

Computer sciences

Internet and security of computers

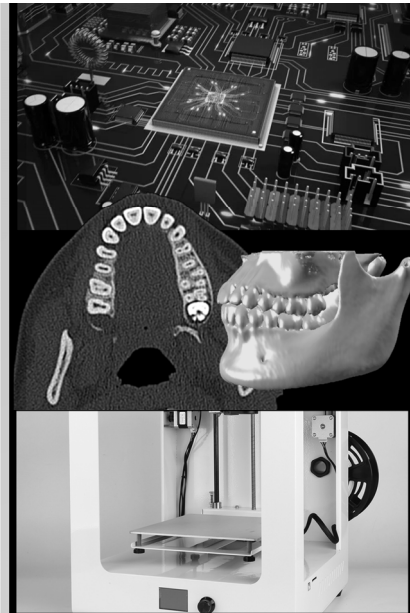
Chia-Feng Lu 盧家鋒

Department Of Biomedical Image And
Radiological Sciences, NYCU
Ext. 67308

alvin4016@nycu.edu.tw

[HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)

2025/11/10



Computer Network

- Network Introduction and Development
- Information Security and Computer Virus

Please download handouts from (Class 9)
http://cflu.lab.nycu.edu.tw/CFLU_course_CompSci.html

電腦網路概論與實務(第六版),
蕭文龍、徐瑋廷, 碁峯資訊出版

[HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)



2025/11/10

Purpose and Benefits

- Information Exchange
 - Internet search (google) and social media (facebook)
- Resource Sharing
 - Hardware (printers, cloud drives and computing), software (files or programs)
- Resource Saving
 - Save paper and manpower for delivery, increase timeliness and storage
- Communication Capability and Flexibility
 - Electronic communication to integrate text, graphics, and video (multimedia).

[HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)

2025/11/10

Network Introduction and Development

[HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)

2025/11/10



Network Category

Based on the connection method and distance

- Local Area Network (LAN) 區域網路
 - A block network within the same home or department.
 - It is the lowest cost, easy to set up, easy to manage, and the number of computers is about 100 or less.
- Metropolitan Area Network (MAN) 都會網路
 - Connection between several LANs.
 - The linkage distance should not exceed several kilometers.
- Wide Area Network (WAN) 廣域網路
 - Long-distance connection requires backbone network for signal transmission.
 - Optical fiber, submarine cable, satellite (cross cities and countries) °

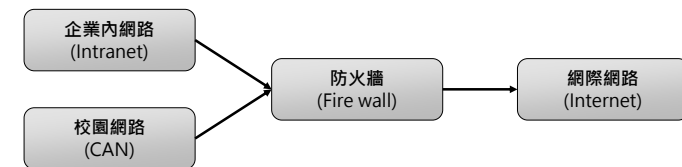
[HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)

2025/11/10

Network Category

Based on the use and scale

- Intranet 企業內網路
- Campus Area Network (CAN) 校園網路
- Internet 網際網路

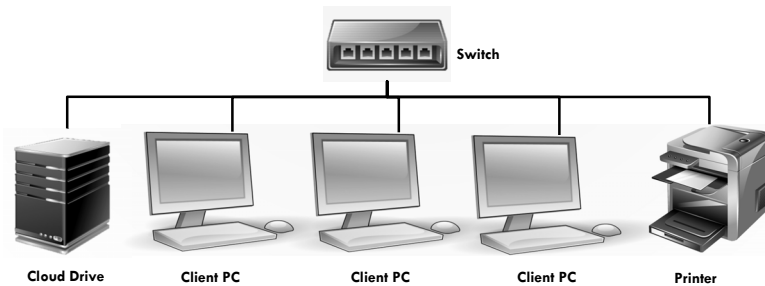


[HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)

