NTUEE

Linux Tutorial

NTUEE 2023 聯合部課

講者：B10 陳柏睿

NTUEE

Slide

OVERVIEW

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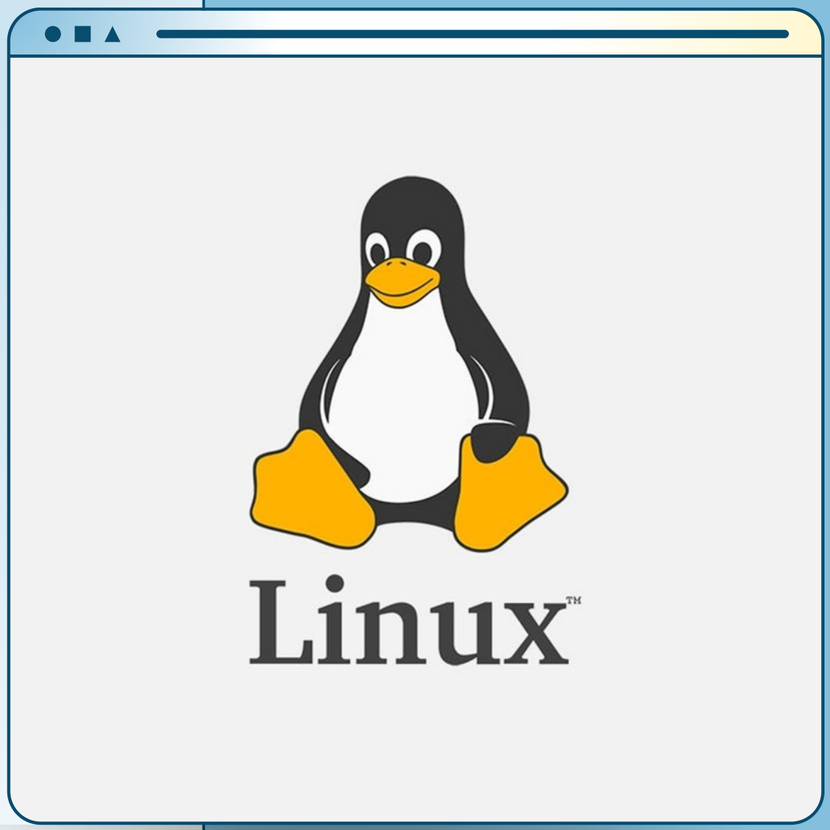
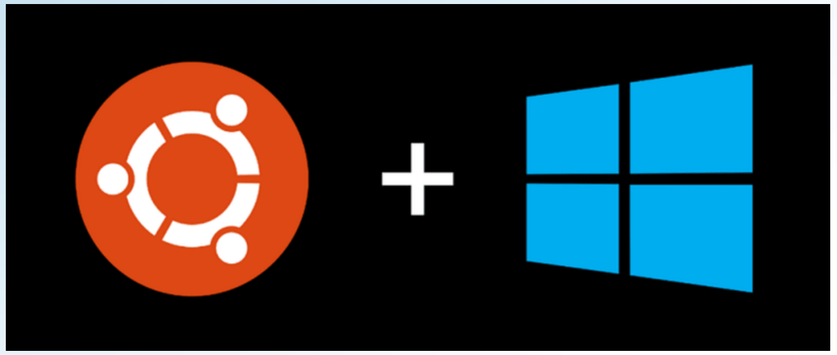


Environment Setup

WSL (Window Subsystems for Linux)

- Windows 10：https://hackmd.io/@Kailyn/BkMi80IeF
- Windows 11：https://hackmd.io/@Kailyn/H1N5OPKIF



Visual Studio Code (VSCode)

