Introduction to Computer Networks
計算機網路概論

因防疫要求，
前四週暫時改為線上遠距同步教學(MS-Teams)

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Dept. of Computer Science and Information Engineering, Asia University
Fall, 2021

(2 hrs)

Communication(通訊,溝通)

電腦網路(Computer Networks) **?**

- 有甚麼好學的?

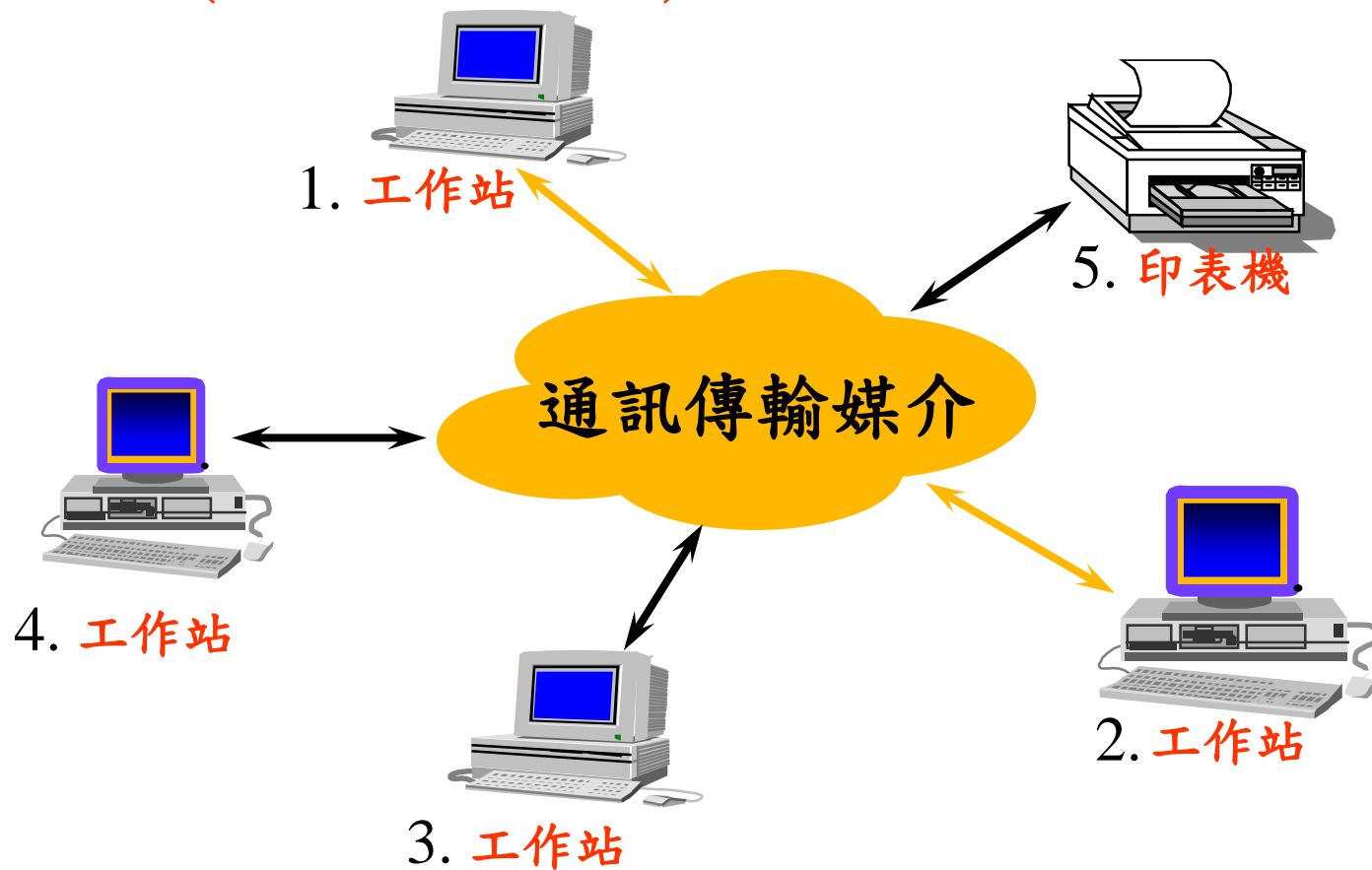Source: https://cc0.wfublog.com/ & http://photopin.com/

什麼是 "網路(Computer Networks)"?