2025/11/10

Network Connection Architecture

- Local Area Network, LAN
 - Lowest cost, easy to set up, easy to manage

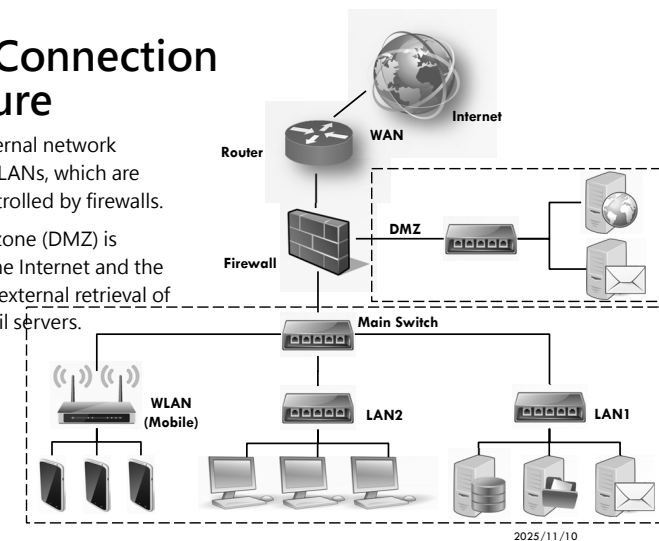


[HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)

2025/11/10

Network Connection Architecture

- The company's internal network consists of several LANs, which are protected and controlled by firewalls.
- The Demilitarized zone (DMZ) is located between the Internet and the intranet and hosts external retrieval of web pages and mail servers.



[HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)

2025/11/10

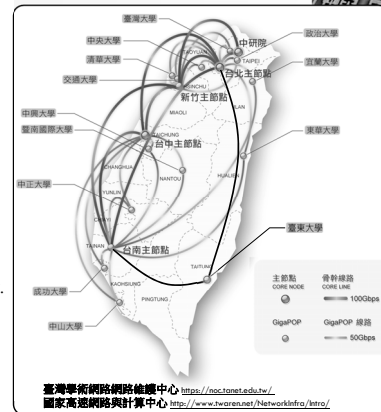
Internet Service Providers (ISP)

• Key ISPs in Taiwan

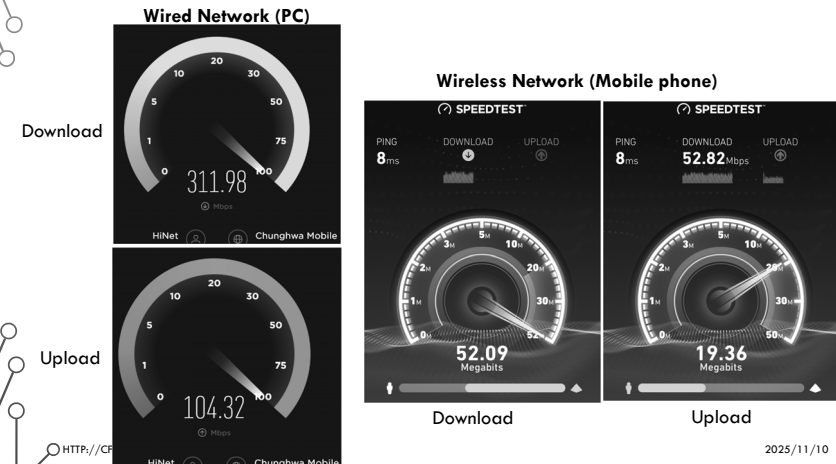
- Taiwan Academic Network, **TANet**
 - 1990 Ministry of Education, for all levels of school units.
- TaiWan Advanced Research and Education Network, **TWAREN**
 - 1998 National Science Council, TANet2.
 - 2002 National Science Council, TWAREN for academic research.
- **SEEDNet** (Far EasTone Telecom)
 - 1992 Ministry of Economic Affairs, for industry development.
- **HiNet** (Chunghwa Telecom)
 - 1994 General Telecommunications Bureau, for civil use.

