Network Administration/System Administration (NTU CSIE, Spring 2019) Homework #2

Network Administration

1. CSMA/CD

現在hub幾乎都消失了，而switch一個埠口就只會向一台裝置溝通，現在又幾乎都使用全雙工通訊技術，就不會有碰撞的問題了。
現在會在switch出現CSMA/CD的情境：Gigabit Ethernet中定義了半雙工、或是連接只支持半雙工的設備。
reference:https://networkengineering.stackexchange.com/questions/51823/does-ethernet-still-use-csma-cd

2. Look Foward to being Fowarder

```
sudo yum install -y openssh-server
sudo systemctl enable sshd
sudo systemctl start sshd
```

Go into nasa-hw0.csie.ntu.edu.tw and find out which port are in used.

```
netstat -tulpn | grep LISTEN
```

```
tcp        0      0 0.0.0.0:8124            0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:8029            0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:8362          0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:8234            0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:31280         0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:1234          0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:8435            0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:22              0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:8123            0.0.0.0:*               LISTEN
tcp6       0      0 :::8124                 :::*                    LISTEN
tcp6       0      0 :::8029                 :::*                    LISTEN
tcp6       0      0 ::1:8362                :::*                    LISTEN
tcp6       0      0 :::8234                 :::*                    LISTEN
tcp6       0      0 ::1:31280               :::*                    LISTEN
tcp6       0      0 ::1:1234                :::*                    LISTEN
tcp6       0      0 :::8435                 :::*                    LISTEN
tcp6       0      0 :::22                   :::*                    LISTEN
tcp6       0      0 :::8123                 :::*                    LISTEN
```

```
ssh -f -N -T -R 8787:localhost:22 b07611012@nasa-hw0.csie.ntu.edu.tw
```

On other computer

```
ssh zeus@nasa-hw0.csie.ntu.edu.tw -p 8787
```

```
✘ wildfoot-vm@ubuntu ~ ssh zeus@nasa-hw0.csie.ntu.edu.tw -p 8787
zeus@nasa-hw0.csie.ntu.edu.tw's password:
Last login: Thu Mar 21 01:47:42 2019
-bash-4.2$ ls
b07611012  course  homework
```

在 nasa-hw0 聽 8787 port 並轉發到 zeus 的 22 port
reference:
https://unix.stackexchange.com/questions/46235/how-does-reverse-ssh-tunneling-work

3. IPerf Everywhere

screenshot

CSIE-WiFi ⇔ CSIE-WiFi

```
$ iperf -c 10.5.5.195
------------------------------------------------------------
Client connecting to 10.5.5.195, TCP port 5001
TCP window size:  129 KByte (default)
------------------------------------------------------------
[  4] local 10.5.2.39 port 62602 connected with 10.5.5.195 port 5001
[ ID] Interval       Transfer     Bandwidth
[  4]  0.0-10.0 sec   166 MBytes   139 Mbits/sec
```