- 找工作面試問你懂網路嗎?
  - 網際網路(Internet; 互聯網)?
  - 網際網路的**使用**?
  - Line, FB, IG, Email, **Google** ?
  - 聊天,遊戲,訂票,購物,定位?
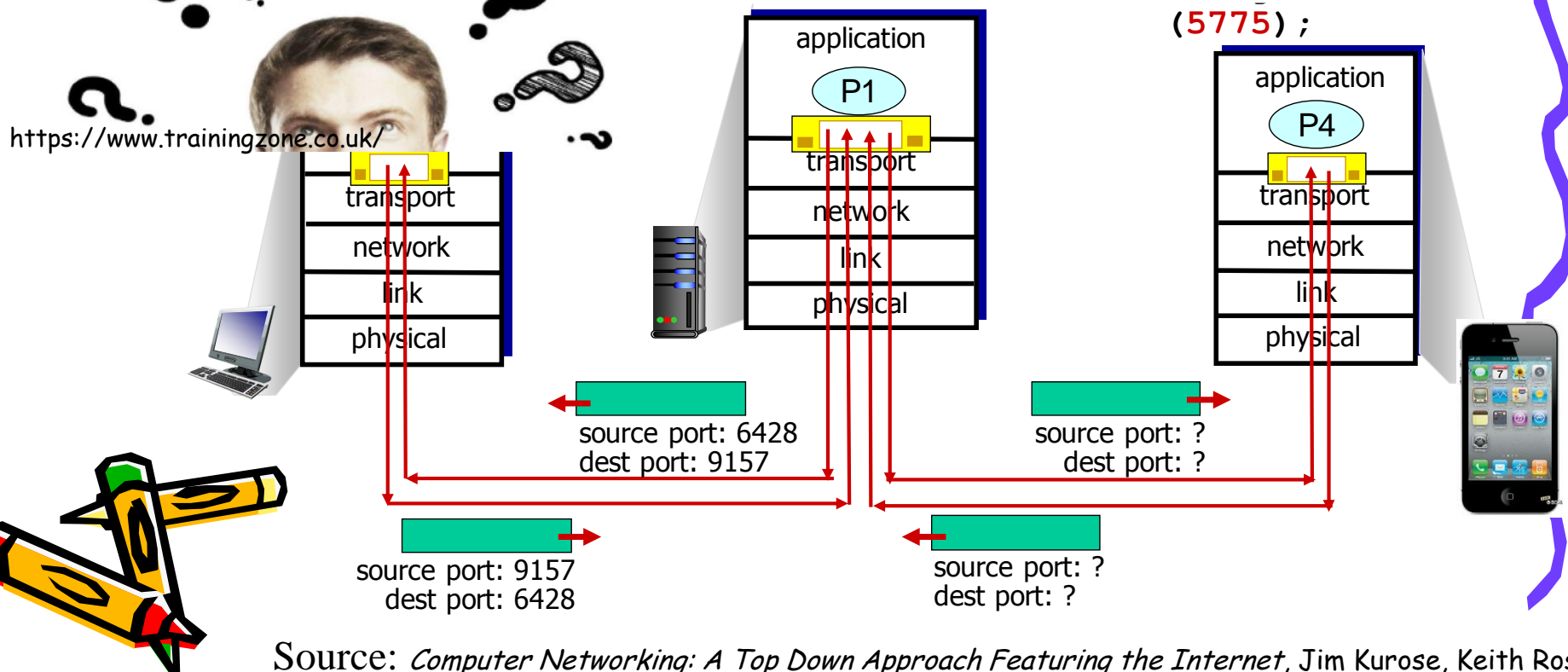 - 網路電視,追劇,音樂,Youtube?
- 以上已經是網路常識

⇨ 網路(Network):

1. 工作站

5. 印表機

通訊傳輸媒介

4. 工作站

3. 工作站

2. 工作站

兩台以上的電腦，透過某種形式的連線，達到訊息交換與資源共享的目的。

"網路(Computer Networks)"
設備/CPU/OS都不同,如何溝通?

比我們想像的還要複雜!

