



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
yooooooooooooooooooooooooooooooooooooo

ubuntu:/$ cp file.txt file2.txt
ubuntu:/$ cat file2.txt
yooooooooooooooooooooooooooooooooooooo
```

```
cat file.txt
```

vi / nano

Edits files.

```
yooooooooooooooooooooooooooooooooooooo
~
~
~
~
~
```

```
ubuntu:/$ vi file.txt
ubuntu:/$ cat file.txt
yooooooooooooooooooooooooooooooooooooo

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
yo00000000000000000000000000000000
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-slub_
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-fl
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_preempt]
```

```
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
```