

Assignment 3 วิชา CS337

1. ทำการ adduser ด้วยคำสั่ง `sudo adduser <name>` โดย <name> ในที่นี้ตั้งชื่อว่า user1

```
ubuntu@vm01:~$ sudo adduser user1
Adding user `user1' ...
Adding new group `user1' (1001) ...
Adding new user `user1' (1001) with group `user1' ...
The home directory `/home/user1' already exists. Not copying from `/etc/skel'.
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for user1
Enter the new value, or press ENTER for the default
  Full Name []:
  Room Number []:
  Work Phone []:
  Home Phone []:
  Other []:

Is the information correct? [Y/n] ubuntu@vm01:~$
ubuntu@vm01:~$
```

2. การกำหนดค่าให้ใช้ sudo โดยไม่ต้องใช้ password ในไฟล์ `/etc/sudoers`

```
GNU nano 6.2 /etc/sudoers
#
# This file MUST be edited with the 'visudo' command as root.
#
# Please consider adding local content in /etc/sudoers.d/ instead of
# directly modifying this file.
#
# See the man page for details on how to write a sudoers file.
#
Defaults        env_reset
Defaults        mail_badpass
Defaults        secure_path="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin"

# Host alias specification

# User alias specification

# Cmnd alias specification

# User privilege specification
root    ALL=(ALL:ALL) ALL
user1    ALL=(ALL:ALL) NOPASSWD:ALL
# Members of the admin group may gain root privileges
%admin    ALL=(ALL) ALL

# Allow members of group sudo to execute any command
%sudo    ALL=(ALL:ALL) ALL
ubuntu    ALL=(ALL) NOPASSWD:ALL

# See sudoers(5) for more information on "#include" directives:

#includedir /etc/sudoers.d
```

```

ubuntu@vm01:~$ su user1
Password:
user1@vm01:/home/ubuntu$ sudo mkdir /home/testdir
user1@vm01:/home/ubuntu$ ls -l /home
total 12
drwxr-xr-x 2 root root 4096 Oct 8 13:13 testdir
drwxr-xr-x 7 ubuntu ubuntu 4096 Oct 8 13:10 ubuntu
drwxr-xr-x 3 user1 user1 4096 Oct 8 03:45 user1
user1@vm01:/home/ubuntu$ sudo rmdir /home/testdir
user1@vm01:/home/ubuntu$ |

```

ทดสอบว่า sudo จะไม่มีการใช้ password

- 2.1 ขั้นตอนนี้คือการสลับผู้ใช้งานจากผู้ใช้ ubuntu ไปยังบัญชีผู้ใช้ myuser ด้วยคำสั่ง su (ย่อมาจาก "substitute user"). คำสั่ง su จะช่วยให้คุณเข้าสู่บัญชีผู้ใช้อื่นโดยไม่ต้องออกจากระบบปัจจุบัน
- 2.2 เมื่อเข้าสู่บัญชี myuser แล้ว ขั้นตอนนี้จะใช้คำสั่ง sudo เพื่อสร้างไดเรกทอรีใหม่ชื่อ testdir ภายในโฟลเดอร์ /home. โดยคำสั่ง mkdir ใช้ในการสร้างโฟลเดอร์ใหม่ myuser จะสามารถใช้คำสั่ง sudo โดยไม่ต้องใส่รหัสผ่าน
- 2.3 หลังจากสร้างไดเรกทอรี testdir สำเร็จแล้ว ขั้นตอนนี้ให้ใช้คำสั่ง ls -l เพื่อตรวจสอบว่ามีโฟลเดอร์ testdir ถูกสร้างขึ้นในโฟลเดอร์ /home หรือไม่ - มี
- 2.4 ขั้นตอนสุดท้ายนี้คือการลบไดเรกทอรี testdir ที่สร้างขึ้นในขั้นตอนก่อนหน้านี้ โดยใช้คำสั่ง rmdir. คำสั่งนี้ใช้สำหรับลบไดเรกทอรีเปล่าที่ไม่มีไฟล์หรือโฟลเดอร์ย่อยโดยที่ myuser จะสามารถลบไดเรกทอรีได้ทันที ไม่จำเป็นต้องใส่รหัสผ่าน