(5775);

https://www.trainingzone.co.uk/

application

P1

transport

network

link

physical

application

P4

transport

network

link

physical

transport

network

link

physical

source port: 6428
dest port: 9157

source port: ?
dest port: ?

source port: 9157
dest port: 6428

source port: ?
dest port: ?

Source: *Computer Networking: A Top Down Approach Featuring the Internet*, Jim Kurose, Keith Ross

"網路(Computer Networks)" 重要嗎?

- 每天我起床的第一件事?

- 上班/上學/生活要電、要網路
  - 提高工作/學習效率、提升生活品質

- AI←大數據←物聯網(IoT)←網路
  - 網路程式設計

Source: https://cc0.wfublog.com/ & http://photopin.com/

(物聯網)

IT Industry undergoes significant evolution every 15 years

- Green IT and sustainable development
- IPv6-ready
- Mobile broadband getting mature
- Cost effective intelligent devices
- Mobile backhaul expansion and migration
- Convergence of billing system
- Large processing capacity/cloud computing

Internet

Internet of Things (M2M)

Rise of PC

IT capability extends from desktop to value chain and business partners, supporting service and collaboration

IT capability expands from supporting people to supporting "things", realizing communication and collaboration among things

Mainframe

IT capability moves from back office to desktop

Emergence of Computer

IT capability limit to back office computer room

1950   1965   1980   1995   2010

Internet of Things (IoT): 物聯網

- 萬物聯網; 物物聯網; T2T; M2M

http://www.3g.co.uk/g_phones/large/internet-of-things-everything-you-need-to-know.jpg

- Sensor network感測器蒐集數據➔網路伺服器
- 雲端再做分析➔再透過網路回饋(循環系統)

www.youtube.com: 2016物聯網(黃能富教授之物聯網基礎架構與應用簡介)

物聯網➔大數據(網路蒐集)➔數據分析

1. 分析後下由經理人決策:

- FinTech(金融科技，Financial technology): 運用科技使金融服務變得更有效率
- 寫程式/網頁/數據、財務分析/基本帳務/投資分析/需求單
- App/大數據/資料探勘/區塊鏈(Block chain)/資訊安全/行動銀行

2. 分析後利用人工智慧(AI)輔助或自動化決策:

- 機器學習(Machine learning): AlphaGo!
- 智慧車(Smart Car)/機器人(Robot)/無人機

"網路(Computer Networks)" 重要嗎?

- 網路安全: ATM jackpotting

2016年東歐駭客集團駭入一銀倫敦分行，利用一臺電話錄音伺服器，橫跨1萬公里，遠端遙控北中兩地22家一銀分行的41臺ATM，十多名車手盜領8,327萬多元。

By Emsisoft Blog

– Backdoor, Firewall, Broadcast, DDoS

Source: http://mkamericas.com/atm-jackpotting-hits-us/

"網路(Computer Networks)" 重要嗎?

- 網路管理/網路分析

圖 2 通过管理进程和代理进程进行网络管理

Source: https://wiki.mbalib.com/zh-tw网络管理系统

Did you know?

