NASA HW2

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NA

Short Answer

1. In CSMA/CD & CSMA/CA, CD stands for collision detection, CA stands for collistion avoidance. CSMA/CD monitors for collision during transmission, and terminate as soon as a collision is detected, while CSMA/CA determines if others are transmitting or not beforehand.

   CSMA/CD is not possible for wireless networks, due to wireless transmitters typically can not sense for collisions while transmitting.

   > https://en.wikipedia.org/wiki/Carrier-sense_multiple_access_with_collision_detection
   >
   > https://en.wikipedia.org/wiki/Carrier-sense_multiple_access_with_collision_avoidance

2. Collision domain is where transmissions from multiple devices can collide with one another, broadcast domain is a range of devices where every device can reach each other with a broadcast message.

   (a) Hubs can not split collision domain nor broadcast domain, since all it does is just forwarding all input signals to all connected devices.

   (b) Switches can split collision domain, since it can actually choose which device to send packets to, thus every port is in a different collision domain. However, it can not split broadcast domain, since when a switch recives a broadcast message, it still send it to everyone.

   (c) Routers can split both collision and broadcast domain. It connects between local networks and the internet, and only direct the data between them to each other, it never broadcast message to everyone, thus seperates different broadcast and collision domain.

   > https://en.wikipedia.org/wiki/Broadcast_domain
   >
   > https://en.wikipedia.org/wiki/Collision_domain

3. Broadcast storm is when switches in a LAN are connected with redundant links, which creates a loop, causing broadcast messages loop around and use up most of the bandwidth, making it unable to transport normal traffic.

   The STP solves this problem by cataloguing redundant links on the network, and block some of the redundant links so that the network forms a spanning tree with a selected switch as the root. When one of the links broke, it will re-enable one of the blocked redundant links so the network can continue without problem.

