Network Administration/System Administration Homework #2

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Acknowledgement 這份作業有參考 ChatGPT，但都是用自己的話寫出，其餘資源都有標注在各題。

1 那傢伙竟然敢無視窗

```
sudo mkfs.exfat /dev/vdi2
sudo blkid /dev/vdi2
sudo mkdir -p /mnt/myusb
sudo nano /etc/fstab
```

新增一行（UUID 在 blkid 時看到）

```
UUID=6BD9-F2F1   /mnt/myusb   exfat   defaults   0   2
```

以下是執行結果截圖

```
UUID=6BD9-F2F1                          /mnt/myusb              exfat   defaults        0 2
[balu@archlinux ~]$ lsblk; df -hT
NAME                            MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
fd0                               2:0    1    4K  0 disk
sda                               8:0    0   32G  0 disk
├─sda1                            8:1    0  200M  0 part /boot
└─sda2                            8:2    0 31.8G  0 part /
sr0                              11:0    1 1024M  0 rom
vda                             252:0    0    1G  0 disk
└─vda1                          252:1    0 1022M  0 part
  └─nasahw2--main-course        253:1    0  500M  0 lvm  /home/balu/course
vdb                             252:16   0    1G  0 disk
└─vdb1                          252:17   0 1022M  0 part
vdc                             252:32   0    2G  0 disk
└─vdc1                          252:33   0    2G  0 part
vdd                             252:48   0   16G  0 disk
└─vdd1                          252:49   0   16G  0 part
vde                             252:64   0  512M  0 disk
└─vde1                          252:65   0  510M  0 part
  └─nasahw2--secondary-videos   253:0    0  508M  0 lvm  /home/balu/videos
vdf                             252:80   0    7G  0 disk
├─vdf1                          252:81   0    2G  0 part
├─vdf2                          252:82   0    2G  0 part
└─vdf3                          252:83   0    2G  0 part
vdg                             252:96   0    7G  0 disk
├─vdg1                          252:97   0    2G  0 part
├─vdg2                          252:98   0    2G  0 part
└─vdg3                          252:99   0    2G  0 part
vdh                             252:112  0    7G  0 disk
├─vdh1                          252:113  0    2G  0 part
├─vdh2                          252:114  0    2G  0 part
└─vdh3                          252:115  0    2G  0 part
vdi                             252:128  0    6G  0 disk
├─vdi1                          252:129  0    2G  0 part
└─vdi2                          252:130  0    4G  0 part /mnt/myusb
zram0                           254:0    0  986M  0 disk [SWAP]
Filesystem                             Type      Size  Used Avail Use% Mounted on
dev                                    devtmpfs  979M     0  979M   0% /dev
run                                    tmpfs     987M  680K  986M   1% /run
/dev/sda2                              ext4       32G  2.2G   28G   8% /
tmpfs                                  tmpfs     987M     0  987M   0% /dev/shm
tmpfs                                  tmpfs     987M     0  987M   0% /tmp
/dev/sda1                              vfat      197M   69M  129M  35% /boot
/dev/mapper/nasahw2--secondary-videos  ext4      466M   66M  371M  16% /home/balu/videos
/dev/mapper/nasahw2--main-course       ext4      459M  4.5M  425M   2% /home/balu/course
tmpfs                                  tmpfs     198M     0  198M   0% /run/user/1000
/dev/vdi2                              exfat     4.0G   96K  4.0G   1% /mnt/myusb
[balu@archlinux ~]$
```

```
[balu@archlinux ~]$ cat /etc/fstab
# Static information about the filesystems.
# See fstab(5) for details.

# <file system> <dir> <type> <options> <dump> <pass>
# /dev/sda2
UUID=d1daff5a-54da-43b8-a88e-83fa4e94a0b1       /               ext4            rw,relatime     0 1

# /dev/sda1
UUID=711C-6167          /boot           vfat            rw,relatime,fmask=0022,dmask=0022,codepage=437,iocharset=ascii,shortname=mixed,utf8,errors=remount-ro  0
 2


/dev/nasahw2-main/course        /home/balu/course       ext4    defaults        0 2
/dev/nasahw2-secondary/videos   /home/balu/videos       ext4    defaults        0 2
UUID=6BD9-F2F1                  /mnt/myusb              exfat   defaults        0 2
[balu@archlinux ~]$
```