3. ใช้ tmux utility เพื่อที่จะสร้าง pseudo terminal session จากนั้นพิมพ์คำสั่ง `ls -l /`

```
user1@vm01:~$ tmux new -s mysession1
```

```
user1@vm01:~$ ls -l /
total 4204796
lrwxrwxrwx 1 root root      7 Mar 14  2023 bin -> usr/bin
drwxr-xr-x 3 root root    4096 Sep 26  06:50 boot
dr-xr-xr-x 2 root root    4096 Mar 14  2023 cdrom
-rw----- 1 root root 10678272 Sep 24  00:01 core
drwxr-xr-x 18 root root   3980 Oct  1  03:15 dev
drwxr-xr-x 98 root root  12288 Oct  8  13:12 etc
drwxr-xr-x 4 root root   4096 Oct  8  13:14 home
lrwxrwxrwx 1 root root      7 Mar 14  2023 lib -> usr/lib
lrwxrwxrwx 1 root root      9 Mar 14  2023 lib32 -> usr/lib32
lrwxrwxrwx 1 root root      9 Mar 14  2023 lib64 -> usr/lib64
lrwxrwxrwx 1 root root     10 Mar 14  2023 libx32 -> usr/libx32
drwx----- 2 root root  16384 Nov 17  2023 lost+found
drwxr-xr-x 2 root root   4096 Mar 14  2023 media
drwxr-xr-x 2 root root   4096 Mar 14  2023 mnt
drwxr-xr-x 2 root root   4096 Mar 14  2023 opt
dr-xr-xr-x 193 root root    0 Oct  1  03:15 proc
drwx----- 5 root root   4096 Sep 27  04:34 root
drwxr-xr-x 31 root root    920 Oct  8  13:19 run
lrwxrwxrwx 1 root root      8 Mar 14  2023 sbin -> usr/sbin
drwxr-xr-x 6 root root   4096 Mar 14  2023 snap
drwxr-xr-x 2 root root   4096 Mar 14  2023 srv
-rw----- 1 root root 4294967296 Nov 17  2023 swap.img
dr-xr-xr-x 13 root root    0 Oct  1  03:15 sys
drwxrwxrwt 14 root root   4096 Oct  8  13:28 tmp
drwxr-xr-x 14 root root   4096 Mar 14  2023 usr
drwxr-xr-x 13 root root   4096 Mar 14  2023 var
user1@vm01:~$
```

[mysession0:bash* "vm01" 13:37 08-Oct-24]

3.1 ใช้คำสั่ง `tmux detach` เพื่อ detach ออกจาก session นั้น

```
drwxr-xr-x 14 root root   4096 Mar 14  2023 usr
drwxr-xr-x 13 root root   4096 Mar 14  2023 var
user1@vm01:~$ tmux detach
```

[mysession0:bash* "vm01" 13:38 08-Oct-24]

3.2 list tmux session ที่มีในระบบด้วยคำสั่ง `tmux ls`

```
user1@vm01:~$ tmux ls
mysession1: 1 windows (created Tue Oct  8 13:35:05 2024)
user1@vm01:~$
```

3.3 ใช้คำสั่ง `tmux attach -t mysession1` เพื่อ attach session ที่มีอยู่แล้วนั่นคือ session 1

```
user1@vm01:~$ tmux attach -t mysession1
```

