# Computer Fundamentals

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Lecture 15

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# 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

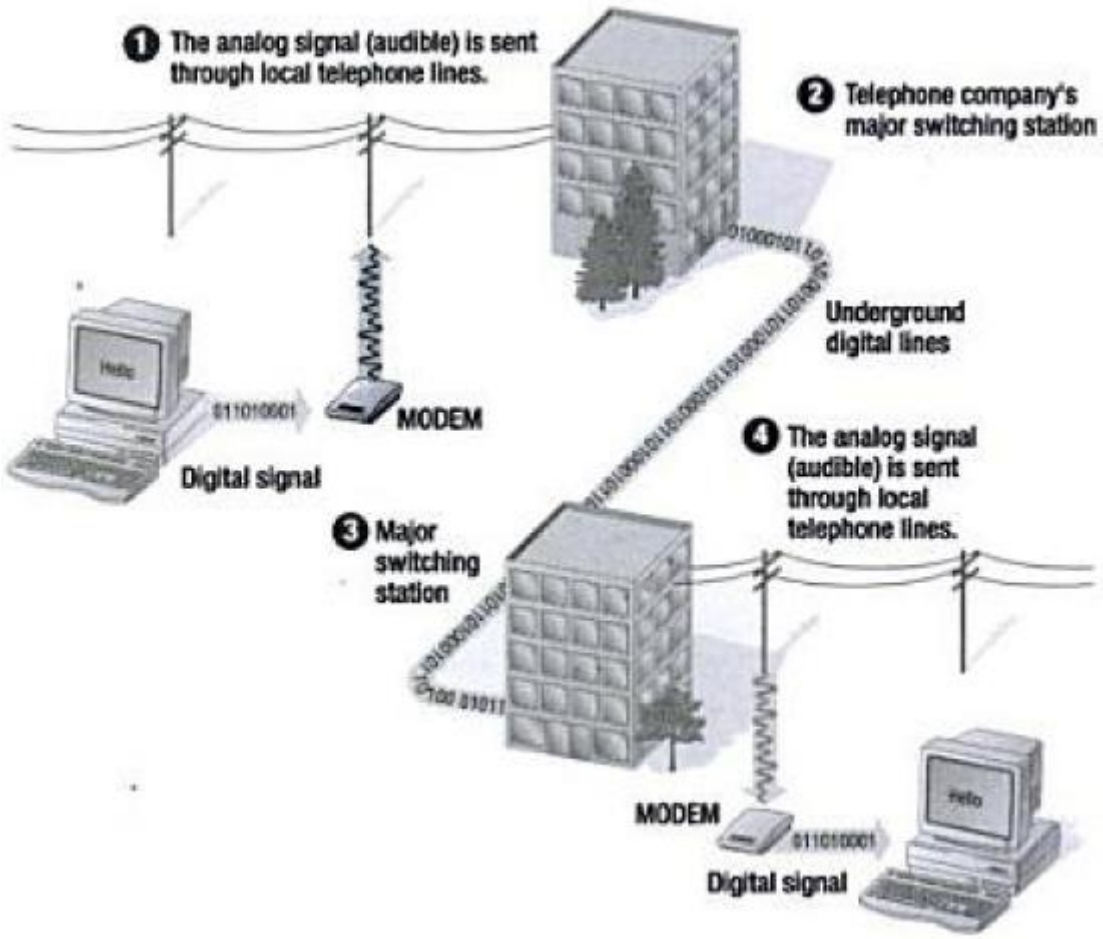
# Modem Communications

- 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
    - Internal
    - External
    - Voice
    - Fax
- Modem uses
  - Connection to the Internet
  - File transfer
    - Uploading
    - Downloading

