# Standardised Data Representation

- Enables different computers to communicate
- Promotes sharing of data amongst users
- Enables Internet to function
- Not the same as data/file formatting

# ASCII

- **A**merican **S**tandard **C**ode for **I**nformation **I**nterchange
- *EBCDIC (**E**xtended **B**inary **C**oded **D**ecimal **I**nterchange **C**ode) once used by IBM*
- Platform independent
- Used on all systems on the Internet
- Contains basic control codes for computer to computer communication and document formatting

# ASCII Control Codes

- Used to start and end data transmission
- Used to acknowledge receipt or non-receipt of data
- Provide a basic standard for formatting data on printers
- Used with VT100 standards for Telnet and bulletin board systems (BBS)
- Control codes have effect, but don’t print

# ASCII Files

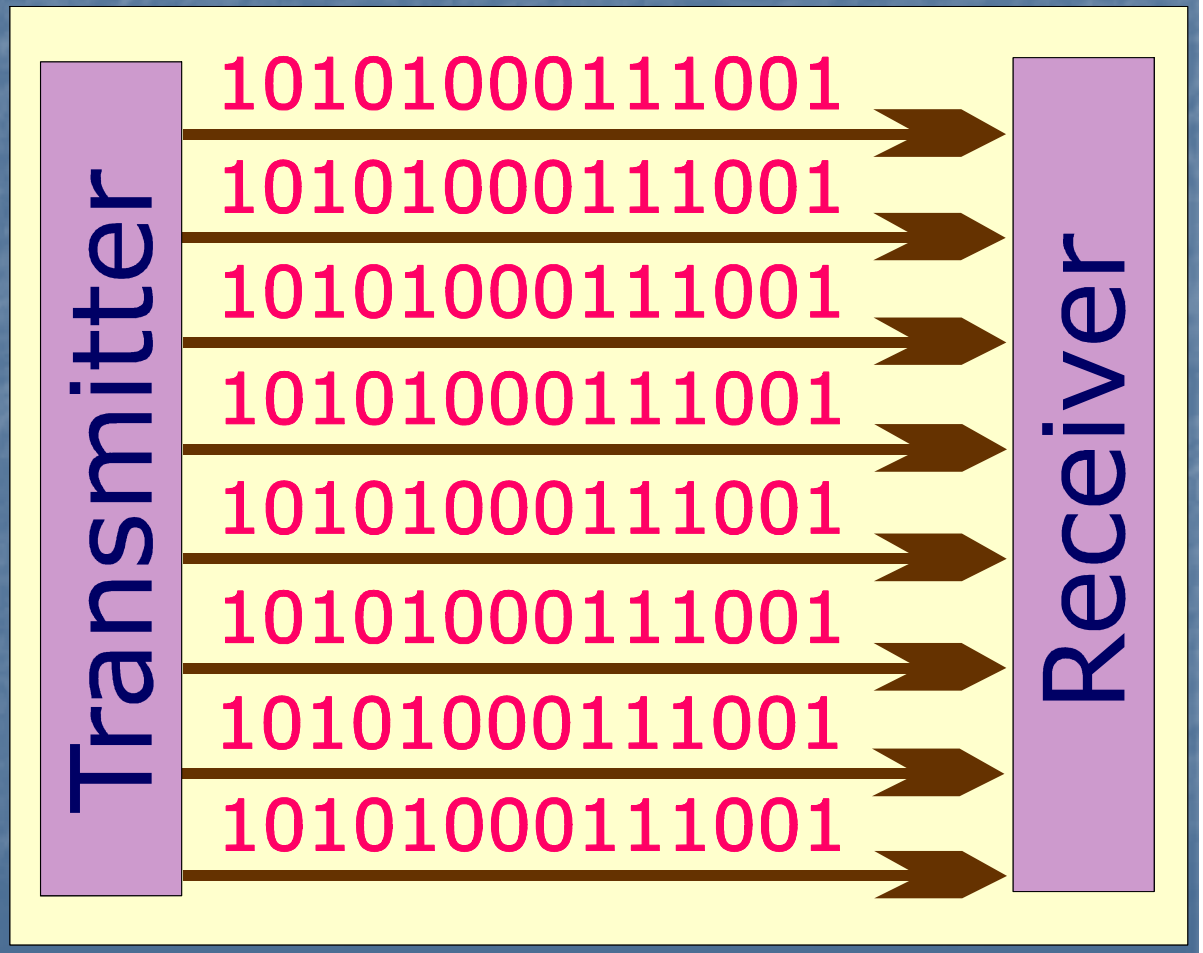
- Referred to as plain text files
- Can be read on any system
- Data formatting performed by applications, not systems
- Formatted data is unreadable without formatting application
- .HTML and .TXT files are examples of ASCII files