3.4 แบ่งหน้าต่างโดยใช้ tmux เป็น 2 ส่วนโดยที่ส่วนที่ 1 ใช้คำสั่ง ls ส่วนที่ 2 ใช้คำสั่ง df

```

user1@vm01: ~
drwxr-xr-x 98 root root 12288 Oct 8 13:12 etc
drwxr-xr-x 4 root root 4096 Oct 8 13:14 home
lrwxrwxrwx 1 root root 7 Mar 14 2023 lib -> usr/lib
lrwxrwxrwx 1 root root 9 Mar 14 2023 lib32 -> usr/lib32
lrwxrwxrwx 1 root root 9 Mar 14 2023 lib64 -> usr/lib64
lrwxrwxrwx 1 root root 10 Mar 14 2023 libx32 -> usr/libx32
drwx----- 2 root root 16384 Nov 17 2023 lost+found
drwxr-xr-x 2 root root 4096 Mar 14 2023 media
drwxr-xr-x 2 root root 4096 Mar 14 2023 mnt
drwxr-xr-x 2 root root 4096 Mar 14 2023 opt
dr-xr-xr-x 194 root root 0 Oct 1 03:15 proc
drwx----- 5 root root 4096 Sep 27 04:34 root
drwxr-xr-x 31 root root 920 Oct 8 13:19 run
lrwxrwxrwx 1 root root 8 Mar 14 2023 sbin -> usr/sbin
bin
drwxr-xr-x 6 root root 4096 Mar 14 2023 snap
drwxr-xr-x 2 root root 4096 Mar 14 2023 srv
-rw----- 1 root root 4294967296 Nov 17 2023 swap.img
dr-xr-xr-x 13 root root 0 Oct 1 03:15 sys
drwxrwxrwt 14 root root 4096 Oct 8 13:28 tmp
drwxr-xr-x 14 root root 4096 Mar 14 2023 usr
drwxr-xr-x 13 root root 4096 Mar 14 2023 var
user1@vm01:~$ tmux detach
user1@vm01:~$ ls
user1@vm01:~$
[mysession0:bash*
"vm01" 13:32 08-Oct-24

```

3.5 ลบหน้าต่างจาก 2 ส่วนมาเป็น 1 ส่วน

```

user1@vm01: ~
drwxr-xr-x 98 root root 12288 Oct 8 13:12 etc
drwxr-xr-x 4 root root 4096 Oct 8 13:14 home
lrwxrwxrwx 1 root root 7 Mar 14 2023 lib -> usr/lib
lrwxrwxrwx 1 root root 9 Mar 14 2023 lib32 -> usr/lib32
lrwxrwxrwx 1 root root 9 Mar 14 2023 lib64 -> usr/lib64
lrwxrwxrwx 1 root root 10 Mar 14 2023 libx32 -> usr/libx32
drwx----- 2 root root 16384 Nov 17 2023 lost+found
drwxr-xr-x 2 root root 4096 Mar 14 2023 media
drwxr-xr-x 2 root root 4096 Mar 14 2023 mnt
drwxr-xr-x 2 root root 4096 Mar 14 2023 opt
dr-xr-xr-x 197 root root 0 Oct 1 03:15 proc
drwx----- 5 root root 4096 Sep 27 04:34 root
drwxr-xr-x 31 root root 920 Oct 8 13:47 run
lrwxrwxrwx 1 root root 8 Mar 14 2023 sbin -> usr/sbin
drwxr-xr-x 6 root root 4096 Mar 14 2023 snap
drwxr-xr-x 2 root root 4096 Mar 14 2023 srv
-rw----- 1 root root 4294967296 Nov 17 2023 swap.img
dr-xr-xr-x 13 root root 0 Oct 1 03:15 sys
drwxrwxrwt 14 root root 4096 Oct 8 13:28 tmp
drwxr-xr-x 14 root root 4096 Mar 14 2023 usr
drwxr-xr-x 13 root root 4096 Mar 14 2023 var
user1@vm01:~$ tmux detach
user1@vm01:~$ ls
user1@vm01:~$
[mysession0:bash*
"vm01" 13:51 08-Oct-24

