

Ubuntu and basic Linux command part 1

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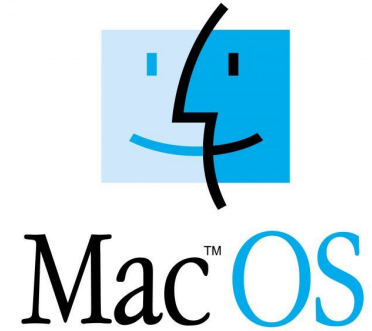
19/05/2024

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1. Introduction

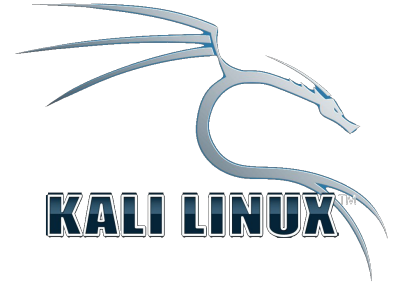
Some popular Operating Systems



Distributions of linux (OS)



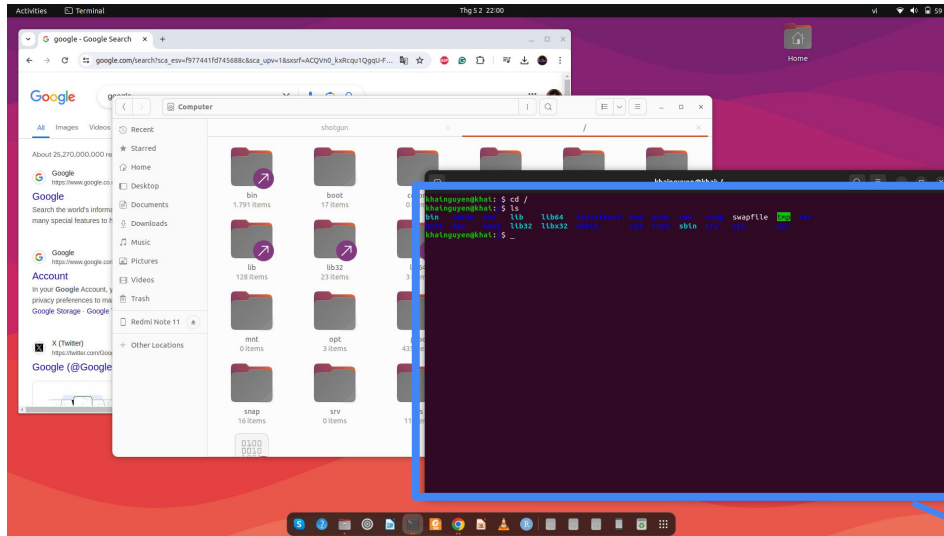
Ubuntu OS has the most users



Why linux in bioinformatics?

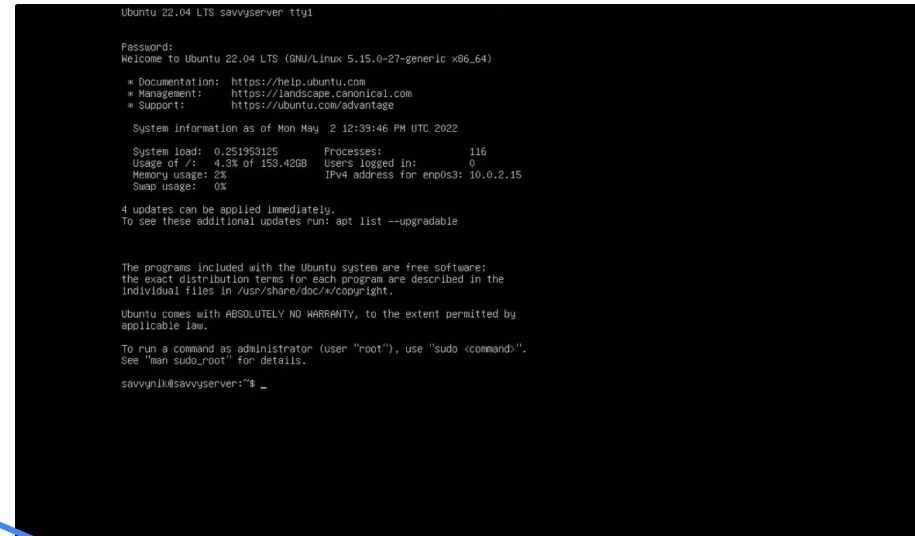
1. Linux is an open-source operating system.
 - Allows users to customize their systems according to their specific needs.
 - It is free.
2. Linux is the most commonly used operating system in High-Performance Computing (HPC). HPC unlocks primary challenges in bioinformatics:
 - Data processing limits.
 - Slow analysis times.
 - Impact on research progress.
3. Most bioinformatics tools and applications are designed to be run on Linux-based operating systems.

interact with the software/package



graphic user interface - GUI
(mouse + keyboard)