- Network Components
  - Sender/Receiver
  - Message
  - Medium

Message

Message

Message →

Sender

Medium

Receiver

Source: *WCB/McGraw-Hill*
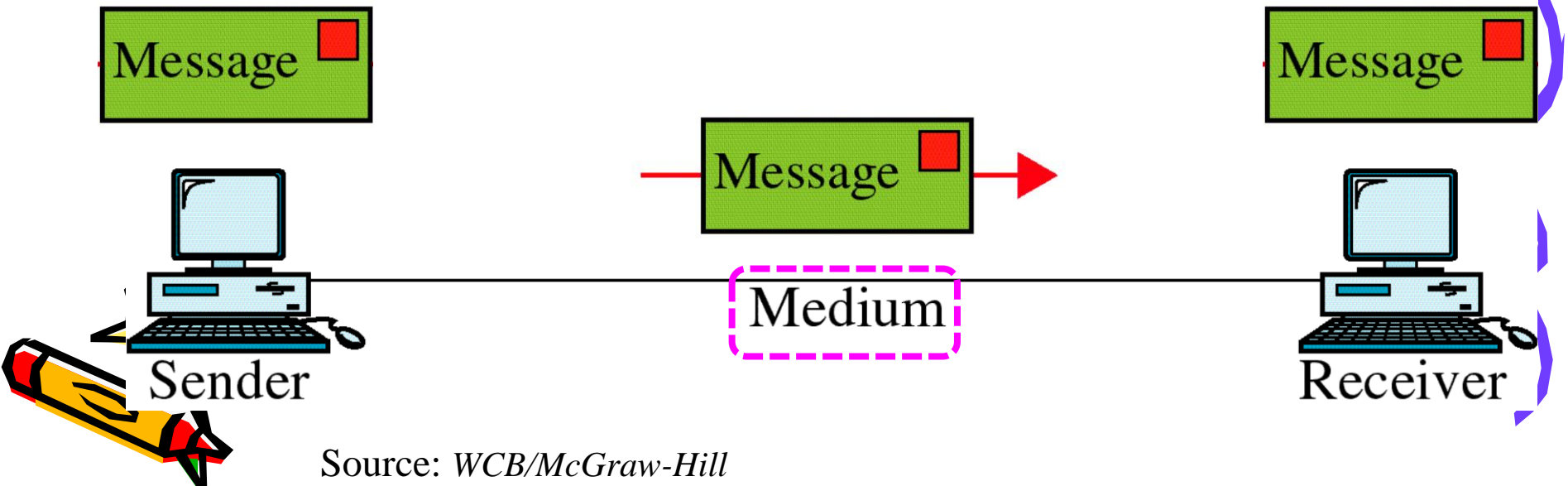
Did you know?

- Network Components
  - Message
  - Sender/Receiver
  - Medium
  - Protocol

Message

Step 1:
Step 2:
Step 3:
....
....

Protocol

Message

Step 1:
Step 2:
Step 3:
....
....

Protocol

Message
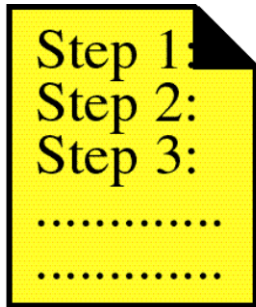
Medium

Sender
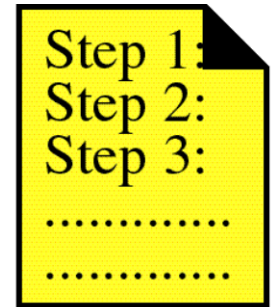
Receiver

Did you know?

- IP (Internet Protocol)
  - Addressing
    - IPv4
    - IPv6
    - Ping
  - Routing
  - Router
  - Traceroute

Computer Networking: A Top Down Approach Featuring the Internet,
Jim Kurose, Keith Ross
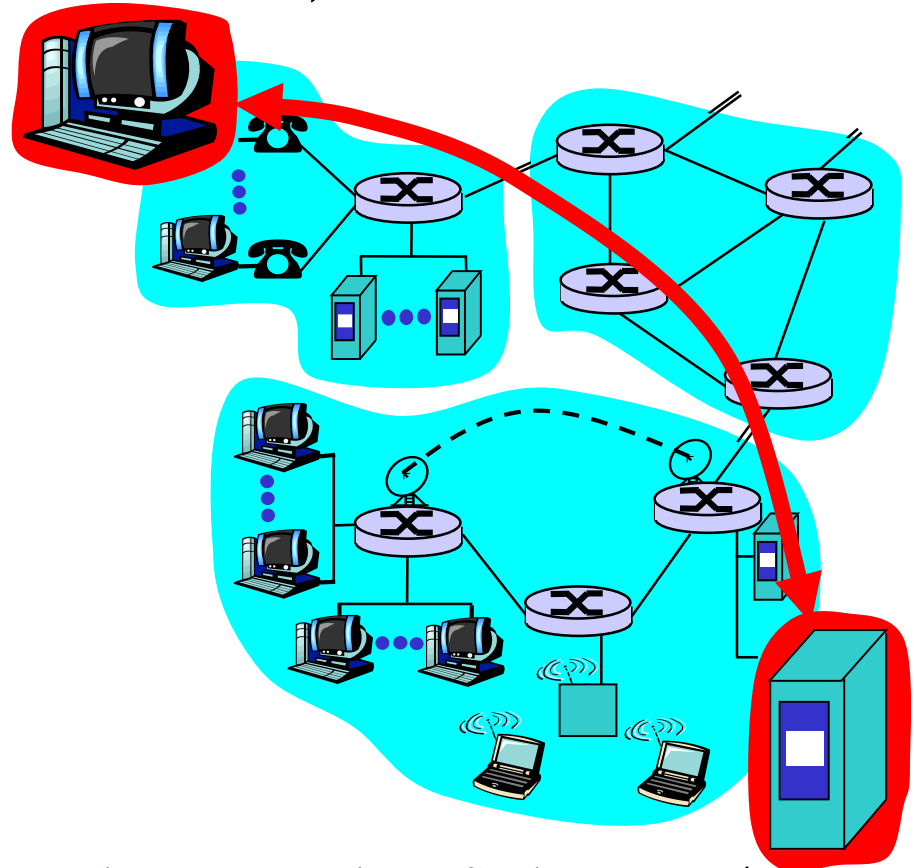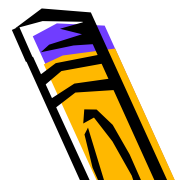
Did you know?

