

#### Computer Fundamentals

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Lecture 15



# Outline

> Data Communications





#### Objectives

- > How computer data travels over telephone lines
- > Explain a modem's function
- > Explain how a modem's transmission speed is measured
- > How digital data connections work
- How wireless networks function





#### Modem Communications

- Plain Old Telephone System (POTS)
  - ☐ Standard phone line
  - Two-way voice communication
  - Uses analog transmission techniques
  - □ Data communication is slow
- > Public Switched Telephone Network (PSTN)
  - World's collection of interconnected voice-oriented public telephone networks
  - Aggregation of circuit-switching telephone networks
  - Referred to as POTS if analog type phone service used
  - Today, almost entirely digital technology





#### Modem Communications (cont.)

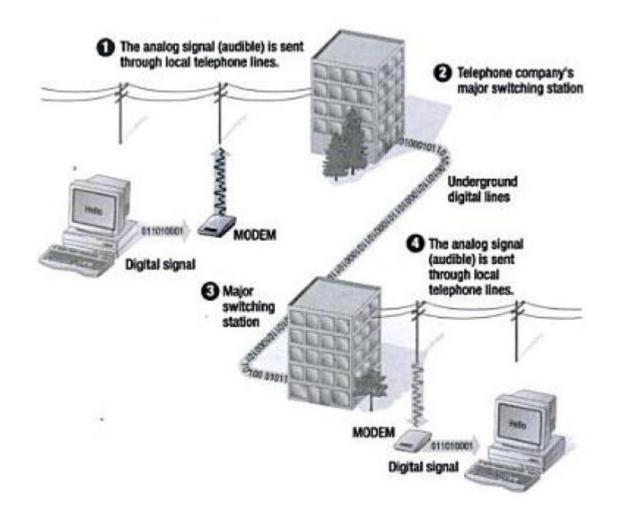
- > Modems
  - ☐ For attaching computer to analogue lines
  - Modulator/Demodulator
    - Modulator converts digital to analog
  - Speed measured in bits per second (bps)
    - Fastest speed of 56 Kbps
    - Quality of phone lines dictates speed
    - V.92 modem standard presented in 1999
  - Several modem types
    - o Internal
    - o External
    - Voice
    - o Fax
- Modem uses
  - ☐ Connection to the Internet
  - ☐ File transfer
    - Uploading
    - Downloading







#### Modem Communications (cont.)







#### Digital Data Connections

- > Digital phone lines
  - Local telephone companies upgraded
  - ☐ Service faster and more reliable
  - New digital phones needed
    - Should translate voice to bits rather than analogue signal
  - Modems not required any more
  - Adapters required for data reformatting
- Broadband connection
  - Any data connection faster than 56 Kbps
  - Common in business
  - Becoming popular in home installations

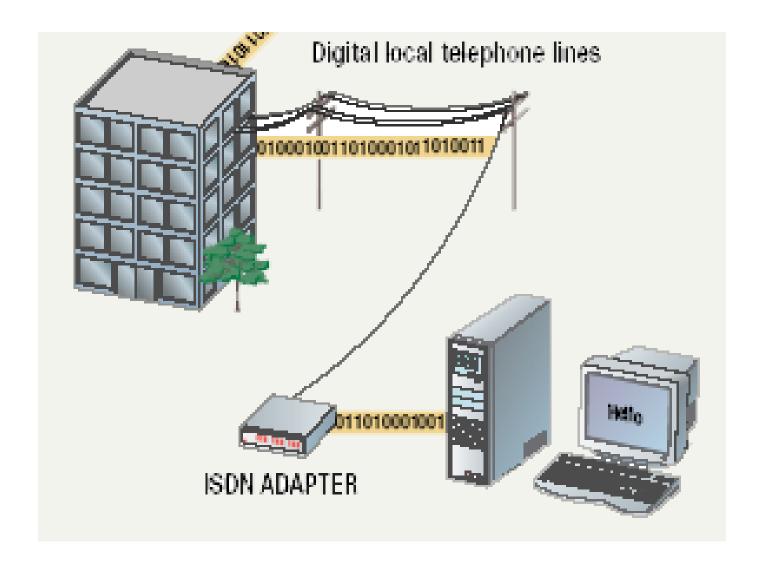




- > ISDN lines
  - ☐ Integrated Services Digital Network
  - ☐ Basic rate uses three channels
    - Two data channels each support 64 Kbps
      - 64\*2 = 128Kbps
    - Error correction channel 19Kbps
  - ☐ Primary rate uses 24 or 30 channels
    - 24 data channels (PCM-24)
      - 64\*24 = 1.544Mbps, T1 service
    - 30 data channels (PCM-30)
      - 64\*30 = 2.048Mbps, E1 service