2 因為要換到新的 SWAP

```
sudo dd if=/dev/zero of=/newswap bs=1M count=4096 status=progress
sudo chmod 600 /newswap
sudo mkswap /newswap
sudo swapon /newswap
```

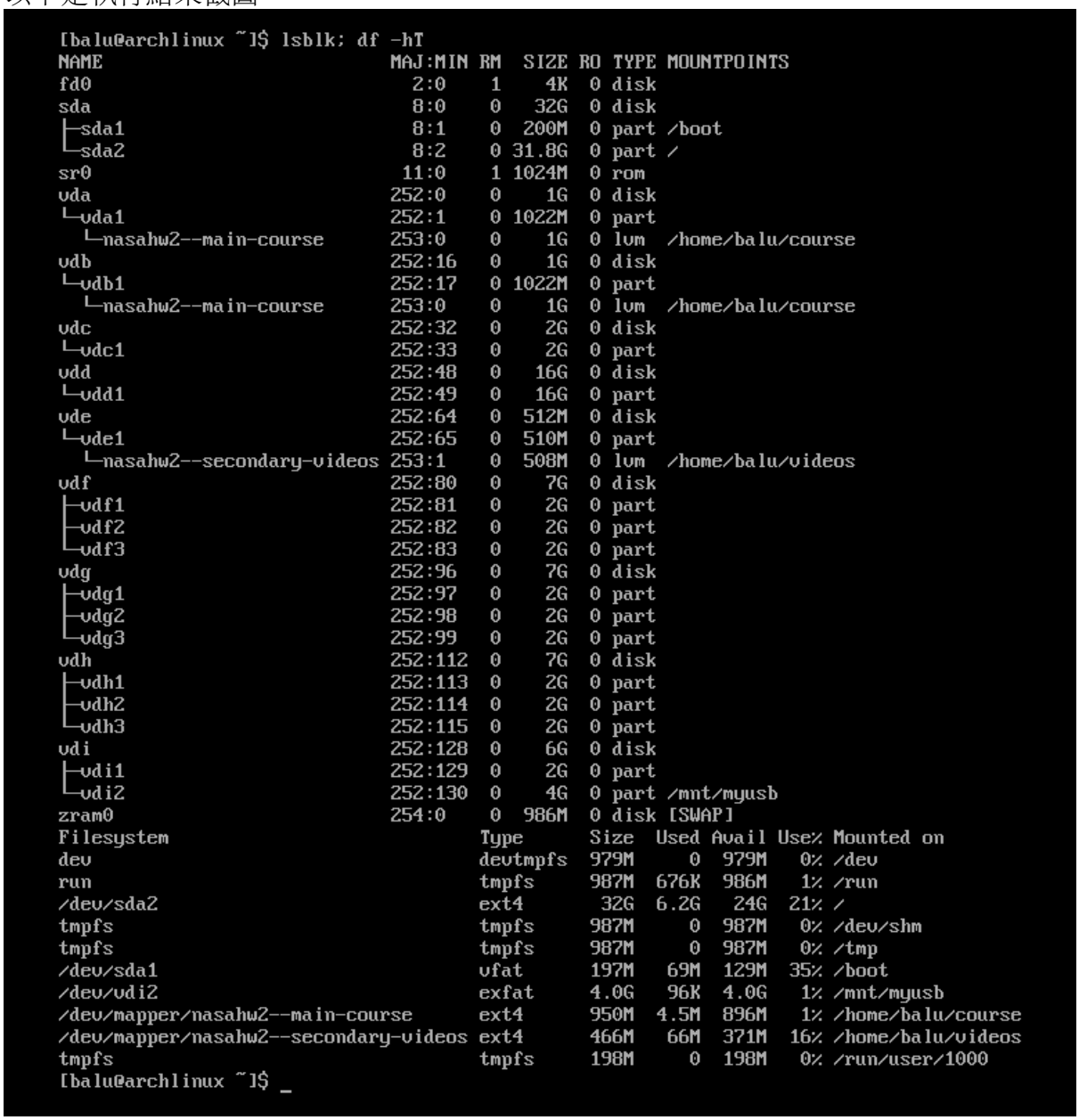
以下是執行結果截圖

```
[balu@archlinux ~]$ free -h
               total        used        free      shared  buff/cache   available
Mem:           1.9Gi        74Mi        68Mi       0.0Ki       1.8Gi       1.7Gi
Swap:          5.0Gi       0.0Ki       5.0Gi
[balu@archlinux ~]$ _
```