```

6509611452 ณัฐนันต์ โพธิ์ประดิษฐ์

6509611858 ประพล ขาวสอาด

```
user1@vm01: ~  
lrwxrwxrwx 1 root root 7 Mar 14 2023 bin -> usr/bin  
drwxr-xr-x 3 root root 4096 Sep 26 06:50 boot  
dr-xr-xr-x 2 root root 4096 Mar 14 2023 cdrom  
-rw----- 1 root root 10678272 Sep 24 00:01 core  
drwxr-xr-x 18 root root 3980 Oct 1 03:15 dev  
drwxr-xr-x 98 root root 12288 Oct 8 13:12 etc  
drwxr-xr-x 4 root root 4096 Oct 8 13:14 home  
lrwxrwxrwx 1 root root 7 Mar 14 2023 lib -> usr/lib  
lrwxrwxrwx 1 root root 9 Mar 14 2023 lib32 -> usr/lib32  
lrwxrwxrwx 1 root root 9 Mar 14 2023 lib64 -> usr/lib64  
lrwxrwxrwx 1 root root 10 Mar 14 2023 libx32 -> usr/libx32  
drwx----- 2 root root 16384 Nov 17 2023 lost+found  
drwxr-xr-x 2 root root 4096 Mar 14 2023 media  
drwxr-xr-x 2 root root 4096 Mar 14 2023 mnt  
drwxr-xr-x 2 root root 4096 Mar 14 2023 opt  
dr-xr-xr-x 197 root root 0 Oct 1 03:15 proc  
drwx----- 5 root root 4096 Sep 27 04:34 root  
drwxr-xr-x 31 root root 920 Oct 8 13:47 run  
lrwxrwxrwx 1 root root 8 Mar 14 2023 sbin -> usr/sbin  
drwxr-xr-x 6 root root 4096 Mar 14 2023 snap  
drwxr-xr-x 2 root root 4096 Mar 14 2023 srv  
-rw----- 1 root root 4294967296 Nov 17 2023 swap.img  
dr-xr-xr-x 13 root root 0 Oct 1 03:15 sys  
drwxrwxrwt 14 root root 4096 Oct 8 13:28 tmp  
drwxr-xr-x 14 root root 4096 Mar 14 2023 usr  
drwxr-xr-x 13 root root 4096 Mar 14 2023 var  
user1@vm01:~$ tmux detach  
user1@vm01:~$ ls  
user1@vm01:~$ |  
[mysession0: bash* "vm01" 13:52 08-Oct-24]
```

3.6 ปิด terminal window

3.7 ssh login to host อีกครั้งจากนั้น attach tmux mysession1

```
user1@vm01: ~  
Welcome to Ubuntu 22.04.5 LTS (GNU/Linux 5.15.0-122-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:        https://ubuntu.com/pro  
  
System information as of Tue Oct 8 01:57:33 PM UTC 2024  
  
System load:  0.0          Processes:      136  
Usage of /:   15.6% of 48.91GB  Users logged in: 1  
Memory usage: 1%          IPv4 address for ens3: 172.16.37.1  
Swap usage:   0%  
  
Expanded Security Maintenance for Applications is not enabled.  
  
2 updates can be applied immediately.  
To see these additional updates run: apt list --upgradable  
  
Enable ESM Apps to receive additional future security updates.  
See https://ubuntu.com/esm or run: sudo pro status  
  
New release '24.04.1 LTS' available.  
Run 'do-release-upgrade' to upgrade to it.  
  
Last login: Tue Oct 8 13:47:44 2024 from 10.8.0.46  
user1@vm01:~$ tmux attach -t mysession1
```