   > http://en.wikipedia.org/wiki/Spanning_Tree_Protocol

IPerf

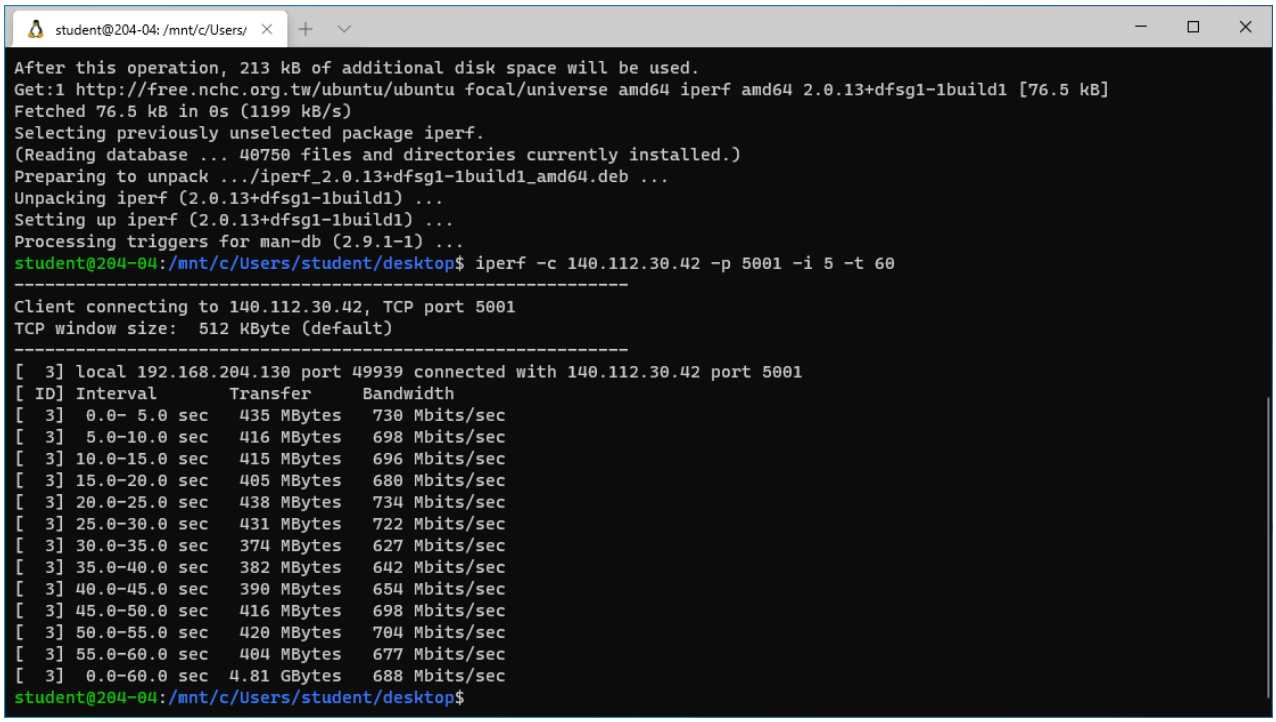
> References: iperf manual page

- Testing steps

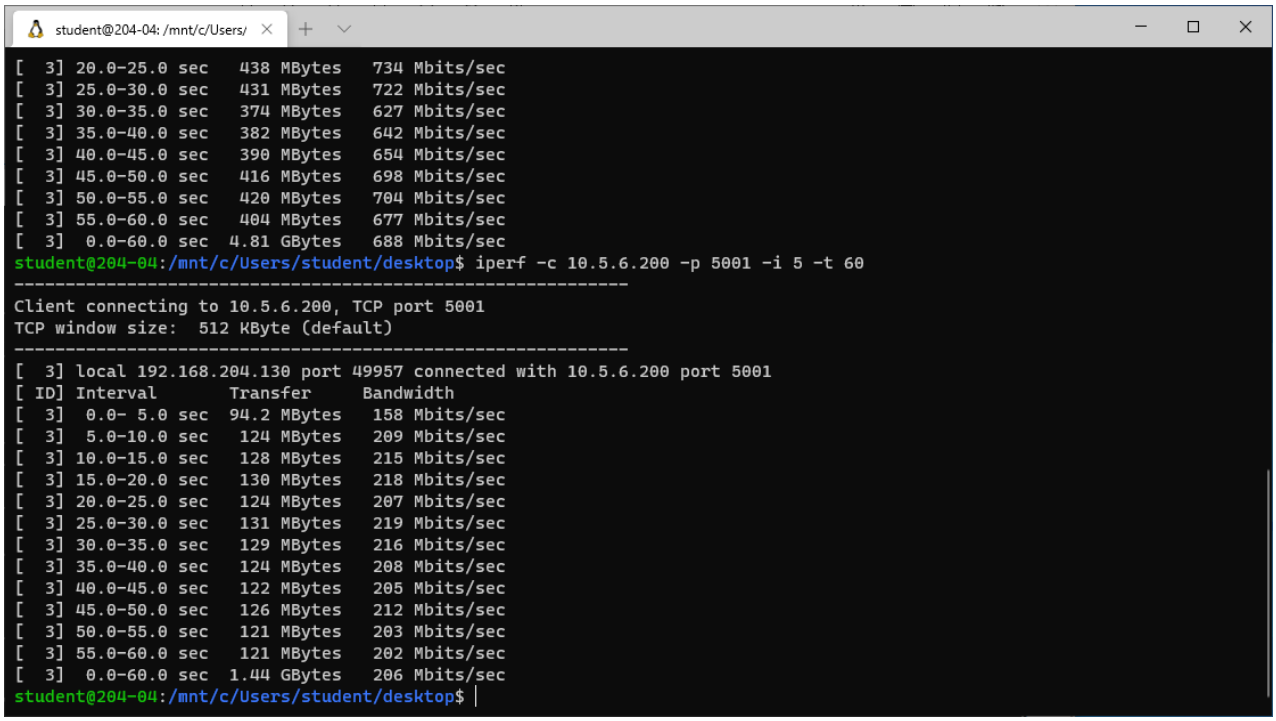
  On one side, use `iperf -s` to listen.

  On the other side, use `iperf -c <ip of the server> -p 5001 -i 5 -t 60` to test every 5 sec for 1 min.

