ICT Notes Compulsory C [CH 1]

1.2 Network Architecture

Local Area Network (LAN)

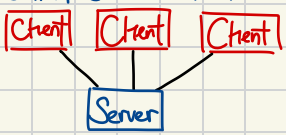
def a network covering a small local area {e.g. home, small offices}

Wide Area Network (WAN)

def a network ① connect through ISP !!!
② consisting many of LANs
③ covering a large area

	LAN	WAN
Coverage	Small	Large
Setup cost	Low	High
Data transfer rate	High	Low

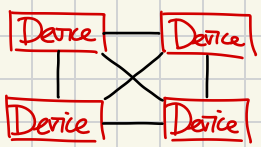
Client-Server Networks



(specific network service)

#remarks ① All resources stored in server and share among clients connected to it
② Administrator controls overall access control of server and shared resources
③ Server runs the provide specific network services on itself
⇒ server need to be more powerful and reliable

Peer-to-Peer Networks (P2P)



#remarks ① users share files on their own
② devices communicate with each other by some software {e.g. BT}
or by {e.g. Wi-Fi, Bluetooth, NFC}

	Client-Server Networks	P2P
pros	① user management by administrator ⇒ more secure	① No need to set up server ⇒ Lower setup cost
	② Easier to manage consistency (一致性) of versions of resources	② No need server knowledge ⇒ Easier to setup
	③ Easier to backup and recover data	③ Higher flexibility to add or remove devices
cons	① Higher setup and maintainance cost	① No centralised management ⇒ Less secure
	② More difficult to setup and maintain	② Require dedicated software
	③ Service stops if server is down	③ Difficult to control versions of resources

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1.4 Network Hardware

Network Interface Card (NIC)

def a circuit board inside a network device connecting the device to a network

Each NICs has a 48-bit unique Media Access Control (MAC) Address for identifying a device (# also known as physical address)

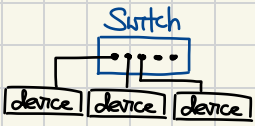
remark ① usually built-into motherboard through peripheral component interconnect (PCI)

② NIC → 1. Ethernet NIC
2 Wireless NIC

→ Network connecting devices

Switch

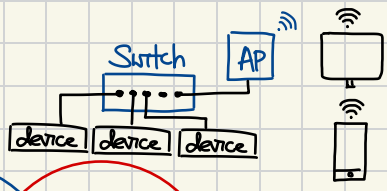
def ① connecting devices to form a LAN
② directs incoming data



Access Point (AP)

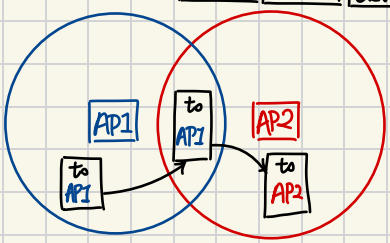
def connects directly to a wired LAN provide wireless connection to form wireless (LAN) through {eg Wi-Fi}

remark AP is identified by its SSID name



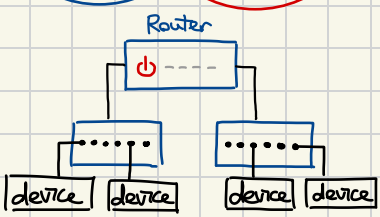
→ Wi-Fi Roaming

def When devices move from AP1 to AP2 wireless NIC disconnect from AP1 and connect to AP2 automatically



Router

def ① connects LANs each other
② connects LANs to WAN



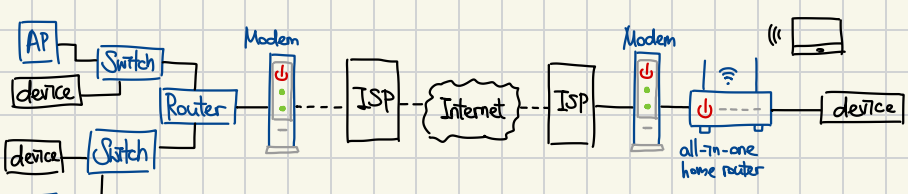
→ all-in-one home routers

def include functions of switch, AP, DNS server, firewall

Modem

def device usually provided by ISP for Internet connection

use analog signals (Internet) ←convert→ digital signal (computers)



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Asymetric Digital Subscriber Line (ADSL) Modem

download speed >> upload speed

Symetric Digital Subscriber Line (SDSL) Modem

remark Support both upload and download
⇒ larger bandwidth is need

download speed = upload speed

→ Network Cables

	UTP cable	STP cable	Fibre optical cable
pros	① Lower cost ② Easier to install	① Faster Transmission speed ③ Less affected by EM Interference (EMI)	① Fastest transmission speed ② Not affected by EMI ③ longer distance ④ Thinner and lighter
cons	① Short distance ② Affected by EMI	① Higher cost ② Short distance	① Highest cost ② Hard to install ③ Easy to be damage

