <i>mkdir -p <filename1>/{f1,f2,f3}</i> | This is used to create multiple subdirectories inside the new parent directory |

4. touch

Creates a file or changes a file's timestamp.

syntax:

\$ touch <flag> {filename}

```
edurekauser@edurekauser-VirtualBox:~$ touch testfile.txt
edurekauser@edurekauser-VirtualBox:~$ ls
Desktop  Downloads  newdirectory  Public  testfile.txt
Documents Music      Pictures     Templates Videos
```

5. mv

Moves files and directories from one directory to another. The file/directory once moved, is deleted from the working directory.

syntax:

\$ mv <flag> {filename} /pathname/

```
edurekauser@edurekauser-VirtualBox:~$ mv testfile.txt /home/edurekauser/Public
edurekauser@edurekauser-VirtualBox:~$ ls /home/edurekauser/Public
testfile.txt
edurekauser@edurekauser-VirtualBox:~$ ls
Desktop  Downloads  newdirectory  Public  Videos
Documents Music      Pictures     Templates
```

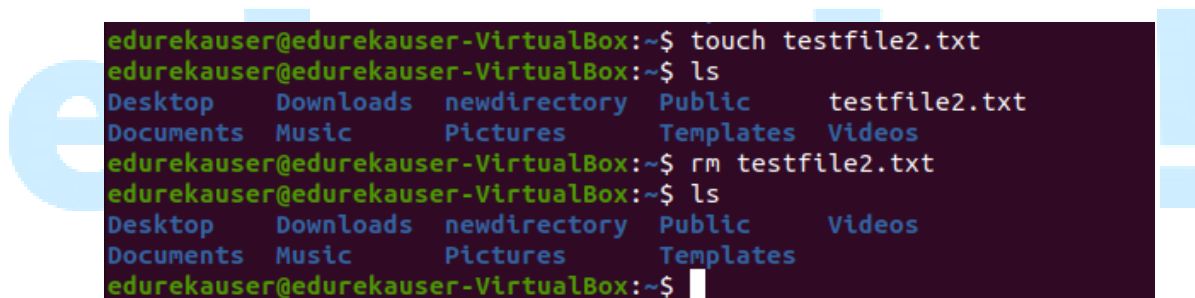
| Command | Explanation |
|---------------------|---|
| <i>mv -i</i> | Enters interactive mode; CLI asks before overwriting files |
| <i>mv -u</i> | Updates the destination file only when the source file is different from the destination file |
| <i>mv -v</i> | Verbose; Prints source and destination files |

6. rm

Removes files from a directory. By default, the rm command does not remove directories. Once removed, the contents of a file cannot be recovered.

syntax:

\$ rm <flag> {filename}



```
edurekauser@edurekauser-VirtualBox:~$ touch testfile2.txt
edurekauser@edurekauser-VirtualBox:~$ ls
Desktop  Downloads  newdirectory  Public  testfile2.txt
Documents Music      Pictures      Templates Videos
edurekauser@edurekauser-VirtualBox:~$ rm testfile2.txt
edurekauser@edurekauser-VirtualBox:~$ ls
Desktop  Downloads  newdirectory  Public  Videos
Documents Music      Pictures      Templates
```

| Command | Explanation |
|----------------------|--|
| <i>rm -r</i> | Removes even non-empty directories. |
| <i>rm -rp</i> | Removes non-empty directories including parent and subdirectories. |

7. cat

Used to read, modify, or concatenate text files. It also displays file contents.

syntax:

\$ cat <flag> {filename}

```
edurekauser@edurekauser-VirtualBox:~$ cat cattestfile.txt
This is a file to test the concatenate command.
```

| Command | Explanation |
|---------------|---|
| <i>cat -b</i> | This is used to add line numbers to non-blank lines |
| <i>cat -n</i> | This is used to add line numbers to all lines |
| <i>cat -s</i> | This is used to squeeze blank lines into one line |
| <i>cat -e</i> | Show \$ at the end of line |

8. tail

Displays the last few lines of a file.

syntax:

\$ tail <flag> {filename}

```
edurekauser@edurekauser-VirtualBox:~$ tail cattestfile.txt
This is a file to test the concatenate command.
---
End of file.
```

9. cp

Copies files and directories. A copy of the file/directory copied, still remains in the working directory.

syntax:

