

LINUX COMMAND

Why Linux ?

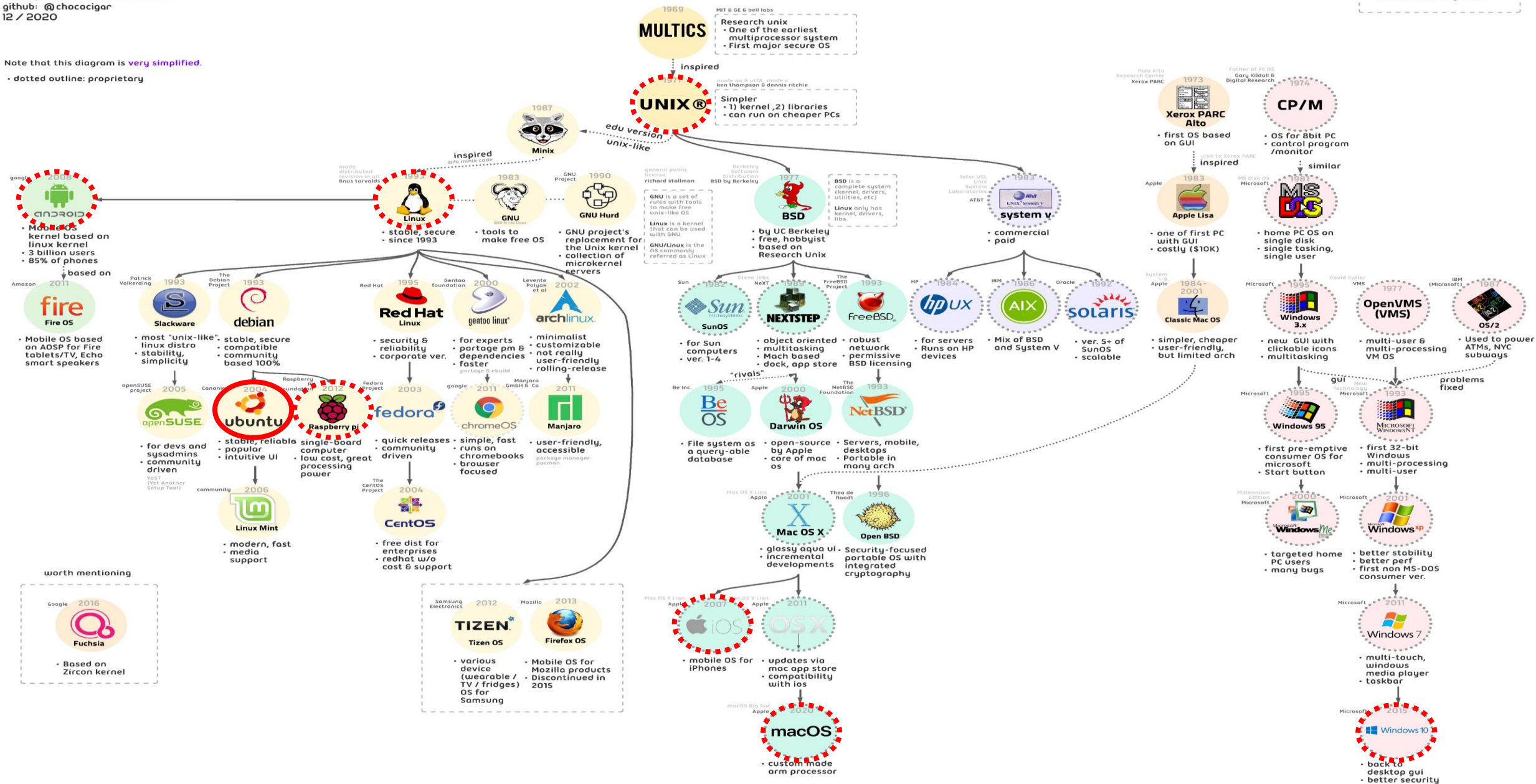


Feature	Linux	Windows
Cost	Free (mostly open source)	Paid (license required)
Security	More secure, fewer threats	More targeted by malware/viruses
Customization	Highly customizable	Limited customization
Software Support	Limited for proprietary apps	Excellent support for commercial apps
Performance	Lightweight, good for older systems	Heavier, needs more resources
Ease of Use	Requires technical knowledge	User-friendly, easier for beginners
Best For	Developers, servers, advanced users	General users, gamers, office environments

for any corrections, please contact
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Note that this diagram is **very simplified**.

