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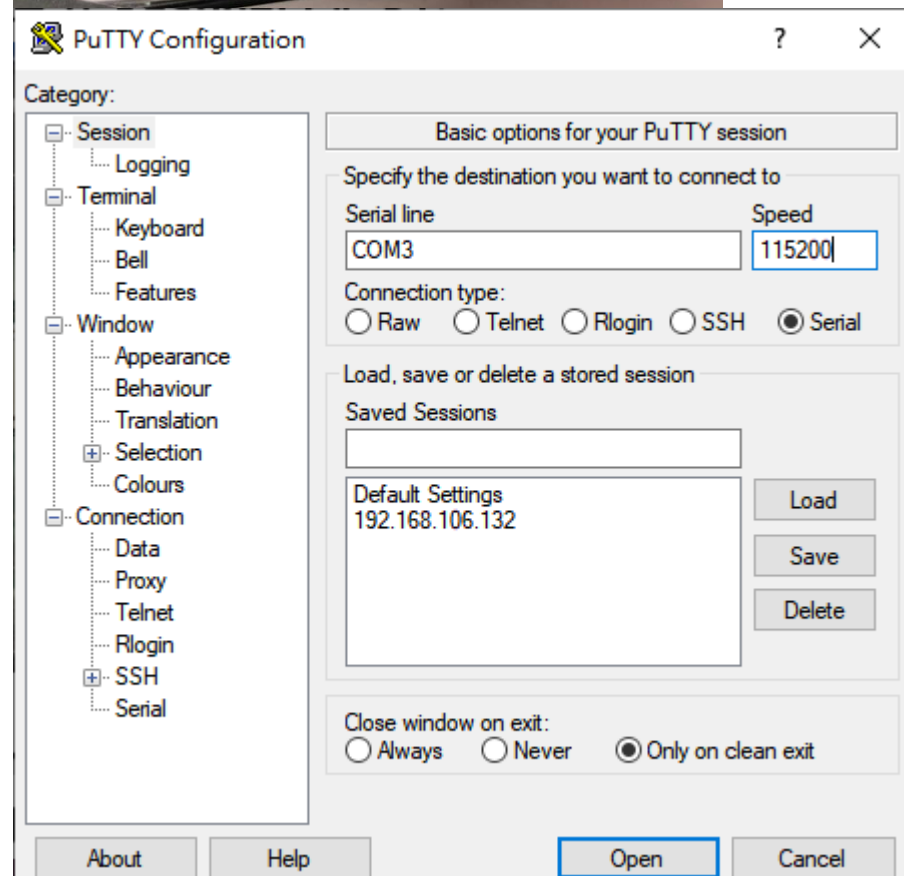
實驗名稱：System backup

實驗目的：

- 從序列埠登入 Raspberry Pi
- 擷取 image file 裡的檔案
- 備份系統 dd

實驗步驟：

- 從序列埠登入 Raspberry Pi



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➤ Mount Image File

1. 獲取分割資訊

```
andy@ubuntu:~/disk/buildroot/output/images$ fdisk sdcard.img

Welcome to fdisk (util-linux 2.27.1).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.


Command (m for help): p
Disk sdcard.img: 152 MiB, 159384064 bytes, 311297 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x00000000


Device            Boot Start      End  Sectors  Size Id Type
sdcard.img1 *             1    65536     65536    32M  c W95 FAT32 (LBA)
sdcard.img2             65537   311296    245760   120M  83 Linux

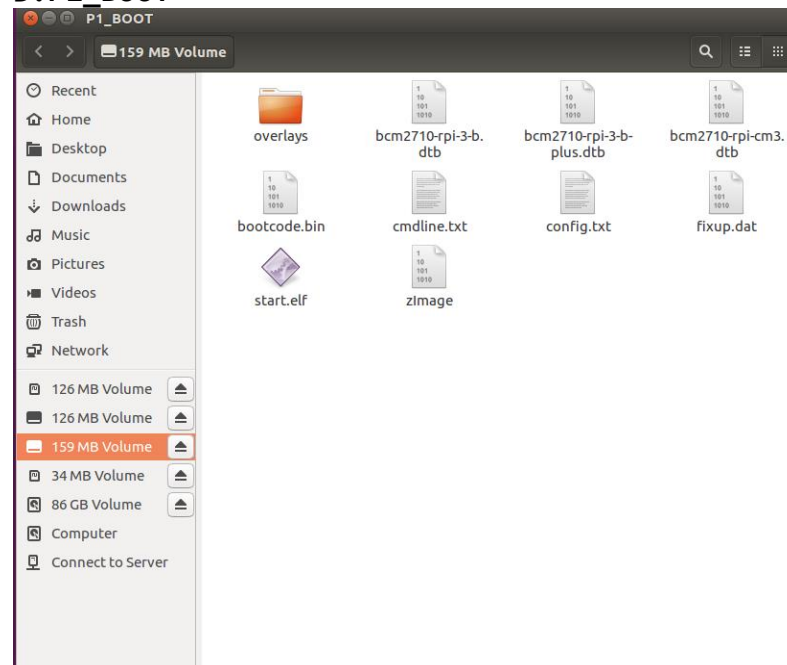
Command (m for help):
```