\$ cp <flag> {filename} /pathname/

```
edurekauser@edurekauser-VirtualBox:~$ cp cattestfile.txt /home/edurekauser/Public
edurekauser@edurekauser-VirtualBox:~$ ls /home/edurekauser/Public
cattestfile.txt  testfile.txt
edurekauser@edurekauser-VirtualBox:~$ ls
cattestfile.txt  Documents  Music      Pictures  Templates
Desktop          Downloads  newdirectory  Public    Videos
edurekauser@edurekauser-VirtualBox:~$
```

| Command | Explanation |
|---------|-------------|
|---------|-------------|

| | |
|---------------------|---|
| <i>cp -i</i> | Enters interactive mode; CLI asks before overwriting files |
| <i>cp -n</i> | Does not overwrite the file |
| <i>cp -u</i> | Updates the destination file only when the source file is different from the destination file |
| <i>cp -r</i> | Recursive copy for copying directories; Copies even hidden files |
| <i>cp -v</i> | Verbose; Prints informative messages |

10. pwd

Displays the current working directory of the terminal.

syntax:

\$ pwd

```
edurekauser@edurekauser-VirtualBox:~$ pwd
/home/edurekauser
edurekauser@edurekauser-VirtualBox:~$
```

11. echo

Writes its arguments to standard output.

syntax:

\$ echo "<text>"

```
edurekauser@edurekauser-VirtualBox:~$ echo "Hello Edureka Learner!"
Hello Edureka Learner!
edurekauser@edurekauser-VirtualBox:~$
```

12. clear

Clears the terminal screen. Contents will not actually be deleted in this case, only scrolled down. You can also clear the screen by pressing **Ctrl+L** on the keyboard.

syntax:

\$ clear

13. whoami

Tells the current logged-in user.

syntax:

\$ whoami

```
edurekauser@edurekauser-VirtualBox:~$ whoami
edurekauser
edurekauser@edurekauser-VirtualBox:~$
```

14. cd

Used to change the current working directory of the user.

syntax:

\$ cd /pathname/

```
edurekauser@edurekauser-VirtualBox:~$ cd /home/edurekauser/Public
edurekauser@edurekauser-VirtualBox:~/Public$
```

| Command | Explanation |
|-------------------|---|
| <i>cd ~</i> | This command also changes the directory to home directory |
| <i>cd /</i> | Changes the directory to root directory |
| <i>cd ..</i> | Changes the directory to its parent directory |
| <i>cd 'xx yy'</i> | We specify the folder name in inverted commas because there is a space in the folder name |

15. df

Shows information about file system.

syntax:

\$ df <flag> <filename>


```
edurekauser@edurekauser-VirtualBox:~$ df
Filesystem      1K-blocks    Used Available Use% Mounted on
udev            1987032         0   1987032   0% /dev
tmpfs           403092        1376   401716   1% /run
/dev/sda5       19992176 7639864 11313720 41% /
tmpfs           2015452         0   2015452   0% /dev/shm
tmpfs           5120          4     5116   1% /run/lock
tmpfs           2015452         0   2015452   0% /sys/fs/cgroup
/dev/loop1       56320       56320         0 100% /snap/core18/1880
/dev/loop2       63616       63616         0 100% /snap/gtk-common-themes/1506
/dev/loop4       30720       30720         0 100% /snap/snapd/8542
/dev/loop0       261760     261760         0 100% /snap/gnome-3-34-1804/36
/dev/loop3       51072       51072         0 100% /snap/snap-store/467
/dev/sda1       523248         4   523244   1% /boot/efi
/dev/loop5       31872       31872         0 100% /snap/snapd/10492
/dev/loop6       56832       56832         0 100% /snap/core18/1944
/dev/loop7       52352       52352         0 100% /snap/snap-store/518
/dev/loop8       66432       66432         0 100% /snap/gtk-common-themes/1514
tmpfs           403088        36   403052   1% /run/user/1000
/dev/loop9       223232     223232         0 100% /snap/gnome-3-34-1804/60
/dev/sr0         59558       59558         0 100% /media/edurekauser/VBox_GAs_6.1
.16
```

16. du

Shows disc usage of files recursively.

syntax:

\$ du <flag> <filename>

```
edurekauser@edurekauser-VirtualBox:~$ du
4      ./Downloads
4      ./newdirectory
4      ./gnupg/private-keys-v1.d
16     ./gnupg
4      ./Templates
8      ./Public
4      ./config/enchant
16     ./config/evolution/sources
20     ./config/evolution
8      ./config/gtk-3.0
4      ./config/gnome-session/saved-session
8      ./config/gnome-session
4      ./config/update-notifier
8      ./config/ibus/bus
12     ./config/ibus
8      ./config/gedit
4      ./config/goa-1.0
12     ./config/dconf
80     ./config/pulse
4      ./config/nautilus
180    ./config
4      ./Videos
1356   ./Pictures
```