- dotted outline: proprietary



What is this ?

```
root@7dfff5bb5554: ~# ls /
bin  boot  dev  etc  home  lib  lib32  lib64  libx32  media
mnt  opt  proc  root  run  sbin  srv  sys  tmp  usr  var
root@7dfff5bb5554:~#
root@7dfff5bb5554:~#
root@7dfff5bb5554:~#
root@7dfff5bb5554:~#
root@7dfff5bb5554:~#
root@7dfff5bb5554:~# |
```

- Terminal
- Shell
- Command Line Interface (CLI)

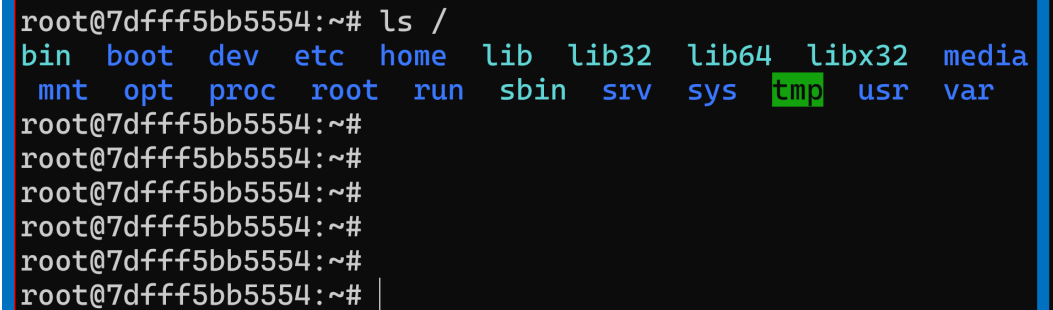
What is the difference ?

Terminal

A window where you enter the commands for the computer to process

Shell

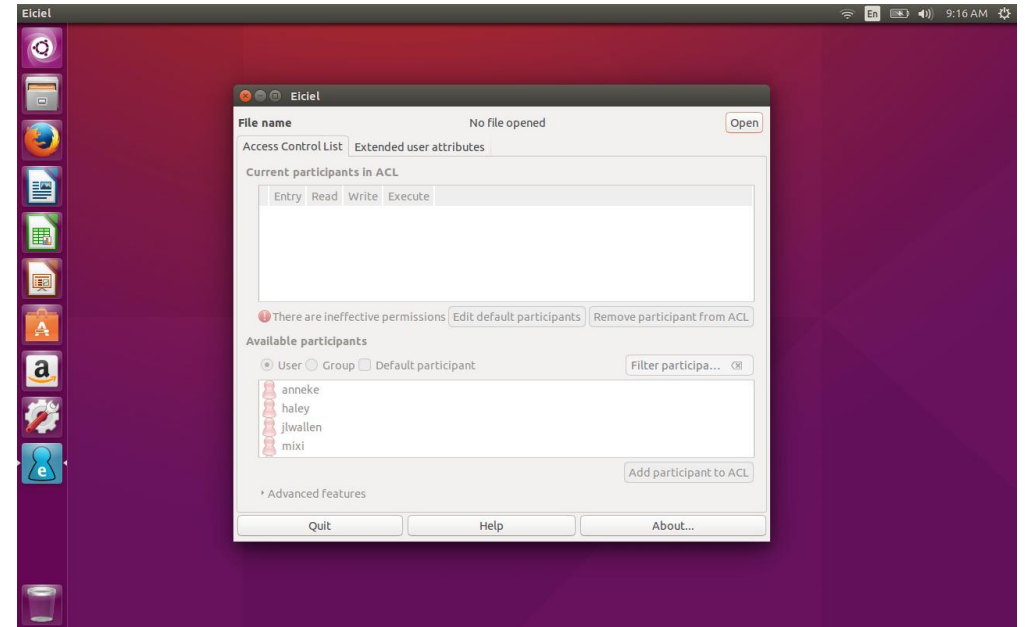
A command-line interpreter that runs commands and outputs the results e.g. Bash, Zsh, Powershell

A screenshot of a terminal window with a black background and a blue border. The window title is 'root@7dfff5bb5554: ~'. The command 'ls /' has been executed, and the output is displayed in two lines of blue text: 'bin boot dev etc home lib lib32 lib64 libx32 media' on the first line and 'mnt opt proc root run sbin srv sys tmp usr var' on the second line. The 'tmp' directory is highlighted with a green background. Below the output, there are five more lines showing the prompt 'root@7dfff5bb5554:~#' without any further input or output.

```
root@7dfff5bb5554:~# ls /
bin boot dev etc home lib lib32 lib64 libx32 media
mnt opt proc root run sbin srv sys tmp usr var
root@7dfff5bb5554:~#
root@7dfff5bb5554:~#
root@7dfff5bb5554:~#
root@7dfff5bb5554:~#
root@7dfff5bb5554:~#
```