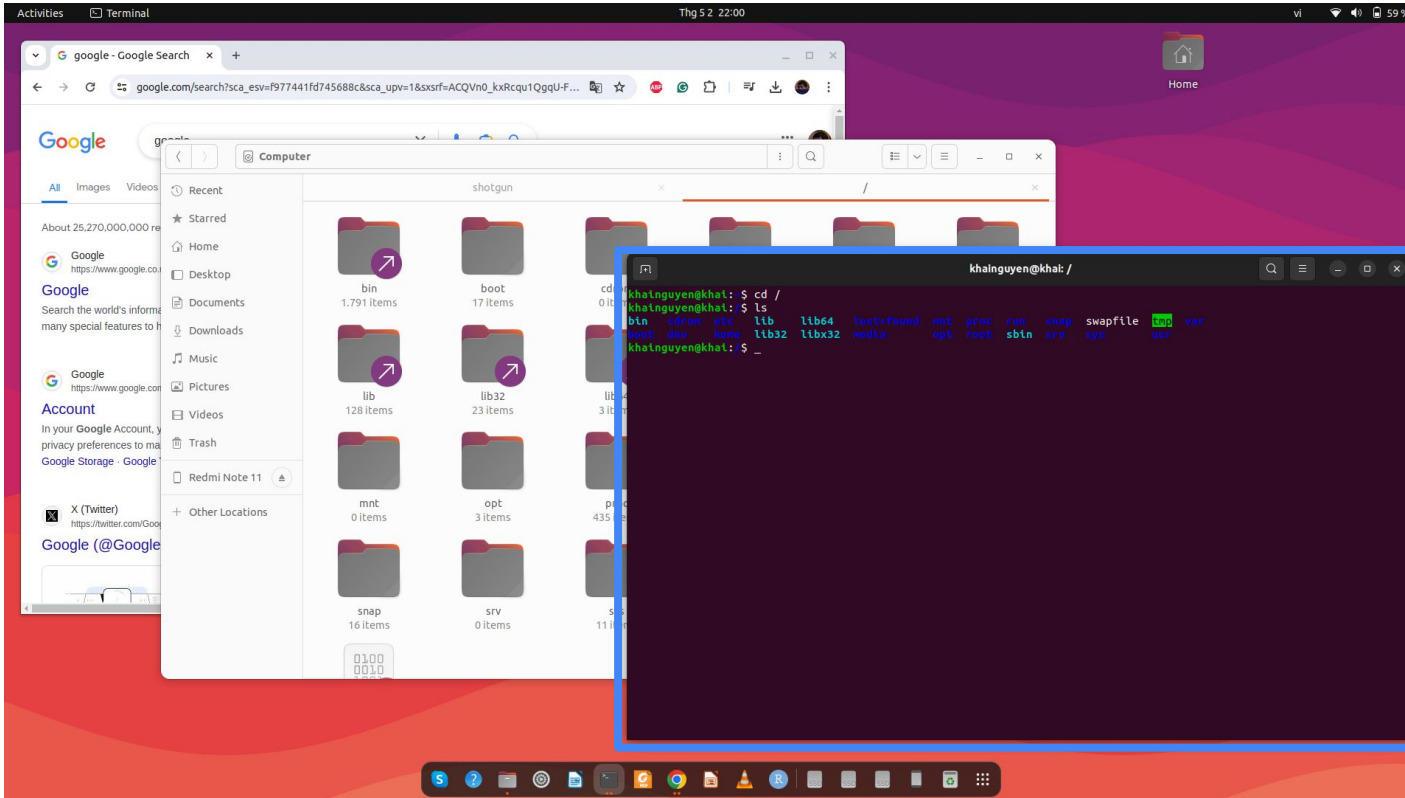
also called



command line interface - CLI
(keyboard)

Ubuntu desktop: GUI + CLI
Ubuntu server: only CLI

Terminal



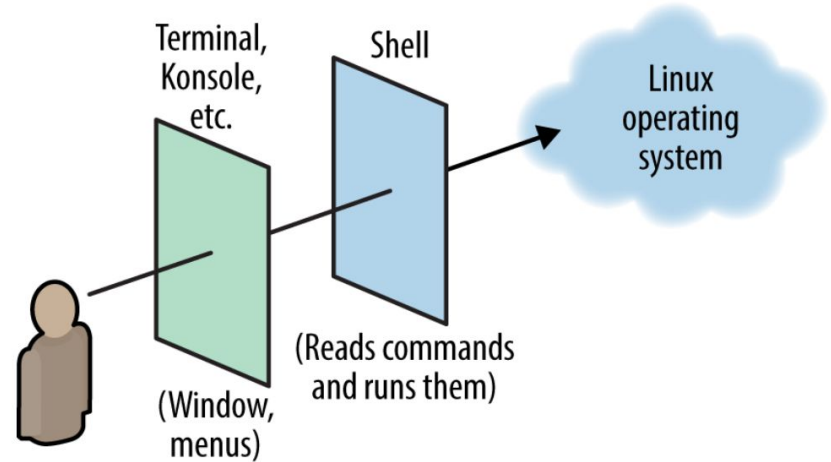
Terminal window
is where you
type commands

Open:
Ctrl + Alt + T keys
on the keyboard

Ubuntu desktop

What is Shell?

- A shell is a special user program that provides an interface for the user to use operating system services.
- Terminal is where we interact with the shell through commands.
- Several types of Shell:
 - + Bourne Shell (sh)
 - + C Shell (csh)
 - + **Bourne Again Shell (bash)**: most popular
 - + Z Shell (zsh)



(Daniel J. Barrett, Linux pocket guide)

Some ways to get the Terminal

easy to
install

1.

macOS: How to open Terminal:

<https://support.apple.com/en-vn/guide/terminal/apd5265185d-f365-44cb-8b09-71a064a42125/mac>

Windows 10/11: Install Ubuntu on Windows Subsystem for Linux (WSL): Recommended for beginners

<https://canonical-ubuntu-wsl.readthedocs-hosted.com/en/latest/guides/install-ubuntu-wsl2/>

2. Install Ubuntu on virtual machine (VM):

Windows: Install Ubuntu on VirtualBox: <https://www.youtube.com/watch?v=ngJQPt-xEeo>

macOS: Install Ubuntu on VirtualBox: https://www.youtube.com/watch?v=b_tOialCSXE

3. Install Ubuntu on physical computer: Best for long term use

Delete Windows & install Ubuntu: https://www.youtube.com/watch?v=oZcvqfWf_ps&t=100s

If you don't want to delete windows:

or a) Dual boot: Ubuntu and Windows on the same hard drive:

<https://www.youtube.com/watch?v=GXxTxBPKecQ&t=229s>

or b) Dual boot: Ubuntu and Windows on the separate hard drive:

(Ubuntu on hard drive 1, Windows on hard drive 2)

<https://www.youtube.com/watch?v=KX85vZ3ANV>

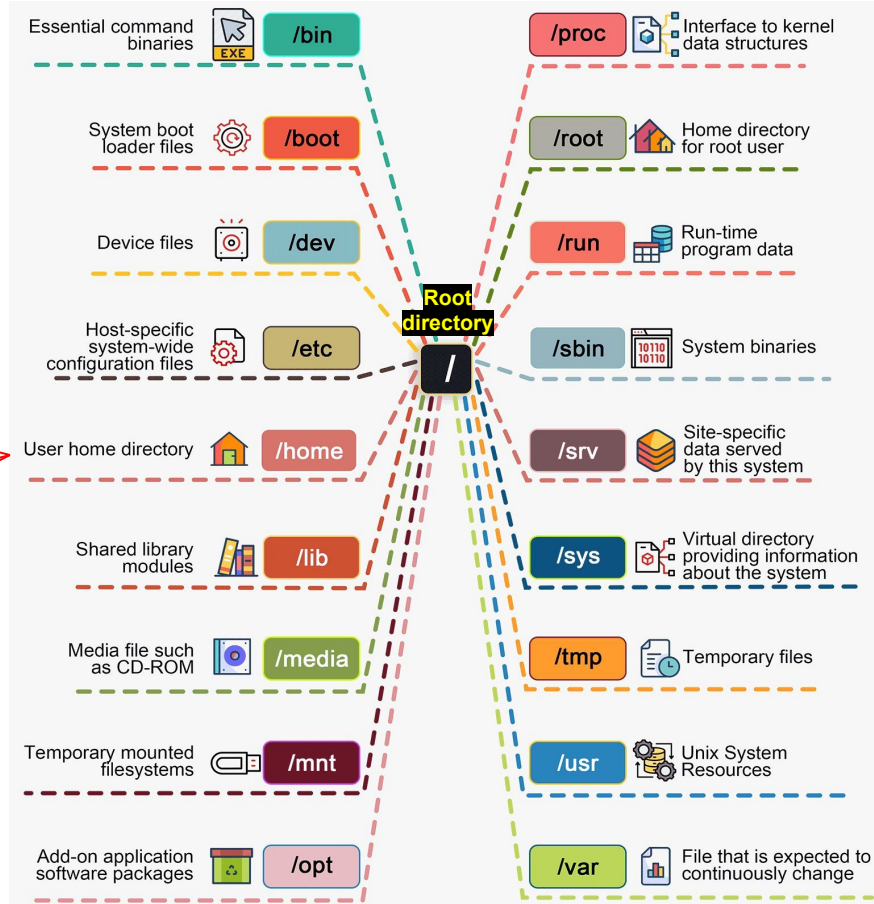
Recommended method b) if you want dual-boot.