- Install：https://code.visualstudio.com/
- Using WSL in VSCode

File & Directory Related Commands

ls：Listing Files/Directories

- command：ls
- files and directories are denoted in different color

```
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3
rakec@LAPTOP-NQPUHVO0:~$
```

ls：Listing Files/Directories

- to show all hidden information, use **ls -al**

```
rakec@LAPTOP-NQPUHVO0:~$ ls -al
total 1040124
drwxr-x--- 19 rakec rakec       4096 Oct  9 10:55 .
drwxr-xr-x  3 root  root        4096 Sep  3 17:34 ..
lrwxrwxrwx  1 rakec rakec         23 Sep  5 11:41 .aws -> /mnt/c/Users/rakec/.aws
lrwxrwxrwx  1 rakec rakec         25 Sep  5 11:41 .azure -> /mnt/c/Users/rakec/.azure
-rw-------  1 rakec rakec      26911 Oct  9 11:27 .bash_history
-rw-r--r--  1 rakec rakec        220 Sep  3 17:34 .bash_logout
-rw-r--r--  1 rakec rakec       4464 Oct  5 20:32 .bashrc
drwx------ 12 rakec rakec       4096 Sep 15 03:16 .cache
drwxr-xr-x  3 rakec rakec       4096 Oct  5 20:32 .cargo
drwxr-xr-x  2 rakec rakec       4096 Sep  3 17:59 .conda
```

mkdir：Create a Directory

- command：mkdir {directory name}

```
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3
rakec@LAPTOP-NQPUHVO0:~$ mkdir practice
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  practice
rakec@LAPTOP-NQPUHVO0:~$
```

cd：Go To Another Directory

- command：cd {directory name}

```
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  practice
rakec@LAPTOP-NQPUHVO0:~$ cd ./practice
rakec@LAPTOP-NQPUHVO0:~/practice$ ls
rakec@LAPTOP-NQPUHVO0:~/practice$
```

- cd .. 會回到上一層directory
- cd ~ 會回到家目錄(home directory)

pwd：Show Current Directory

- command：pwd

```
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  practice
rakec@LAPTOP-NQPUHVO0:~$ pwd
/home/rakec
rakec@LAPTOP-NQPUHVO0:~$ cd practice/
rakec@LAPTOP-NQPUHVO0:~/practice$ pwd
/home/rakec/practice
rakec@LAPTOP-NQPUHVO0:~/practice$
```

touch：Create a File

- command：touch {file name}

```
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  practice
rakec@LAPTOP-NQPUHVO0:~$ cd practice/
rakec@LAPTOP-NQPUHVO0:~/practice$ ls
rakec@LAPTOP-NQPUHVO0:~/practice$ touch test.txt
rakec@LAPTOP-NQPUHVO0:~/practice$ ls
test.txt
rakec@LAPTOP-NQPUHVO0:~/practice$
```