HTTP://CFLU.LAB.NYCU.EDU.TW

TANet/TWAREN

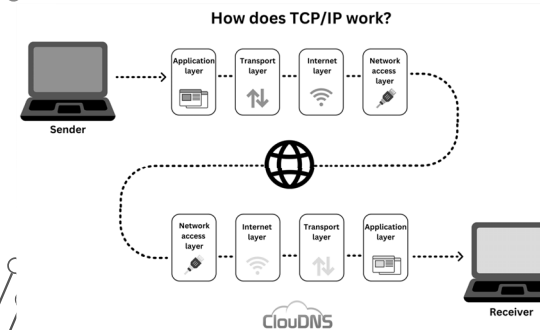


Speed Test Website /App <http://www.speedtest.net/>



TCP/IP

• Transmission Control Protocol (TCP) & Internet Protocol (IP)



<https://www.cloudns.net/blog/tcp-transmission-control-protocol-what-is-it-and-how-does-it-work/>

HTTP://CFLU.LAB.NYCU.EDU.TW

- When an Internet application is used (e.g., viewing a web page with a browser), the message is generated and sent from the application layer to the network access layer, and then sent out over the network line.
- When the other party receives the message, the message is sent in the reverse direction, up through the layers of protocols, and finally interpreted by the application at the top.

2025/11/10

Actual Download Speed?

- There is a difference between MB/s and Mb/s. Where B stands for Byte and b stands for bit.
- 1 Byte = 8 bits
- 1Mb/s = 0.125MB/s
- The fastest download speed of 100Mb/s broadband is 12.5 MB/s,
- The fastest download speed of 1Gb/s broadband is 125 MB/s.

HTTP://CFLU.LAB.NYCU.EDU.TW

2025/11/10

IP Address

- Each Internet-connected computer has a unique address for easy differentiation and identification, ensuring that no data is sent to the wrong computer.
 - IPv4: xxx.xxx.xxx.xxx (8 bits per number, 0~255, total 32 bits)
- The numbers are too difficult to remember, so the corresponding domain names are generated.
 - Naming: machine.subdomain.subdomain.domain
 - Machine: www, ftp,
 - Subdomain (additional level, optional): Organization Name
 - Subdomain (first level): Organization Name
 - Domain : generic (edu, org, com,...) +country code (tw,jp,...)

HTTP://CFLU.LAB.NYCU.EDU.TW

2025/11/10

IP Address

- Domain names
 - machine.subdomain.subdomain.domain
- Examples:
 - www.nycu.edu.tw
 - www.edu.tw
 - www.google.com.tw
 - www.facebook.com
- IPv4
 - xxx.xxx.xxx.xxx
- Corresponding IP:
 - 140.113.42.195
 - 140.111.14.180
 - 140.250.198.67
 - 31.13.87.36

IP Search: <https://www.ntunhs.net/lang/B5/index-1.html>

HTTP://CFLU.LAB.NYCU.EDU.TW

2025/11/10

Domain Name System (DNS)

- Established in 1984.
- The DNS server is responsible for the conversion of domain names to IP addresses.
 - When a domain name is entered, the DNS server can find the corresponding IP address.
 - If you do not set the DNS server address correctly, you may not be able to connect to any website.
 - If you type in the IP address, you will not have any problem.

HTTP://CFLU.LAB.NYCU.EDU.TW

2025/11/10

Information Security & Computer Virus

Types of virus and real cases

HTTP://CFLU.LAB.NYCU.EDU.TW

2025/11/10

Physical Security

- ## Data Security

- Data integrity and privacy; preventing damage from intruders.

Program Security

- Performance, quality control, debugging and legality of software.

System Security

- Normal operation of computers/networks; user education and training.

○ [HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)

2025/11/10



- Monitoring and misuse of personal information
 - Websites use cookies as small text files to track user behavior.
 - Number of visits, pages visited, and products purchased.

- Phishing 網路釣魚

- Fake emails and websites as "bait" to leak private information, plant viruses, corrupt systems, or steal sensitive information.

- Wiretapping 網路竊聽

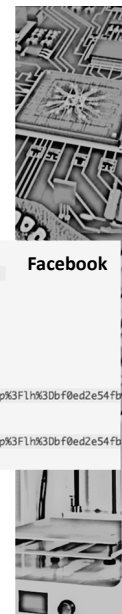
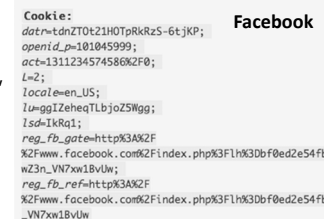
- Improperly capturing packets from the Internet

- Hacking attacks 駭客攻擊

- Paralysis of service attacks, mail bombs, server vulnerabilities, and Trojan horses.