Warning: backup your data before install!!!

More reference: https://www.youtube.com/watch?v=oZcvqfWf_ps&t=100s

a bit
difficult
to install

Linux file systems



user_name directory (or folder):

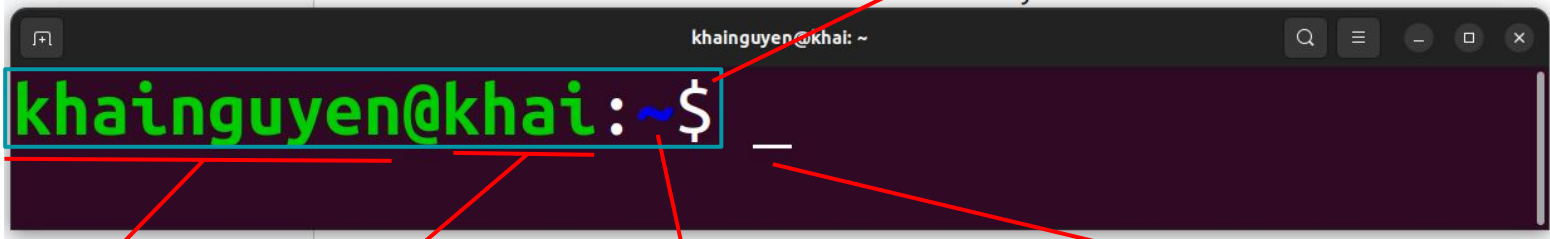
`/home/khainguyen/`
`/home/vanA/`
`/home/vanB/`

The root directory is a special directory that contains all of the other files and directories on the computer. The root directory is specified as a `/` at the beginning of a path

When opening the terminal, **default:**

tell you the computer is ready to accept a command


command prompt



The terminal window shows the prompt `khainguyen@khai: ~$`. Annotations include: a blue box around the prompt labeled 'command prompt'; a red arrow pointing to the tilde (~) labeled 'The tilde (~) represents the home directory of the currently logged in 'user_name''; a red arrow pointing to the dollar sign (\$) labeled '\$ means non-root user'; and a red arrow pointing to the cursor (a vertical line) labeled 'cursor'.

user_name host name

This case, user_name is **khainguyen**, so the path is: /home/khainguyen



The terminal window shows the command `pwd` being entered and executed. A red arrow labeled 'ENTER' points to the end of the command line. The output of the command is `/home/khainguyen`.

To print the current path, type the command: `pwd` → stands for 'print working directory', then hitting the ENTER key on keyboard to run the command

A basic command, could be:

Example: `ls` command

The command line will be read **from left to right** by the shell once press ENTER



A terminal window with a dark background. The prompt is 'khainguyen@khai: ~\$' in green. The command 'ls -l /var/' is entered in white. A red arrow above the command points from left to right. Below the command, blue and red arrows point to specific parts: 'ls' is labeled 'command (must have)', the first space is 'a space', '-l' is 'option/flag (optional) hyphen-prefixed characters', the second space is 'a space', and '/var/' is 'parameter (optional)'.

```
khainguyen@khai: ~$ ls -l /var/
```

command
(must have)

a space

option/flag
(optional)
hyphen-prefixed
characters

a space

parameter
(optional)

How do I know what options a command has?

man command_name

Example: `ls` command

```
khainguyen@khai:~$ man ls
```

```
khainguyen@khai: ~
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 alphabetically if none of -cftuvSUX nor --sort is specified.

    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 characters

    --block-size=SIZE
        with -l, scale sizes by SIZE when printing them;
        e.g., '--block-size=M'; see SIZE format below

    -B, --ignore-backups
        do not list implied entries ending with ~

    -c
        with -lt: sort by, and show, ctime (time of last
        modification of file status information);
        with -l: show ctime and sort by name;
        otherwise: sort by ctime, newest first

    -C
        list entries by columns

    --color[=WHEN]
        colorize the output; WHEN can be 'always' (default
        if omitted), 'auto', or 'never'; more info below

    -d, --directory
        list directories themselves, not their contents

    -D, --dired
        generate output designed for Emacs' dired mode

Manual page ls(1) line 1 (press h for help or q to quit)
```

Press q key on keyboard to exit

command_name --help

```
khainguyen@khai:~$ ls --help
```

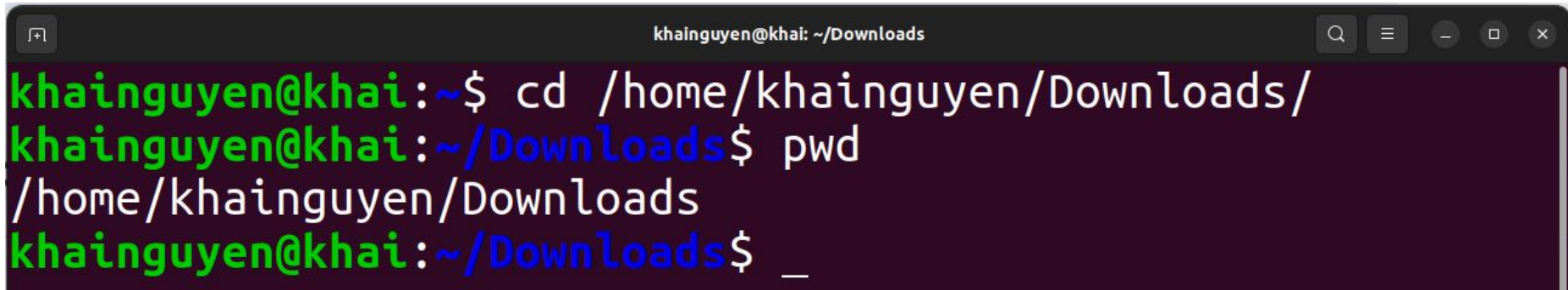
```
khainguyen@khai:~$ ls --help
Usage: ls [OPTION]... [FILE]...
List information about the FILES (the current directory by default).
Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.

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 characters
--block-size=SIZE
    with -l, scale sizes by SIZE when printing them;
    e.g., '--block-size=M'; see SIZE format below
-B, --ignore-backups
    do not list implied entries ending with ~
-c
    with -lt: sort by, and show, ctime (time of last
    modification of file status information);
    with -l: show ctime and sort by name;
    otherwise: sort by ctime, newest first
-C
    list entries by columns
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-d, --directory
    list directories themselves, not their contents
-D, --dired
    generate output designed for Emacs' dired mode
```

2. Some basic Linux commands work with files and directories

change working directory

`cd` command, an abbreviation for 'change directory'.