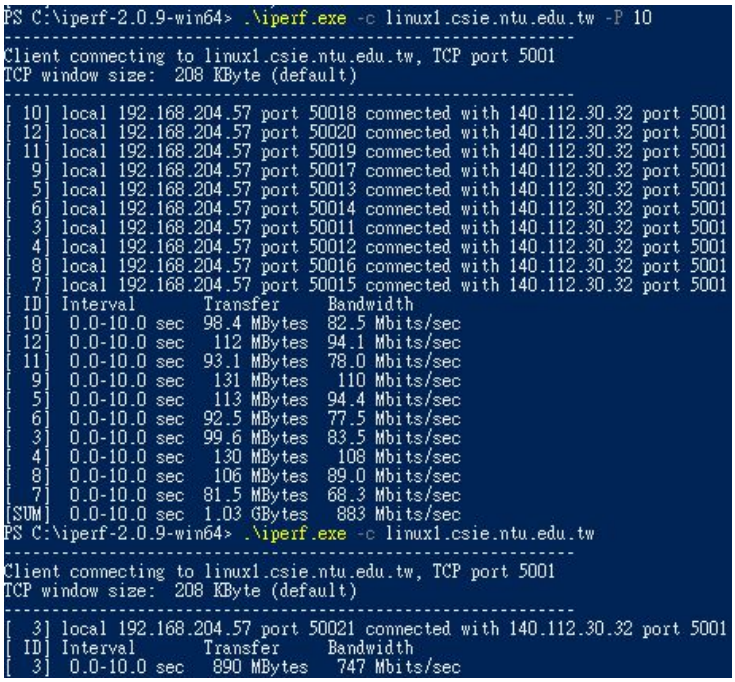
CSIE-WiFi ⇔ PC204

```
------------------------------------------------------------
Server listening on TCP port 5001
TCP window size: 85.3 KByte (default)
------------------------------------------------------------
[  4] local 10.5.4.108 port 5001 connected with 192.168.204.57 port 49984
[ ID] Interval       Transfer     Bandwidth
[  4]  0.0-10.0 sec  83.9 MBytes  70.2 Mbits/sec
[  4] local 10.5.4.108 port 5001 connected with 192.168.204.57 port 49986
[  5] local 10.5.4.108 port 5001 connected with 192.168.204.57 port 49988
[  6] local 10.5.4.108 port 5001 connected with 192.168.204.57 port 49985
[  7] local 10.5.4.108 port 5001 connected with 192.168.204.57 port 49989
[  8] local 10.5.4.108 port 5001 connected with 192.168.204.57 port 49990
[  9] local 10.5.4.108 port 5001 connected with 192.168.204.57 port 49991
[ 11] local 10.5.4.108 port 5001 connected with 192.168.204.57 port 49993
[ 10] local 10.5.4.108 port 5001 connected with 192.168.204.57 port 49987
[ 13] local 10.5.4.108 port 5001 connected with 192.168.204.57 port 49994
[ 12] local 10.5.4.108 port 5001 connected with 192.168.204.57 port 49992
[  7]  0.0-11.1 sec  2.38 MBytes  1.80 Mbits/sec
[ 10]  0.0-11.1 sec  2.50 MBytes  1.89 Mbits/sec
[  5]  0.0-11.1 sec  1.88 MBytes  1.41 Mbits/sec
[ 12]  0.0-11.5 sec  3.25 MBytes  2.38 Mbits/sec
[ 11]  0.0-11.5 sec  2.88 MBytes  2.09 Mbits/sec
[  6]  0.0-11.6 sec  2.00 MBytes  1.45 Mbits/sec
[  4]  0.0-12.7 sec  2.00 MBytes  1.32 Mbits/sec
[ 13]  0.0-13.3 sec  2.25 MBytes  1.42 Mbits/sec
[  8]  0.0-13.4 sec  2.25 MBytes  1.40 Mbits/sec
[  9]  0.0-13.4 sec   768 KBytes   468 Kbits/sec
[SUM]  0.0-13.4 sec  22.1 MBytes  13.8 Mbits/sec
```

