



Linux

Linux is a **free and open-source operating system** designed for **security, stability, and performance**.

It supports **multiple users** and **multiple processes** running at the same time, making it suitable for servers, cloud systems, and development environments.

Operating System (OS)

An **Operating System** is system software that acts as an **interface between computer hardware and the user**.

It:

- Manages hardware resources (CPU, memory, storage, I/O)
- Provides an environment for applications to run
- Allows users to interact with the system without understanding machine-level instructions

Without an OS, applications like browsers or editors cannot function.

Kernel

The **kernel** is the **core of the operating system** and operates at the lowest level.

It is responsible for:

- CPU process scheduling
- Memory management
- Device and hardware communication
- Handling system calls

All software ultimately interacts with hardware through the kernel.

Daemons

Daemons are **background processes** that provide essential system services.

Key points:

- Run without direct user interaction
- Start at boot or system login
- Handle tasks like printing, scheduling, networking, and logging

Examples include services for SSH, cron jobs, and system monitoring.

Shell

The **shell** is a program that allows users to **interact with the operating system**.

It:

- Accepts commands from the user
- Executes programs and scripts
- Displays output

Shells can be **command-line based** or **graphical**, but command-line shells are preferred for automation and administration.

Command

A **command** is an instruction given to the shell to perform a specific task, such as file handling, process control, or system inspection.

Terminal

A **terminal** is a **text-based interface** used to access the shell.

It allows users to enter commands and view their output.

The terminal does not execute commands itself—it **passes them to the shell**.

Linux commands are instructions executed in the terminal (shell) to interact with the operating system.

2. Navigation Commands

pwd

Prints the current working directory.

```
ubuntu:~$ pwd  
/root  
ubuntu:~$ whoami  
root
```

pwd

ls

Lists files and directories.

```
ubuntu:~$ ls
filesystem
ubuntu:~$ ls-a
ls-a: command not found
ubuntu:~$ ls -a
.  .bash_history  .profile  .theia  .wget-hsts
..  .bashrc       .ssh      .vimrc  filesystem
ubuntu:~$ ls -lh
total 0
lrwxrwxrwx 1 root root 1 Jan 21 14:56 filesystem -> /
```

```
ls
ls -l# long format
ls -a# show hidden files
ls -lh# human-readable files
```

cd

Changes directory.

```
ubuntu:~$ cd filesystem
ubuntu:~/filesystem$ cd ..
ubuntu:~$ pwd
/root
ubuntu:~$ cd ~
ubuntu:~$ pwd
/root
ubuntu:~$ cd /
ubuntu:/$ pwd
/
```

```
cd folder_name
cd ..# move up one directory
cd ~# home directory
cd /# root directory
```

3. File Management

touch

Creates empty files.

```
touch file.txt
```

cat

Displays file content.

```
ubuntu:$ touch file.txt
ubuntu:$ cat file.txt
ubuntu:$ nano file.txt
ubuntu:$ cat file.txt
ubuntu:$ nano file.txt
ubuntu:$ cat file.txt
yooooooooooooooooooooo
ubuntu:$ cp file.txt file2.txt
ubuntu:$ cat file2.txt
yooooooooooooooooooooo
```

```
cat file.txt
```

vi / nano

Edits files.

```
yooooooooooooooooooooo
```

```
~  
~  
~  
~  
~
```

```
ubuntu:$ vi file.txt
ubuntu:$ cat file.txt
yoooooooooooooooooooo
exit
```

```
vi file.txt  
nano file.txt
```

cp

Copies files or directories.

```
cp source.txt destination.txt  
cp -r dir1 dir2
```

mv

Moves or renames files.

```
mv old.txt new.txt  
mv file.txt /path/to/location/
```

rm

Deletes files or directories.

```
rm file.txt  
rm -r directory/  
rm -rf directory/# force delete
```

4. Directory Management

mkdir

Creates directories.

```
ubuntu:$ mkdir folder
ubuntu:$ cd folder
ubuntu:/folder$ mkdir dir1 dir2 dir3
ubuntu:/folder$ ls
dir1 dir2 dir3
ubuntu:/folder$ rmdir
rmdir: missing operand
Try 'rmdir --help' for more information.
ubuntu:/folder$ rmdir folder
rmdir: failed to remove 'folder': No such file or directory
ubuntu:/folder$ rmdir dir1
ubuntu:/folder$ ls
dir2 dir3
ubuntu:/folder$ █
```

```
mkdir folder
mkdir dir1 dir2 dir3
```

rmdir

Deletes empty directories.

```
rmdir folder
```

5. Viewing & Searching

less

View large files page by page.

```
less file.txt
```

head / **tail**

View beginning or end of files.

```
head file.txt  
tail file.txt  
tail -f log.txt# live updates
```

find

Search files.

```
find . -name file.txt
```

grep

```
ubuntu:/$ grep "yo" file.txt  
yooooooooooooooooooooooo  
ubuntu:/$ █
```