A terminal window with a dark background and light-colored text. The window title bar shows 'khainguyen@khai: ~/Downloads'. The terminal content shows a sequence of commands and their outputs: a 'cd' command to change to the Downloads directory, followed by a 'pwd' command that outputs the full path to the Downloads directory. The prompt color changes from green to blue after the directory change.

```
khainguyen@khai: ~/Downloads  
khainguyen@khai:~$ cd /home/khainguyen/Downloads/  
khainguyen@khai:~/Downloads$ pwd  
/home/khainguyen/Downloads  
khainguyen@khai:~/Downloads$ _
```


Path shortcuts

- ~ the home directory of the currently logged in 'user_name'
- / the root directory
- . the current directory (or the working directory)
- .. the parent directory of the working directory
- ../.. the parent directory of the parent directory of the working directory

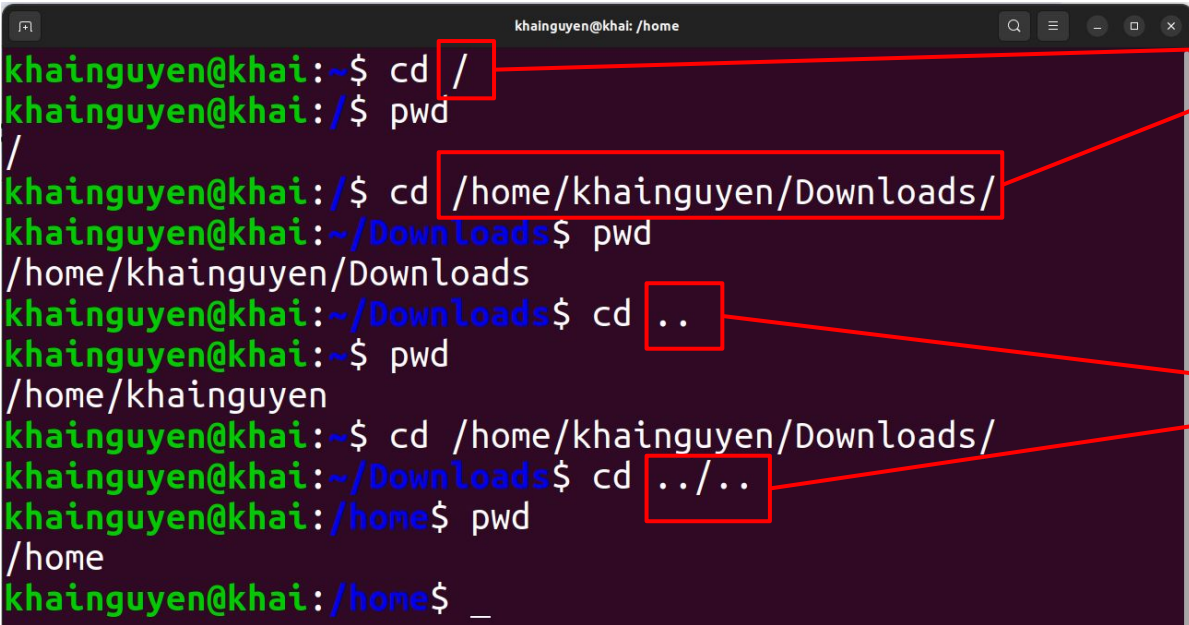
```
khainguyen@khai: ~/home
khainguyen@khai:~$ cd /
khainguyen@khai:/$ pwd
/
khainguyen@khai:/$ cd /home/khainguyen/Downloads/
khainguyen@khai:~/Downloads$ pwd
/home/khainguyen/Downloads
khainguyen@khai:~/Downloads$ cd ..
khainguyen@khai:~$ pwd
/home/khainguyen
khainguyen@khai:~$ cd /home/khainguyen/Downloads/
khainguyen@khai:~/Downloads$ cd ../../
khainguyen@khai:~/home$ pwd
/home
khainguyen@khai:~/home$ _
```

```
khainguyen@khai: ~
khainguyen@khai:~$ cd /home/khainguyen/Downloads/
khainguyen@khai:~/Downloads$ pwd
/home/khainguyen/Downloads
khainguyen@khai:~/Downloads$ cd
khainguyen@khai:~$ pwd
/home/khainguyen
khainguyen@khai:~$ _
```

just `cd` to
change to `~`

Absolute path: from the root directory to the interest directory/file.

Relative path: from the working directory to the interest directory/file.



A terminal window titled 'khainguyen@khai: /home' showing a series of commands and directory changes. Red boxes highlight specific paths, and red arrows point from text labels to these boxes.

```
khainguyen@khai:~$ cd /
khainguyen@khai:/$ pwd
/
khainguyen@khai:/$ cd /home/khainguyen/Downloads/
khainguyen@khai:~/Downloads$ pwd
/home/khainguyen/Downloads
khainguyen@khai:~/Downloads$ cd ..
khainguyen@khai:~$ pwd
/home/khainguyen
khainguyen@khai:~$ cd /home/khainguyen/Downloads/
khainguyen@khai:~/Downloads$ cd ../../
khainguyen@khai:/home$ pwd
/home
khainguyen@khai:/home$ _
```

Absolute path (points to `/` and `/home/khainguyen/Downloads/`)

Relative path (points to `..` and `../../`)

Clean up all the command lines and results above, with command: `clear`

```
khainguyen@khai: /home
khainguyen@khai:~$ cd /
khainguyen@khai:/$ pwd
/
khainguyen@khai:/$ cd /home/khainguyen/Downloads/
khainguyen@khai:~/Downloads$ pwd
/home/khainguyen/Downloads
khainguyen@khai:~/Downloads$ cd ..
khainguyen@khai:~$ pwd
/home/khainguyen
khainguyen@khai:~$ cd /home/khainguyen/Downloads/
khainguyen@khai:~/Downloads$ cd ../../
khainguyen@khai:/home$ pwd
/home
khainguyen@khai:/home$ clear_
```

ENTER

```
khainguyen@khai:/home$ _
```

or using: Ctrl-L

Listing content (files and subdirectories) of a directory

with command: `ls` ("`ls`" stands for "`list`")

`ls` files and directories in current directory (in short format):

`ls`

```
khainguyen@khai:~$ ls
230Sam  ENTER  opt  r_ngs2amr
bin     Exercise_1  Pictures  shotgun
card    localDB  Public  snap
Desktop  ngs2amr  qiime2-amplicon-2024.2-py38-linux-conda.yml  Templates
Documents  Miniconda3-py312_24.1.2-0-Linux-x86_64.sh  qiime2-import  Videos
Downloads  Music  R
khainguyen@khai:~$
```

`ls -a` list all files and directories in current directory (in short format):

`ls -a`

or

`ls --all`

```
khainguyen@khai:~$ ls -a
.      .gnome          Public
..     .gnupg          .python_history
230Sam .hplip          qiime2-amplicon-2024.2-py38-linux-conda.yml
.anthony .ibus           qiime2-import
.bash_history .java           R
.bash_logout .lessshst      .Rhistory
.bashrc      .local          r_ngs2amr
bin          localDB         shotgun
.cache       ngs2amr         snap
card         Miniconda3-py312_24.1.2-0-Linux-x86_64.sh  sudo_as_admin_successful
.conda       .mozilla        templates
.condaarc   Music           .thunderbird
.config     .noble          .vim.d
.cups       .nv             .var
Desktop     opt             Videos
Documents   .pam_environment  .viminfo
Downloads   Pictures         .vscode
ENTER       .pki            .wget-hsts
Exercise_1  .profile        .xinputrc
khainguyen@khai:~$
```