vim：Edit Content of a File

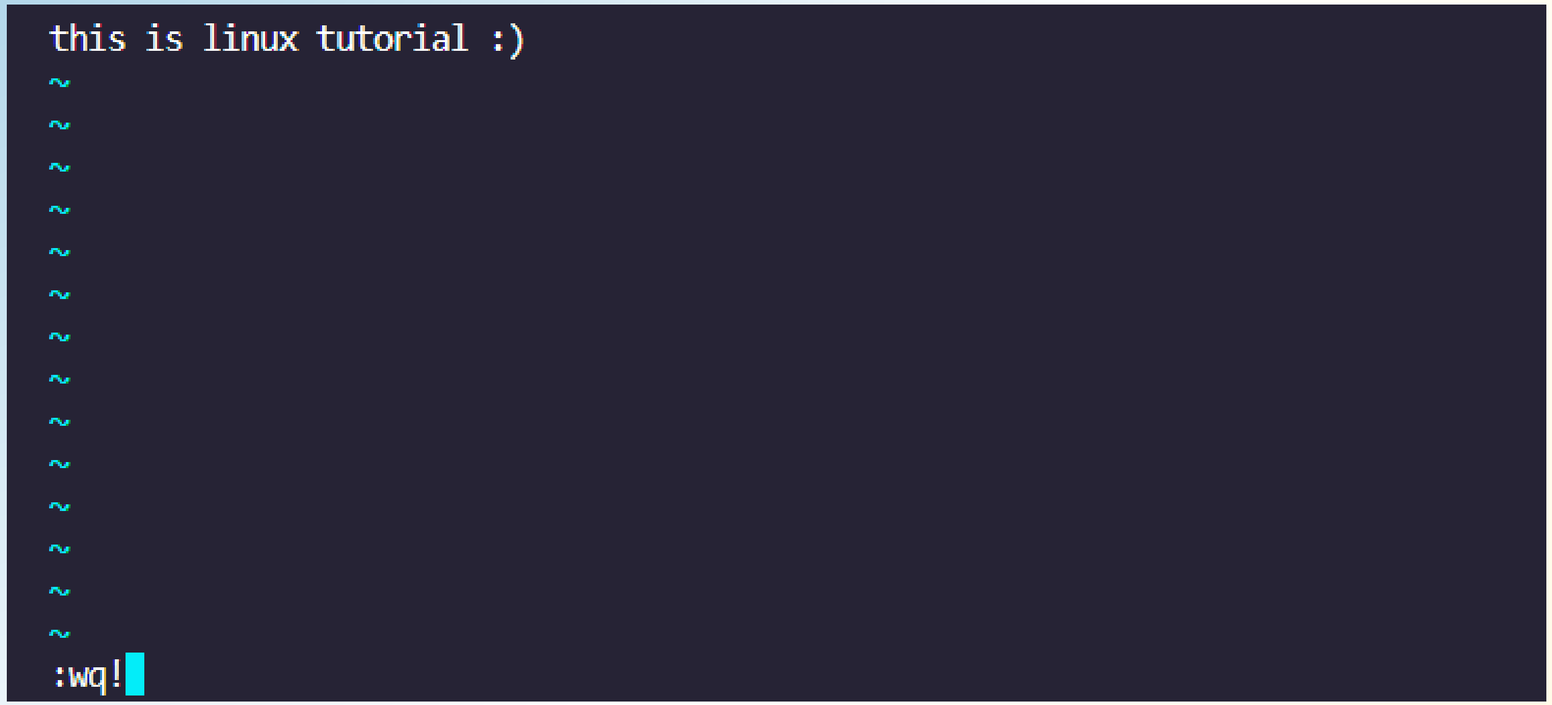
- command：vim {file name}

```
rakec@LAPTOP-NQPUHVO0:~$ cd practice/
rakec@LAPTOP-NQPUHVO0:~/practice$ ls
test.txt
rakec@LAPTOP-NQPUHVO0:~/practice$ vim test.txt
```

vim：Edit Content of a File

- press `i` to insert new context, and press `esc` when finishing inserting
- use :wq! to save new change and quit

vim：Edit Content of a File



cat：View Content of a File

- command：cat {file name}

```
rakec@LAPTOP-NQPUHVO0:~$ cd practice/
rakec@LAPTOP-NQPUHVO0:~/practice$ ls
test.txt
rakec@LAPTOP-NQPUHVO0:~/practice$ vim test.txt
rakec@LAPTOP-NQPUHVO0:~/practice$ cat test.txt
hello,

this is linux tutorial :)
rakec@LAPTOP-NQPUHVO0:~/practice$
```

rm：Remove a File/Directory

- command：rm {file name}

```
rakec@LAPTOP-NQPUHVO0:~$ cd practice/
rakec@LAPTOP-NQPUHVO0:~/practice$ ls
test.txt
rakec@LAPTOP-NQPUHVO0:~/practice$ rm test.txt
rakec@LAPTOP-NQPUHVO0:~/practice$ ls
rakec@LAPTOP-NQPUHVO0:~/practice$
```

rm：Remove a File/Directory

- to remove a directory which is not empty, add -r flag

```
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  practice
rakec@LAPTOP-NQPUHVO0:~$ rm -r practice/
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3
rakec@LAPTOP-NQPUHVO0:~$
```

cp：Copy File/Directory

- command：cp {source} {target}

```
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  practice
rakec@LAPTOP-NQPUHVO0:~$ cd practice/
rakec@LAPTOP-NQPUHVO0:~/practice$ ls
test.txt
rakec@LAPTOP-NQPUHVO0:~/practice$ cp ./test.txt ../
rakec@LAPTOP-NQPUHVO0:~/practice$ cd ..
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  practice  test.txt
rakec@LAPTOP-NQPUHVO0:~$
```

