Summary - The Internet

> 编写：钟钧儒
>
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This is a summary on important concepts showed in the lecture notes, and categorized by the author.

Networks

Network: A **collection** of computers and devices **connected** to **share** information and resources.

Networks by range:

- LAN: **Local Area Network**
- WAN: **Wide Area Network**
- The Internet: A **network** of computer **networks** worldwide. (two "network")
    - **Information Highway**, **the net**, **cyberspace**

The Internet

- History of the Internet
    - 1957: The first artificial satellite by USSR
    - 1958: US Department of Defense: the **Advance Research Project Agency**
    - **1969: APRANET**
    - 1984: APRANET connected 1000+ computers
    - 1992: the **World Wide Web (WWW)** *protocol* released.
- Nobody owns the Internet, non-profit group *Internet Society*.

Connectivity

- Connection mechanisms:
    - Wired connection:
        - Phone *modem* (调制解调器，猫), up to 64Kbps
        - **Broadband connection**, up to 2-4Mbps
            - *DSL / ADSL:* (Asymmetric) Digital Subscriber Line, (非对称)数位用户线路, Download > Upload
            - Cable *modem* (有线电视调制解调器)
        - LAN, with switches (交换机) and routers (路由器)
    - Wireless connection:
        - Hotspots (热点)
        - Wireless adapters (无线网卡): Use by computers
        - Wireless routers (无线路由器): Send signal

- **Internet Services Provider**

Who & Where (Addressing)

One major problem in Internet is to find **who you are** and **where you are**. In order to solve this problem, the **Internet Protocol (IP)** was introduced.

- **IP Address** (IMPORTANT)
  - 4*8 = 32bits length
  - Composed of **network address** and **host number**
  - **Network address** indicates the network this computer locates
  - **Host number** indicates the specific computer in that network

Another problem is that the IP address is hard to be memorized by human. People established a system call **Domain Name System (DNS)** to covert meaningful names to IP addresses.

- **Domain Name System (DNS)** (IMPORTANT)
  - A *hostname* consists of **domain name** and **computer name**
  - e.g. `uic.edu.hk` is a *domain name*, and `dst.uic.edu.hk` can be a *hostname* indicates a *computer* within the domain `uic.edu.hk`.
  - It is a *recursive* process. It can be said that, `uic.edu.hk` is a *hostname* in domain `edu.hk`, and `edu.hk` is a *hostname* in domain `.hk`.
- **Top-level domain**
  - The last section of a domain name is the **top-level domain** to identify the organization that this *hostname* belongs to.
  - A country-based (except US) organization has a two-letter country code.
- A Domain Name **Server** (DNS) is used to *translate* the domain name to *IP Address*.

Client / Server Model

All machines work on the Internet follow the **Client / Server** model.

Client send *requests* and server send *responses*.

Packets & Routers

- Messages are divided into **fixed-sized**, **numbered packets**.
- **Routers** are used to direct these **packets**, they determine the **path** between you and an Internet server.

Protocols & Applications

Network protocols are always layered. The layered protocol is referred to as a **protocol stack**.

Here is a case of layered protocols. *Just for your references.*

TOP ↑ Bottom	*Level*	*Level Name*	**Protocol Name**	
			Abbreviation	**Full Title**
	7	*Application* *应用层*	**DNS**	**Domain Name System** 域名服务
			FTP	**File Transfer Protocol** 文件传输协议
			HTTP	**Hyper Text Transfer Protocol** 超文本传输协议
			POP	**Post Office Protocol** 邮局协议（收件）
			SMTP	**Simple Mail Transfer Protocol** 简单邮件传输协议（发件）
			Telnet	一种访问远程计算机的协议
	4	*Transfer* *传输层*	**TCP**	**Transmission Control Protocol**
			UDP	**User Datagram Protocol**
	3	*Network* *网络层*	**IP** **IPv4 32bit** **IPv6 128bit**	**Internet Protocol**
			Router 路由器	**Determine the path between you and an Internet server.**

- TCP: **Transmission Control Protocol**
  - Breaks messages into packets, then hands to IP software for delivery.
  - Orders and reassembles the packets to messages at destinations.
- IP: **Internet Protocol**
  - Deals with the *routing* of the packets.