`ls --help`

`-a, --all`

do not ignore entries starting with `.`

list files and directories in current directory (in long format):

ls -l

```
khainguyen@khai:~$ ls -l
total 140772
drwxrwxr-x  4 khainguyen khainguyen    4096 Thg 3   7 19:26 2305an
drwxrwxr-x  2 khainguyen khainguyen    4096 Thg 10  8 2023 bin
drwxrwxr-x  6 khainguyen khainguyen    4096 Thg 4  21 17:50 card
drwxr-xr-x  2 khainguyen khainguyen    4096 Thg 10  8 2023 Desktop
drwxr-xr-x  2 khainguyen khainguyen    4096 Thg 11 25 22:16 Documents
drwxr-xr-x  4 khainguyen khainguyen    4096 Thg 5   4 00:05 Downloads
drwxrwxr-x 19 khainguyen khainguyen    4096 Thg 3  25 19:50 ENTER
drwxrwxr-x  5 khainguyen khainguyen    4096 Thg 3   6 15:28 Exercise_1
drwxrwxr-x  2 khainguyen khainguyen    4096 Thg 4  21 10:35 localDB
drwxrwxr-x  9 khainguyen khainguyen    4096 Thg 4  18 13:33 mgs2anr
-rw-rw-r--  1 khainguyen khainguyen 144041912 Thg 3  25 17:29 Miniconda3-py312_24.1.2-0-Linux-x86_64.sh
drwxr-xr-x  2 khainguyen khainguyen    4096 Thg 10  8 2023 Music
drwxrwxr-x  3 khainguyen khainguyen    4096 Thg 10  8 2023 opt
drwxr-xr-x  3 khainguyen khainguyen    4096 Thg 10  8 2023 Pictures
drwxr-xr-x  2 khainguyen khainguyen    4096 Thg 10  8 2023 Public
-rw-rw-r--  1 khainguyen khainguyen 13837 Thg 3  25 20:09 qiime2-amplicon-2024.2-py38-linux-conda.yml
drwxrwxr-x 14 khainguyen khainguyen    4096 Thg 3  29 18:11 qiime2-import
drwxrwxr-x  3 khainguyen khainguyen    4096 Thg 4  16 20:03 R
drwxrwxr-x  3 khainguyen khainguyen    4096 Thg 4  18 13:25 r_mgs2anr
drwxrwxr-x  2 khainguyen khainguyen    4096 Thg 5   2 20:11 shotgun
drwx----- 7 khainguyen khainguyen    4096 Thg 10 24 2023 snap
drwxr-xr-x  2 khainguyen khainguyen    4096 Thg 10  8 2023 Templates
drwxr-xr-x  3 khainguyen khainguyen    4096 Thg 10 27 2023 Videos
khainguyen@khai:~$
```


list all files and directories in current directory (in long format):

ls -al

```
khainguyen@khai:~$ ls -al
total 140964
drwxr-x--- 42 khainguyen khainguyen 4096 Thg 5  4 15:33 .
drwxr-xr-x  3 root       root       4096 Thg 10  8 2023 ..
drwxrwxr-x  4 khainguyen khainguyen 4096 Thg 3  7 19:26 2305am
drwx----- 2 khainguyen khainguyen 4096 Thg 11 21 23:18 .antby
-rw----- 1 khainguyen khainguyen 56345 Thg 5  4 15:28 .bash_history
-rw-r--r-- 1 khainguyen khainguyen 220 Thg 10  8 2023 .bash_logout
-rw-r--r-- 1 khainguyen khainguyen 4619 Thg 5  2 23:57 .bashrc
drwxrwxr-x  2 khainguyen khainguyen 4096 Thg 10  8 2023 bin
drwx----- 36 khainguyen khainguyen 4096 Thg 4 21 16:24 .cache
drwxrwxr-x  6 khainguyen khainguyen 4096 Thg 4 21 17:50 card
drwxrwxr-x  2 khainguyen khainguyen 4096 Thg 10 11 2023 .conda
-rw-rw-r--  1 khainguyen khainguyen 26 Thg 3 25 22:13 .condarc
drwx----- 34 khainguyen khainguyen 4096 Thg 4 30 23:24 .config
drwx----- 2 khainguyen khainguyen 4096 Thg 3  6 17:33 .cups
drwxr-xr-x  2 khainguyen khainguyen 4096 Thg 10  8 2023 Desktop
drwxr-xr-x  2 khainguyen khainguyen 4096 Thg 11 25 22:16 Documents
drwxr-xr-x  4 khainguyen khainguyen 4096 Thg 5  4 00:05 Downloads
drwxrwxr-x 19 khainguyen khainguyen 4096 Thg 3 25 19:50 ENTER
drwxrwxr-x  5 khainguyen khainguyen 4096 Thg 3  6 15:28 Exercise_1
drwx----- 3 khainguyen khainguyen 4096 Thg 10  8 2023 .gnome
drwx----- 2 khainguyen khainguyen 4096 Thg 4 30 23:24 .gnupg
drwxr-xr-x  2 khainguyen khainguyen 4096 Thg 3  6 17:21 .hplip
drwxrwxr-x  3 khainguyen khainguyen 4096 Thg 10  8 2023 .ibus
drwxrwxr-x  3 khainguyen khainguyen 4096 Thg 12 13 16:41 .java
-rw----- 1 khainguyen khainguyen 20 Thg 4 16 18:10 .lessht
drwx----- 3 khainguyen khainguyen 4096 Thg 10  8 2023 .local
drwxrwxr-x  2 khainguyen khainguyen 4096 Thg 4 21 10:35 localDB
drwxrwxr-x  9 khainguyen khainguyen 4096 Thg 4 18 13:33 mgs2anr
-rw-rw-r-- 1 khainguyen khainguyen 144041912 Thg 3 25 17:29 Miniconda3-py312_24.1.2-0-Linux-x86_64.sh
drwx----- 3 khainguyen khainguyen 4096 Thg 11 25 20:56 .mozilla
drwxr-xr-x  2 khainguyen khainguyen 4096 Thg 10  8 2023 Music
drwxrwxr-x  2 khainguyen khainguyen 4096 Thg 11  9 20:23 .ncbi
drwx----- 3 khainguyen khainguyen 4096 Thg 10 12 2023 .nv
drwxrwxr-x  3 khainguyen khainguyen 4096 Thg 10  8 2023 opt
-rw-r--r-- 1 khainguyen khainguyen 303 Thg 10  9 2023 .pam_environment
```

```
drwxrwxr-x  5 khainguyen khainguyen 4096 Thg 10  8 2023 .pki
-rw-r--r-- 1 khainguyen khainguyen 303 Thg 10  9 2023 .pam_environment
drwxr-xr-x  3 khainguyen khainguyen 4096 Thg 10  8 2023 Pictures
drwx----- 3 khainguyen khainguyen 4096 Thg 10  8 2023 .pkl
-rw-r--r-- 1 khainguyen khainguyen 851 Thg 4 18 00:30 .profile
drwxr-xr-x  2 khainguyen khainguyen 4096 Thg 10  8 2023 Public
-rw----- 1 khainguyen khainguyen 858 Thg 3  3 16:25 .python_history
-rw-rw-r-- 1 khainguyen khainguyen 13837 Thg 3 25 20:09 qiime2-amplicon-2024.2-py38-linux-conda.yml
drwxrwxr-x 14 khainguyen khainguyen 4096 Thg 3 29 18:11 qiime2-import
drwxrwxr-x  3 khainguyen khainguyen 4096 Thg 4 16 20:03 R
-rw-rw-r-- 1 khainguyen khainguyen 88 Thg 4 21 21:00 .Rhistory
drwxrwxr-x  3 khainguyen khainguyen 4096 Thg 4 18 13:25 r_mgs2anr
drwxrwxr-x  2 khainguyen khainguyen 4096 Thg 5  2 20:11 shotgun
drwx----- 7 khainguyen khainguyen 4096 Thg 10 24 2023 snap
-rw-r--r-- 1 khainguyen khainguyen 0 Thg 10  8 2023 .sudo_as_admin_successful
drwxr-xr-x  2 khainguyen khainguyen 4096 Thg 10  8 2023 Templates
drwx----- 6 khainguyen khainguyen 4096 Thg 11 25 20:56 .thunderbird
drwx----- 3 khainguyen khainguyen 4096 Thg 10  8 2023 .tin.d
drwxr-xr-x  3 khainguyen khainguyen 4096 Thg 10 18 2023 .var
drwxr-xr-x  3 khainguyen khainguyen 4096 Thg 10 27 2023 Videos
-rw----- 1 khainguyen khainguyen 7478 Thg 4 21 10:47 .viminfo
drwxrwxr-x  4 khainguyen khainguyen 4096 Thg 4 30 23:24 .vscode
-rw-rw-r-- 1 khainguyen khainguyen 530 Thg 4 18 12:31 .wget-hsts
-rw-rw-r-- 1 khainguyen khainguyen 131 Thg 10  8 2023 .xinputrc
khainguyen@khai:~$
```