CSIE-WiFi ⇔ linux1.csie.ntu.edu.tw

```
✘ wildfootw@wildfootw-X550JK ~ iperf -c linux1.csie.ntu.edu.tw
------------------------------------------------------------
Client connecting to linux1.csie.ntu.edu.tw, TCP port 5001
TCP window size: 85.0 KByte (default)
------------------------------------------------------------
[  3] local 10.5.4.108 port 45984 connected with 140.112.30.32 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-13.4 sec  4.69 MBytes  2.93 Mbits/sec
 wildfootw@wildfootw-X550JK ~ iperf -c linux1.csie.ntu.edu.tw -P 10
------------------------------------------------------------
Client connecting to linux1.csie.ntu.edu.tw, TCP port 5001
TCP window size: 85.0 KByte (default)
------------------------------------------------------------
[ 11] local 10.5.4.108 port 46004 connected with 140.112.30.32 port 5001
[  8] local 10.5.4.108 port 45992 connected with 140.112.30.32 port 5001
[  5] local 10.5.4.108 port 45990 connected with 140.112.30.32 port 5001
[  3] local 10.5.4.108 port 45986 connected with 140.112.30.32 port 5001
[  6] local 10.5.4.108 port 45988 connected with 140.112.30.32 port 5001
[  7] local 10.5.4.108 port 45996 connected with 140.112.30.32 port 5001
[  9] local 10.5.4.108 port 45994 connected with 140.112.30.32 port 5001
[ 12] local 10.5.4.108 port 45998 connected with 140.112.30.32 port 5001
[ 10] local 10.5.4.108 port 46000 connected with 140.112.30.32 port 5001
[  4] local 10.5.4.108 port 46002 connected with 140.112.30.32 port 5001
[ ID] Interval       Transfer     Bandwidth
[ 11]  0.0-11.2 sec   209 KBytes   153 Kbits/sec
[  8]  0.0-11.2 sec   252 KBytes   184 Kbits/sec
[  5]  0.0-11.2 sec   243 KBytes   178 Kbits/sec
[  3]  0.0-11.2 sec   240 KBytes   176 Kbits/sec
[  9]  0.0-11.2 sec   238 KBytes   174 Kbits/sec
[ 12]  0.0-11.2 sec   216 KBytes   159 Kbits/sec
[  6]  0.0-11.2 sec   259 KBytes   189 Kbits/sec
[  7]  0.0-11.4 sec   208 KBytes   149 Kbits/sec
[ 10]  0.0-12.2 sec   191 KBytes   128 Kbits/sec
[  4]  0.0-13.7 sec   178 KBytes   106 Kbits/sec
[SUM]  0.0-13.7 sec  2.18 MBytes  1.33 Mbits/sec
```

PC204 ⇔ linux1.csie.ntu.edu.tw



CSIE-WiFi ⇔ CSIE-WiFi	140 Mbits/sec
CSIE-WiFi ⇔ PC204	70 Mbits/sec
CSIE-WiFi ⇔ linux1.csie.ntu.edu.tw	3 Mbits/sec
PC204 ⇔ linux1.csie.ntu.edu.tw	883 Mbits/sec

首先第四項，雙方都是系館內的有線網路，通常為了能夠擴充方便，會有相當高的頻寬，避免以後設備更多造成速度瓶頸。再來另外三個都是有接 wifi 的，第一項的兩台筆電可能是連同一台 ap 所以速度最快，第二項跟第三項推測可能 ap 是接最近的 switch，所以連 PC204 的速度會比較快。