3 為資料創造新的棲身之處

```
sudo lvextend -L 1G /dev/nasahw2-main/course
sudo resize2fs /dev/nasahw2-main/course
```

以下是執行結果截圖



4 我有拜託妳別把我的作業告訴其他人了吧

```
sudo lvcreate -L 800M -n homework nasahw2-main
sudo cryptsetup luksFormat /dev/nasahw2-main/homework /home/balu/lvm_key
sudo cryptsetup luksOpen /dev/nasahw2-main/homework homework \
--key-file /home/balu/lvm_key
sudo mkfs.ext4 /dev/mapper/homework
sudo mkdir -p /home/balu/homework
sudo mount /dev/mapper/homework /home/balu/homework
```

在 /etc/crypttab 新增

```
homework    /dev/nasahw2-main/homework    /home/balu/lvm_key    luks
```

在 /etc/fstab 新增

```
/dev/mapper/homework    /home/balu/homework    ext4    defaults    0 2
```

以下是執行結果截圖

```
NAME                                MAJ:MIN RM  SIZE RO TYPE  MOUNTPOINTS
fd0                                   2:0    1    4K  0 disk
sda                                   8:0    0   32G  0 disk
├─sda1                                8:1    0  200M  0 part  /boot
└─sda2                                8:2    0 31.8G  0 part  /
sr0                                  11:0    1 1024M  0 rom
vda                                 252:0    0    1G  0 disk
└─vda1                              252:1    0 1022M  0 part
  └─nasahw2--main-course            253:0    0    1G  0 lvm   /home/balu/course
vdb                                 252:16   0    1G  0 disk
└─vdb1                              252:17   0 1022M  0 part
  ├─nasahw2--main-course            253:0    0    1G  0 lvm   /home/balu/course
  └─nasahw2--main-homework          253:2    0  800M  0 lvm
    └─homework                      253:3    0  784M  0 crypt /home/balu/homework
vdc                                 252:32   0    2G  0 disk
└─vdc1                              252:33   0    2G  0 part
vdd                                 252:48   0   16G  0 disk
└─vdd1                              252:49   0   16G  0 part
vde                                 252:64   0  512M  0 disk
└─vde1                              252:65   0  510M  0 part
  └─nasahw2--secondary-videos       253:1    0  508M  0 lvm   /home/balu/videos
vdf                                 252:80   0    7G  0 disk
├─vdf1                              252:81   0    2G  0 part
├─vdf2                              252:82   0    2G  0 part
└─vdf3                              252:83   0    2G  0 part
vdg                                 252:96   0    7G  0 disk
├─vdg1                              252:97   0    2G  0 part
├─vdg2                              252:98   0    2G  0 part
└─vdg3                              252:99   0    2G  0 part
vdh                                 252:112  0    7G  0 disk
├─vdh1                              252:113  0    2G  0 part
├─vdh2                              252:114  0    2G  0 part
└─vdh3                              252:115  0    2G  0 part
vdi                                 252:128  0    6G  0 disk
├─vdi1                              252:129  0    2G  0 part
└─vdi2                              252:130  0    4G  0 part  /mnt/myusb
zram0                               254:0    0  986M  0 disk  [SWAP]
Filesystem                                Type      Size  Used Avail Use% Mounted on
dev                                       devtmpfs  979M     0  979M   0% /dev
run                                       tmpfs     987M  688K  986M   1% /run
/dev/sda2                                 ext4       32G  6.2G   24G  21% /
tmpfs                                     tmpfs     987M     0  987M   0% /dev/shm
tmpfs                                     tmpfs     987M     0  987M   0% /tmp
/dev/sda1                                 vfat      197M   69M  129M  35% /boot
/dev/vdi2                                 exfat     4.0G   96K  4.0G   1% /mnt/myusb
/dev/mapper/nasahw2--main-course          ext4      950M  4.5M  896M   1% /home/balu/course
/dev/mapper/nasahw2--secondary-videos     ext4      466M   66M  371M  16% /home/balu/videos
tmpfs                                     tmpfs     198M     0  198M   0% /run/user/1000
/dev/mapper/homework                      ext4      755M  220K  700M   1% /home/balu/homework
[balu@archlinux ~]$ _
```