○ [HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)

2025/11/10



No Eggs Can Remain Unbroken When The Nest Is Upset

覆巢之下無完卵

- Overall information security is built on a series of interlocking protection mechanisms.
- An attacker only needs to find the weakest link in the chain to completely disrupt the entire protection mechanism.

○ [HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)

2025/11/10



- Trojan horse/botnet (木馬/殭屍網路): 45%

- Opens a backdoor, allowing the remote manipulation to steal accounts, data, and even use webcams.
- The infected computer becomes a botnet for the controller, sending a large number of spam packets to paralyze the attack target.

- Computer worm (蠕蟲病毒): 25%

- A self-replicating program that executes junk code to greatly reduce the efficiency of the computer's operation and usage.

- Macro virus (巨集病毒): 15%

- Embedded in documents or inserted as malicious code into word-processing programs.

○ [HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)

2025/11/10



Signs of an Infected Computer

- Slow start up and slow performance
- Suspicious hard drive activity
- Lack of storage space/memory capacity/missing files
- Crashes/restart/error messages
- Unexpected pop-up windows
- High network activity
- Email is hijacked

Scan your computer with anti-virus software.

[HTTP://CFLU.LAB.NYCU.EDU.TW](http://cflulab.nycu.edu.tw)

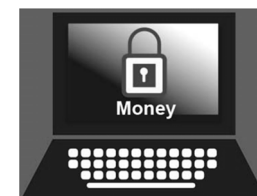
2025/11/10

2005-2017, Ransomware

(勒索病毒)

趨勢科技資安趨勢部落格 2018.10.3
<https://blog.trendmicro.com.tw/?p=57054>

- File encryption and ransom demand
- "Your files have been encrypted by me. If you really care about these data, I suggest you don't waste your precious time looking for a solution that doesn't exist! "
- 2015 FBI: "Suggesting victims pay up" causes controversy...



[HTTP://CFLU.LAB.NYCU.EDU.TW](http://cflulab.nycu.edu.tw)

2025/11/10

Ransomware continues to challenge law enforcement agencies

- Massachusetts police department Paid \$750 in Ransom in 2013.
- The Illinois police department paid \$500 in 2015.
- Dickson County (Tenn.) sheriff's office paid \$572 in 2015.
- Lincoln County (Maine) sheriff's office and four rural police stations paid approximately \$300 in ransom payments in 2015.
- The Alabama police department was attacked in June 2015 and refused to pay the \$500 ransom, instead giving up the encrypted files.

[HTTP://CFLU.LAB.NYCU.EDU.TW](http://cflulab.nycu.edu.tw)

2025/11/10

2017, WannaCry/wcry \$600 bitcoin

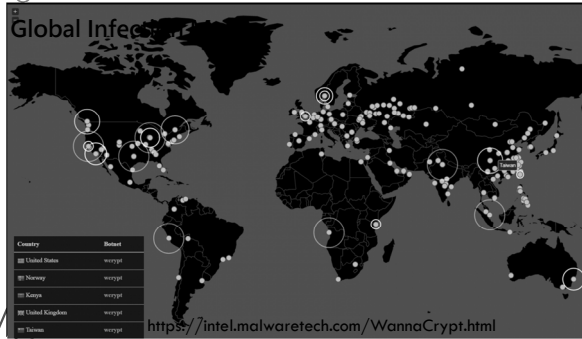
- The first ransomware worm with mass spreading and extortion benefits
- WNCRY extensions are used to encrypt files, targeting a total of 176 extensions, including Microsoft Office, databases, compressed files, multimedia files and extensions commonly used in programming languages.