→ Wireless communication links

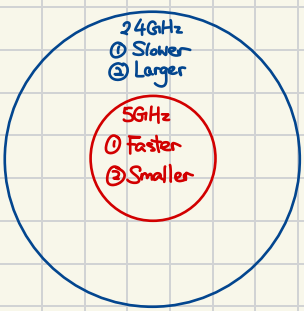
Satalite (衛星) # orbiting around Earth

Microwave (微波) # on top of buildings

Wi-Fi

① use radio wave ② Common use in forming Wireless LAN

Wi-Fi	2.4GHz	5GHz
Speed	Slower	Faster
Range	Larger	Smaller
Radio interference	More	Less
Wall penetration power (穿透)	Higher	Lower



Bluetooth

① use radio wave

② common use for short-distance wireless data transmission between mobile device

	Wired Network	Wireless Network
Adv	① Faster speed ② More secure	① Not require cables ② Higher flexibility
Disadv	① Lower mobility	① Slower speed ② Smaller range ③ more unstable ④ Lower security

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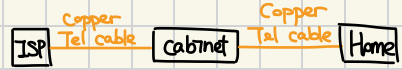
15 Methods of Internet access

Broadband

def high-speed wired Internet access method

Broadband Type	Download speed
ADSL Broadband 	Slowest
FTTC Broadband 	Medium
FTTH Broadband 	Fastest

Leased Line

def private network connect with ISP directly # remark not share infrastructure

provide fixed bandwidth, secure, stable connection

Mobile data

Generations 2G, 3G, 4G, 5G # remark 5G ≠ 5GHz !

5G larger capacity, lower latency, connect multiple devices

Wi-Fi Hotspots

def provide wireless Internet access services

36000 Wi-Fi Hotspots free to use

	Broadband	Leased Line	Mobile data	Wi-Fi Hotspot
Connectivity	Wired	Wired	Wireless	Wireless
Bandwidth	High	Highest	High	Moderate
Cost	Moderate	Highest	High	Low
Security	High	Highest	High	Moderate
Availability	High	Moderate	High	Low

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21 TCP/IP

TCP

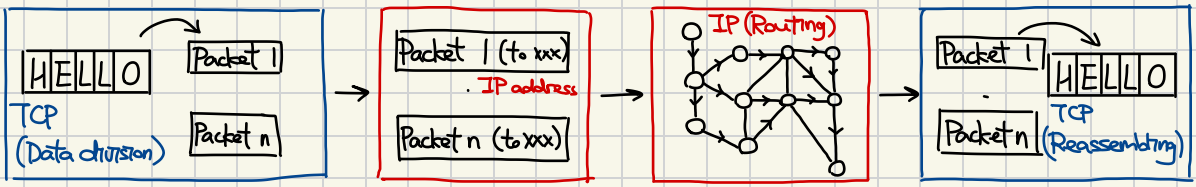
def ① divide data into smaller packets and numbered (# sent one by one)

② reassemble packets to original data

IP

def ① add destination address to each packet

② select path for each packet ⇒ avoid network congestion (# different path)



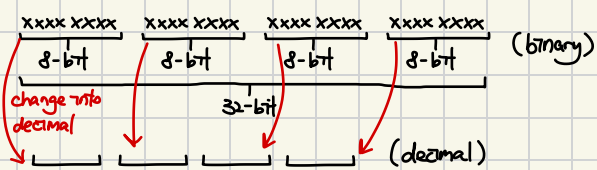
22 IP Address

IP Address

def changable numerical value identifying devices

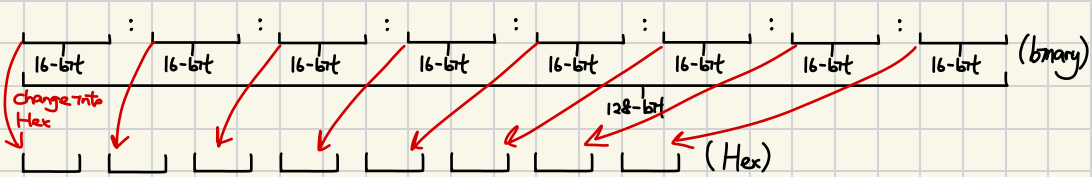
⇒ unique

→ IPv4



2^{32} availble address

→ IPv6



remark (Bin ↔ Hex)

aaaa bbbb cccc dddd (Bin)

↕ ↕ ↕ ↕

a' b' c' d' (Hex)

4 digit BIN ↔ 1 digit HEX

2^{128} availble address

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2.3 DNS

FQDN(Full Qualified Domain Name) #remark FQDN is unique

Hostname Domain Name
WWW.google.com.
Registration TLD
root domain

WWW tourism.gov.hk
TLD
gTLDs ccTLDs

FQDN = Hostname + Domain

Domain = Registration + TLD (# TLD = Top Level Domain)

TLD = gTLDs + ccTLDs (# gTLD = generic TLD ccTLD = country code TLD)

#remark Domain names are not the same !!!