5 快照真的好難喔

```
sudo wipefs -a /dev/vdc1
sudo vgextend nasahw2-main /dev/vdc1
sudo lvcreate -L 1G -s -n backup /dev/nasahw2-main/course
sudo mkdir -p /mnt/backup
sudo mount /dev/nasahw2-main/backup /mnt/backup
cd /mnt/backup
sudo tar -I zstd -cvf /home/balu/backup.tar.zst .
```

```
cd
sudo umount /mnt/backup
sudo lvremove -y /dev/nasahw2-main/backup
```

以下是建立 snapshot 後的截圖

```
[balu@archlinux ~]$ lsblk
NAME                            MAJ:MIN RM  SIZE RO TYPE  MOUNTPOINTS
fd0                               2:0    1    4K  0 disk
sda                               8:0    0   32G  0 disk
├─sda1                            8:1    0  200M  0 part  /boot
└─sda2                            8:2    0 31.8G  0 part  /
sr0                              11:0    1 1024M  0 rom
vda                             252:0    0    1G  0 disk
└─vda1                          252:1    0 1022M  0 part
  └─nasahw2--main-course-real   253:4    0    1G  0 lvm
    ├─nasahw2--main-course      253:0    0    1G  0 lvm   /home/balu/course
    └─nasahw2--main-backup      253:6    0    1G  0 lvm   /mnt/backup
vdb                             252:16   0    1G  0 disk
└─vdb1                          252:17   0 1022M  0 part
  ├─nasahw2--main-homework      253:2    0  800M  0 lvm
  │ └─homework                  253:3    0  784M  0 crypt /home/balu/homework
  └─nasahw2--main-course-real   253:4    0    1G  0 lvm
    ├─nasahw2--main-course      253:0    0    1G  0 lvm   /home/balu/course
    └─nasahw2--main-backup      253:6    0    1G  0 lvm   /mnt/backup
vdc                             252:32   0    2G  0 disk
└─vdc1                          252:33   0    2G  0 part
  └─nasahw2--main-backup-cow    253:5    0    1G  0 lvm
    └─nasahw2--main-backup      253:6    0    1G  0 lvm   /mnt/backup
vdd                             252:48   0   16G  0 disk
└─vdd1                          252:49   0   16G  0 part
vde                             252:64   0  512M  0 disk
└─vde1                          252:65   0  510M  0 part
  └─nasahw2--secondary-videos   253:1    0  508M  0 lvm   /home/balu/videos
vdf                             252:80   0    7G  0 disk
├─vdf1                          252:81   0    2G  0 part
├─vdf2                          252:82   0    2G  0 part
└─vdf3                          252:83   0    2G  0 part
vdg                             252:96   0    7G  0 disk
├─vdg1                          252:97   0    2G  0 part
├─vdg2                          252:98   0    2G  0 part
└─vdg3                          252:99   0    2G  0 part
vdh                             252:112  0    7G  0 disk
├─vdh1                          252:113  0    2G  0 part
├─vdh2                          252:114  0    2G  0 part
└─vdh3                          252:115  0    2G  0 part
vdi                             252:128  0    6G  0 disk
├─vdi1                          252:129  0    2G  0 part
└─vdi2                          252:130  0    4G  0 part  /mnt/myusb
zram0                           254:0    0  986M  0 disk  [SWAP]
[balu@archlinux ~]$
```

