Internet Public Network

Bandwidth

- Data rate measured in bits (not bytes) per seconds

- Kbps (Kilobits per seconds)
  - 125 chars/sec

- Mbps (Megabits per seconds)
  - 1,250 chars/sec

- Gbps (Gigabits per seconds)
  - 12,500 chars/sec
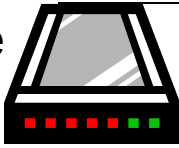
Connecting to the Internet

- **Requirement**
  - A computer or PDA or cell phone
  - An account with an ISP (Internet Service Provider)
  - A modem (**mo**dulator/**dem**odulator) for dial-up services or a NIC (Network Interface Card) for DSL/Cable services

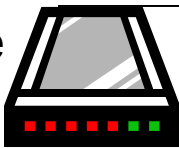# Home Network (single machine)

Wall Jack

DSL/Cable
Modem

USB/Ethernet
Cable

Home Network (multiple machines)

Wall Jack
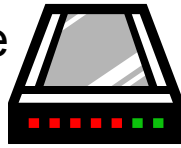
DSL/Cable Modem

USB/Ethernet Cable

Hub/Switch/Router

Home Network (multiple machines)
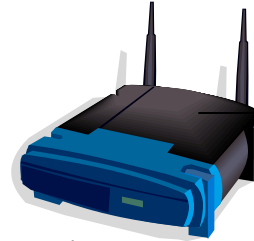
Wall Jack

Ethernet Cable

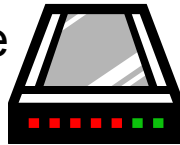DSL/Cable Modem

Hub/Switch/Router

Home Wireless Network

Wall Jack

Ethernet Cable

DSL/Cable Modem

Hub/Switch/Router

Connection Types

- LAN
- WLAN
- Dial-up Services
- Broadband Services
- WAN

LAN (Local Area Network)

- A network of computers that are in the same physical location, such as home or building

- Usually connected using Ethernet
  - A standard on how computers communicate over a shared media (cable)

Old: BNC connector for coaxial cable

New: RJ45 for twisted pair cable

http://en.wikipedia.org/wiki/Image:BNC_connector.jpg

http://en.wikipedia.org/wiki/Image:Ethernet_RJ45_connector_p1160054.jpg

LAN (Local Area Network)

- **Ethernet Standard**
  - 10BaseT
    - 10Mbps (Mega bits per second)
  - 100BaseT
    - 100Mbps
  - 1000BaseT
    - 1000Mbps or 1Gbps
- **Correction from the book (pg. 10)**
  - Why do we get faster connection at work or on campus than at home?

LAN (Local Area Network)

- Question: Can 2 computers communicate by connecting each other using an Ethernet cable back-to-back?

WLAN (Wireless LAN)

- ## Wi-Fi (Wireless Fidelity)
  - A wireless technology that connects computers without cables

- ## Access Point (AP)
  - A device (base station) that connects wireless devices together
  - Usually connected to a wired-network

- ## ESSID (Extended Service Set ID)
  - A "name" for the AP, eg. mobilenet

- ## Hotspot
  - The area covered by wireless access points

WLAN (Wireless LAN)

- **Standard**
  - 802.11b - 11Mbps ⎫
  - 802.11g - 54Mbps ⎭ 2.4G
  - 802.11a - 54Mbps ⎬ 5G
- **Security**
  - WEP (Wired Equivalen Privacy)
  - WPA (Wi-Fi Protected Access)
  - To prevent **wardriving**

Dial-up Services

- Modem
  - **Mo**dulator/**dem**odulator
  - A device that converts analog signal to digital (modulation) and vice versa (demodulation)
  - Speed
    - 1200/2400/9600 bps
    - 14.4/28.8/33.6 Kbps
    - 56 Kbps

Dial-up Services

- ISDN
  - Integrated Services Digital Network
  - 2 data channel (56K each)
  - 1 voice channel