What is the difference ?

```
[root@localhost ~]# ping -q fa.wikipedia.org
PING text.pmtpa.wikimedia.org (208.80.152.2) 56(84) bytes of data:
6C
--- text.pmtpa.wikimedia.org ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 540.528/540.528/540.528/0.000 ms
[root@localhost ~]# pwd
/root
[root@localhost ~]# cd /var
[root@localhost var]# ls -la
total 72
drwxr-xr-x. 18 root root 4096 Jul 30 22:43 .
drwxr-xr-x. 23 root root 4096 Sep 14 20:42 ..
drwxr-xr-x. 2 root root 4096 May 14 00:15 account
drwxr-xr-x. 11 root root 4096 Jul 31 22:26 cache
drwxr-xr-x. 3 root root 4096 May 18 16:03 db
drwxr-xr-x. 3 root root 4096 May 18 16:03 empty
drwxr-xr-x. 2 root root 4096 May 18 16:03 games
drwxrwx--T. 2 root gdm 4096 Jun 2 18:39 gdm
drwxr-xr-x. 38 root root 4096 May 18 16:03 lib
drwxr-xr-x. 2 root root 4096 May 18 16:03 local
drwxrwxrwx. 1 root root 11 May 14 00:12 lock -> ../run/lock
drwxr-xr-x. 14 root root 4096 Sep 14 20:42 log
drwxrwxrwx. 1 root root 10 Jul 30 22:43 mail -> spool/mail
drwxr-xr-x. 2 root root 4096 May 18 16:03 nis
drwxr-xr-x. 2 root root 4096 May 18 16:03 opt
drwxr-xr-x. 2 root root 4096 May 18 16:03 preserve
drwxr-xr-x. 2 root root 4096 Jul 1 22:11 report
drwxrwxrwx. 1 root root 6 May 14 00:12 run -> ../run
drwxr-xr-x. 14 root root 4096 May 18 16:03 spool
drwxrwxrwt. 4 root root 4096 Sep 12 23:50 tmp
drwxr-xr-x. 2 root root 4096 May 18 16:03 yp
[root@localhost var]# yum search wiki
Loaded plugins: langpacks, presto, refresh-packagekit, remove-with-leaves
rpmfusion-free-updates                | 2.7 kB      00:00
rpmfusion-free-updates/primary_db     | 206 kB      00:04
rpmfusion-nonfree-updates             | 2.7 kB      00:00
updates/metalink                      | 5.9 kB      00:00
updates                               | 4.7 kB      00:00
updates/primary_db                    | 73% [=====] 62 kB/s | 2.6 MB      00:15 ETA
```



Command Line Interface (CLI)

- type commands

Graphical User Interface (GUI)

- click graphical elements

Why use CLI if we have GUI?

1. More efficient for many tasks

- Creating multiple files

2. Easy to automate tasks

- Backing up files daily

3. Required for some advanced or specific operations

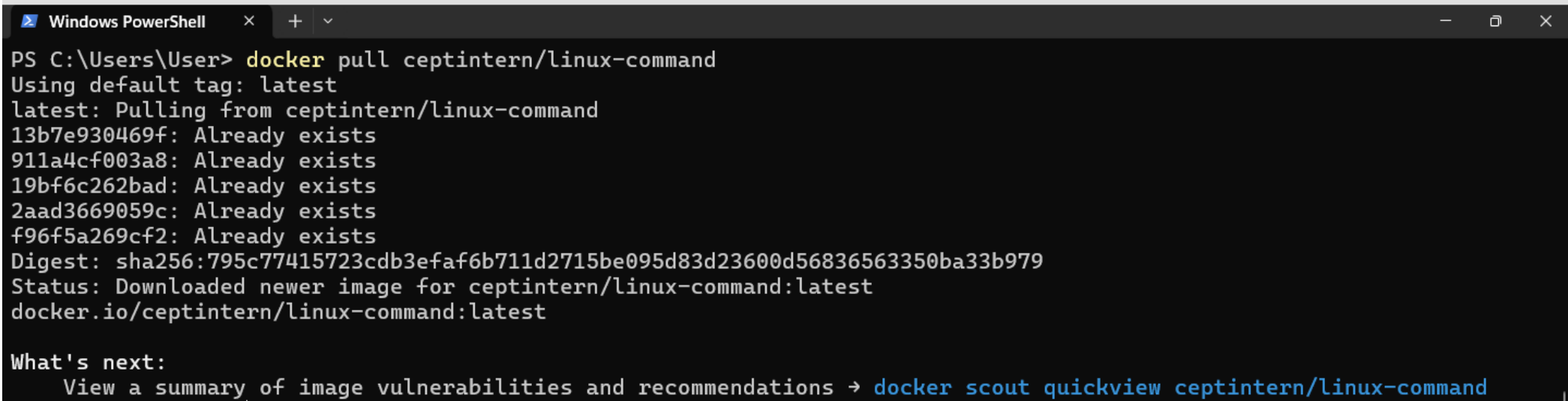
- Managing remote servers

LET'S CREATE OUR
LINUX CONTAINER

Let create our Ubuntu container

Open your terminal → Pull image from docker registry

```
docker pull ceptintern/linux-command
```