- TCP (Transmission Control Protocol) vs. UDP
  - Flow control
    - Socket
  - Congestion control

Bursty flow

Leaky bucket

Fixed flow
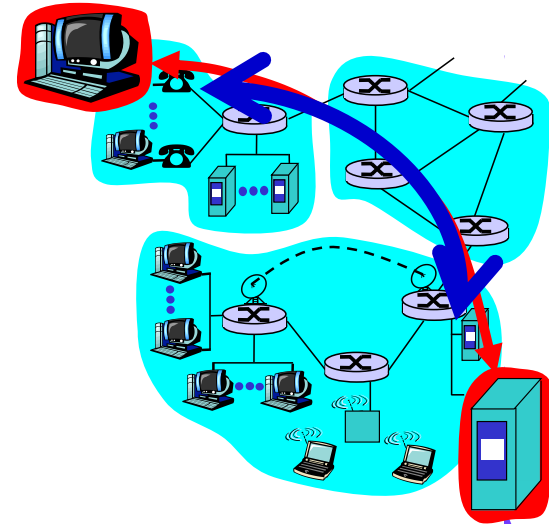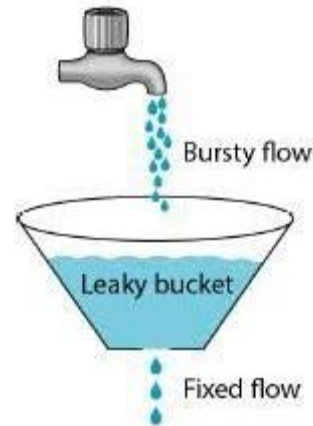
www.shutterstock.com · 110041646

Source: https://cc0.wfublog.com/ or http://photopin.com/ or Google
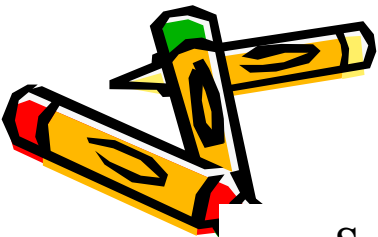
Did you know?

- Protocols
  - MAC: CSMA/CD, CSMA/CA, …
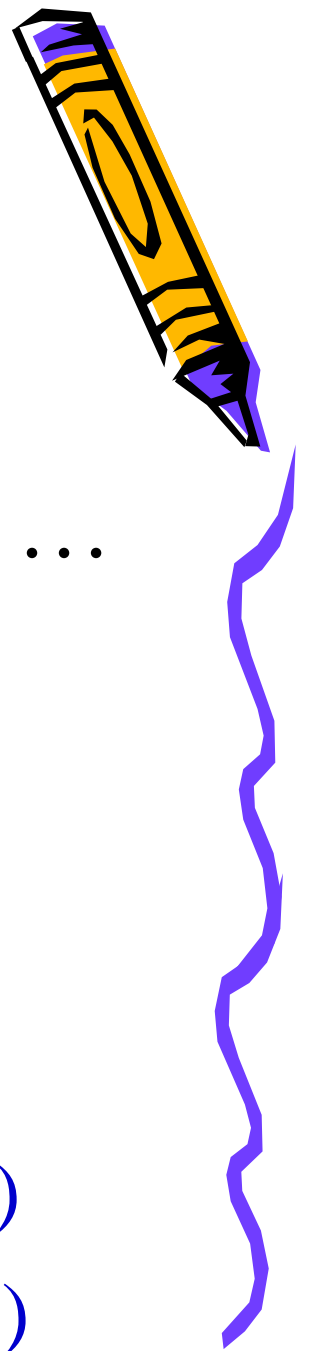 - IPv4, IPv6, IPX, AppleTalk, …
    - IPv4: 140.113.149.57
  - DHCP/NAT
  - DNS (Domain Name):
    - http://www.asia.edu.tw   (IANA)
    - http://亞洲大學.tw   (TWNIC)

