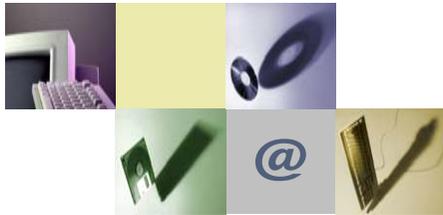## Internet

Digital Computer Concept and Practice

Introduction

- A large network made up of a number of smaller networks irrespective of OS or kinds of computers.
- A worldwide, publicly accessible series of interconnected computer networks that transmit data by packet switching using TCP/IP protocol .
- Internet is decentralized.
  - Each internet computer (a host) is independent.
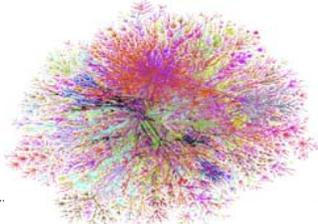
Different colors based on IP address
http://research.lumeta.com/ches/map

Introduction

- ARPANET (1969)
  - ARPA (Advanced Research Project Agency) Network
- Explosive growth in mid- to late-80's.
  - Government → academia → research labs → corporations → individuals
- Goal: Exchange of information

http://mappa.mundi.net/maps/maps_001/

Introduction

- Intranet
  - A private enterprise network that uses internet and web technologies for information gathering and distribution within an organization.
- Extranet
  - A community of interest created by extending an intranet to selected entities external to an organization.

Requirements of Internet Uses

- Computer
- Modem or LAN card
- Browser
- ISP (Internet Service Provider)
  - A company or business that provides access to the internet and related services
- NIC (Network Information Center)
  - IP address, domain name

Internet protocol
Internet address
Internet services (WWW, E-mail, FTP)

TCP/IP

- TCP (Transmission Control Protocol)
  - A set of rules to exchange messages with other internet points <u>at the information packet level</u>.
  - Provides reliable, in-order delivery of a stream of bytes, making it suitable for applications like file transfer and e-mail.

- IP (Internet Protocol)
  - A set of rules to send and receive messages <u>at the internet address level</u>.
  - Provides the service of communicable unique global addressing among computers.
  - Messages ⟶ Packets

(1) Internet Protocol

- Protocol
  - Can be defined as a set of rules governing the syntax, semantics and synchronization of communication.
  - Communication by sending or receiving packets
    → Rules for converting a "message" into "packets"
- TCP/IP
  - A set of rules to enable computers to communicate over a network (internet).

(2) Internet Address

- IP address (IPv4)
  - A unique identifier for a computer or device on a TCP/IP network.
  - Uses 32-bit (4-byte) addresses, which limits the address space to 2^{32} possible unique addresses → IPv6
  - Written as four numbers separated by periods.

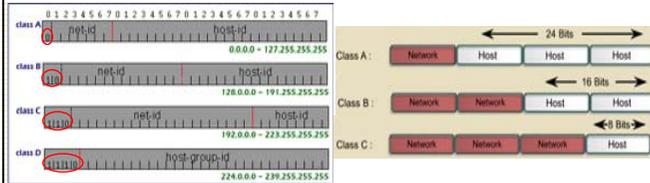An IPv4 address (dotted-decimal notation)

$$172 \ . \ 16 \ . \ 254 \ . \ 1$$

10101100.00010000.11111110.00000001

One byte=Eight bits

Thirty-two bits (4 * 8), or 4 bytes

  - Network address + host address
    cf.) MAC (Media Access Control) address

IP Address

- IP address class

class A	net-id	host-id
	0.0.0.0 – 127.255.255.255
class B	net-id	host-id
	128.0.0.0 – 191.255.255.255
class C	net-id	host-id
	192.0.0.0 – 223.255.255.255
class D	host-group-id
	224.0.0.0 – 239.255.255.255

Class A: Network Host Host Host — 24 Bits
Class B: Network Network Host Host — 16 Bits
Class C: Network Network Network Host — 8 Bits

- Class A: large organizations, governments
- Class B: medium-sized organizations
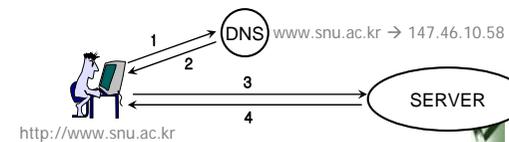- Class C: small organizations

Port

- Several programs in a computer use the same network → Assign a unique number (port) to each program
- Port number is a way to identify a specific process to which an internet or other network message is to be forwarded when it arrives at a server.
- Needs "IP address" and "port" to communicate with other computers .
- Common port numbers
  - WWW: 80
  - FTP: 21
  - Telnet: 23

DNS (Domain Name System)