A screenshot of a Windows PowerShell terminal window. The title bar shows 'Windows PowerShell' with standard window controls. The command prompt shows 'PS C:\Users\User> docker pull ceptintern/linux-command'. The output indicates the image is being pulled from the registry, lists several layers that already exist, shows the digest, and confirms the download of the latest image. At the bottom, it suggests running 'docker scout quickview ceptintern/linux-command' for a security scan.

```
Windows PowerShell x + v
PS C:\Users\User> docker pull ceptintern/linux-command
Using default tag: latest
latest: Pulling from ceptintern/linux-command
13b7e930469f: Already exists
911a4cf003a8: Already exists
19bf6c262bad: Already exists
2aad3669059c: Already exists
f96f5a269cf2: Already exists
Digest: sha256:795c77415723cdb3efaf6b711d2715be095d83d23600d56836563350ba33b979
Status: Downloaded newer image for ceptintern/linux-command:latest
docker.io/ceptintern/linux-command:latest

What's next:
View a summary of image vulnerabilities and recommendations → docker scout quickview ceptintern/linux-command
```

Run Ubuntu container

```
docker run -d -p 2222:22 --name ubuntu
ceptintern/linux-command
```

BASIC LINUX COMMAND

Enter the Ubuntu container

`ssh <user>@<hostname> -p <port>`
-secure shell used to securely connect to
remote systems over an unsecured network

Open your terminal → Input ssh command

`ssh cept@localhost -p 2222`

→ Insert password password: password

```
PS C:\Users\User> ssh cept@localhost -p 2222
cept@localhost's password:
Welcome to Ubuntu 20.04.6 LTS (GNU/Linux 5.15.167.4-microsoft-standard-WSL2 x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro
Last login: Mon Jun  2 08:02:48 2025 from 172.17.0.1
cept@dd6f6cb92417:~$ |
```

Terminal Interface

User	Hostname	Current Working Directory
<pre>cept@64654e33ab9c:/\$ ls</pre>		
<pre>bin dev home lib32 libx32</pre>		
<pre>mnt proc run srv tmp var</pre>		
<pre>boot etc lib lib64 media</pre>		
<pre>opt root sbin sys usr</pre>		
<pre>cept@64654e33ab9c:/\$</pre>		

Input command

Output result

Prompt

Linux Command Structure

```
cept@64654e33ab9c:~$ command <options> <arguments>
```



The diagram illustrates the structure of a Linux command. It shows a terminal prompt 'cept@64654e33ab9c:~\$' followed by three components: 'command', '<options>', and '<arguments>'. Each component is enclosed in a colored box: 'command' is red, '<options>' is orange, and '<arguments>' is green. Arrows point from these boxes to their respective descriptions below: a red arrow from 'command' points to 'Name of the command', an orange arrow from '<options>' points to '(Optional) Flags to modify the command begin with – (dash)', and a green arrow from '<arguments>' points to 'Inputs of the command'.

Name of the command

(Optional) Flags to modify the command begin with – (dash)

Inputs of the command

Let's start with the first command

clear -clear the terminal screen

- short key: **ctrl + l**

Commands are case sensitive

ls <directory> -list <directory> (if not specify, list current directory)

- Directory is same as folder

```
cept@c760c9c4e37b:~$ ls
ant bird cat zoo
cept@c760c9c4e37b:~$ ls -l
total 4
-rw-rw-r-- 1 cept cept 0 May 31 13:58 ant
-rw-rw-r-- 1 cept cept 0 May 31 13:58 bird
-rw-rw-r-- 1 cept cept 0 May 31 13:58 cat
drwxrwxr-x 2 cept cept 4096 May 31 13:58 zoo
cept@c760c9c4e37b:~$ ls -a
. .bash_history .bashrc .profile bird zoo
.. .bash_logout .cache ant cat
```