以下是刪除 snapshot 後的截圖

```
NAME                            MAJ:MIN RM  SIZE RO TYPE  MOUNTPOINTS
fd0                               2:0    1    4K  0 disk
sda                               8:0    0   32G  0 disk
├─sda1                            8:1    0  200M  0 part  /boot
└─sda2                            8:2    0 31.8G  0 part  /
sr0                              11:0    1 1024M  0 rom
vda                             252:0    0    1G  0 disk
└─vda1                          252:1    0 1022M  0 part
  └─nasahw2--main-course        253:0    0    1G  0 lvm   /home/balu/course
vdb                             252:16   0    1G  0 disk
└─vdb1                          252:17   0 1022M  0 part
  ├─nasahw2--main-course        253:0    0    1G  0 lvm   /home/balu/course
  └─nasahw2--main-homework      253:2    0  800M  0 lvm
    └─homework                  253:3    0  784M  0 crypt /home/balu/homework
vdc                             252:32   0    2G  0 disk
└─vdc1                          252:33   0    2G  0 part
vdd                             252:48   0   16G  0 disk
└─vdd1                          252:49   0   16G  0 part
vde                             252:64   0  512M  0 disk
└─vde1                          252:65   0  510M  0 part
  └─nasahw2--secondary-videos   253:1    0  508M  0 lvm   /home/balu/videos
vdf                             252:80   0    7G  0 disk
├─vdf1                          252:81   0    2G  0 part
├─vdf2                          252:82   0    2G  0 part
└─vdf3                          252:83   0    2G  0 part
vdg                             252:96   0    7G  0 disk
├─vdg1                          252:97   0    2G  0 part
├─vdg2                          252:98   0    2G  0 part
└─vdg3                          252:99   0    2G  0 part
vdh                             252:112  0    7G  0 disk
├─vdh1                          252:113  0    2G  0 part
├─vdh2                          252:114  0    2G  0 part
└─vdh3                          252:115  0    2G  0 part
vdi                             252:128  0    6G  0 disk
├─vdi1                          252:129  0    2G  0 part
└─vdi2                          252:130  0    4G  0 part  /mnt/myusb
zram0                           254:0    0  986M  0 disk  [SWAP]
Filesystem                             Type      Size  Used Avail Use% Mounted on
dev                                    devtmpfs  979M     0  979M   0% /dev
run                                    tmpfs     987M  712K  986M   1% /run
/dev/sda2                              ext4       32G  6.2G   24G  21% /
tmpfs                                  tmpfs     987M     0  987M   0% /dev/shm
tmpfs                                  tmpfs     987M     0  987M   0% /tmp
/dev/sda1                              vfat      197M   69M  129M  35% /boot
/dev/vdi2                              exfat     4.0G   96K  4.0G   1% /mnt/myusb
/dev/mapper/nasahw2--main-course       ext4      950M  4.5M  896M   1% /home/balu/course
/dev/mapper/nasahw2--secondary-videos  ext4      466M   66M  371M  16% /home/balu/videos
tmpfs                                  tmpfs     198M     0  198M   0% /run/user/1000
/dev/mapper/homework                   ext4      755M  220K  700M   1% /home/balu/homework
[balu@archlinux ~]$
```

6 好老舊喔

```
sudo wipefs -a /dev/vdd1
sudo vgextend nasahw2-secondary /dev/vdd1
sudo pvmove /dev/vde1 /dev/vdd1
```

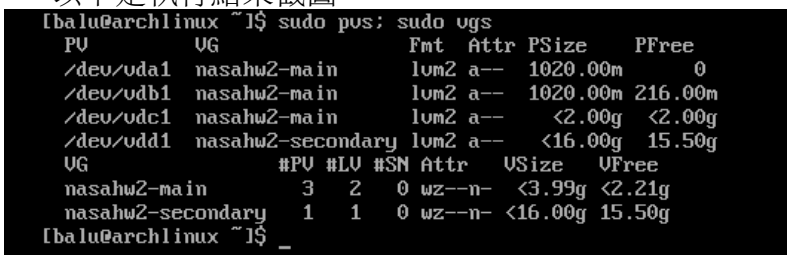
檢查

```
sudo pvs -o+pv_used
```

看 PSize 還在，但 Used 是 0。

```
sudo vgreduce nasahw2-secondary /dev/vde1
sudo pvremove /dev/vde1
```