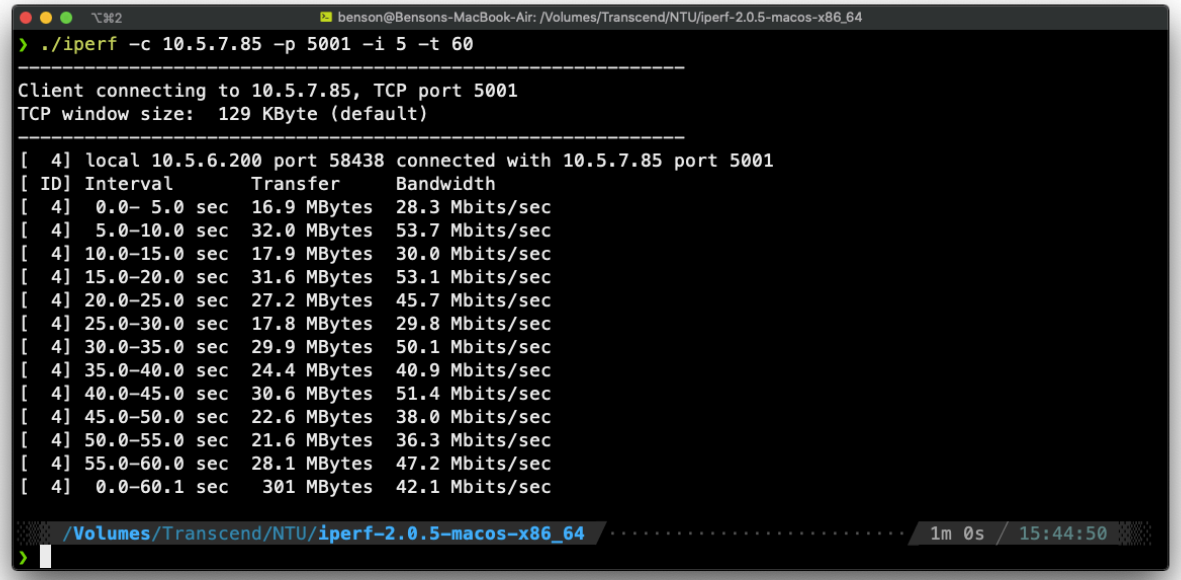
- 204 PC - Workstation



- 204 PC - Wifi device



- Wifi device - Wifi device



204 - Workstation: It's a wired connection, so naturally it's super fast.

204 (upload) - Wifi device (download): Choke point is wifi download speed.