Support multiple options

ls -l -a

ls -la

**TIP: command `--help`
to summarize usage**

```
cept@c760c9c4e37b:~$ ls --help
Usage: ls [OPTION]... [FILE]...
List information about the FILES (the current dir
Sort entries alphabetically if none of -cftuvSUX

Mandatory arguments to long options are mandatory
-a, --all do not ignore entries starting with .
-A, --almost-all do not list implied entries
--author with -l, print the author name of each file entry
-b, --escape print C-style escape sequences
--block-size=SIZE with -l, scale sizes by SIZE before printing them; e.g., '--block-size=K'
-B, --ignore-backups do not list implied entries that backup
-c sort by, a
```

`pwd` -print working directory

```
cept@64654e33ab9c:~$ pwd
/home/cept
```

`cd` <directory> -change directory

```
cept@64654e33ab9c:~$ cd zoo
cept@64654e33ab9c:~/zoo$ ls
dog
```

Important directory

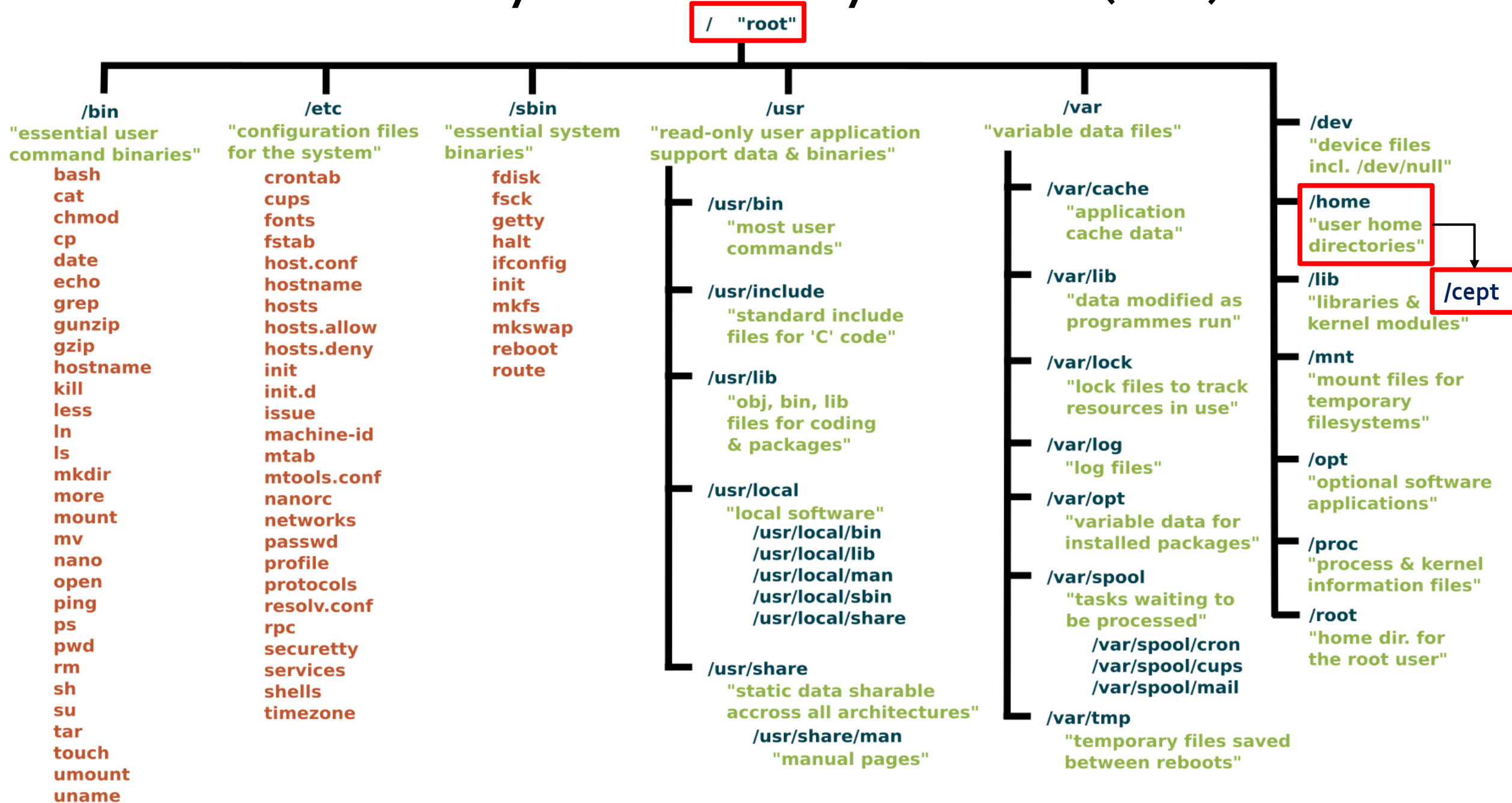
- ~ -home directory
- .
- .. -parent directory
- / -root directory