2. Mount First Partition to P1_BOOT

Mount Second Partition to P2_ROOTFS

```
andy@ubuntu:~/disk/buildroot/output/images$ sudo mount -o loop,offset=$((1*512))
sdcard.img P1_BOOT
andy@ubuntu:~/disk/buildroot/output/images$ sudo mount -o loop,offset=$((65537*5
12)) sdcard.img P2_ROOTFS
```

3. P1_BOOT

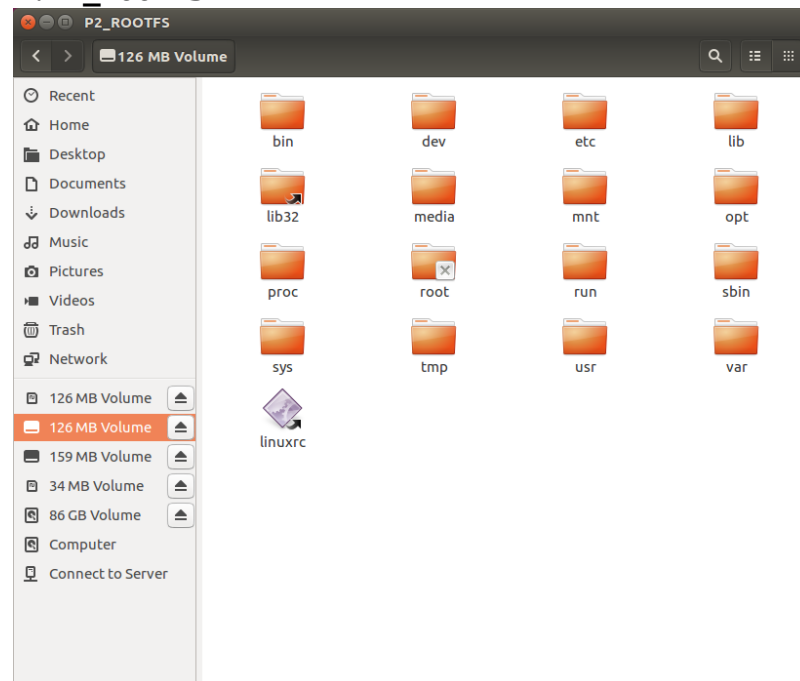


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4. P2_ROOTFS



➤ 備份 SD card

1.Backup SD card

```
andy@ubuntu:~/disk$ sudo -s
root@ubuntu:~/disk# dd if=/dev/sdc of=backup.img
31116288+0 records in
31116288+0 records out
15931539456 bytes (16 GB, 15 GiB) copied, 1184.04 s, 13.5 MB/s
```

2.Backup BOOT Part

```
root@ubuntu:~/disk# dd if=/dev/sdc1 of=boot_part.img
65536+0 records in
65536+0 records out
33554432 bytes (34 MB, 32 MiB) copied, 0.193731 s, 173 MB/s
```

3.Backup ROOTFS Part

```
root@ubuntu:~/disk# dd if=/dev/sdc2 of=filesys_part.img
245760+0 records in
245760+0 records out
125829120 bytes (126 MB, 120 MiB) copied, 12.6067 s, 10.0 MB/s
```

4.Result

```
andy@ubuntu:~/disk/Backup$ ll
total 15713804
drwxrwxr-x 2 andy andy      4096 May 15 11:26 ./
drwxr-xr-x 8 andy andy      4096 May 15 11:28 ../
-rw-r--r-- 1 andy andy 15931539456 May 15 11:26 backup.img
-rw-r--r-- 1 andy andy  33554432 May 15 11:26 boot_part.img
-rw-r--r-- 1 andy andy 125829120 May 15 11:26 filesys_part.img
```

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➤ 備份系統:使用 rsync

1.利用 dd 建立 image file

```
Command (m for help): p
Disk /dev/sdc: 14.9 GiB, 15931539456 bytes, 31116288 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0xd5d17f5c

Device      Boot Start    End Sectors  Size Id Type
/dev/sdc1   *          1  65536    65536   32M  c W95 FAT32 (LBA)
/dev/sdc2             65537 311296   245760  120M  83 Linux

andy@ubuntu:~/disk/rsync$ sudo -s
[sudo] password for andy:
root@ubuntu:~/disk/rsync# dd if=/dev/zero of=filesystem.img bs=1024 count=245760
245760+0 records in
245760+0 records out
251658240 bytes (252 MB, 240 MiB) copied, 0.640698 s, 393 MB/s
root@ubuntu:~/disk/rsync#
```