Cooperation: 李宥霆

System Administration

1. More space (15 pts)

```
sudo lsblk
```

```
NAME           MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda              8:0    0   20G  0 disk
├─sda1           8:1    0    1G  0 part /boot
├─sda2           8:2    0    9G  0 part
│ ├─Zeus-root  253:0    0    2G  0 lvm  /
│ ├─Zeus-swap  253:1    0    2G  0 lvm  [SWAP]
│ ├─Zeus-home  253:2    0    4G  0 lvm  /home
│ └─Zeus-video 253:3    0    1G  0 lvm  /home/zeus/course
└─sda3           8:3    0  909M  0 part
sr0             11:0    1  918M  0 rom
```

```
sudo fdisk /dev/sda
n e default default
n default +3G w
sudo partprobe # reload table
sudo pvcreate /dev/sda5 # change sda4 type to lvm pv
sudo vgextend Zeus /dev/sda5 # extend vg “Zeus” size
sudo lvextend --size +1G /dev/Zeus/video
sudo umount /dev/Zeus/video
sudo e2fsck -f /dev/Zeus/video
sudo resize2fs /dev/Zeus/video # resize ext2/ext3/ext4 file system
sudo mount /dev/Zeus/video
```

```
-bash-4.2$ lsblk; df -h;
NAME           MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda              8:0    0   20G  0 disk
├─sda1           8:1    0    1G  0 part /boot
├─sda2           8:2    0    9G  0 part
│ ├─Zeus-root  253:0    0    2G  0 lvm  /
│ ├─Zeus-swap  253:1    0    2G  0 lvm  [SWAP]
│ ├─Zeus-home  253:2    0    4G  0 lvm  /home
│ └─Zeus-video 253:3    0    2G  0 lvm  /home/zeus/course
├─sda3           8:3    0  909M  0 part
├─sda4           8:4    0  512B  0 part
└─sda5           8:5    0    3G  0 part
  └─Zeus-video 253:3    0    2G  0 lvm  /home/zeus/course
sr0             11:0    1  918M  0 rom
Filesystem             Size  Used Avail Use% Mounted on
/dev/mapper/Zeus-root  2.0G  1.2G  644M  65% /
devtmpfs               475M     0  475M   0% /dev
tmpfs                  487M     0  487M   0% /dev/shm
tmpfs                  487M  7.6M  479M   2% /run
tmpfs                  487M     0  487M   0% /sys/fs/cgroup
/dev/sda1             1008M  132M  825M  14% /boot
/dev/mapper/Zeus-home  3.9G   17M  3.6G   1% /home
tmpfs                   98M     0   98M   0% /run/user/1000
/dev/mapper/Zeus-video 2.0G  919M  947M  50% /home/zeus/course
```

Reference:
https://unix.stackexchange.com/questions/441789/resize2fs-fail-to-resize-partition-to-full-capacity

https://www.tecmint.com/extend-and-reduce-lvms-in-linux/

2. New Video (5 pts)

```
sudo mount /dev/sda3 /mnt/media
sudo mount -o remount,rw "/dev/Zeus/video"
cp /mnt/media/new_video.mp4 /home/zeus/course
```

```
-bash-4.2$ pwd
/home/zeus/course
-bash-4.2$ ls -la
total 1818628
drwxr-xr-x. 3 zeus zeus      4096 Mar 16 12:45 .
drwxr-xr-x. 4 zeus zeus      4096 Mar 16 10:27 ..
drwx------. 2 zeus zeus     16384 Mar  8 08:16 lost+found
-rw-r--r--. 1 zeus zeus 902242304 Mar 16 12:46 new_video.mp4
-rw-r--r--. 1 root root 960000000 Mar  8 00:28 old_video.mp4
```

Reference:
https://askubuntu.com/questions/47538/how-to-make-read-only-file-system-writable

3. Encrypted Homework (15pts)

```
sudo yum install cryptsetup
sudo modprobe dm-crypt
```

Back up data

```
sudo fdisk /dev/sda
n default +4G w
sudo partprobe
sudo dd if=/dev/Zeus/home of=/dev/sda6
```

Although I have been noticed that there is a tool called “luksipc” can convert plain to LUKS directly, the latest version remain 0.04 make me step back.

```
sudo umount -l /dev/Zeus/home
sudo cryptsetup -y --cipher aes-cbc-essiv:sha256 --key-size 256 luksFormat
/dev/Zeus/home
YES passphrase:NASAZeus
sudo cryptsetup luksOpen /dev/Zeus/home home # home for name in /dev/mapper
sudo mkfs.ext4 /dev/mapper/home
sudo mount /dev/mapper/home /home
sudo dd if=/dev/sda6 of=/dev/mapper/home
sudo mount /dev/mapper/Zeus-video /home/zeus/course
```

Mount on boot

```
sudo cryptsetup luksUUID /dev/Zeus/home > home_UUID
sudo vim home_UUID /etc/crypttab
sudo vim /etc/fstab
```