cp：Copy File/Directory

- if you want to copy a directory, add -r flag

```
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  practice  test.txt
rakec@LAPTOP-NQPUHVO0:~$ cd practice/
rakec@LAPTOP-NQPUHVO0:~/practice$ mkdir practice2
rakec@LAPTOP-NQPUHVO0:~/practice$ ls
practice2  test.txt
rakec@LAPTOP-NQPUHVO0:~/practice$ cp -r ./practice2 ../
rakec@LAPTOP-NQPUHVO0:~/practice$ cd ..
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  practice  practice2  test.txt
rakec@LAPTOP-NQPUHVO0:~$
```

mv：Move File/Directory

- command：mv {source} {target}

```
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  practice  practice2  test.txt
rakec@LAPTOP-NQPUHVO0:~$ mv ./test.txt ./practice2
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  practice  practice2
rakec@LAPTOP-NQPUHVO0:~$ cd practice2
rakec@LAPTOP-NQPUHVO0:~/practice2$ ls
test.txt
rakec@LAPTOP-NQPUHVO0:~/practice2$
```

mv：Move File/Directory

- mv command can also be used to rename file

```
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  practice  practice2
rakec@LAPTOP-NQPUHVO0:~$ cd practice2
rakec@LAPTOP-NQPUHVO0:~/practice2$ ls
test.txt
rakec@LAPTOP-NQPUHVO0:~/practice2$ mv ./test.txt ./test2.txt
rakec@LAPTOP-NQPUHVO0:~/practice2$ ls
test2.txt
rakec@LAPTOP-NQPUHVO0:~/practice2$
```

User Related Commands

su：Give Administrative Access to Another User

- command：**su {user name}**

```
rakec@LAPTOP-NQPUHVO0:~$ su rakec
Password:
rakec@LAPTOP-NQPUHVO0:~$
```

- now this user can use **sudo** command to grant administrative access

sudo：Grant Administrative Access

- command：sudo {command}

```
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  practice  practice2
rakec@LAPTOP-NQPUHVO0:~$ sudo rm -r practice2
[sudo] password for rakec:
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  practice
rakec@LAPTOP-NQPUHVO0:~$
```

- use sudo carefully!!!

sudo：Grant Administrative Access

- to check how much sudo access you have, run **sudo -l**

```
rakec@LAPTOP-NQPUHVO0:~$ sudo -l
[sudo] password for rakec:
Matching Defaults entries for rakec on LAPTOP-NQPUHVO0:
    env_reset, mail_badpass, secure_path=/usr/local/sbin\:/usr/local/bin\:/usr/sbi

User rakec may run the following commands on LAPTOP-NQPUHVO0:
    (ALL : ALL) ALL
rakec@LAPTOP-NQPUHVO0:~$
```

adduser：Add a New User

- command：sudo adduser {new user}

```
rakec@LAPTOP-NQPUHVO0:~$ sudo adduser test
[sudo] password for rakec:
Adding user `test' ...
Adding new group `test' (1002) ...
Adding new user `test' (1001) with group `test' ...
Creating home directory `/home/test' ...
Copying files from `/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for test
Enter the new value, or press ENTER for the default
```

deluser：Delete a User

- command：sudo deluser {user name}

```
rakec@LAPTOP-NQPUHVO0:~$ sudo deluser test
Removing user `test' ...
Warning: group `test' has no more members.
Done.
rakec@LAPTOP-NQPUHVO0:~$
```

More About sudo

- https://officeguide.cc/ubuntu-linux-sudo-sudoer-user-group-configuration-tutorial-examples/

passwd：Create/Change Password

- command：passwd {user name}

```
rakec@LAPTOP-NQPUHVO0:~$ passwd rakec
Changing password for rakec.
Current password:
New password:
Retype new password:
passwd: password updated successfully
rakec@LAPTOP-NQPUHVO0:~$
```

apt-get update：Update Package Information to System

- command：**sudo apt-get update**

```
rakec@LAPTOP-NQPUHVO0:~$ sudo apt-get update
[sudo] password for rakec:
Get:1 file:/var/cuda-repo-wsl-ubuntu-12-2-local  InRelease [1572 B]
Get:1 file:/var/cuda-repo-wsl-ubuntu-12-2-local  InRelease [1572 B]
Hit:2 https://dl.yarnpkg.com/debian stable InRelease
Hit:3 http://security.ubuntu.com/ubuntu jammy-security InRelease
Ign:4 https://repo.mongodb.org/apt/ubuntu jammy/mongodb-org/7.0 InRelease
Hit:5 http://archive.ubuntu.com/ubuntu jammy InRelease
Hit:6 https://repo.mongodb.org/apt/ubuntu jammy/mongodb-org/7.0 Release
```