list files and directories in another directory (in long format):

`ls -l path_to_directory`

```
khainguyen@khai:~$ ls -l /var/
total 48
drwxr-xr-x  2 root root    4096 Thg 5   1 00:00 backups
drwxr-xr-x 18 root root    4096 Thg 10  11 2023 cache
drwxrwsrwt  2 root whoopsie 4096 Thg 5   5 13:28 crash
drwxr-xr-x 74 root root    4096 Thg 3   6 16:40 lib
drwxrwsr-x  2 root staff    4096 Thg 4  18 2022 local
lrwxrwxrwx  1 root root         9 Thg 10   8 2023 lock -> /run/lock
drwxrwxr-x 14 root syslog    4096 Thg 5   6 00:00 log
drwxrwsr-x  2 root mail     4096 Thg 8   8 2023 mail
drwxrwsrwt  2 root whoopsie 4096 Thg 8   8 2023 metrics
drwxr-xr-x  2 root root     4096 Thg 8   8 2023 opt
lrwxrwxrwx  1 root root         4 Thg 10   8 2023 run -> /run
drwxr-xr-x 16 root root     4096 Thg 10  24 2023 snap
drwxr-xr-x  7 root root     4096 Thg 8   8 2023 spool
drwxrwxrwt 13 root root     4096 Thg 5   6 15:55 tmp
khainguyen@khai:~$ _
```



```
khainguyen@khai:~$ ls -l
total 140772
```

drwxrwxr-x	4	khainguyen	khainguyen	4096	Thg 3	7	19:26	230Sam
drwxrwxr-x	2	khainguyen	khainguyen	4096	Thg 10	8	2023	bin
drwxrwxr-x	6	khainguyen	khainguyen	4096	Thg 4	21	17:50	card
drwxr-xr-x	2	khainguyen	khainguyen	4096	Thg 10	8	2023	Desktop
drwxr-xr-x	2	khainguyen	khainguyen	4096	Thg 11	25	22:16	Documents
drwxr-xr-x	4	khainguyen	khainguyen	4096	Thg 5	4	00:05	Downloads
drwxrwxr-x	19	khainguyen	khainguyen	4096	Thg 3	25	19:50	ENTER
drwxrwxr-x	5	khainguyen	khainguyen	4096	Thg 3	6	15:28	Exercise_1
drwxrwxr-x	2	khainguyen	khainguyen	4096	Thg 4	21	10:35	localDB
drwxrwxr-x	9	khainguyen	khainguyen	4096	Thg 4	18	13:33	mgs2amr
-rw-rw-r--	1	khainguyen	khainguyen	144041912	Thg 3	25	17:29	Miniconda3-py312_24.1.2-0-Linux-x86_64.sh
drwxr-xr-x	2	khainguyen	khainguyen	4096	Thg 10	8	2023	Music
drwxrwxr-x	3	khainguyen	khainguyen	4096	Thg 10	8	2023	opt
drwxr-xr-x	3	khainguyen	khainguyen	4096	Thg 10	8	2023	Pictures
drwxr-xr-x	2	khainguyen	khainguyen	4096	Thg 10	8	2023	Public
-rw-rw-r--	1	khainguyen	khainguyen	13837	Thg 3	25	20:09	qiime2-amplicon-2024.2-py38-linux-conda.yml
drwxrwxr-x	14	khainguyen	khainguyen	4096	Thg 3	29	18:11	qiime2-import
drwxrwxr-x	3	khainguyen	khainguyen	4096	Thg 4	16	20:03	R
drwxrwxr-x	3	khainguyen	khainguyen	4096	Thg 4	18	13:25	r_mgs2amr
drwxrwxr-x	2	khainguyen	khainguyen	4096	Thg 5	2	20:11	shotgun
drwx-----	7	khainguyen	khainguyen	4096	Thg 10	24	2023	snap
drwxr-xr-x	2	khainguyen	khainguyen	4096	Thg 10	8	2023	Templates
drwxr-xr-x	3	khainguyen	khainguyen	4096	Thg 10	27	2023	Videos

File type:
"d" means
this is a
directory

Permissions

Owner of file
(user_name)

user
group

size
(in bytes)

Last modification time

directory/file name

number of
hard links

Create and remove directory

Create a directory named “Huka” in the current directory (~) , with the command: mkdir


mkdir Huka

or

mkdir ./Huka

“mkdir” stands for “make directory”

```
khainguyen@khai:~$ ls
230Sam    Downloads  Miniconda3-py312_24.1.2-0-Linux-x86_64.sh  qiime2-amplicon-2024.2-py38-linux-conda.yml  snap
bin        ENTER      Music                                           qiime2-import  Templates
card       Exercise_1 opt                                              R              Videos
Desktop    localDB    Pictures                                       r_mgs2amr
Documents  mgs2amr    Public                                         shotgun
khainguyen@khai:~$ mkdir Huka
khainguyen@khai:~$ ls
230Sam    Downloads  mgs2amr    Public    shotgun
bin        ENTER      Miniconda3-py312_24.1.2-0-Linux-x86_64.sh  qiime2-amplicon-2024.2-py38-linux-conda.yml  snap
card       Exercise_1 Music                                           qiime2-import  Templates
Desktop    Huka      opt                                              R              Videos
Documents  LocalDB   Pictures                                       r_mgs2amr
khainguyen@khai:~$ _
```