Broadband Services

- xDSL (Digital Subscriber Line)
  - A technology that provides digital data transmission over unused frequencies on traditional telephone lines
  - For example, ADSL (Asymmetric DSL): DL > UL
  - Speed
    - Downlink
      - 128Kbps - 4Mbps
    - Uplink
      - 64Kbps - 800Kbps
  - Need a DSL modem
  - Splitters are needed to separate the voice and data signal

Broadband Services

- Cable
    - A technology that provides digital data transmission over cable TV infrastructure
    - Speed
        - Downlink
            - 128Kbps - 3~5Mbps
        - Uplink
            - 64Kbps - 128Kbps~1Mbps
    - Need a cable modem

Broadband Services

- ## Satellite
  - A technology that provide digital data transmission over satellites
  - Speed
    - Downlink
      - 500Kbps - 1Mbps
    - Uplink
      - 50Kbps - 100Kbps
  - Need a satellite dish

WAN (Wide Area Network)

- A LAN spans a large geographic area, such as connections between cities

- Usually connected using leased line
    - T1 (1.5Mbps)
    - T3 (45Mbps) } Telecommunication lines
    - OC3 (155Mbps)
    - OC12 (622Mbps) } Fiber optic lines
    - OC48 (2.4Gbps)

Hub/Switch/Router

- To connect multiple segments of networks into a larger one
- Hub
  - A multiport repeater to enhance signal within the same LAN
- Switch
  - Like hub but with intelligent
  - Better performance
- Router
  - Forward packets from one LAN to another

Intranet vs. Internet

- Intranet
  - A private network that is contained within an enterprise
  - Could be LANs and WANs
- Internet
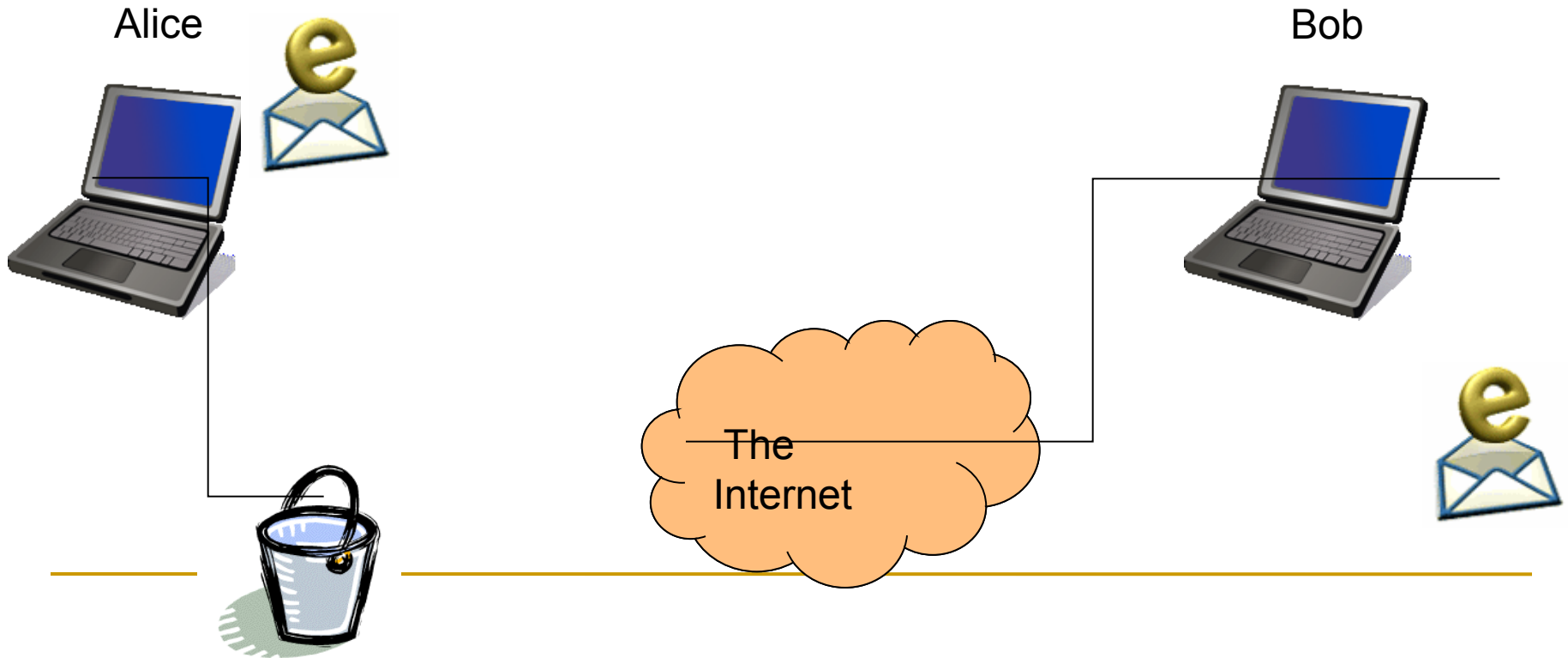 - A public network of networks
- Both are using TCP/IP