TIP: use **tab**
to complete unique word
use **up arrow**
to use previous command

home: current user's home directory
parent: one level up from the current
root: top-level directory

Exploring Linux with `cd ..` reveals Linux file structure

Linux Filesystem Hierarchy Structure (FHS)



FILE AND DIRECTORY

MANAGEMENT

touch <file> - create files

- if the file exists, touch update file timestamps

```
cept@c760c9c4e37b:~$ touch elephant
cept@c760c9c4e37b:~$ ls
ant  bird  cat  elephant  zoo
```

mkdir <directory> - make directories

```
cept@c760c9c4e37b:~$ mkdir aquarium
cept@c760c9c4e37b:~$ ls
ant  aquarium  bird  cat  zoo
```

TIP: file extension (.txt, .png, .zip)

- Use by software to interpret file

Create multiple files /directories

```
touch file1 file2
mkdir dir{1..3}
```

Create directory with parent directory

```
mkdir -p grandparent_dir/parent_dir/dir
```

rmdir < directory > - remove empty directories

cp <src> <dest> - copy from source to destination directory

```
cept@c760c9c4e37b:~$ cp cat house/  
cept@c760c9c4e37b:~$ ls  
ant bird cat house  
cept@c760c9c4e37b:~$ ls house/  
cat
```

rm <file> - removes a file

```
cept@c760c9c4e37b:~$ rm cat  
cept@c760c9c4e37b:~$ ls  
ant bird house
```

mv <src> <dest> - move source to destination directory

- Can use to rename file/directory by enter the new name

Copy/Remove directory

cp -r src dest
rm -r src dest
(r = recursive)

```
cept@c760c9c4e37b:~$ ls  
ant bird house  
cept@c760c9c4e37b:~$ cp -r house new_house  
cept@c760c9c4e37b:~$ ls  
ant bird house new_house  
cept@c760c9c4e37b:~$ rm -r house/  
cept@c760c9c4e37b:~$ ls  
ant bird new_house
```

```
cept@c760c9c4e37b:~$ ls  
ant bird cat house  
cept@c760c9c4e37b:~$ mv cat house/  
cept@c760c9c4e37b:~$ ls  
ant bird house  
cept@c760c9c4e37b:~$ ls house/  
cat  
cept@c760c9c4e37b:~$ mv ant ant.txt  
cept@c760c9c4e37b:~$ ls  
ant.txt bird house
```

FILE VIEWING AND

EDITING

echo <string> - display text or variable

```
cept@c760c9c4e37b:~$ echo hello world
hello world
cept@c760c9c4e37b:~$ name="Bob"
cept@c760c9c4e37b:~$ echo hello $name
hello Bob
```

Add single line in file
echo <string> >> file

```
$ echo what is your name ? >> ant
$ echo how are you ? >> ant
```

cat <file> - display a file

```
cept@c760c9c4e37b:~$ cat ant
what is your name ?
how are you ?
```

Add line by line in file
cat >> file
• Use ctrl+d to quit

grep - global regular expression print
(search for text that match a pattern)

```
cept@c760c9c4e37b:~$ cat ant|grep you
what is your name ?
how are you ?
```

