Cis1  Chapter 12
Basics of
Communications
The Basics

telecommunications - long distance electronic communications

network - any computer system that links together two or more computers

combination of:
1. Hardware
2. Software
Advantages of a Network & Communications

• share hardware (printers, scanners, hard disk drives, …)

• share software (application software)

• share data and information (documents, data files, …)

• communications (email, web pages, video conferencing,…)
LANs and WANs

A Local Area Network (LAN) is a combination of hardware and software, which allows computer software, data and peripherals to be shared, within a limited geographical distance.

A Wide Area Network (WAN) is a combination of hardware and software that allows computers and peripherals to be shared, with no limitations to the geographical distance.

(More Later)
Serial Communications

• Most Networks (LANs & WANs) use

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Serial Communications -
information (bits) are
transmitted one bit at a time
Modems

Modem
(MOdulator/DEModulator) = hardware device which allows computer to communicate with each other over ordinary telephone lines
Modems

• Modems are used to convert digital signals (from the computer) to analog signals (to be transmitted over the telephone lines) and from analog signals (from the telephone lines) to digital (to the computer)

• (DA and AD converters)
Modems
Analog v.s. Digital

**Digital Signals** - Individual electrical pulses, using two different discrete elements, representing specific information. These two different elements are used to represent an on bit or an off bit. (0 or 1)
• **Analog Signals** - A method of sending information, voice, video, data, etc., where the transmitted signal is *analogous* to the original signal. In other words the electrical transmission of voice of telephone lines, is analogous (looks like) the sound waves our voice makes in the airwaves. Analog signals use a continuous electrical wave using a wide range of frequencies or pitches. Looks like *sine waves*. 
• Computer communicate in binary or digital (stream of bits, one of two values)

• Telephones communicate in analog (continuous wave like a sound wave)

Why do computers use modems to communicate with one another?

Because phone lines are so common.
Modem Mumbo Jumbo

- **bps** - the number of bits per second (bps) a modem can send and receive information (actually its signal changes)
- **communications port** (COM port) - serial port
- **compression** - method of squeezing information into fewer bits so it can be transmitted in less time
More Mumbo Jumbo

• **download** - receiving information from another computer

• **upload** - sending information to another computer

• **protocol** - a set of rules computers use when transferring information between each other.
External Modem - A modem which is connected to a (serial) port on the computer.
Internal Modem - An interface card which contains a modem.
Modem Speed

• Speed of the modem is measured in the number of bits per second (bps)
• This is the maximum number of bits that the modem can send and receive.
• Early modems transmitted 300 to 2400 bps
• Today’s modems transmit 14,400 (14.4K), 28,800 (28.8), 33,600 (33.6K), or 56,000 (56K) bits per second
• Realistically need a 56K bps modem to connect to the internet.
• Faster the modem, faster text, graphics, sound, and video files (bits) can be delivered to your computer from another computer (or visa versa)
Remote Communications

- access to other computers remotely, just as if you were sitting there
- work from home
- help a friend or client
- download & upload files

Fax and Voicemail

- send and receive faxes
- use computer as a telephone answering machine storing messages on the hard disk
- Software: WinFax, ...
Connecting to the Internet

What do you need?
1. a modem
2. an Internet Service Provider (ISP)
3. “browser software”
   – Netscape Navigator
   – Microsoft Internet Explorer

We will talk a lot more about this: LATER
56K Modems, ADSL, ISDN and Other Communications Technologies
The 56K Modem

• Telephone lines will only let us transmit a limited number of bits from our home to the central office (Shannon’s Law: signal to noise ratio)

• **local loop**, the wires from your home or business to the Telephone Company’s Central Office

• Most of the **PSTN** (Public Switched Telephone Network using digital transmission (aka **POTS** – Plain Old Telephone System))
• For 56K service you must have:
  1. 56K Modem
  2. Internet Service Provider which supports 56K (later)
  3. Phone line which supports 56K
What else?

• Were two competing technologies:
  1. 56KFlex (Rockwell and Lucent)
  2. X2 (U.S. Robotics)
Now the standard is V.90

See your Internet Service Provider before purchasing!

• Will never get 56K speed, more likely 40 - 52K
ADSL

- **ADSL** - Asymmetric Digital Subscriber Line *(or Loop)*
- Other “flavors” like SDSL, HDSL, VDSL (actually older ISDN technology is also dsl)
- **local loop**, the wires from your home or business to the Telephone Company’s Central Office, rest of PSTN is digital
- Uses existing “higher quality” voice grade telephone lines to transmit high-speed digital signals
- 64 kbps to 8 Mbps, and more
ISDN

- **ISDN**, Integrated Services Digital Network
- 64 or 128kbps service
- This requires a new twisted-pair line to be installed from the Telephone Company’s Central Office to your home or business, and will required some additional equipment at your site.
Cable Modems

• Example: TCI’s @Home service, which uses your existing cable-TV connection to connect to the Internet.

• Use a technology known as cable-modems to connect your computer to the Cable Company’s coaxial or fiber optic cable.

(diagram of cable/dsl network)
Wireless Communications

• Uses wireless transmission such as satellite and cellular
• Great for rural and remote areas
• Some technical limitations regarding speed (bandwidth)
• DirectPC
Competition and Monopolies

• Communication companies getting into new markets including telephone (local and long distance), cable-TV, video on demand, and Internet markets