① Registration are not the same

② TLD are not the same !!! {eg google.com ≠ google.com.hk}

gTLD include {eg com, edu, gov, org, net} ccTLD include {eg au, cn, hk, jp, uk}

DNS Server

def. Translating domain names into IP address (name resolution)

2.4 URL

URL

http // www.example.com.hk 80 /about/network.html
Network Protocol
FQDN
Port No
Path

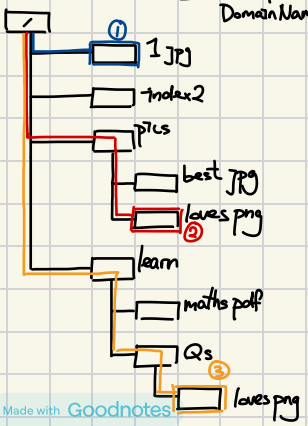
Network Protocol \def rules used for network communication

Port number \def identifying applications running the same host {eg www} (# not neccessary)

Path

def specific location of resources {eg

Folder structure of www.example.org.hk
Domain Name



Path ① 1.jpg

URL ① https // www.example.org.hk / 1.jpg

Path ② pics/loves.png

URL ② https // www.example.org.hk / pics / loves.png

Path ③ learn/Qs/loves.png

URL ③ https // www.example.org.hk / learn / Qs / loves.png

remark ① use "/" to seperate (see ↓)

② Network protocol can be "http//"

}

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2.5 Network Protocols

→ HTTP

HTTP = Hypertext Transfer Protocol

HTTPS = HTTP secure (# HTTPS use SSL to encrypt data)

When devices running web browser

① browser sends HTTP/HTTPS request to web server (# browser act as client)

② Web server response

	HTTP	HTTPS
URL begins with	http://	https://
Default Port No	80	443
Encryption	No	Yes
Security	Unsecure	Secure

→ Email Protocol

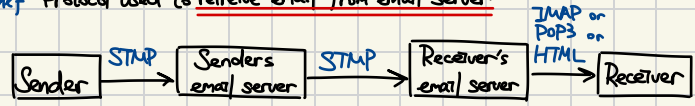
SMTP = Simple Mail Transfer Protocol

def Protocol used to send emails to email server

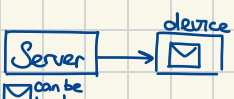
Email access protocol {eg

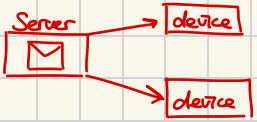
① IMAP ② POP3

def Protocol used to retrieve email from email server



POP3	IMAP
① emails download to local device	① emails kept on server
② emails organised on local device after being download	② emails organised on server changes on devices are consistent
③ No need Internet connection	③ need Internet connection





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3.2 Online Service

→ Email

Email recipients field

To \def original receiver

Cc \def ppl also receive the email, other recipients also know these ppl receive the email

Bcc \def ppl also receive the email, others do not know these ppl receive the email

Responding email

Reply \def to sender only

Reply all \def to sender, To, Cc

Forward \def to new recipient

Sending files

Attachments \def takes up storage in mail box (# ≤ 25 MB in general)

Inline embedding \def attachments shown in email directly (# usually support images)

Hyperlinks

def link open in browser

⇒ ① size limit much larger

② not taking up mail box storage but taking up storage where file is stored

3.4 Multimedia on Web

→ Graphics

① Bitmap Graphics

File format	JPG	PNG	GIF	APNG	WebP
Browser support	All	Most	Most	latest	latest
File size	lossy compression ⇒ Small	Lossless compressions ⇒ Large	Smaller	> GIF	< JPG
Features and Applications	A photos on social media	F① transparent background A① logos F② More details A② banners	F① Support animations F② Support 8-bit colors (lower color depth)	F① Support animations F② Support 24-bit colors (larger color depth)	F Support lossy and lossless compression A Newspaper

② Vector graphics

File format SVG

Browser support Most

File Size Vector graphic ⇒ Smaller

Features Without loss in quality even scale to any size

Application Interface components and diagrams

ICT Notes Compulsory C [CH3]

→ Audio

File format	MP3	FLAC	WAV
Browser support	Most	Most	Most
File size	lossy compression ⇒ Small	lossless ⇒ Large	Uncompressed ⇒ very large
Features and Applications	A Audio streaming	F High-quality	/

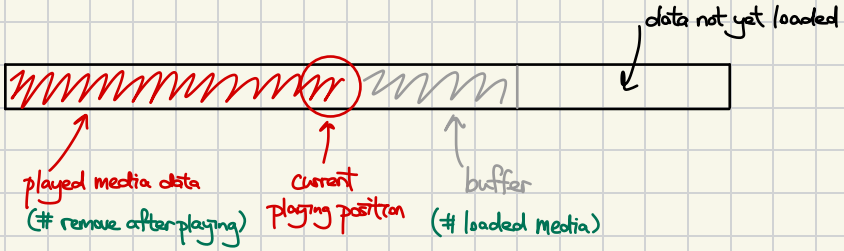
→ Video

File format	MP4	WebM
Browser support	Most	latest
File size	High compression rate ⇒ small	High compression rate ⇒ smaller
Features and Applications	A Streaming	A Streaming

3.5 Streaming

Streaming

def playing the media while downloading



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