pipe (|)
connect the output to
another input
$$g(f(x)) = f(x) | g(x)$$

more <file> - display a file one page at a time

less <file> - display a file one page at a time

- Use q to quit

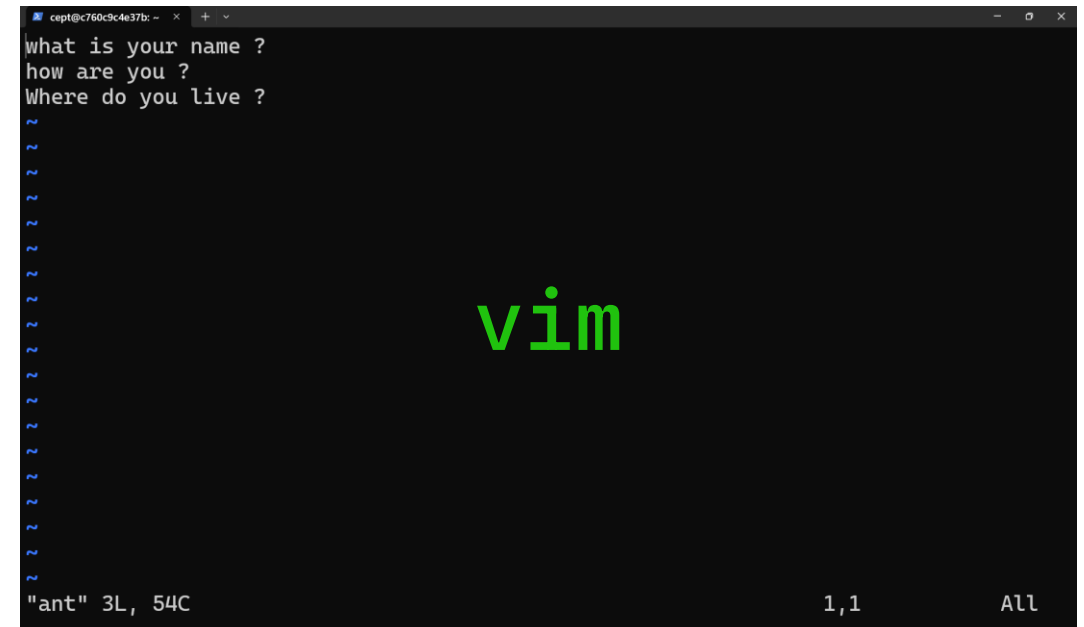
head <file> - display the first part of a file

tail <file> - display the last part of a file

nano <file> - open text editor

vim <file> - open text editor

- Use :q to quit



USER PERMISSIONS

whoami - show current logged-in user

su <user> - switch user

useradd <user> -add a new user without password

passwd <user> -add user's password

adduser <user> -add a new user with password

userdel <user> -delete a user

chmod <mode> <file> -change mode of a file

chown <user> <file> -change ownership of a file

sudo <command> - superuser do (run command as root)

```
cept@c760c9c4e37b:~$ whoami  
cept
```

```
cept@c760c9c4e37b:~$ su  
Password:  
root@c760c9c4e37b: /home/cept#
```

Some command
need permission to
run (e.g. adduser,
apt, ...)

Some directory
need permission to
access/run
command
(e.g. /root, /bin, ...)

IN LINUX EVERYTHING IS A FILE !!!

means **files**, **directories**, **devices**, **processes**, **command** and even **network sockets** are all accessed and managed as files

Example: command is a file

```
root@c760c9c4e37b:/# cd /bin
root@c760c9c4e37b:/bin# ls -l|grep ls
-rwxr-xr-x 1 root root      39256 Sep  5  2019 false
-rwxr-xr-x 1 root root     142144 Sep  5  2019 ls
```

```
root@c760c9c4e37b:~# cd /bin
root@c760c9c4e37b:/bin# cp ls cuee
root@c760c9c4e37b:/bin# cuee /
bin  dev  home  lib32  libx32  mnt  proc  run  srv  tmp  var
boot etc  lib   lib64  media  opt  root  sbin sys  usr
```

PACKAGE --- MANAGEMENT

apt -advanced package tool

apt update - check for package updates

apt upgrade - download and install the updates

apt install <package> - install a package

apt remove <package> - remove a package

TIP: **man <command>**
to show the
command manual
but need installation

```
root@c760c9c4e37b:/home/cept# apt install man-db
Reading package lists... Done
Building dependency tree
Reading state information... Done
Suggested packages:
  apparmor groff www-browser
The following NEW packages will be installed:
  man-db
0 upgraded, 1 newly installed, 0 to remove and 0 not up
graded
```

```
root@c760c9c4e37b:/home/cept# man ls
```

```
LS(1)                                User Commands                                LS(1)
NAME
  ls - list directory contents
SYNOPSIS
  ls [OPTION]... [FILE]...
DESCRIPTION
  List information about the FILES (the current
  directory by default). Sort entries alphabet-
  ically if none of -cftuvSUX nor --sort is
  specified.
ual page ls(1) line 1 (press h for help or q to quit)
```

SYSTEM INFORMATION

uname -shows system information

```
root@c760c9c4e37b:/home/cept# uname
Linux
```

top -show real-time system processes

```
top - 05:09:18 up 11:25, 1 user, load average: 0.00,
Tasks: 7 total, 1 running, 6 sleeping, 0 stopp
%Cpu(s): 0.0 us, 0.0 sy, 0.0 ni,100.0 id, 0.0 wa,
MiB Mem : 7796.3 total, 6583.7 free, 718.0 used
MiB Swap: 2048.0 total, 2048.0 free, 0.0 used
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU
1	root	20	0	12196	7172	6252	S	0.0
7464	root	20	0	13404	8672	7500	S	0.0
7474	cept	20	0	13404	4712	3540	S	0.0
7475	cept	20	0	4248	3516	2912	S	0.0
7505	root	20	0	5216	3192	2760	S	0.0
7506	root	20	0	4248	3528	2940	S	0.0
7840	root	20	0	6104	3296	2840	R	0.0

df -h -show disk usage