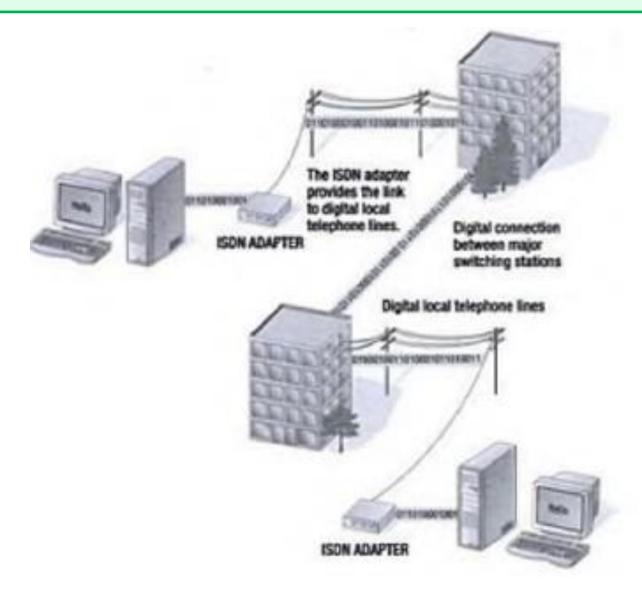
















- > T lines
  - ☐ High-capacity voice/data ISDN lines
  - Used to control phone and data
  - Several variants
    - T1 transmits at 1.544 Mbps (24 channels)
    - T3 transmits at 44.736 Mbps (672 channels)





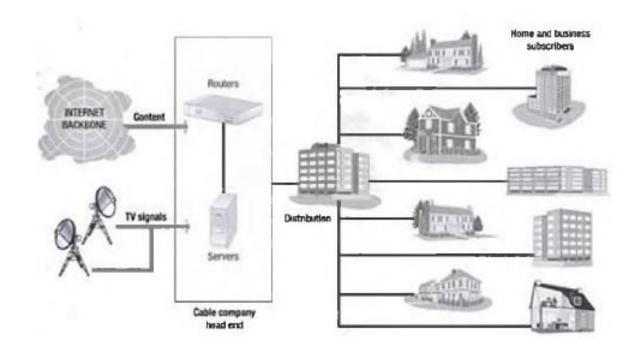
- > DSL technologies
  - ☐ Digital Subscriber Line
  - Popular with home users
  - Speeds range from 100 Kbps to 30 Mbps
  - ☐ Asymmetrical DSL (ADSL)
    - Upload speed slower than download speed
  - Symmetrical DSL (SDSL)
  - Requires a DSL modem
    - Between analogue phone lines and computer





- Cable modem connections
  - □ Popular with home and office users
  - Connection through cable TV
  - ☐ Speeds between 1 and 3 Mbps
  - Requires a cable modem









#### > ATM

- ☐ Asynchronous Transfer Mode
- ☐ Concept for transfer of broadband data
- ☐ Efficient transfer of video and sound
- □ Requires a special NIC and hardware





#### Wireless Networks

- > Benefits
  - ☐ No cable to pull
  - □ Mobile devices access network resources
  - ☐ Mobility and flexibility for office workers





#### Wireless Networks (cont.)

- Wireless IEEE 802.11
  - Also called Wi-Fi (Wireless Fidelity)
  - ☐ IEEE standard
    - Institute of Electrical and Electronics Engineers
  - Several versions
    - o 802.11b connects up to 11Mbps
    - 802.11g connects up to 56Mbps
    - o 802.11a
    - o 802.11n
  - ☐ Use the same type of devices





#### Wireless Networks (cont.)

- Wireless Access Point (WAP)
  - ☐ Center of a wireless network
  - WAPs combined cover a larger area
  - □ Distance to WAP determines bandwidth
  - ☐ Range is 50 to 150 meters
  - Extension points can extend range
    - o E.g. TP-link







#### Wireless Networks (cont.)

- Wireless Adapters
  - ☐ Wireless NIC
  - ☐ Used by devices to connect
  - ☐ Includes signal strength software