Source: https://cc0.wfublog.com/ or http://photopin.com/ or Google
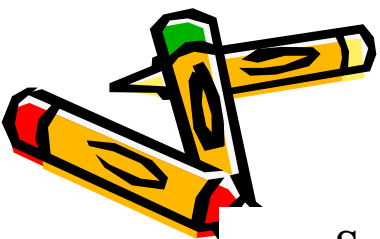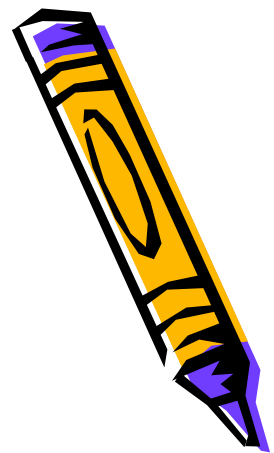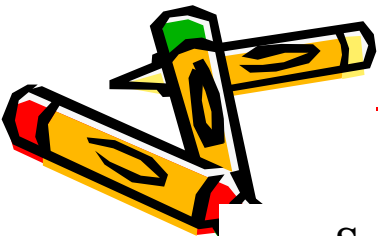
Did you know?

- LAN
  - Ethernet, …
  - WiFi, …
  - NIC/Hub/Switch/Router
- WAN
  - Internet, 3G/4G/5G
  - Intranet, VPN
  - ISP, ADSL, Cable, FTTH/B/C
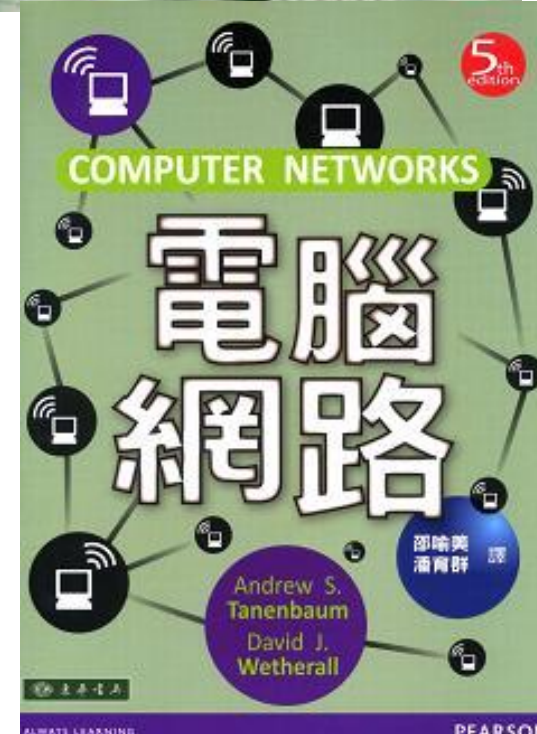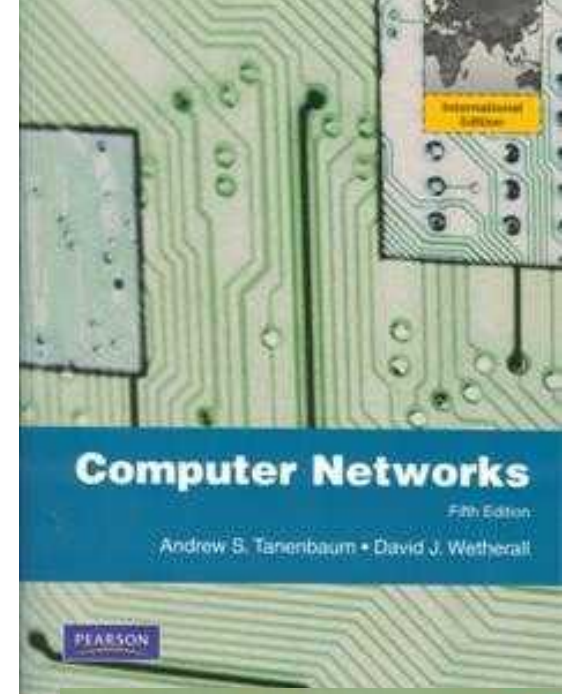
Administration