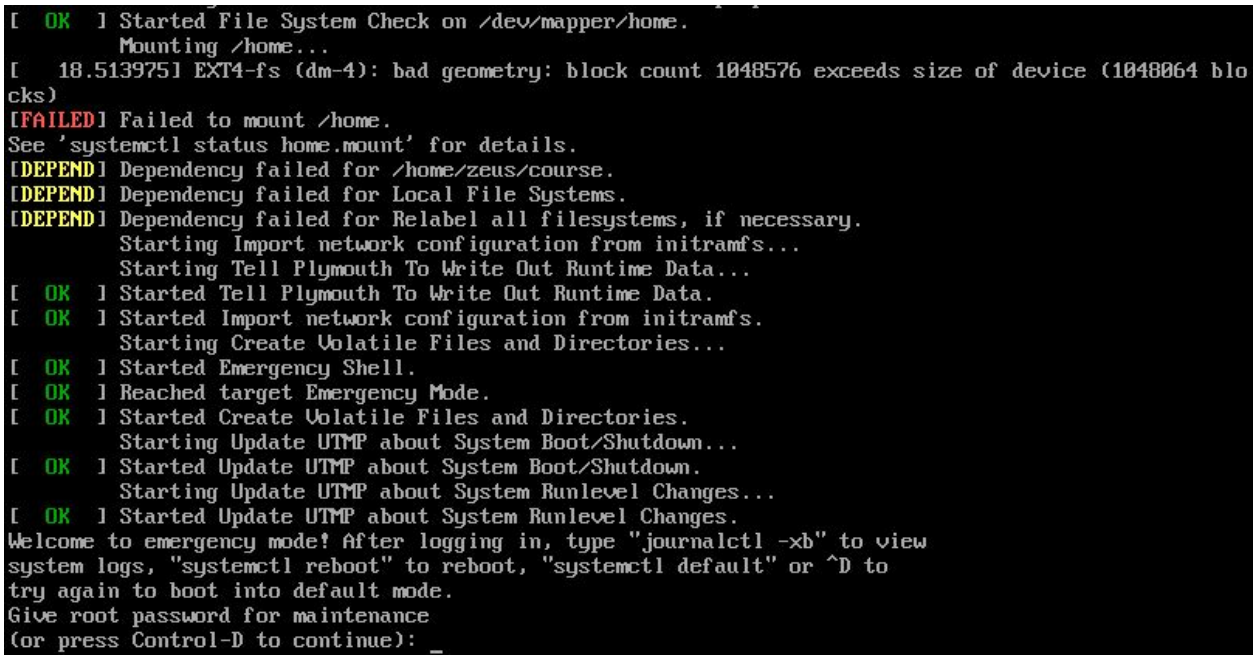
In /etc/crypttab add

```
home /dev/disk/by-uuid/225bc86e-b792-4a9f-898c-11f0260ad506 none luks
```