[HTTP://CFLU.LAB.NYCU.EDU.TW](http://cflulab.nycu.edu.tw)

2017, WannaCry/wcry

Originating from phishing lures users to download malware from Dropbox URL



Target OS : Microsoft Windows

[HTTP://CFLLJ.LAB.NYCU.EDU.TW](http://cfllj.lab.nycu.edu.tw)

2025/11/10

法國雷諾汽車 (Renault)
雷諾在法國北部Sandouville的工廠，專門記錄員工生產狀況的電子版出現WannaCry勒索訊息。

德國鐵路 (Deutsche Bahn)
德國鐵路車站內的電子看板遭WannaCry勒索攻擊，鐵路運行未受到影響。

俄羅斯內政部統計
根據內政部發言人表示，俄羅斯內政部約1千臺電腦受WannaCry攻擊。

英國國民保健署NHS
英國NHS旗下有16家醫院、45臺設備遭WannaCry攻擊，部分手術被迫取消。

英國日產汽車 (Nissan)
英國Nissan位在Sunderland的汽車工廠，內部電腦遭WannaCry勒索攻擊。

南韓連鎖電影院CJ CGV
南韓CJ CGV電影院的廣告伺服器遭攻擊，約50間戲院受WannaCry入侵而遭殃。

日本
根據日本JPCERT統計，日本有600家公司，2,000臺電腦受WannaCry攻擊影響。

中國
根據奇虎360安全部門表示，有29,372個機構遭到攻擊，包含政府機構、大學、銀行自動提款機和醫院。

臺灣教育部統計
全臺總共10所學校（大學以下），59臺電腦受WannaCry攻擊。

臺灣電力公司
共有116臺行政電腦遭WannaCry攻擊，供電、輸電系統的電腦並未受到影響。

臺灣新北恩主公醫院
院內有3臺位於加護病房內的行動護理車的電腦，遭受WannaCry攻擊影響。

Four Symptoms of Ransomware Infection

- Unidentified external connections/links
- Strange file extensions start to appear under each directory, e.g. .crypt, .ECC, .AAA, .XXX, .ZZZ, etc.
- Ransom Note files (ransom payment instruction files) or shortcuts everywhere
- Strange shortcuts in browser toolbar

[HTTP://CFLLJ.LAB.NYCU.EDU.TW](http://cfllj.lab.nycu.edu.tw)

2025/11/10

1. Be careful with social engineering

- Using the human relationships to steal data
 - Ex: This is the XXX center, we suspect that you are stealing other people's data and perform hacking attacks, please provide your account name and password immediately for the subsequent process.
- Pay special attention to the email
 - Sender's name.
 - Even if the email is from the same unit or someone you know, pay attention to the subject and content if it is unusual.
 - Do not open links and attachments casually.
 - Use the spam filter.

[HTTP://CFLLJ.LAB.NYCU.EDU.TW](http://cfllj.lab.nycu.edu.tw)

2025/11/10

2. Protect sensitive data

- Don't stick your personal account password on your laptop or screen.
- Don't put sensitive documents (account passwords, identity documents, financial and research data) on your desktop.
- No emailing of sensitive data.



[HTTP://CFLLJ.LAB.NYCU.EDU.TW](http://cfllj.lab.nycu.edu.tw)

2025/11/10

3. Password setting should be solid

- Passwords must be changed regularly
- Disable Guest anonymous account
- 以中文輸入法按鍵來當成密碼
- 以英文字或數字穿插
- 以一句英文，每字字首當成密碼

密碼長度	26 英文字母	26 英文字母+10 數字	52大小寫英文字母	96 可印出字元
4	0	0	1 分鐘	13分鐘
5	0	10分鐘	1 小時	22 小時
6	50分鐘	6 小時	2.2 天	3 個月
7	22 小時	9 天	4 個月	23 年
8	24 天	10.5個月	17 年	2287 年
9	21 個月	32.6 年	881 年	21萬9000 年
10	45 年	1159 年	45838 年	2100萬年

[HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)

2025/11/10

4. Remote backup of important data

- Prevent important data or devices from being lost or maliciously locked.
- It is recommended to backup on different devices, but it is also necessary to confirm the security of these devices.

[HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)

2025/11/10

5. Anti-virus software

- Install well-known anti-virus software (free versions are usually available)
- Update virus code regularly
- Keep up to date with the latest virus information
 - Newspapers and magazines
 - Anti-virus software vendors

[HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)

2025/11/10

THE END

ALVIN4016@NYCU.EDU.TW

[HTTP://CFLU.LAB.NYCU.EDU.TW](http://CFLU.LAB.NYCU.EDU.TW)

2025/11/10