Search text inside files.

```
grep"error" filecd.txt
```

6. Permissions & Ownership

chmod

Change file permissions.

```
chmod 755 script.sh  
chmod +x script.sh
```

chown

Change file owner.

```
chown user:group file.txt
```

Permission Breakdown

```
r = read (4)  
w = write (2)  
x = execute (1)
```

7. System Information

whoami

Displays current user.

```
whoami
```

uname

System information.

```
uname -a
```

df

```
ubuntu:$ df -h  
Filesystem      Size  Used Avail Use% Mounted on  
tmpfs           191M   980K  190M   1% /run  
/dev/vda1        19G   5.3G   14G   29% /  
tmpfs           952M   84K  952M   1% /dev/shm  
tmpfs            5.0M    0   5.0M   0% /run/lock  
/dev/vda16       881M  117M  703M  15% /boot  
/dev/vda15       105M   6.2M   99M   6% /boot/efi  
ubuntu:$ free  
              total        used         free        shared  buff/cache  
available  
Mem:       1948940          479864        292304          1064     1374436  
        1469076  
Swap:      1048572              0        1048572  
ubuntu:$
```

Disk usage.

```
df -h
```

free

Memory usage.

```
free -h
```

8. Process Management

ps

View running processes.

```
ubuntu:/$ ps -ef
UID      PID  PPID  C STIME TTY      TIME CMD
root      1      0  0 05:50 ?        00:00:03 /sbin/init
root      2      0  0 05:50 ?        00:00:00 [kthreadd]
root      3      2  0 05:50 ?        00:00:00 [pool_workqueue_]
root      4      2  0 05:50 ?        00:00:00 [kworker/R-rcu_g
root      5      2  0 05:50 ?        00:00:00 [kworker/R-rcu_p
root      6      2  0 05:50 ?        00:00:00 [kworker/R-slab_
root      7      2  0 05:50 ?        00:00:00 [kworker/R-netns
root      8      2  0 05:50 ?        00:00:00 [kworker/0:0-eve
root      9      2  0 05:50 ?        00:00:00 [kworker/0:0H-kb
root     11      2  0 05:50 ?        00:00:00 [kworker/u2:0-f1
root     12      2  0 05:50 ?        00:00:00 [kworker/R-mm_pe
root     13      2  0 05:50 ?        00:00:00 [rcu_tasks_kthre
root     14      2  0 05:50 ?        00:00:00 [rcu_tasks_rude_
root     15      2  0 05:50 ?        00:00:00 [rcu_tasks_trace
root     16      2  0 05:50 ?        00:00:00 [ksoftirqd/0]
root     17      2  0 05:50 ?        00:00:00 [rcu_bh_bh]
```

```
ps -ef
```

top

Real-time process monitoring.

top

kill

Terminate processes.

kill PID

kill -9 PID

9. Networking Basics

ip

Network configuration.

```
ubuntu:$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN
    group default qlen 1000
        link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
        inet 127.0.0.1/8 scope host lo
            valid_lft forever preferred_lft forever
            inet6 ::1/128 scope host noprefixroute
                valid_lft forever preferred_lft forever
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel
    state UP group default qlen 1000
        link/ether 92:61:09:39:d5:2a brd ff:ff:ff:ff:ff:ff
        inet 172.30.1.2/24 brd 172.30.1.255 scope global dynamic noprefi
xroute enp1s0
            valid_lft 86311930sec preferred_lft 75522730sec
            inet6 fe80::de88:3ddf:e564:81b4/64 scope link
                valid_lft forever preferred_lft forever
3: docker0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1454 qdisc noque
ue state DOWN group default
        link/ether fa:87:36:39:bb:ed brd ff:ff:ff:ff:ff:ff
        inet 172.17.0.1/16 brd 172.17.255.255 scope global docker0
            valid_lft forever preferred_lft forever
```

```
ip a
```

ping

```
ubuntu:/$ ping reachthefinals.com
PING reachthefinals.com (198.185.159.144) 56(84) bytes of data.
64 bytes from 198.185.159.144: icmp_seq=1 ttl=53 time=11.0 ms
64 bytes from 198.185.159.144: icmp_seq=2 ttl=53 time=10.6 ms
64 bytes from 198.185.159.144: icmp_seq=3 ttl=53 time=11.0 ms
64 bytes from 198.185.159.144: icmp_seq=4 ttl=53 time=10.6 ms
```

Check connectivity.

```
ping google.com
```

curl / wget

Download data.

```
curl url
wget url
```

10. Command History

history

```
13  pwd
14  cd /
15  pwd
16  touch file.txt
17  cat file.txt
18  nano file.txt
19  cat file.txt
20  nano file.txt
21  cat file.txt
22  cp file.txt file2.txt
23  cat file2.txt
24  ls
25  cp -r filesystem media
26  pwd
27  cp -r / media
28  vi file.txt
29  cat file.txt
30  mkdir folder
31  cd folder
32  mkdir dir1 dir2 dir3
33  ls
34  rmdir
35  rmdir folder
36  rmdir dir1
37  ls
38  cd ..
39  ls
40  grep "yo" file.txt
41  grep "yo" file.txt
42  df =h
43  df -h
44  free
45  ps -ef
46  top
47  ip
48  ifconfig
49  ping reachthefinals.com
50  ip a
51  curl reachthefinals.com
52  ls
53  wget reachthefinals.com
54  cat index.html
55  history
ubuntu:/$ █
```

Shows previously executed commands.

```
history
```