apt-get upgrade：Update Packages to Latest Version

- command：**sudo apt-get upgrade**
- run **sudo apt-get update** first

```
rakec@LAPTOP-NQPUHVO0:~$ sudo apt-get upgrade
[sudo] password for rakec:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
The following packages were automatically installed and are no longer required:
  cmake-data dh-elpa-helper emacsen-common libarchive13 libjsoncpp25 librhash0 python3-cliapp python3-markdo
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
rakec@LAPTOP-NQPUHVO0:~$
```

apt install：Install New Dependencies

- command：sudo apt install {dependency name}

```
rakec@LAPTOP-NQPUHVO0:~$ sudo apt install zip
[sudo] password for rakec:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
```

Packaging Related Commands

zip：Zip a Folder

- command：zip {zip name} {folder}

```
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  practice
rakec@LAPTOP-NQPUHVO0:~$ ls practice/
test.txt
rakec@LAPTOP-NQPUHVO0:~$ zip prac_zip ./practice/
  adding: practice/ (stored 0%)
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  prac_zip.zip  practice
rakec@LAPTOP-NQPUHVO0:~$
```

unzip：Unzip a Folder

- command：unzip {zip name}

```
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  prac_zip.zip
rakec@LAPTOP-NQPUHVO0:~$ unzip prac_zip.zip
Archive:  prac_zip.zip
   creating: practice/
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  prac_zip.zip  practice
rakec@LAPTOP-NQPUHVO0:~$
```

unzip：Unzip a Folder

- to unzip to another directory, add -d flag

```
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3  prac_zip.zip  practice
rakec@LAPTOP-NQPUHVO0:~$ mkdir practice2
rakec@LAPTOP-NQPUHVO0:~$ unzip prac_zip.zip -d ./practice2
Archive:  prac_zip.zip
   creating: ./practice2/practice/
rakec@LAPTOP-NQPUHVO0:~$ cd practice2
rakec@LAPTOP-NQPUHVO0:~/practice2$ ls
practice
rakec@LAPTOP-NQPUHVO0:~/practice2$
```

Other Packaging Formats

- http://note.drx.tw/2008/04/command.html

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Networking Related Commands

ip：Check NIC(網卡) & IP Address

- command：ip a

```
rakec@LAPTOP-NQPUHVO0:~$ 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
       valid_lft forever preferred_lft forever
2: bond0: <BROADCAST,MULTICAST,MASTER> mtu 1500 qdisc noop state DOWN group default qlen 1000
    link/ether 8a:fc:cb:80:80:a0 brd ff:ff:ff:ff:ff:ff
3: dummy0: <BROADCAST,NOARP> mtu 1500 qdisc noop state DOWN group default qlen 1000
    link/ether ba:78:79:58:01:f3 brd ff:ff:ff:ff:ff:ff
4: tunl0@NONE: <NOARP> mtu 1480 qdisc noop state DOWN group default qlen 1000
    link/ipip 0.0.0.0 brd 0.0.0.0
```

ip：Check NIC(網卡) & IP Address

- to check ipv4 address, use ip -4 a. Similarly, to check ipv6 address, use ip -6 a

```
rakec@LAPTOP-NQPUHVO0:~$ ip -4 a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
6: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    inet 172.28.234.252/20 brd 172.28.239.255 scope global eth0
       valid_lft forever preferred_lft forever
```

ip：Check NIC(網卡) & IP Address

- to check ipv4 address, use ip -4 a. Similarly, to check ipv6 address, use ip -6 a

```
rakec@LAPTOP-NQPUHVO0:~$ ip -6 a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 state UNKNOWN qlen 1000
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
6: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 state UP qlen 1000
    inet6 fe80::215:5dff:fe18:2d72/64 scope link
       valid_lft forever preferred_lft forever
rakec@LAPTOP-NQPUHVO0:~$
```

