

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 Forward 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
```

```

x 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

```

xwldfootw@wldfootw-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
wldfootw@wldfootw-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

```

PS C:\iperf-2.0.9-win64> .\iperf.exe -c linux1.csie.ntu.edu.tw -P 10
-----
Client connecting to linux1.csie.ntu.edu.tw, TCP port 5001
TCP window size: 208 KByte (default)
-----
[ 10] local 192.168.204.57 port 50018 connected with 140.112.30.32 port 5001
[ 12] local 192.168.204.57 port 50020 connected with 140.112.30.32 port 5001
[ 11] local 192.168.204.57 port 50019 connected with 140.112.30.32 port 5001
[ 9 ] local 192.168.204.57 port 50017 connected with 140.112.30.32 port 5001
[ 5 ] local 192.168.204.57 port 50013 connected with 140.112.30.32 port 5001
[ 6 ] local 192.168.204.57 port 50014 connected with 140.112.30.32 port 5001
[ 3 ] local 192.168.204.57 port 50011 connected with 140.112.30.32 port 5001
[ 4 ] local 192.168.204.57 port 50012 connected with 140.112.30.32 port 5001
[ 8 ] local 192.168.204.57 port 50016 connected with 140.112.30.32 port 5001
[ 7 ] local 192.168.204.57 port 50015 connected with 140.112.30.32 port 5001
ID Interval Transfer Bandwidth
10] 0.0-10.0 sec 98.4 MBytes 82.5 Mbits/sec
12] 0.0-10.0 sec 112 MBytes 94.1 Mbits/sec
11] 0.0-10.0 sec 93.1 MBytes 78.0 Mbits/sec
9 ] 0.0-10.0 sec 131 MBytes 110 Mbits/sec
5 ] 0.0-10.0 sec 113 MBytes 94.4 Mbits/sec
6 ] 0.0-10.0 sec 92.5 MBytes 77.5 Mbits/sec
3 ] 0.0-10.0 sec 99.6 MBytes 83.5 Mbits/sec
4 ] 0.0-10.0 sec 130 MBytes 108 Mbits/sec
8 ] 0.0-10.0 sec 106 MBytes 89.0 Mbits/sec
7 ] 0.0-10.0 sec 81.5 MBytes 68.3 Mbits/sec
SUM] 0.0-10.0 sec 1.03 GBytes 883 Mbits/sec
PS C:\iperf-2.0.9-win64> .\iperf.exe -c linux1.csie.ntu.edu.tw
-----
Client connecting to linux1.csie.ntu.edu.tw, TCP port 5001
TCP window size: 208 KByte (default)
-----
[ 3 ] local 192.168.204.57 port 50021 connected with 140.112.30.32 port 5001
ID Interval Transfer Bandwidth
3 ] 0.0-10.0 sec 890 MBytes 747 Mbits/sec

```

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>

y

<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。

```
[ OK ] Started File System Check on /dev/mapper/home.
Mounting /home...
[ 18.513975] EXT4-fs (dm-4): bad geometry: block count 1048576 exceeds size of device (1048064 blocks)
[FAILED] Failed to mount /home.
See 'systemctl status home.mount' for details.
[DEPEND] Dependency failed for /home/zeus/course.
[DEPEND] Dependency failed for Local File Systems.
[DEPEND] Dependency failed for Relabel all filesystems, if necessary.
Starting Import network configuration from initramfs...
Starting Tell Plymouth To Write Out Runtime Data...
[ OK ] Started Tell Plymouth To Write Out Runtime Data.
[ OK ] Started Import network configuration from initramfs.
Starting Create Volatile Files and Directories...
[ OK ] Started Emergency Shell.
[ OK ] Reached target Emergency Mode.
[ OK ] Started Create Volatile Files and Directories.
Starting Update UTMP about System Boot/Shutdown...
[ OK ] Started Update UTMP about System Boot/Shutdown.
Starting Update UTMP about System Runlevel Changes...
[ OK ] Started Update UTMP about System Runlevel Changes.
Welcome to emergency mode! After logging in, type "journalctl -xb" to view
system logs, "systemctl reboot" to reboot, "systemctl default" or ^D to
try again to boot into default mode.
Give root password for maintenance
(or press Control-D to continue): _
```

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

```
Please enter passphrase for disk Zeus-home (home) on /home!:_
```

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
```

```

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   512B  0 part
├─sda5      8:5    0    3G  0 part
│   └─Zeus-video 253:3    0    2G  0 lvm  /home/zeus/course
├─sda6      8:6    0    2G  0 part  /btrfsdisk
├─sda7      8:7    0    2G  0 part
└─sr0      11:0    1   918M  0 rom

Label: none  uuid: 68adf372-6498-40e1-a24f-c715b2c4cb5f
    Total devices 2 FS bytes used 256.00KiB
    devid    1 size 2.00GiB used 417.50MiB path /dev/sda6
    devid    2 size 2.00GiB used 417.50MiB path /dev/sda7

```

Reference:

<https://www.phoronix.com/scan.php?page=article&item=linux-50-filesystems&num=4>

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