# Modem Communications (cont.)



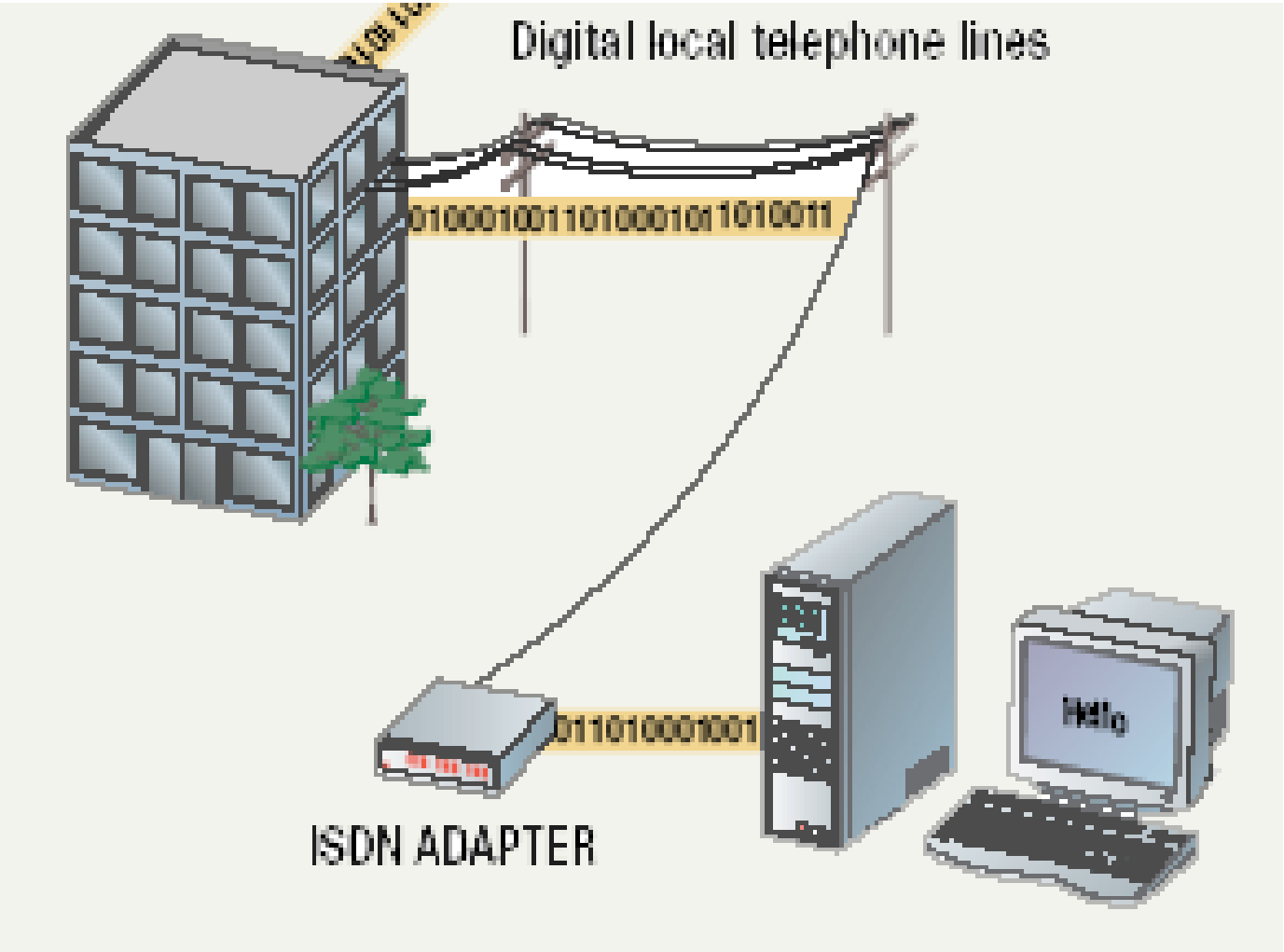
# Digital Data Connections

- 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

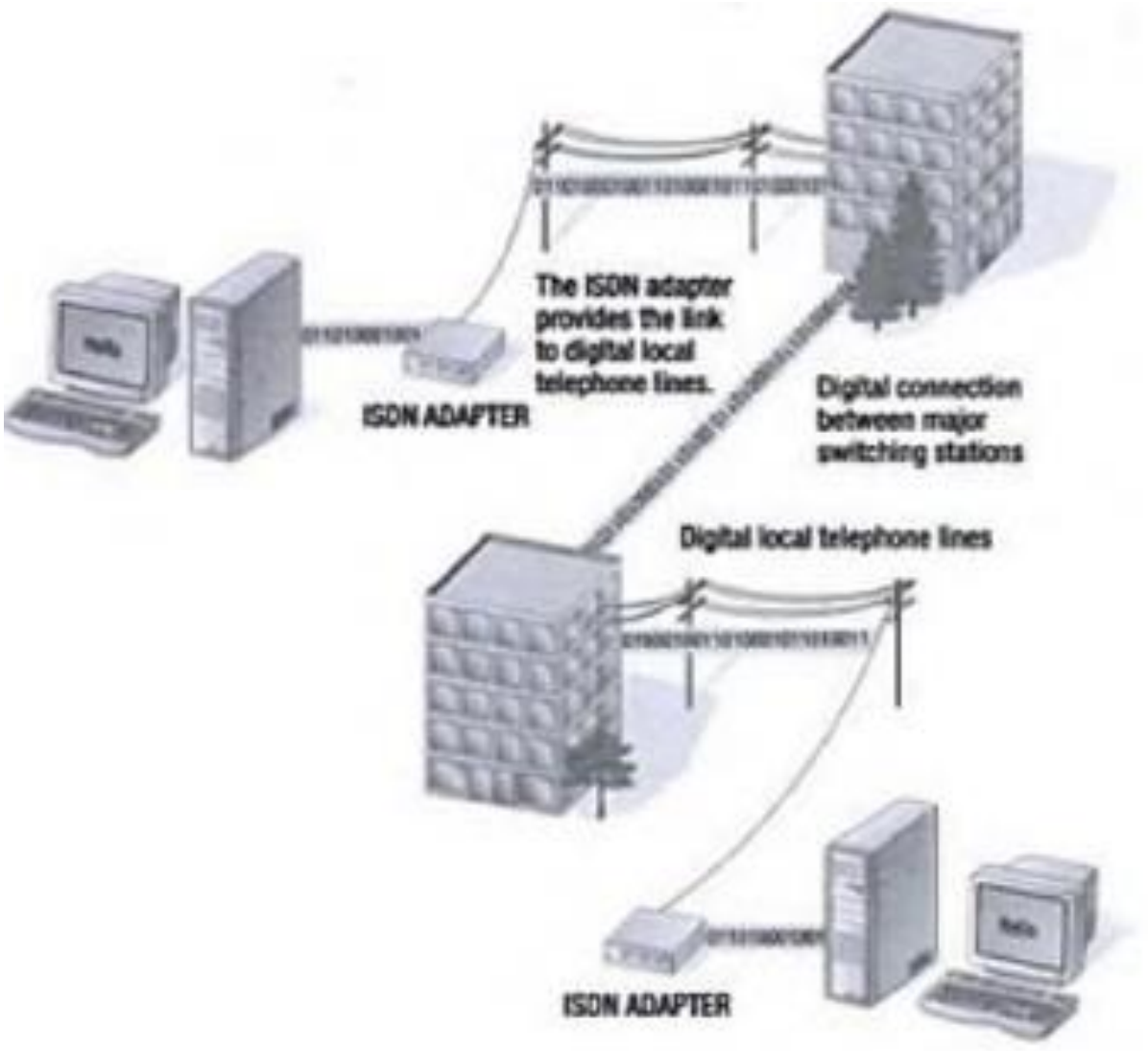
# Digital Data Connections (cont.)