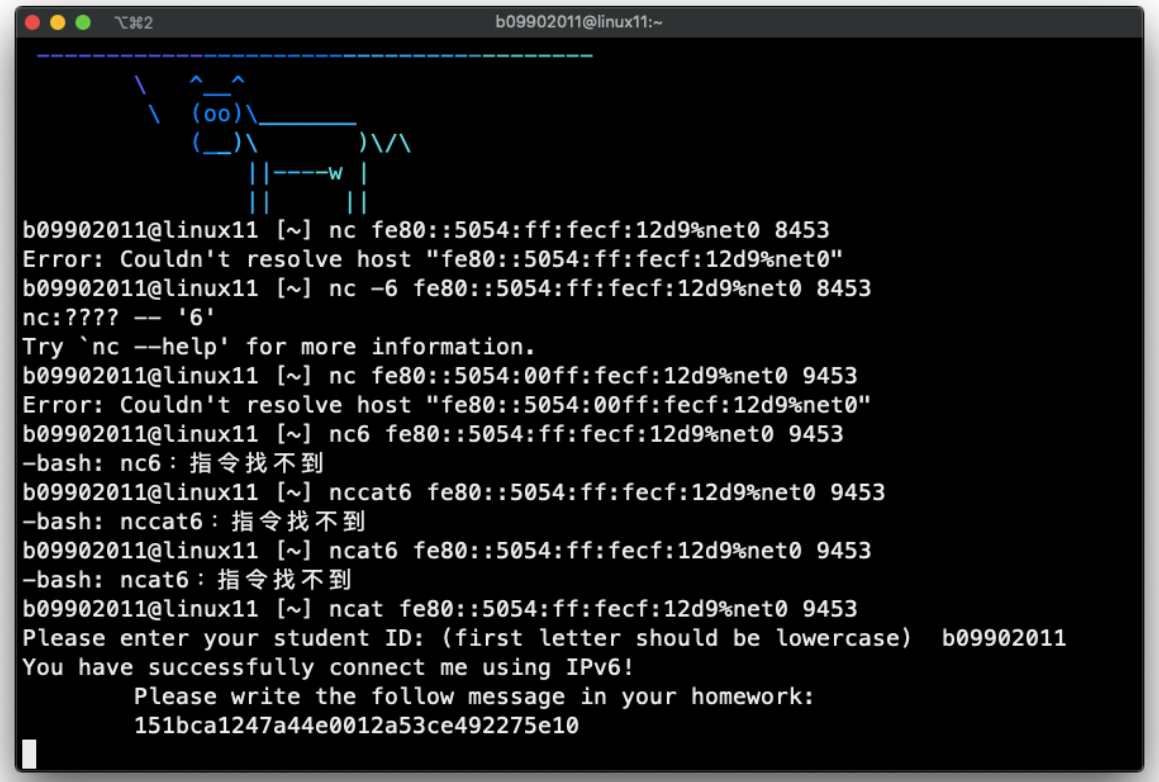
Wifi device (upload) - Wifi device (download): Choke point is wifi upload speed.

Therefore in terms of bandwidth, (1) > (2) > (3).

IPv6

On `oasis1.csie.ntu.edu.tw`, we can use `netstat -tupln` to find the server is running at `fe80::5054:ff:fecf:12d9`.

The `fe80` makes it so we must connect from within the network, and specify the network interface.



Here you go: `151bca1247a44e0012a53ce492275e10`

SA

> References for this section: https://btrfs.wiki.kernel.org/index.php/Main_Page
>
> Discussed with 郭懷元、林弘毅

1

```
su
umount /dev/sda3
e2fsck -f /dev/sda3
resize2fs /dev/sda3 5G
gdisk: d 3, n 3(+5G), n 4(all), t 0700(microsoft basic data), w
mkfs.exfat /dev/sda4
vim /etc/fstab
# change "UUID=..." to /dev/sda3
# add line "/dev/sda4 /home/nasa/share exfat defaults 0 0"
reboot
```

```
[root@nasahw2 nasa]# lsblk; df -hT
NAME   MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda      8:0    0   20G  0 disk
|-sda1   8:1    0  256M  0 part /boot
|-sda2   8:2    0  9.1G  0 part /
|-sda3   8:3    0    5G  0 part /home/nasa/documents
`-sda4   8:4    0  5.7G  0 part /home/nasa/share
sdb      8:16   0   16G  0 disk
sdc      8:32   0   16G  0 disk
sdd      8:48   0   16G  0 disk
sde      8:64   0    8G  0 disk
`-sde1   8:65   0    8G  0 part /home/nasa/backup
Filesystem     Type      Size  Used Avail Use% Mounted on
dev            devtmpfs  2.0G     0  2.0G   0% /dev
run            tmpfs     2.0G  664K  2.0G   1% /run
/dev/sda2      ext4      8.8G  3.1G  5.3G  37% /
tmpfs          tmpfs     2.0G     0  2.0G   0% /dev/shm
tmpfs          tmpfs     4.0M     0  4.0M   0% /sys/fs/cgroup
tmpfs          tmpfs     2.0G     0  2.0G   0% /tmp
/dev/sde1      btrfs     8.0G  3.6M  7.5G   1% /home/nasa/backup
/dev/sda4      exfat     5.7G   96K  5.7G   1% /home/nasa/share
/dev/sda3      ext4      4.9G   33M  4.6G   1% /home/nasa/documents
/dev/sda1      vfat      256M   46M  211M  18% /boot
tmpfs          tmpfs     392M     0  392M   0% /run/user/1000
[root@nasahw2 nasa]#
```