ADVANCED FILE RELATED COMMANDS

1. grep

Searches for a particular string/word in a text file. This is similar to “Ctrl+F” but, executed via a CLI.

syntax:

\$ grep <flag or element_to_search> {filename}

```
edurekauser@edurekauser-VirtualBox:~$ cat cattestfile.txt
This is a file to test the concatenate command.
---
End of file.
edurekauser@edurekauser-VirtualBox:~$ grep file cattestfile.txt
This is a file to test the concatenate command.
End of file.
edurekauser@edurekauser-VirtualBox:~$
```

| Command | Explanation |
|----------------|--|
| <i>grep -i</i> | Returns the results for case insensitive strings |
| <i>grep -n</i> | Returns the matching strings along with their line number |
| <i>grep -v</i> | Returns the result of lines not matching the search string |
| <i>grep -c</i> | Returns the number of lines in which the results matched the search string |

2. sed

A stream editor used to perform basic text transformations on an input stream (an input file or a input from a pipeline).

syntax:

\$ sed <flag> {filename}

```
edurekauser@edurekauser-VirtualBox:~$ cat cattestfile.txt
This is a file to test the concatenate command.
---
End of file.
edurekauser@edurekauser-VirtualBox:~$ sed 's/concatenate/sed/' cattestfile.txt
> output.txt
edurekauser@edurekauser-VirtualBox:~$ cat output.txt
This is a file to test the sed command.
---
End of file.
edurekauser@edurekauser-VirtualBox:~$
```

| Command | Explanation |
|---------------|--|
| <i>sed -f</i> | Adds the contents of script file to the commands for execution |
| <i>sed -e</i> | Adds the script to the command |
| <i>sed -r</i> | Allows to use regular expressions in the script |
| <i>sed -z</i> | Separates lines by NULL characters |
| <i>sed -n</i> | Prevents automatic printing of pattern space |
| <i>sed -s</i> | Considers files as separate rather than a single stream |

3. history

Displays or manipulates the history list of commands.

```
edurekauser@edurekauser-VirtualBox:~$ history 5
47 cat output.txt
48 sed --help
49 man sed
50 history --help
51 history 5
edurekauser@edurekauser-VirtualBox:~$ ls
cattestfile.txt  Documents  Music      output.txt  Public  Videos
Desktop         Downloads  newdirectory Pictures    Templates
edurekauser@edurekauser-VirtualBox:~$ history 5
49 man sed
50 history --help
51 history 5
52 ls
53 history 5
edurekauser@edurekauser-VirtualBox:~$
```

4. sort

Sorts the results of a search either alphabetically or numerically. Files, file contents and directories can be sorted using this command.

syntax:

\$ sort <flag> {filename}

```
edurekauser@edurekauser-VirtualBox:~$ cat sorttestfile.txt
ls
pwd
mv
rm
cat
cd
edurekauser@edurekauser-VirtualBox:~$ sort sorttestfile.txt
cat
cd
ls
mv
pwd
rm
edurekauser@edurekauser-VirtualBox:~$
```

| Command | Explanation |
|----------------|---|
| <i>sort -r</i> | the flag returns the results in reverse order; |
| <i>sort -f</i> | the flag does case insensitive sorting |
| <i>sort -n</i> | the flag returns the results as per numerical order |

User Management in Linux

1. su

Switches to root-user so that superuser permissions can be used to execute commands.

syntax:

```
$ su
```

2. su <username>

Switches to a different user whose name is passed as the argument.

syntax:

```
$ su <username>
```

3. sudo

Executes only that command with root/superuser privileges.