6509611452 ณัฐนันต์ โพธิ์ประดิษฐ์

6509611858 ประพล ขาวสอาด

```
user1@vm01: ~  
lrwxrwxrwx 1 root root 7 Mar 14 2023 bin -> usr/bin  
drwxr-xr-x 3 root root 4096 Sep 26 06:50 boot  
dr-xr-xr-x 2 root root 4096 Mar 14 2023 cdrom  
-rw----- 1 root root 10678272 Sep 24 00:01 core  
drwxr-xr-x 18 root root 3980 Oct 1 03:15 dev  
drwxr-xr-x 98 root root 12288 Oct 8 13:12 etc  
drwxr-xr-x 4 root root 4096 Oct 8 13:14 home  
lrwxrwxrwx 1 root root 7 Mar 14 2023 lib -> usr/lib  
lrwxrwxrwx 1 root root 9 Mar 14 2023 lib32 -> usr/lib32  
lrwxrwxrwx 1 root root 9 Mar 14 2023 lib64 -> usr/lib64  
lrwxrwxrwx 1 root root 10 Mar 14 2023 libx32 -> usr/libx32  
drwx----- 2 root root 16384 Nov 17 2023 lost+found  
drwxr-xr-x 2 root root 4096 Mar 14 2023 media  
drwxr-xr-x 2 root root 4096 Mar 14 2023 mnt  
drwxr-xr-x 2 root root 4096 Mar 14 2023 opt  
dr-xr-xr-x 197 root root 0 Oct 1 03:15 proc  
drwx----- 5 root root 4096 Sep 27 04:34 root  
drwxr-xr-x 31 root root 920 Oct 8 13:47 run  
lrwxrwxrwx 1 root root 8 Mar 14 2023 sbin -> usr/sbin  
drwxr-xr-x 6 root root 4096 Mar 14 2023 snap  
drwxr-xr-x 2 root root 4096 Mar 14 2023 srv  
-rw----- 1 root root 4294967296 Nov 17 2023 swap.img  
dr-xr-xr-x 13 root root 0 Oct 1 03:15 sys  
drwxrwxrwt 14 root root 4096 Oct 8 13:28 tmp  
drwxr-xr-x 14 root root 4096 Mar 14 2023 usr  
drwxr-xr-x 13 root root 4096 Mar 14 2023 var  
user1@vm01:~$ tmux detach  
user1@vm01:~$ ls  
user1@vm01:~$ |  
[mysession0:bash* "vm01" 13:58 08-Oct-24]
```

3.8 ทำลาย tmux session

```
user1@vm01: ~  
drwxr-xr-x 3 root root 4096 Sep 26 06:50 boot  
dr-xr-xr-x 2 root root 4096 Mar 14 2023 cdrom  
-rw----- 1 root root 10678272 Sep 24 00:01 core  
drwxr-xr-x 18 root root 3980 Oct 1 03:15 dev  
drwxr-xr-x 98 root root 12288 Oct 8 13:12 etc  
drwxr-xr-x 4 root root 4096 Oct 8 13:14 home  
lrwxrwxrwx 1 root root 7 Mar 14 2023 lib -> usr/lib  
lrwxrwxrwx 1 root root 9 Mar 14 2023 lib32 -> usr/lib32  
lrwxrwxrwx 1 root root 9 Mar 14 2023 lib64 -> usr/lib64  
lrwxrwxrwx 1 root root 10 Mar 14 2023 libx32 -> usr/libx32  
drwx----- 2 root root 16384 Nov 17 2023 lost+found  
drwxr-xr-x 2 root root 4096 Mar 14 2023 media  
drwxr-xr-x 2 root root 4096 Mar 14 2023 mnt  
drwxr-xr-x 2 root root 4096 Mar 14 2023 opt  
dr-xr-xr-x 197 root root 0 Oct 1 03:15 proc  
drwx----- 5 root root 4096 Sep 27 04:34 root  
drwxr-xr-x 31 root root 920 Oct 8 13:47 run  
lrwxrwxrwx 1 root root 8 Mar 14 2023 sbin -> usr/sbin  
drwxr-xr-x 6 root root 4096 Mar 14 2023 snap  
drwxr-xr-x 2 root root 4096 Mar 14 2023 srv  
-rw----- 1 root root 4294967296 Nov 17 2023 swap.img  
dr-xr-xr-x 13 root root 0 Oct 1 03:15 sys  
drwxrwxrwt 14 root root 4096 Oct 8 13:28 tmp  
drwxr-xr-x 14 root root 4096 Mar 14 2023 usr  
drwxr-xr-x 13 root root 4096 Mar 14 2023 var  
user1@vm01:~$ tmux detach  
user1@vm01:~$ ls  
user1@vm01:~$ tmux detach  
user1@vm01:~$ exit  
[mysession0:bash* "vm01" 13:59 08-Oct-24]
```