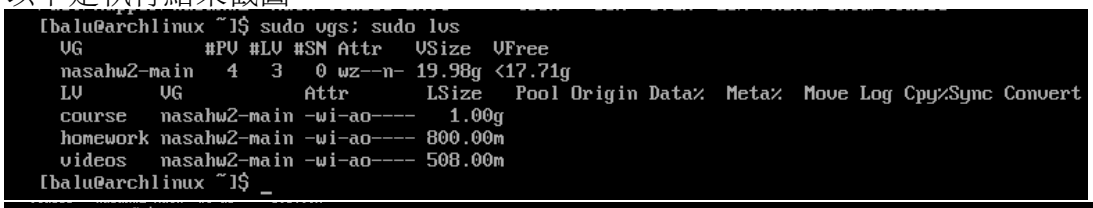
以下是執行結果截圖

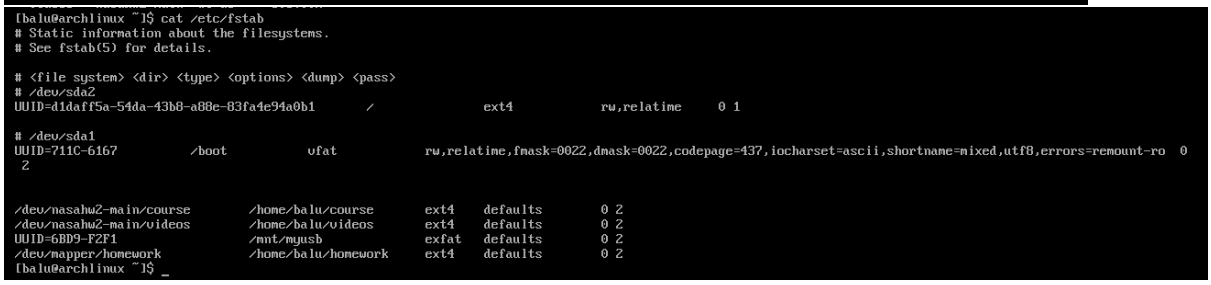


7 我看還是再來合一次吧

```
sudo umount /home/balu/videos/
sudo lvchange -an nasahw2-secondary/videos
sudo vgchange -an nasahw2-secondary
sudo vgmerge nasahw2-main nasahw2-secondary
sudo vgchange -ay nasahw2-main
```

最後要把 /etc/fstab 的 nasahw2-secondary 換成 nasahw2-main
以下是執行結果截圖





8 等一下，妳還沒回答我

1. ZFS 整合了 Volume Manager 的功能，而 btrfs 需要 Linux LVM 搭配或是單獨使用。

2. FUSE 允許在使用者空間實作檔案系統，不需要修改 kernel。優點是開發容易，安全性較高，但缺點是效能較差，因為需要在 user space/kernel space 切換。

3. MBR（Master Boot Record）最多 4 個主分割，支援硬碟 $\leq$ 2TB；GPT（GUID Partition Table）支援幾乎無限分割，磁碟可超過 2TB。

4. 1MB 是 10^6 Bytes；1MiB 是$2^20 = 1048576$ Bytes。`ls -lh` 預設使用 SI（MB，GB）

5. - RAID 0：多個硬碟同時讀寫，效能提升，但沒有資料備份。
   - RAID 1：兩個硬碟鏡像，一樣的資料存兩份，允許一個硬碟故障。
   - RAID 5：至少需要三個硬碟，允許一個硬碟故障，利用 parity 及多個硬碟同時讀能增加讀的速度，並做資料備份。
   - RAID 10：四顆硬碟，先鏡像再做 RAID 0 分條，同時具備效能與容錯。