Run “ls” to check

a new directory is created

Create and remove directory

Create three directory named “Huki”, “Huka”, “Huke” in the current directory

```
mkdir Huki Huka Huke
```

Delete a **empty** directory named “Huka” in current directory, with command: rmdir

```
rmdir Huka
```

“rmdir” stands for “**r**emove **d**irectory”

Delete a **non-empty** directory named “Huka” in current directory, with the command “rm”, option -r:

```
rm -r Huka
```

or

```
rm -R Huka
```

or

```
rm --recursive Huka/
```

“rm” stands for “**r**emove”

```
rm --help
```

```
-r, -R, --recursive  remove directories and their contents recursively
```

Create and remove file

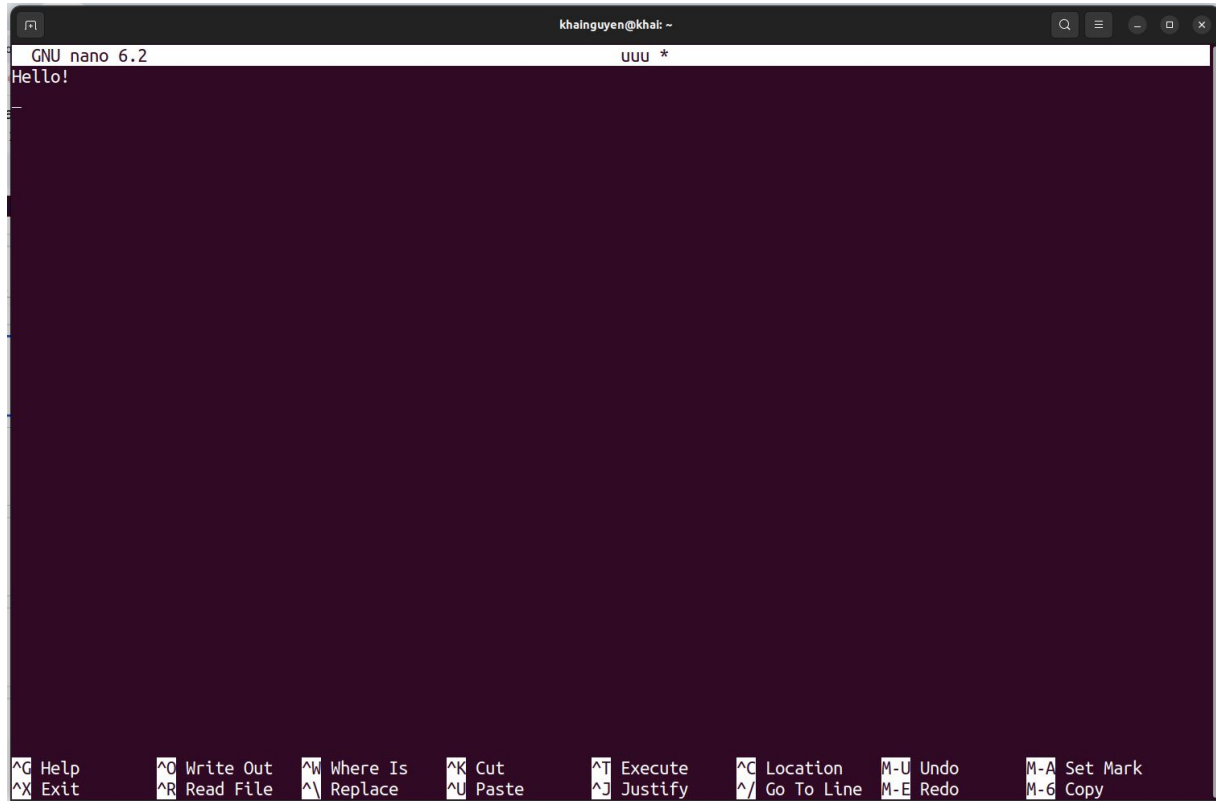
Create and edit text file with nano, a text editor

1. Create a text file named "uuu" ("uuu" doesn't exist):

nano

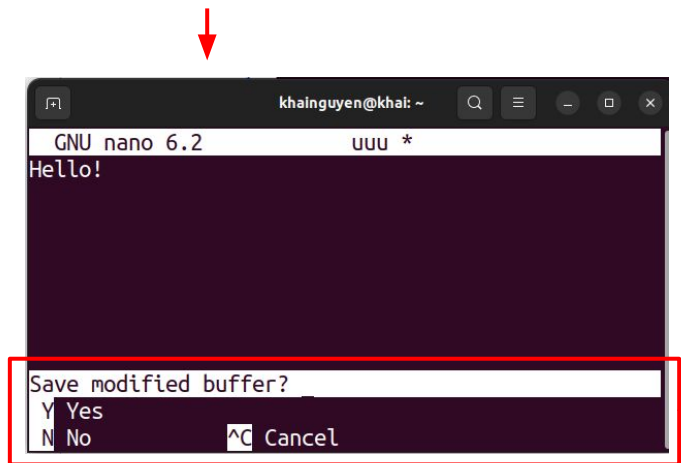
or

nano uuu

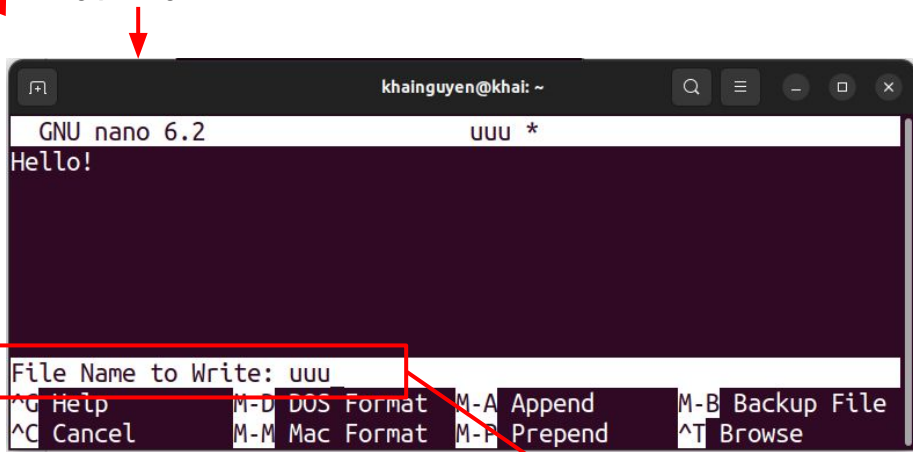


The screenshot shows a terminal window with the nano text editor open. The title bar indicates the user is khainguyen@khai: ~. The editor's status bar shows 'GNU nano 6.2' and the current file is 'uuu *'. The main editing area contains the text 'Hello!' on the first line. The bottom status bar displays various keyboard shortcuts for navigation and editing, such as ^O for Help, ^X for Exit, ^W for Write Out, and ^R for Read File.