2.透過 fdisk 分割 partition

```
root@ubuntu:~/disk/rsync# fdisk filesystem.img

Welcome to fdisk (util-linux 2.27.1).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table.
Created a new DOS disklabel with disk identifier 0x9622cc69.

Command (m for help): n
Partition type
   p   primary (0 primary, 0 extended, 4 free)
   e   extended (container for logical partitions)
Select (default p): p
Partition number (1-4, default 1): 1
First sector (2048-491519, default 2048):
Last sector, +sectors or +size[K,M,G,T,P] (2048-491519, default 491519):

Created a new partition 1 of type 'Linux' and of size 239 MiB.

Command (m for help): w
The partition table has been altered.
Syncing disks.

root@ubuntu:~/disk/rsync# fdisk filesystem.img

Welcome to fdisk (util-linux 2.27.1).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Command (m for help): p
Disk filesystem.img: 240 MiB, 251658240 bytes, 491520 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x9622cc69

Device      Boot Start    End Sectors  Size Id Type
filesystem.img1      2048 491519  489472  239M  83 Linux

Command (m for help):
```

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3. 透過 losetup 連結 image file 中的 partition

```
root@ubuntu:~/disk/rsync# losetup --offset=$((2048*512)) --sizelimit=$((489472*512)) /dev/loop0 filesystem.img
root@ubuntu:~/disk/rsync#
```

4. format image file 中的 partition

```
root@ubuntu:~/disk/rsync# mkfs.ext4 /dev/loop0
mke2fs 1.42.13 (17-May-2015)
Discarding device blocks: done
Creating filesystem with 244736 1k blocks and 61200 inodes
Filesystem UUID: aee416ba-0dfa-4902-a89f-752132ad943d
Superblock backups stored on blocks:
    8193, 24577, 40961, 57345, 73729, 204801, 221185

Allocating group tables: done
Writing inode tables: done
Creating journal (4096 blocks): done
Writing superblocks and filesystem accounting information: done
```

5. Mount the partition

```
root@ubuntu:~/disk/rsync# mkdir /mnt/sys_backup
root@ubuntu:~/disk/rsync# mount /dev/loop0 /mnt/sys_backup
root@ubuntu:~/disk/rsync#
```

6. rsync

```
mmc2/usr/sbin/partprobe -> ../../bin/busybox
mmc2/usr/sbin/rdate -> ../../bin/busybox
mmc2/usr/sbin/readprofile -> ../../bin/busybox
mmc2/usr/sbin/setlogcons -> ../../bin/busybox
mmc2/usr/sbin/ubirename -> ../../bin/busybox
mmc2/usr/share/
mmc2/usr/share/udhcpc/
mmc2/usr/share/udhcpc/default.script
mmc2/usr/share/udhcpc/default.script.d/
mmc2/var/
mmc2/var/cache -> ../tmp
mmc2/var/lock -> ../tmp
mmc2/var/log -> ../tmp
mmc2/var/run -> ../run
mmc2/var/spool -> ../tmp
mmc2/var/tmp -> ../tmp
mmc2/var/lib/
mmc2/var/lib/misc -> ../../tmp
mmc2/var/lib/random-seed
mmc2/var/www/

sent 62,645,165 bytes  received 35,211 bytes  4,642,990.81 bytes/sec
total size is 62,520,578  speedup is 1.00
root@ubuntu:~/disk/rsync#
```

6. 移除 pseudo device

```
root@ubuntu:~/disk/rsync# losetup -d /dev/loop0
root@ubuntu:~/disk/rsync#
```

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問題與討論：

● What is loop device?

Loop device 是一種偽設備(pseudo-device),也可以說是模擬設備。

在使用之前,一個 loop device 必須要與一個檔進行 mount。

這種結合方式給使用者提供了一個替代塊特殊檔的介面。

因此,如果這個檔包含有一個完整的檔案系統,那麼這個檔就可以像一個磁片設備一樣被 mount 起來。

● 請說明下面 rsync 使用的各個參數的意義：

```
$ rsync -axvH --delete /mnt/mmc2 /mnt/sys_backup/
```

-a: archive mode

-x: don't cross filesystem boundaries

-v: increase verbosity

-H: preserve hard links

--delete: delete extraneous files from dest dirs

/mnt/mmc2: SRC

/mnt/sys_backup/:DEST

心得：

這次的實驗讓我了解如何使用 TTL 連接樹梅派,以及如何備分樹梅派 SD 卡上的資料,跟如何使用 rsync 來備份資料。