- Using IP address only?
- DNS
  - Internet system to translate domain names into IP addresses
  - Serves as a 'phone book' for Internet by translating human-readable computer hostnames e.g. 147.46.10.20 → portal.snu.ac.kr
- Domain name: host name + domain name
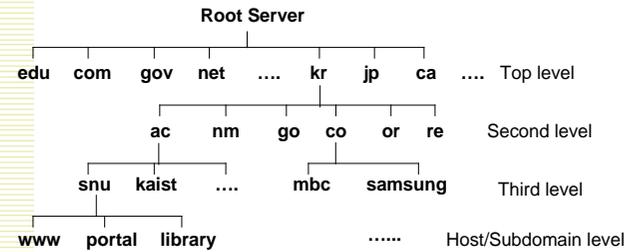 - portal.snu.ac.kr
    host   domain

DNS (Domain Name System)

- DNS server
  - The DNS consists of a hierarchical set of DNS servers.
  - DNS server translates a domain name into the corresponding IP address.
  - If a host does not know the IP address of a domain name → ask a name server
  - e.g. SNU: 147.46.80.1, 147.46.37.10

1 DNS www.snu.ac.kr → 147.46.10.58
2
3 SERVER
4
http://www.snu.ac.kr

Domains

Root Server

edu	**com**	**gov**	**net**	**….**	**kr**	**jp**	**ca**	**….** Top level

ac   **nm**   **go**   **co**   **or**   **re**   Second level

snu   **kaist**   **….**   **mbc**   **samsung**   Third level

www   **portal**   **library**   ......   Host/Subdomain level

www	.	snu	.	ac	.	kr
Host Name		Seoul National Univ.		School		Korea

Internet Services

- Telnet
  - Telnet is a common way to remotely control servers.
  - Windows telnet program
- Usenet (User's Network)
  - Usenet is a global, distributed Internet discussion system.
  - Outlook Express
- Internet chatting
  - IRC (Internet Relay Chatting): mIRC
  - IM (Instant messenger): MSN (Live) messenger, NateON
- P2P (peer to peer)
  - Napster, eMule, Pruna

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(3) Internet Services

- WWW (World Wide Web)
  - Supports text, images, videos, and other multimedia and navigates between them using hyperlinks.
  - Internet Explorer, Firefox, Netscape, …
- E-mail (Electronic Mail)
  - Internet mailing systems
  - Web mail service: Hanmail, Hotmail, Gmail, etc
  - Mailer: Outlook Express, Thunderbird
- FTP (File Transport Protocol)
  - Used to transfer data (file) through a network.
 - ALFTP, Cute FTP

WWW (World Wide Web)

- A system of interlinked hypertext documents accessed via the Internet.
- Created by Sir Tim Berners-Lee, working at CERN in Geneva, Switzerland (1989).
- Web browser: Mosaic (1993)
  - Various protocols support
    - FTP, Gopher, News, Mail etc.
  - Graphic interface

  - HTTP
  - URL
  - HTML

HTTP (HypetText Transfer Protocol)

- A communications protocol for the transfer of information on the WWW.
- Client /Server structure

Client computer — Web browser
Request → Response ←
Server computer — HTML documents — Web server (HTTPD)
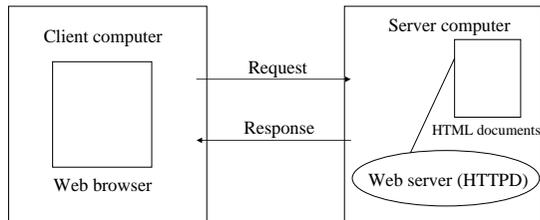
HTML (HyperText Markup Language)

- HTML is the predominant markup language for Web documents.
- Represents the structure and layout of a Web document using tags and their attributes.
- HTML tags
  - <HTML></HTML>
  - <HEAD></HEAD>
  - <TITLE></TITLE>
  - <BODY></BODY>

URL (Uniform Resource Locator)

- Global address of documents and other resources on the World Wide Web
- URL format

Protocol://Domain (IP) address [:Port number] / Directory / File

- http://www.naver.com:80/index.html
  - 80 can be omitted (default port number)
  - URL does not specifies a filename → transmit "index.html"

E-mail

- Email Address: bcbae@icomf.idis.or.kr
- Using E-mail: Web services or e-mail clients
- E-mail protocol
  - SMTP (Simple Message Transfer Protocol)
    - Standard protocol for e-mail transmissions across the Internet.
  - POP3 (Post Office Protocol 3)
    - Local e-mail clients use the POP3 to retrieve e-mail from a remote server over a TCP/IP connection.
    - POP3 support → Can use e-mail clients
- E-mail structure
  - Header: receiver, sender, title, date, cc, bcc
  - Contents