- Text:

  Andrew S. Tanenbaum, David J. "Computer Networks," 5th ed., Pearson Education (東華書局), 2011, ISBN:9789862800973。
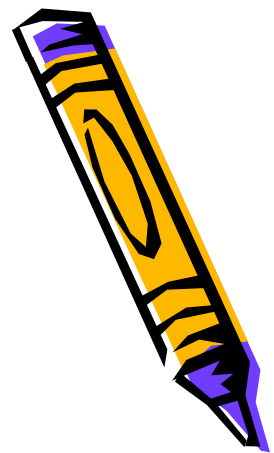
- Reference:

1. 邵喻美、潘育群譯, "電腦網路(第五版)," 東華書局, 2012.
2. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach," 7th ed., Pearson, 2016.
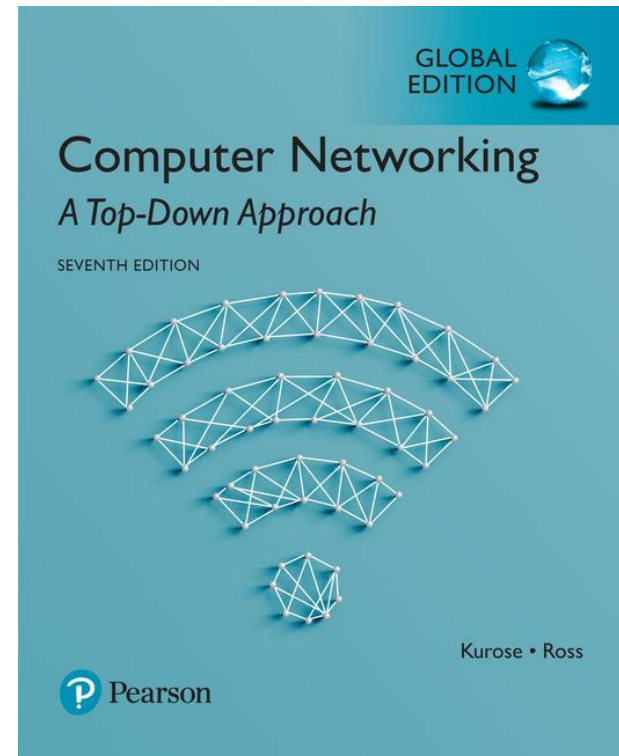
Administration (cont.)

- Reference:

2. James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach," 7th ed., Global Edition, Pearson, 2016, ISBN: 9781292153599

Administration(cont.)

- Instructor:

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- Office hours:

  TUE(二) 14:10 – 17:00   THU(四) 10:10 – 17:00
  FRI(五) 10:10 – 12:00

- Grade:

  Attendance (including Q&A)   10%
  Homework assignments & quiz   30%
  Mid-term exam 30% (若因防疫，則改為作業+小考+期中報告)
  Final exam (open book)   30%

手機(TronClass暢課APP):現在進行線上隨堂測驗

計算機網路概論
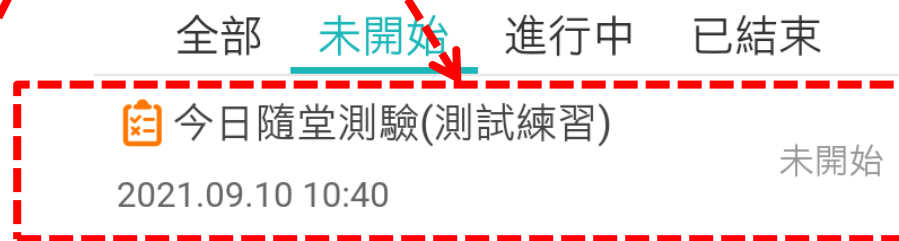
現在進行隨堂測驗

(只能使用手機TronClass暢課APP)
而且有時間限制

Q&A

祝大家有個充實而愉快的新學期!