2

```
su
dd if=/dev/zero of=/myswap bs=1G count=2
mkswap /myswap
swapon /myswap
```

```
[root@nasahw2 nasa]# free -h
              total        used        free      shared  buff/cache   available
Mem:          3.8Gi        91Mi       1.6Gi       1.0Mi       2.1Gi       3.5Gi
Swap:         2.0Gi          0B       2.0Gi
[root@nasahw2 nasa]# _
```

3

```
su
mkfs.btrfs -d raid1 -m raid1 -f /dev/sdb /dev/sdc
mount /dev/sdb /home/nasa/mnt
```

```
[root@nasahw2 nasa]# sudo btrfs filesystem show /home/nasa/mnt
Label: none  uuid: 56216ed3-9f47-4cc6-9c9a-a7eceb57e166
        Total devices 2 FS bytes used 448.00KiB
        devid    1 size 16.00GiB used 1.26GiB path /dev/sdb
        devid    2 size 16.00GiB used 1.26GiB path /dev/sdc

[root@nasahw2 nasa]# sudo btrfs filesystem df /home/nasa/mnt
Data, RAID1: total=1.00GiB, used=320.00KiB
System, RAID1: total=8.00MiB, used=16.00KiB
Metadata, RAID1: total=256.00MiB, used=112.00KiB
GlobalReserve, single: total=3.25MiB, used=0.00B
[root@nasahw2 nasa]#
```

4

```
su
btrfs subvolume create /home/nasa/mnt/@
btrfs subvolume create /home/nasa/mnt/@videos
btrfs subvolume create /home/nasa/mnt/@documents
mkdir /home/nasa/courses/videos
mkdir /home/nasa/courses/documents
vim /etc/fstab
# add lines:
# /dev/sdb /home/nasa/courses btrfs subvol=@ 0 0
# /dev/sdb /home/nasa/courses/videos btrfs subvol=@videos 0 0
# /dev/sdb /home/nasa/courses/documents btrfs subvol=@documents 0 0
reboot
```

```
[root@nasahw2 nasa]# btrfs subvolume list -p /home/nasa/courses
ID 258 gen 12 parent 5 top level 5 path @
ID 259 gen 9 parent 5 top level 5 path @videos
ID 260 gen 10 parent 5 top level 5 path @documents
[root@nasahw2 nasa]# cat /etc/fstab
# /dev/sda2 UUID=ade68796-6e1e-4a05-b443-fdc6be933014
PARTUUID=f80310f1-f90e-0144-b5b0-7a8ba789d8b7   /               ext4            rw,relatime     0 1

tracefs                 /sys/kernel/tracing     tracefs         rw,nosuid,nodev,noexec  0 0

# /dev/sda3 UUID=3a8af8d5-7777-42e3-ba36-026647029d5
/dev/sda3       /home/nasa/documents    ext4            rw,relatime     0 2

# /dev/sda1 UUID=2177-52A4
PARTUUID=e1ca0f4c-a859-ab49-96b5-ed154009fbd4   /boot           vfat            rw,relatime,fmask=0022,dmask=0022,codepage=437,i
ocharset=ascii,shortname=mixed,utf8,errors=remount-ro   0 2

# /dev/sdd1 UUID=b2d6670d-b2bb-4af3-ab47-7500a8e1520b LABEL=backup
PARTUUID=dfa995af-b842-ad4f-a3a4-c7ca47c83bb8   /home/nasa/backup       btrfs           rw,relatime,space_cache,subvolid=5,subvo
l=/     0 0

/dev/sda4  /home/nasa/share exfat defaults 0 0
/dev/sdb /home/nasa/courses btrfs subvol=@ 0 0
/dev/sdb /home/nasa/courses/videos btrfs subvol=@videos 0 0
/dev/sdb /home/nasa/courses/documents btrfs subvol=@documents 0 0
[root@nasahw2 nasa]#
```

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```
su
btrfs subvolume snapshot -r /home/nasa/courses/documents
/home/nasa/courses/documents_backup
```

6