syntax:

```
$ sudo <command>
```

```
edurekauser@edurekauser-VirtualBox:~$ cat /etc/shadow
cat: /etc/shadow: Permission denied
edurekauser@edurekauser-VirtualBox:~$ sudo cat /etc/shadow
[sudo] password for edurekauser:
root!!:18614:0:99999:7:::
daemon*:18474:0:99999:7:::
bin*:18474:0:99999:7:::
sys*:18474:0:99999:7:::
sync*:18474:0:99999:7:::
games*:18474:0:99999:7:::
```

```
edurekauser@edurekauser-VirtualBox:~$ tail -2 /etc/passwd
systemd-coredump:x:999:999:systemd Core Dumper:/:usr/sbin/nologin
vboxadd:x:998:1:/:var/run/vboxadd:/bin/false
edurekauser@edurekauser-VirtualBox:~$ sudo useradd student
edurekauser@edurekauser-VirtualBox:~$ tail -2 /etc/passwd
vboxadd:x:998:1:/:var/run/vboxadd:/bin/false
student:x:1001:1001:/:home/student:/bin/sh
edurekauser@edurekauser-VirtualBox:~$
```

```
edurekauser@edurekauser-VirtualBox:~$ tail -2 /etc/passwd
vboxadd:x:998:1::/var/run/vboxadd:/bin/false
student:x:1001:1001::/home/student:/bin/sh
edurekauser@edurekauser-VirtualBox:~$ sudo userdel student
edurekauser@edurekauser-VirtualBox:~$ tail -2 /etc/passwd
systemd-coredump:x:999:999:systemd Core Dumper:/:usr/sbin/nologin
vboxadd:x:998:1::/var/run/vboxadd:/bin/false
edurekauser@edurekauser-VirtualBox:~$
```

| Command | Explanation |
|--|-------------------------------------|
| <i>sudo useradd <username></i> | Adding a new user |
| <i>sudo passwd <username></i> | Setting a password for the new user |
| <i>sudo userdel <username></i> | Deleting the user |
| <i>sudo groupadd <groupname></i> | Adding a new group |
| <i>sudo groupdel <groupname></i> | Deleting the group |
| <i>sudo usermod -g <groupname> <username></i> | Adding a user to a primary group |

Ownership and Permission

To view permissions of existing files-

```
edurekauser@edurekauser-VirtualBox:~$ ls -l
total 48
-rw-rw-r-- 1 edurekauser edurekauser  65 Dec 29 12:57 cattestfile.txt
drwxr-xr-x 2 edurekauser edurekauser 4096 Dec 18 15:23 Desktop
drwxr-xr-x 2 edurekauser edurekauser 4096 Dec 18 15:23 Documents
drwxr-xr-x 2 edurekauser edurekauser 4096 Dec 18 15:23 Downloads
drwxr-xr-x 2 edurekauser edurekauser 4096 Dec 18 15:23 Music
drwxrwxr-x 2 edurekauser edurekauser 4096 Dec 29 12:30 newdirectory
-rw-rw-r-- 1 edurekauser edurekauser   57 Dec 29 14:07 output.txt
drwxr-xr-x 2 edurekauser edurekauser 4096 Dec 29 12:58 Pictures
drwxr-xr-x 2 edurekauser edurekauser 4096 Dec 29 13:00 Public
-rw-rw-r-- 1 edurekauser edurekauser   20 Dec 29 14:21 sorttestfile.txt
drwxr-xr-x 2 edurekauser edurekauser 4096 Dec 18 15:23 Templates
drwxr-xr-x 2 edurekauser edurekauser 4096 Dec 18 15:23 Videos
```

1. chown

Used to change the user/owner of a file.

syntax:

```
$ chown <username> {filename}
```

2. chmod

Used to change the access permissions of files and directories. Consider the example below.

syntax:

```
$ chmod <permissions of user,group,others> {filename}
```

```
edurekauser@edurekauser-VirtualBox:~$ cat output.txt
This is a file to test the sed command.
---
End of file.
edurekauser@edurekauser-VirtualBox:~$ ls output.txt
output.txt
edurekauser@edurekauser-VirtualBox:~$ ls -l output.txt
-rw-rw-r-- 1 edurekauser edurekauser 57 Dec 29 14:07 output.txt
edurekauser@edurekauser-VirtualBox:~$ cat output.txt
This is a file to test the sed command.
---
End of file.
edurekauser@edurekauser-VirtualBox:~$ chmod 222 output.txt
edurekauser@edurekauser-VirtualBox:~$ cat output.txt
cat: output.txt: Permission denied
edurekauser@edurekauser-VirtualBox:~$ chmod 755 output.txt
edurekauser@edurekauser-VirtualBox:~$ cat output.txt
This is a file to test the sed command.
---
End of file.
edurekauser@edurekauser-VirtualBox:~$
```

The permissions associated with each digit are as follows-

| Number | read | write | execute |
|--------|------|-------|---------|
| 0 | – | – | – |
| 1 | – | – | yes |
| 2 | – | yes | – |
| 3 | – | yes | yes |
| 4 | yes | – | – |
| 5 | yes | – | yes |
| 6 | yes | yes | – |
| 7 | yes | yes | yes |

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