In /etc/fstab add

```
/dev/mapper/home /home ext4 defaults 1 2
```

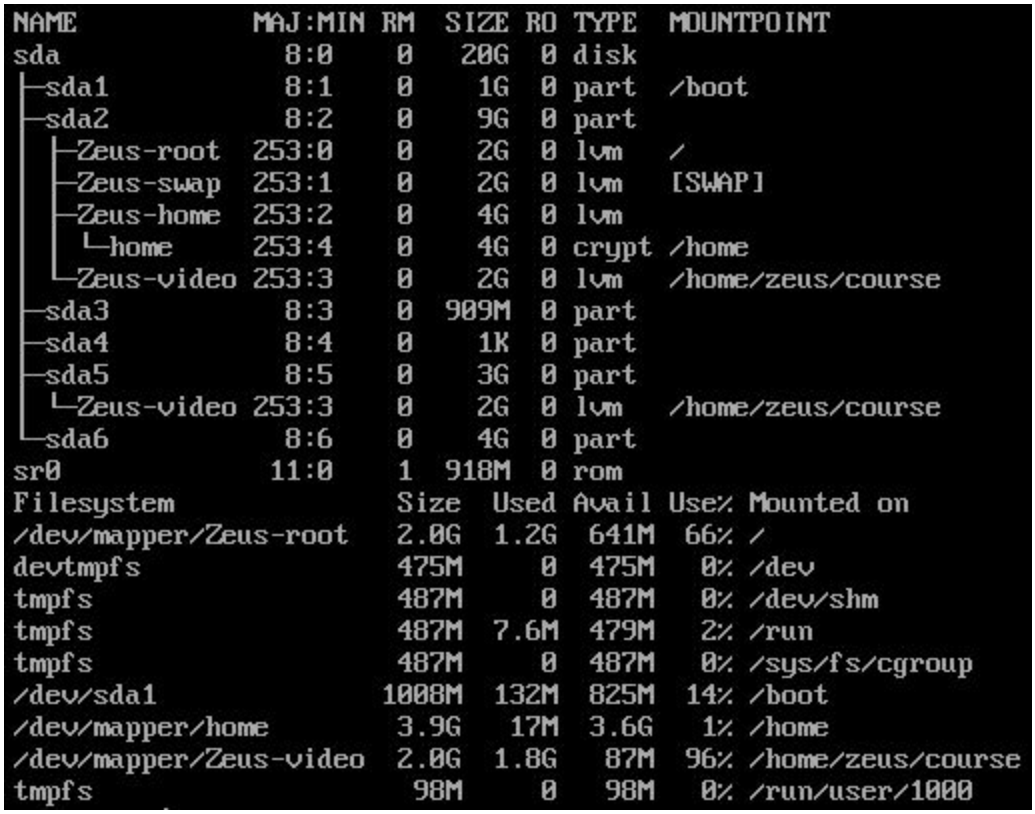
And reboot…..，然後他就死掉了，我嘗試使用single mode，但他似乎總是會先進入emergency mode。



只好先掛硬碟到另一個vm，註解掉剛剛加在fstab中的那行

```
sudo e2fsck -f /dev/mapper/home
sudo resize2fs /dev/mapper/home
```