```
su
mv /home/nasa/videos/* /home/nasa/courses/videos
btrfs subvolume snapshot -r /home/nasa/courses/videos
/home/nasa/courses/videos_backup
btrfs send /home/nasa/courses/videos_backup | btrfs receive /home/nasa/backup
```

```
[root@nasahw2 courses]# btrfs subvolume list -p /home/nasa/backup
ID 257 gen 18 parent 5 top level 5 path videos_backup
[root@nasahw2 courses]#
```

7

```
su
btrfs add device /dev/sdd /home/nasa/courses
btrfs balance start -dconvert=raid5 -mconvert=raid5 /home/nasa/courses
```

```
[root@nasahw2 courses]# btrfs filesystem df /home/nasa/courses; btrfs filesystem show /home/nasa/courses
Data, RAID5: total=2.00GiB, used=54.73MiB
System, RAID5: total=128.00MiB, used=16.00KiB
Metadata, RAID5: total=512.00MiB, used=272.00KiB
GlobalReserve, single: total=3.25MiB, used=0.00B
Label: none  uuid: 56216ed3-9f47-4cc6-9c9a-a7eceb57e166
        Total devices 3 FS bytes used 55.02MiB
        devid    1 size 16.00GiB used 1.31GiB path /dev/sdb
        devid    2 size 16.00GiB used 1.31GiB path /dev/sdc
        devid    3 size 16.00GiB used 1.31GiB path /dev/sdd

[root@nasahw2 courses]# _
```

8

```
sudo btrfs device delete /dev/sdc /home/nasa/courses
btrfs balance start -dconvert=raid1 -mconvert=raid1 /home/nasa/courses
```

```
[root@nasahw2 courses]# btrfs filesystem df /home/nasa/courses; btrfs filesystem show /home/nasa/courses
Data, RAID1: total=2.00GiB, used=54.48MiB
System, RAID1: total=64.00MiB, used=16.00KiB
Metadata, RAID1: total=256.00MiB, used=256.00KiB
GlobalReserve, single: total=3.25MiB, used=0.00B
Label: none  uuid: 56216ed3-9f47-4cc6-9c9a-a7eceb57e166
        Total devices 2 FS bytes used 54.75MiB
        devid    1 size 16.00GiB used 2.31GiB path /dev/sdb
        devid    3 size 16.00GiB used 2.31GiB path /dev/sdd

[root@nasahw2 courses]# _
```

9

1. Ext4 v.s btrfs:

	Ext4	btrfs
Max. File size	16TB	16EB
Max. File number	2^{32}	2^{64}
Snapshots	No	Yes
RAID	No	Yes

> https://linuxhint.com/btrfs-vs-ext4-filesystems-comparison/

1. RAID
    - RAID 0: Combining multiple drives' space to make a BIIIG drive.
    - RAID 1: Mirror everything on all drives, to get a drive with the size of the smallest among its components.
    - RAID 5: Uses one drive as checksum, and distribute data evenly to all remaining drives. When any one of the drives is broken, its data can be recovered from the rest. Require at least 3 drives.
    - RAID 10: Divide the drives to 2 groups, use RAID 1 to make each group into a drive, then make these 2 drives as a RAID 0 drive.

    > https://en.wikipedia.org/wiki/RAID

2. FUSE

    FUSE, or filesystem in userspace, is a framework allowing non-privileged users to mount and create their own filesystem. This is very helpful, however its somewhat slower, and has to be loaded from somewhere else to boot.

    > https://unix.stackexchange.com/questions/4146/what-are-the-benefits-and-downsides-to-use-fusefs-filesystems

3. ZFS & Hardware RAID

    ZFS is a 128 bit filesystem with integrated software RAID features, with supports for many unix-like OSes. Hardware RAID uses extra hardware to assist various RAID operations, which makes it faster and also won't take up CPU rescourses.

    Personally I would choose ZFS, just because it's more modern and hardware RAID is just too expensive.

    > https://en.wikipedia.org/wiki/ZFS#Summary