ip：Check NIC(網卡) & IP Address

- to show information of a single NIC, use ip a show {NIC name}

```
rakec@LAPTOP-NQPUHVO0:~$ ip a show eth0
6: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:15:5d:18:2d:72 brd ff:ff:ff:ff:ff:ff
    inet 172.28.234.252/20 brd 172.28.239.255 scope global eth0
       valid_lft forever preferred_lft forever
    inet6 fe80::215:5dff:fe18:2d72/64 scope link
       valid_lft forever preferred_lft forever
rakec@LAPTOP-NQPUHVO0:~$
```

ping：Check the Connectivity of Two Nodes

- command：ping {destination}

```
rakec@LAPTOP-NQPUHVO0:~$ ping github.com
PING github.com (20.27.177.113) 56(84) bytes of data.
64 bytes from 20.27.177.113 (20.27.177.113): icmp_seq=1 ttl=110 time=53.5 ms
64 bytes from 20.27.177.113 (20.27.177.113): icmp_seq=2 ttl=110 time=52.6 ms
64 bytes from 20.27.177.113 (20.27.177.113): icmp_seq=3 ttl=110 time=56.1 ms
64 bytes from 20.27.177.113 (20.27.177.113): icmp_seq=4 ttl=110 time=53.3 ms
64 bytes from 20.27.177.113 (20.27.177.113): icmp_seq=5 ttl=110 time=55.5 ms
64 bytes from 20.27.177.113 (20.27.177.113): icmp_seq=6 ttl=110 time=53.2 ms
64 bytes from 20.27.177.113 (20.27.177.113): icmp_seq=7 ttl=110 time=55.8 ms
```

ssh：Create Remote Connection through ssh Protocol

- command：**ssh {user name}@{host(IP/domain name)}**
- ssh setup：**ssh-keygen**
- if you want to specify which port to connect, add **-p** flag

ssh：Create Remote Connection through ssh Protocol

```
rakec@LAPTOP-NQPUHVO0:~$ ssh ntueeinfodep@140.112.18.177
The authenticity of host '140.112.18.177 (140.112.18.177)' can't be established.
ED25519 key fingerprint is SHA256:9tgfTmLCXCB4IRIbTOg2nyTTfCgN4DT2uPlPrJ1KpS8.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '140.112.18.177' (ED25519) to the list of known hosts.
(ntueeinfodep@140.112.18.177) Password:
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 5.15.0-79-generic x86_64)
```

Other Important Commands

clear：Clear terminal

- command：clear

```
rakec@LAPTOP-NQPUHVO0:~$ ls
Anaconda3-2023.07-2-Linux-x86_64.sh  Code  anaconda3
rakec@LAPTOP-NQPUHVO0:~$ cd Code
rakec@LAPTOP-NQPUHVO0:~/Code$ ls
Alg23_PA  Control-Matlab  Music_AI-video_to_music  NTUEEInfo  Piano
rakec@LAPTOP-NQPUHVO0:~/Code$ clear
```

df：Show the Disk Space Used

- command：df

```
rakec@LAPTOP-NQPUHVO0:~$ df
Filesystem      1K-blocks      Used Available Use% Mounted on
/dev/sdb       1055762868  44872044 957187352   5% /
none              4011448         4   4011444   1% /mnt/wsl
tools           249463804 234053800  15410004  94% /init
none              4011448         8   4011440   1% /run
none              4011448         0   4011448   0% /run/lock
none              4011448         0   4011448   0% /run/shm
none              4011448         0   4011448   0% /run/user
tmpfs             4011448         0   4011448   0% /sys/fs/cgroup
drivers         249463804 234053800  15410004  94% /usr/lib/wsl/drivers
lib             249463804 234053800  15410004  94% /usr/lib/wsl/lib
```

lsblk：Show Unmounted Disk

- command：lsblk

```
rakec@LAPTOP-NQPUHVO0:~$ lsblk
NAME MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda    8:0    0  256G  0 disk
sdb    8:16   0    1T  0 disk /
rakec@LAPTOP-NQPUHVO0:~$
```

- mount the disk：https://www.groovypost.com/howto/mount-a-disk-in-linux/

References

- https://www.javatpoint.com/linux-commands#Content

</Thanks>