```
root@c760c9c4e37b:/home/cept# df -h
Filesystem      Size  Used Avail Use% Mounted on
overlay         1007G  5.3G  951G   1% /
tmpfs            64M    0    64M   0% /dev
tmpfs            3.9G    0   3.9G   0% /sys/fs/cgroup
shm              64M    0    64M   0% /dev/shm
/dev/sdd         1007G  5.3G  951G   1% /etc/hosts
tmpfs            3.9G    0   3.9G   0% /proc/acpi
tmpfs            3.9G    0   3.9G   0% /sys/firmware
```

TIP: htop

same as top moreover
human-readable format
but need installation

```
1 [ 0.] 5 [ 0.] 9 [ 0.] 13 [ 0.]
2 [ 0.] 6 [ 0.] 10 [ 0.] 14 [ 0.]
3 [ 1.] 7 [ 0.] 11 [ 0.] 15 [ 0.]
4 [ 0.] 8 [ 0.] 12 [ 0.] 16 [ 0.]
Mem[||||] 726M/7.61G Tasks: 7, 0 thr; 1 running
Swp[      ] 0K/2.00G Load average: 0.00 0.00 0.00
Uptime: 11:25:58
```

PID	USER	PRI	NI	VIRT	RES	SHR	S	CPU%	MEM%
1	root	20	0	12196	7172	6252	S	0.0	0.1
7464	root	20	0	13404	8672	7500	S	0.0	0.1
7474	cept	20	0	13404	4712	3540	S	0.0	0.1
7475	cept	20	0	4248	3516	2912	S	0.0	0.0

F1Help F2Setup F3Search F4Filter F5Tree F6SortBy F7Nice

free -h -show memory usage

```
root@c760c9c4e37b:/home/cept# free -h
              total        used        free      shared  buff/cache   available
Mem:          7.6Gi         720Mi         6.4Gi         3.0Mi         495Mi         6.7Gi
Swap:          2.0Gi           0B         2.0Gi
```

ARCHIVING AND --- COMPRESSION

`tar -czf <name.tar.gz> <file_to_archive>`

- Create a .tar.gz file

`tar -xzf <file.tar.gz>`

- Extracts a .tar.gz file

- c: create

- z: compress using gzip

- f: file name

- x: extract

```
cept@c760c9c4e37b:~$ ls
folder
cept@c760c9c4e37b:~$ cat folder/file
This is a how to compress and extract file example.
```

```
cept@c760c9c4e37b:~$ tar -czf archive.tar.gz folder/
cept@c760c9c4e37b:~$ ls -l
total 8
-rw-rw-r-- 1 cept cept 191 Jun  2 05:52 archive.tar.gz
drwxrwxr-x 2 cept cept 4096 Jun  2 05:42 folder
cept@c760c9c4e37b:~$ rm -r folder
cept@c760c9c4e37b:~$ ls
archive.tar.gz
cept@c760c9c4e37b:~$ tar -xzf archive.tar.gz
cept@c760c9c4e37b:~$ ls
archive.tar.gz folder
cept@c760c9c4e37b:~$ cat folder/file
This is a how to compress and extract file example.
```

`zip -r file.zip <dir>`

- Compresses into a .zip file
- r: recursive

`unzip file.zip`

- Extracts a .zip file

```
cept@c760c9c4e37b:~$ ls
folder
cept@c760c9c4e37b:~$ cat folder/file
This is a how to compress and extract file example.
```

```
cept@c760c9c4e37b:~$ zip -r archive.zip folder/
  adding: folder/ (stored 0%)
  adding: folder/file (deflated 4%)
cept@c760c9c4e37b:~$ ls -l
total 8
-rw-rw-r-- 1 cept cept  364 Jun  2 05:55 archive.zip
drwxrwxr-x 2 cept cept 4096 Jun  2 05:42 folder
cept@c760c9c4e37b:~$ rm -r folder
cept@c760c9c4e37b:~$ ls
archive.zip
cept@c760c9c4e37b:~$ unzip archive.zip
Archive:  archive.zip
  creating: folder/
  inflating: folder/file
cept@c760c9c4e37b:~$ ls
archive.zip  folder
cept@c760c9c4e37b:~$ cat folder/file
This is a how to compress and extract file example.
```


NETWORKING

ping <hostname> -send packets to test network connectivity

ifconfig -View or configure network interfaces

ip a -Show network interfaces information

curl <url> -Fetches data from a URL (API, download)

wget <url> -Downloads files from a URL