TCP/IP

- A family of protocols that makes the Internet works

- The Robustness Principle
  - "Be liberal in what you accept, and conservative in what you send" - Jon Postel

TCP/IP (cont)

Application Layer Eg. WWW, FTP, IRC, Email, telnet, …	Data
Transport Layer Eg. TCP, UDP	Segments
Network Layer Eg. IP	**Packets**
Link Layer Eg. Ethernet, WiFi	Frames
Physical Layer Eg. Ethernet Cable, fiber-optics	Bits

Packets

- A small chunk of data transmitted over the Internet

Alice

Bob

The Internet

VPN (Virtual Private Network)

- A secure tunnel to a private network through a public network

- Once established, local node appears to be a node in the private network in a secure manner

- Correction from the book (pg. 11):
  - VPN does not mean using telephone line connection!!!

Host & IP Address

- Correction from the book:
  - ✓ "A host is a computer connected directly to the Internet"
  - ✗ "You home computer is not a host"
- Each host needs an IP address
- IP address
  - ❏ A 32-bit number, arranged in 4 numbers seperated by "."
  - ❏ Eg. 74.125.19.147

DNS (Domain Name System)

- Domain name to IP address conversion
  - Eg. www.google.com → ??.???.??.??
- Domain name or IP address lookup
  - http://cqcounter.com/whois/

Top-level Domains

- **gTLDs (generic TLDs)**
    - .com, .edu, .net, .org, .gov, .mil
    - .aero, .biz, .coop, .info, .museum, .name, .pro
- **ccTLDs (country code TLDs)**
    - .au, .ca, .br, .de, .fi, .fr, .jp, .hk, .cn, .tw, .my, …
    - .us

Second-level Domains

- Domains that are directly below a TLD
- Eg.
  - ucr.edu
  - google.com
  - sony.co.jp
- Must apply to a registrar for the appropriate TLD

Domain Names & Registrars

- Profitable domain names
  - CreditCards.com - $2.75M
  - Loans.com – $3M
  - Business.com - $7.5M
- Network Solutions, Inc used to monopolize the name registration
- Now, ~500 registrars

How To Register A Domain Name?

- Come up a new name

- 2 name servers' IP addresses

- 1 administrative contact

- 1 technical contact

- Register the name to an Internet domain registrar
  - Eg. www.netsol.com, www.godaddy.com

Used to be done via email or fax, now all web-based!

Policies

- ## AUP (Acceptable Use Policies)
  - A legal document, written to protect the ISP from unlawful use of its service, and outlines prohibited uses of the service and possible consequences of misuse

- ## Privacy Policies
  - A document describes an ISP's policy for protecting users' information

Conclusion

- Described how to get connected to the Internet

- Talked about the related network technologies and components