2. Exit nano: ctrl + x



3. Type "y" to save:



Edit the file name if you don't want the name "uuu"

4. Finish: press ENTER key

We can view the file "uuu" with nano by run (if the file exist in current directory):

```
nano uuu
```

Create a empty file named "uuu", with "touch" command :

```
touch uuu
```

Delete a (empty or non-empty) file named "uuu" in current directory, with the command "rm":

```
rm uuu
```

View the file with another commands

View the file with command: less

```
khainguyen@khai:~$ less uuu
```

ENTER



```
khainguyen@khai: ~  
dgdfg  
gdgdf  
dfgdfgd  
uuu (END)
```

press "q" key to quit

View the file with command: cat

```
khainguyen@khai:~$ cat uuu  
dgdfg  
gdgdf  
dfgdfgd
```

Copy and move file/directory

Copy a file named “uuu” in the current directory to ./Download/, with command: cp

```
cp ./uuu ./Download/
```

“cp” stands for “**copy**”

Copy three the file named “uuu”, “iii”, “yyy” in the current directory to./Download/

```
cp ./uuu ./iii ./yyy ./Download/
```

or

```
cp uuu iii yyy ./Download/
```

or

```
cp ./{iii,yyy,uuu} ./Downloads/
```

Create a copy of the file named "uuu" with a different name "ooo" in the current directory

```
cp ./uuu ./ooo
```

Copy a empty directory named “Huka” in the current directory to ./Download/

```
cp ./Huka/ ./Download/
```

Copy and move file/directory

Copy a **non-empty** directory named “Huka” in the current directory to ./Download/

```
cp -r ./Huka/ ./Download/
```

Move a file named “uuu” in the current directory to /home/khainguyen/Download/, with command: mv

```
mv ./uuu ./Download/
```

“mv” stands for **move**”

Move a **empty** directory named “Huka” in the current directory to /home/khainguyen/Download/

```
mv ./Huka/ ./Downloads/
```

if Huka/ is a **non-empty** directory, add -r option:

```
mv -r ./Huka/ ./Downloads/
```

Rename a file named “uuu” to “eee”:

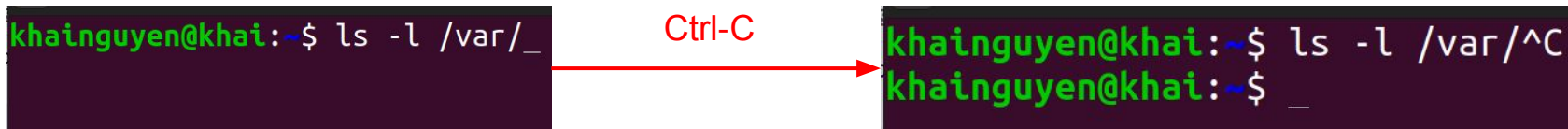
```
mv ./uuu ./eee
```

Rename a directory named “Huka” to “Huko”:

```
mv ./Huka/ ./Huko/
```


Shortcuts:

- Ctrl-C stops the current in-progress command and/or



The diagram illustrates the effect of pressing Ctrl-C. On the left, a terminal window shows the command `ls -l /var/_` being entered. A red arrow labeled "Ctrl-C" points to the right, where the terminal window shows the command `ls -l /var/^C` and a new prompt `_` on the next line, indicating the command was interrupted.

- **Up arrow** key: shows previous commands

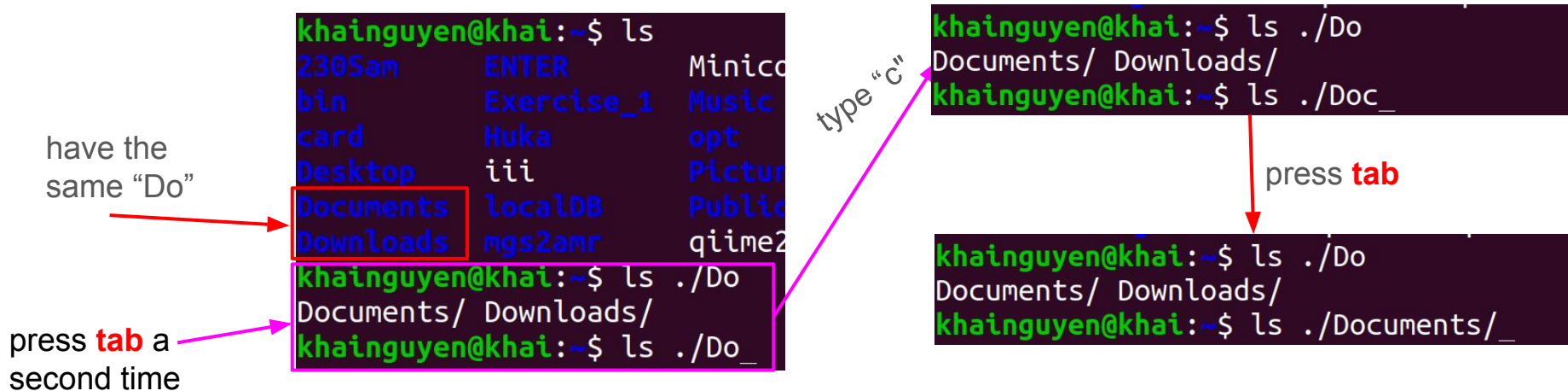


A terminal window showing the prompt `khainguyen@khai:~$ _`, indicating that the Up arrow key has been pressed to recall a previous command.

- **history** command: will show the history of commands you have run.

Shortcuts:

- Ctrl-A moves the cursor to the beginning of the line.
- Ctrl-E moves the cursor to the end of the line.
- Tab key automatically completes commands.



- Ctrl-D exit the terminal.

Summary

pwd	print working directory (or current directory) path
cd	change working directory
ls	Listing content (files and subdirectories) of the directory
clear	clean up all the command lines and results above
mkdir	create the directory
rmdir	delete the empty directory
rm	delete file
rm -r	delete non-empty (or empty) directory, delete file

Summary

nano	a text editor: create, view, edit the text file
touch	create the empty file
less	view text file page by page
cat	Print the content of the text file to the terminal
cp	copy file/directory
mv	move file/directory, rename file/directory
man command_name	Instructions for using the command
command_name --help	

Homework

1. Move to the “Documents” directory in “user_name” directory in home directory. Use: cd

Solve the questions below while **still in the “Documents” directory**

2. Create 01 directory named “bio1” in “Documents” directory. Use: mkdir

3. Create 01 file named “chr1” in “bio1” directory. Use: touch or nano

4. Create 02 directories named “bio2” and “bio3” in “Documents” directory, with **one command line**. Use: mkdir

5. Create: 2 files named “chr2” and “chr3” in “bio2” directory, 2 files named “chr4” and “chr5” in “bio3” directory, with **one command line**. Use: mkdir

6. Copy “chr2” file into “bio1” directory, with a different name “c2”. Use: cp

7. Delete all newly created files and folders above, with **one command line**. Use: rm -r