再把fstab那行加回來，reboot

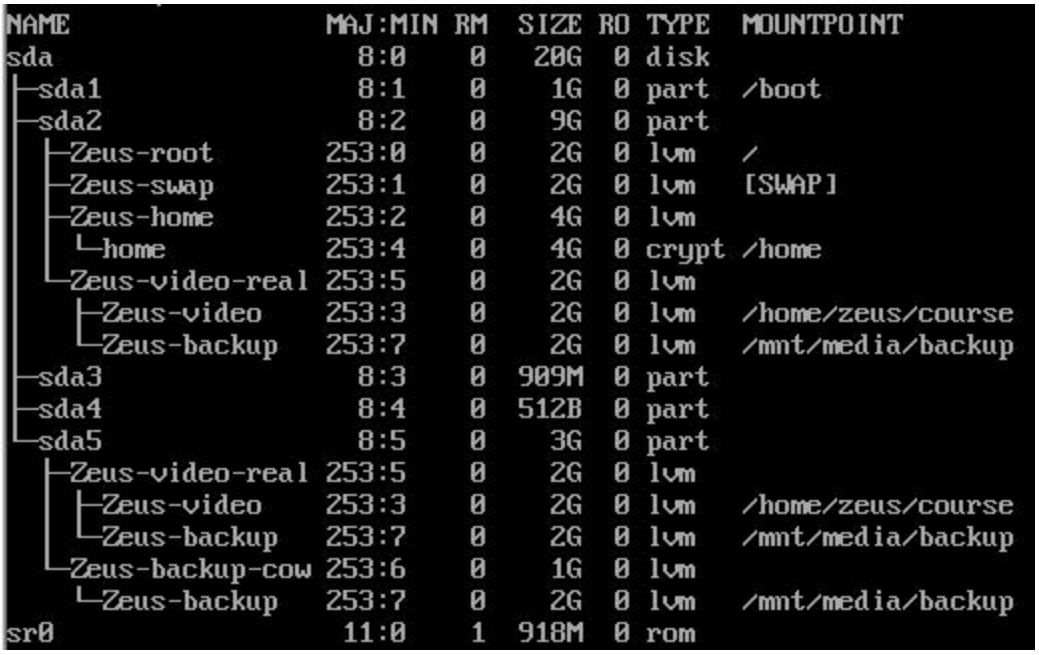


```
NAME            MAJ:MIN RM  SIZE RO TYPE  MOUNTPOINT
sda               8:0    0   20G  0 disk
├─sda1            8:1    0    1G  0 part  /boot
├─sda2            8:2    0    9G  0 part
│ ├─Zeus-root   253:0    0    2G  0 lvm   /
│ ├─Zeus-swap   253:1    0    2G  0 lvm   [SWAP]
│ ├─Zeus-home   253:2    0    4G  0 lvm
│ │ └─home      253:4    0    4G  0 crypt /home
│ └─Zeus-video  253:3    0    2G  0 lvm   /home/zeus/course
├─sda3            8:3    0  909M  0 part
├─sda4            8:4    0    1K  0 part
├─sda5            8:5    0    3G  0 part
│ └─Zeus-video  253:3    0    2G  0 lvm   /home/zeus/course
└─sda6            8:6    0    4G  0 part
sr0              11:0    1  918M  0 rom
Filesystem                Size  Used Avail Use% Mounted on
/dev/mapper/Zeus-root     2.0G  1.2G  641M  66% /
devtmpfs                  475M     0  475M   0% /dev
tmpfs                     487M     0  487M   0% /dev/shm
tmpfs                     487M  7.6M  479M   2% /run
tmpfs                     487M     0  487M   0% /sys/fs/cgroup
/dev/sda1                1008M  132M  825M  14% /boot
/dev/mapper/home          3.9G   17M  3.6G   1% /home
/dev/mapper/Zeus-video    2.0G  1.8G   87M  96% /home/zeus/course
tmpfs                      98M     0   98M   0% /run/user/1000
```

Reference:
https://www.johannes-bauer.com/linux/luksipc/
https://www.debuntu.org/how-to-encrypted-partitions-over-lvm-with-luks-page-2-encrypting-the-partitions/
https://www.youtube.com/watch?v=dT4kvmpCJfs
https://unix.stackexchange.com/questions/115698/fix-ext4-fs-bad-geometry-block-count-exceeds-size-of-device

4. Backup (10pts)

```
sudo lvcreate -L 1GB -s -n backup /dev/mapper/Zeus-video
sudo mkdir /mnt/media/backup
sudo mount /dev/Zeus/backup /mnt/media/backup
sudo tar -cv -f /home/backup-video.tar /mnt/media/backup
```



```
NAME                MAJ:MIN RM  SIZE RO TYPE  MOUNTPOINT
sda                   8:0    0   20G  0 disk
├─sda1                8:1    0    1G  0 part  /boot
├─sda2                8:2    0    9G  0 part
│ ├─Zeus-root       253:0    0    2G  0 lvm   /
│ ├─Zeus-swap       253:1    0    2G  0 lvm   [SWAP]
│ ├─Zeus-home       253:2    0    4G  0 lvm
│ │ └─home          253:4    0    4G  0 crypt /home
│ └─Zeus-video-real 253:5    0    2G  0 lvm
│   ├─Zeus-video    253:3    0    2G  0 lvm   /home/zeus/course
│   └─Zeus-backup   253:7    0    2G  0 lvm   /mnt/media/backup
├─sda3                8:3    0  909M  0 part
├─sda4                8:4    0  512B  0 part
└─sda5                8:5    0    3G  0 part
  ├─Zeus-video-real 253:5    0    2G  0 lvm
  │ ├─Zeus-video    253:3    0    2G  0 lvm   /home/zeus/course
  │ └─Zeus-backup   253:7    0    2G  0 lvm   /mnt/media/backup
  └─Zeus-backup-cow 253:6    0    1G  0 lvm
    └─Zeus-backup   253:7    0    2G  0 lvm   /mnt/media/backup
sr0                  11:0    1  918M  0 rom
```

```
sudo umount /dev/Zeus/backup
sudo lvremove /dev/Zeus/backup
```

reference:https://www.tecmint.com/take-snapshot-of-logical-volume-and-restore-in-lvm/