6509611452 ณัฐนันต์ โพธิ์ประดิษฐ์

6509611858 ประพล ขาวสอาด

```
user1@vm01: ~  
* Support: https://ubuntu.com/pro  
System information as of Tue Oct 8 01:57:33 PM UTC 2024  
System load: 0.0 Processes: 136  
Usage of /: 15.6% of 48.91GB Users logged in: 1  
Memory usage: 1% IPv4 address for ens3: 172.16.37.1  
Swap usage: 0%  
  
Expanded Security Maintenance for Applications is not enabled.  
  
2 updates can be applied immediately.  
To see these additional updates run: apt list --upgradable  
  
Enable ESM Apps to receive additional future security updates.  
See https://ubuntu.com/esm or run: sudo pro status  
  
New release '24.04.1 LTS' available.  
Run 'do-release-upgrade' to upgrade to it.  
  
Last login: Tue Oct 8 13:47:44 2024 from 10.8.0.46  
user1@vm01:~$ tmux attach -t mysession1  
[detached (from session mysession1)]  
user1@vm01:~$ tmux attach -t mysession1  
[exited]  
user1@vm01:~$ tmux ls  
no server running on /tmp/tmux-1001/default  
user1@vm01:~$
```

4. สร้าง private และ public key บนเครื่องด้วยคำสั่ง ssh-keygen

```
natanan@BeepBoop: ~$ ssh-keygen -t ed25519
Generating public/private ed25519 key pair.
Enter file in which to save the key (/home/natanan/.ssh/id_ed25519): user1key
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in user1key
Your public key has been saved in user1key.pub
The key fingerprint is:
SHA256:1X6DNF5jeA+jVhihOF5OmHtoPJbctuwkDP7eq9SdGkw natanan@BeepBoop
The key's randomart image is:
+--[ED25519 256]--+
|
|   o
|  + o +
|  = = * 0
|  + @ + 0 =
|  . S E * o .
|  . = 0 + o .
|  . + B o
|  o = o
|  .+.=.
+-----[SHA256]-----+
natanan@BeepBoop: ~$
```

5. ใช้คำสั่ง ssh-copy-id เพื่อ copy public key จาก natanan@BeepBoop ไปที่บัญชี user@172.16.37.1

```
natanan@BeepBoop: ~$ ssh-copy-id -i user1key.pub user1@172.16.37.1
/usr/bin/ssh-copy-id: INFO: Source of key(s) to be installed: "user1key.pub"
/usr/bin/ssh-copy-id: INFO: attempting to log in with the new key(s), to filter out any that are already installed
/usr/bin/ssh-copy-id: INFO: 1 key(s) remain to be installed -- if you are prompted now it is to install the new keys
Enter passphrase for key '/home/natanan/.ssh/id_ed25519':

Number of key(s) added: 1

Now try logging into the machine, with: "ssh 'user1@172.16.37.1'"
and check to make sure that only the key(s) you wanted were added.

natanan@BeepBoop: ~$
```


6509611452 ณัฐนันท์ โพธิ์ประดิษฐ์

6509611858 ประพล ขาวสอาด

6. ใช้คำสั่ง ssh-agent และ ssh-add เพื่อทำ remote login จาก natanan@BeepBoop ไปยัง user1@vm01

```
user1@vm01: ~  
natanan@BeepBoop:~$ ssh-agent tcsh  
BeepBoop:~> ssh-add user1key  
Enter passphrase for user1key:  
Bad passphrase, try again for user1key:  
Identity added: user1key (natanan@BeepBoop)  
BeepBoop:~> ssh-add -l  
256 SHA256:1X6DNF5jeA+jVhioF50mHtoPJbctuwkDP7eq9SdGkw natanan@BeepBoop (ED25519)  
BeepBoop:~> ssh user1@172.16.37.1  
Welcome to Ubuntu 22.04.5 LTS (GNU/Linux 5.15.0-122-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:        https://ubuntu.com/pro  
  
System information as of Tue Oct  8 02:51:48 PM UTC 2024  
  
System load:  0.0           Processes:            133  
Usage of /:   15.6% of 48.91GB Users logged in:      0  
Memory usage: 1%           IPv4 address for ens3: 172.16.37.1  
Swap usage:   0%  
  
Expanded Security Maintenance for Applications is not enabled.  
  
2 updates can be applied immediately.  
To see these additional updates run: apt list --upgradable  
  
Enable ESM Apps to receive additional future security updates.  
See https://ubuntu.com/esm or run: sudo pro status  
  
New release '24.04.1 LTS' available.  
Run 'do-release-upgrade' to upgrade to it.  
  
Last login: Tue Oct  8 14:20:18 2024 from 10.8.0.46  
user1@vm01:~$ |
```