- 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

# Digital Data Connections (cont.)



# Digital Data Connections (cont.)



# Digital Data Connections (cont.)

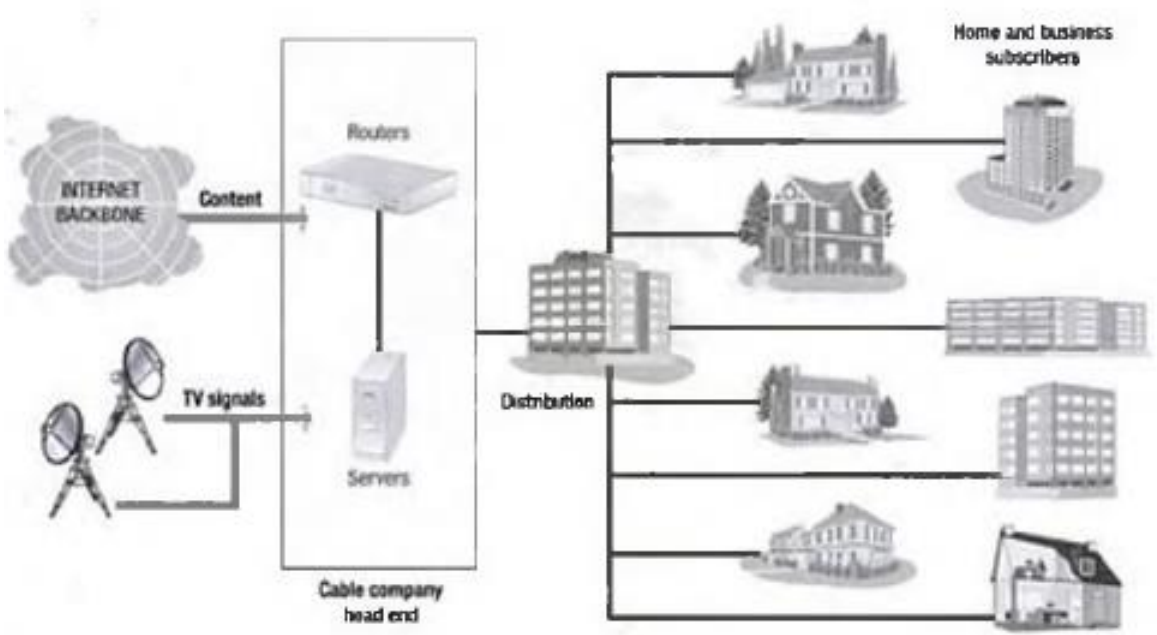
- T lines
  - High-capacity voice/data ISDN lines
  - Used to control phone and data
  - Several variants
    - T1 transmits at 1.544 Mbps (24 channels)
    - T3 transmits at 44.736 Mbps (672 channels)

# Digital Data Connections (cont.)

- 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

# Digital Data Connections (cont.)

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



# Digital Data Connections (cont.)

- 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
    - 802.11b connects up to 11Mbps
    - 802.11g connects up to 56Mbps
    - 802.11a
    - 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
    - E.g. TP-link

# Wireless Networks (cont.)

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