5. Experiment (5pts)

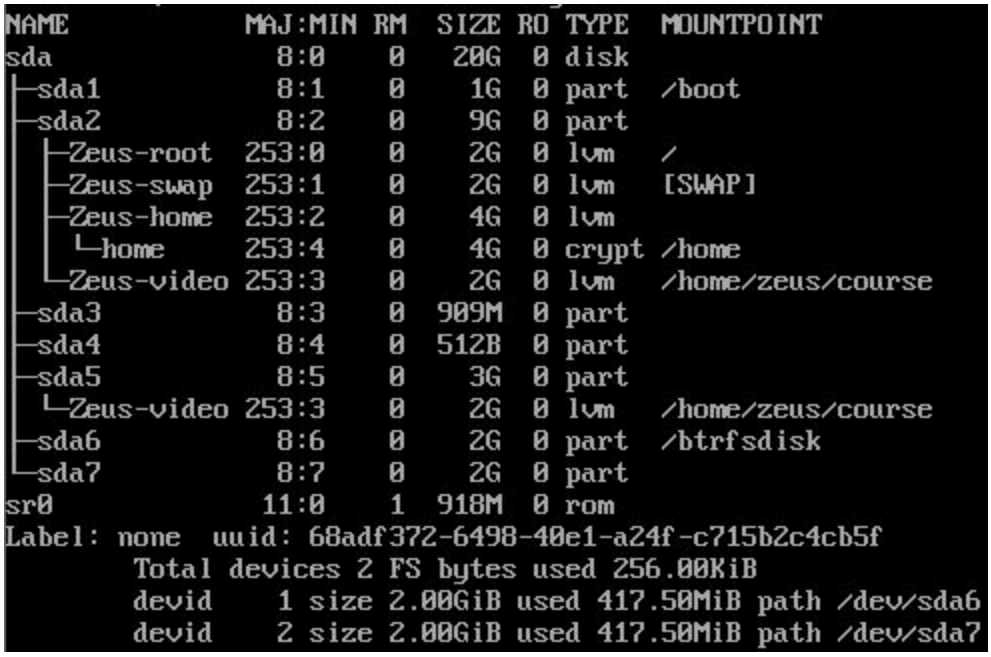
BTRFS支援多種功能

- Ensures data integrity to avoid data corruption (using CRC32C)
- Send/receive function to copy filesystems over network
- Read-only or writeable snapshots
- Incremental backups (through snapshots)
- 但速度似乎是最慢的

RAID0: 合併硬碟，擴展容量，且加速讀寫速度
RAID1: 鏡像硬碟內容，互相備援，寫入慢，讀取快
RAID5: 最少需要三顆硬碟，容許一顆硬碟損壞，速度比RAID0略慢

• Bonus (5pts):

```
sudo -f -m raid1 -d raid1 /dev/sda6 /dev/sda7
sudo mkdir /btrfsdisk
sudo mount /dev/sda6 /btrfsdisk
```



Reference:

https://www.phoronix.com/scan.php?page=article&item=linux-50-filesystems&num=4
https://www.marksei.com/btrfs-what-is-it-and-why-is-it-great/
https://en.wikipedia.org/wiki/RAID
https://btrfs.wiki.kernel.org/index.php/Using_Btrfs_with_Multiple_Devices
https://medium.com/cowbear-coder/平衡樹檔案系統-btrfs-建置磁碟陣列-4ac6314f6b84