7. ใช้คำสั่ง htop เพื่อดูสถานะเครื่อง

```

user1@vm01: ~
0[ 0.0%] 3[ 0.0%]
1[ 0.0%] 4[ 0.0%]
2[ 0.3%] 5[ 0.0%]
Mem[||||] 217M/15.6G Tasks: 28, 36 thr; 1 running
Swp[ ] 0K/4.00G Load average: 0.07 0.02 0.00
Uptime: 7 days, 11:42:49

  PID USER   PRI  NI  VIRT   RES   SHR  S  CPU% MEM%   TIME+  Command
11520 user1    20    0  8464   4868  3584  R   0.7   0.0   0:00.08 htop
   1 root      20    0  162M  11536  8148  S   0.0   0.1   0:11.26 /sbin/init maybe-ubiquity
  403 root      19   -1 72452 30292 29180  S   0.0   0.2   0:04.21 /lib/systemd/systemd-journald
  440 root      RT    0  282M  27100  9072  S   0.0   0.2   1:25.53 /sbin/multipathd -d -s
  444 root      20    0  26256  7184  4780  S   0.0   0.0   0:01.93 /lib/systemd/systemd-udev
  445 root      20    0  282M  27100  9072  S   0.0   0.2   0:00.00 /sbin/multipathd -d -s
  446 root      RT    0  282M  27100  9072  S   0.0   0.2   0:00.00 /sbin/multipathd -d -s
  447 root      RT    0  282M  27100  9072  S   0.0   0.2   0:00.00 /sbin/multipathd -d -s
  448 root      RT    0  282M  27100  9072  S   0.0   0.2   0:01.18 /sbin/multipathd -d -s
  449 root      RT    0  282M  27100  9072  S   0.0   0.2   0:56.19 /sbin/multipathd -d -s
  450 root      RT    0  282M  27100  9072  S   0.0   0.2   0:00.00 /sbin/multipathd -d -s
  537 systemd-t 20    0  89364  6588  5788  S   0.0   0.0   0:02.21 /lib/systemd/systemd-timesyncd
  540 systemd-t 20    0  89364  6588  5788  S   0.0   0.0   0:00.00 /lib/systemd/systemd-timesyncd
  637 systemd-n 20    0  16128  8052  7040  S   0.0   0.0   0:02.06 /lib/systemd/systemd-networkd
  639 systemd-r 20    0  25660 12788  8436  S   0.0   0.1   0:01.99 /lib/systemd/systemd-resolved
  650 root      20    0  6896   2864  2624  S   0.0   0.0   0:01.78 /usr/sbin/cron -f -P
  651 messagebu 20    0  8980   5316  4288  S   0.0   0.0   0:01.38 @dbus-daemon --system --address=systemd: --nofork --nop
  658 root      20    0  82776  3872  3520  S   0.0   0.0   0:27.23 /usr/sbin/irqbalance --foreground
  659 root      20    0  32740 18904 10280  S   0.0   0.1   0:00.11 /usr/bin/python3 /usr/bin/networkd-dispatcher --run-sta
  660 root      20    0  229M  6872  6240  S   0.0   0.0   0:00.18 /usr/libexec/polkitd --no-debug
  661 syslog    20    0  217M  5548  4460  S   0.0   0.0   0:00.55 /usr/sbin/rsyslogd -n -iNONE
  664 root      20    0 1578M 30540 19092  S   0.0   0.2   0:53.29 /usr/lib/snapd/snapd
  666 root      20    0  82776  3872  3520  S   0.0   0.0   0:00.00 /usr/sbin/irqbalance --foreground
  667 root      20    0 15500  7524  6572  S   0.0   0.0   0:02.13 /lib/systemd/systemd-logind
  669 root      20    0  229M  6872  6240  S   0.0   0.0   0:00.00 /usr/libexec/polkitd --no-debug
  670 root      20    0  383M 13408 10732  S   0.0   0.1   0:28.75 /usr/libexec/udisks2/udisksd
  687 root      20    0  6176   1108  1020  S   0.0   0.0   0:00.00 /sbin/agetty -o -p -- \u --noclear tty1 linux
  692 root      20    0  383M 13408 10732  S   0.0   0.1   0:00.00 /usr/libexec/udisks2/udisksd
  693 syslog    20    0  217M  5548  4460  S   0.0   0.0   0:00.23 /usr/sbin/rsyslogd -n -iNONE
  694 syslog    20    0  217M  5548  4460  S   0.0   0.0   0:00.00 /usr/sbin/rsyslogd -n -iNONE
  695 syslog    20    0  217M  5548  4460  S   0.0   0.0   0:00.19 /usr/sbin/rsyslogd -n -iNONE
  699 root      20    0  229M  6872  6240  S   0.0   0.0   0:00.12 /usr/libexec/polkitd --no-debug
F1Help F2Setup F3Search F4Filter F5Tree F6SortBy F7Nice F8Nice F9Kill F10Quit

```

8. ใช้คำสั่ง df -h เพื่อดูสถานะของอุปกรณ์เก็บข้อมูล

```

user1@vm01:~$ df -h
Filesystem      Size  Used Avail Use% Mounted on
tmpfs           1.6G  988K  1.6G   1% /run
/dev/sda2       49G   7.7G   39G  17% /
tmpfs           7.9G    0  7.9G   0% /dev/shm
tmpfs           5.0M    0  5.0M   0% /run/lock
tmpfs           1.6G  4.0K  1.6G   1% /run/user/1001
user1@vm01:~$

```

9. ใช้คำสั่ง lablk เพื่อดูสถานะการเก็บข้อมูลแบบ block device บน host

```
user1@vm01:~$ sudo lsblk
NAME MAJ:MIN RM SIZE RO TYPE MOUNTPOINTS
loop0 7:0 0 63.9M 1 loop /snap/core20/2318
loop1 7:1 0 64M 1 loop /snap/core20/2379
loop2 7:2 0 91.9M 1 loop /snap/lxd/29619
loop3 7:3 0 91.8M 1 loop /snap/lxd/24061
loop4 7:4 0 49.8M 1 loop /snap/snapd/18357
loop5 7:5 0 38.8M 1 loop /snap/snapd/21759
sda 8:0 0 70G 0 disk
├─sda1 8:1 0 1M 0 part
└─sda2 8:2 0 50G 0 part /
sr0 11:0 1 1024M 0 rom
user1@vm01:~$
```

10. ใช้คำสั่ง lspci เพื่อดูข้อมูล I/O บน device

```
user1@vm01:~$ lspci
00:00.0 Host bridge: Intel Corporation 440FX - 82441FX PMC [Natoma] (rev 02)
00:01.0 ISA bridge: Intel Corporation 82371SB PIIX3 ISA [Natoma/Triton II]
00:01.1 IDE interface: Intel Corporation 82371SB PIIX3 IDE [Natoma/Triton II]
00:01.3 Bridge: Intel Corporation 82371AB/EB/MB PIIX4 ACPI (rev 03)
00:02.0 VGA compatible controller: Device 1234:1111 (rev 02)
00:03.0 Ethernet controller: Red Hat, Inc. Virtio network device
user1@vm01:~$
```