# Serial and Parallel Communications

- Most PCs have two standard serial ports, called COM1 and COM2
  - Ports are called ttyS0 and ttyS1 under UNIX
- Modern systems also have U**S**B ports
- Most PCs have one parallel port, called LPT1
  - Up to two more can be added
- Additional ports may be added, but resource conflicts may arise
- Parallel transmission ***used to be*** faster

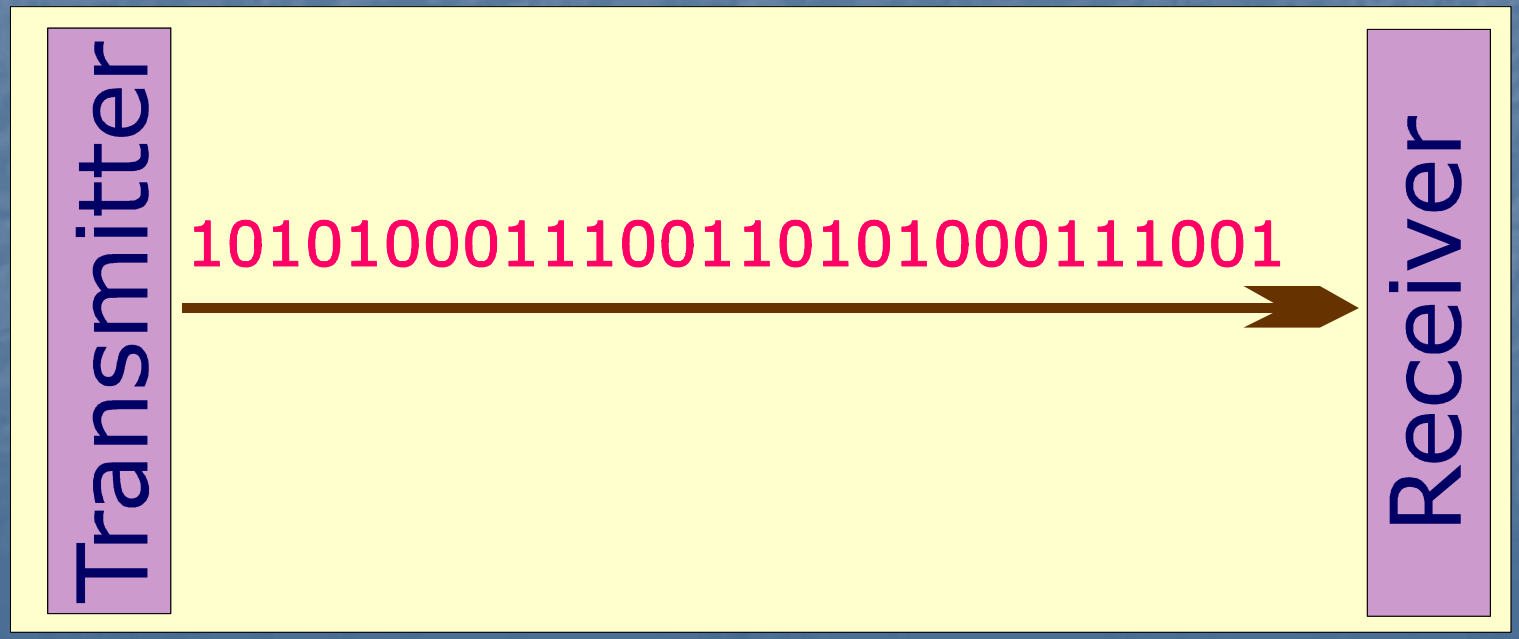
# Parallel Transmission Of Data

- Multiple bits transmitted at the same time
- Used to communicate with most PC printers
- Can be used with some scanners



# Serial Transmission Of Data

- One bit transmitted at a time
- Used to communicate with longer range transmission devices
- In modern use less prone to interference

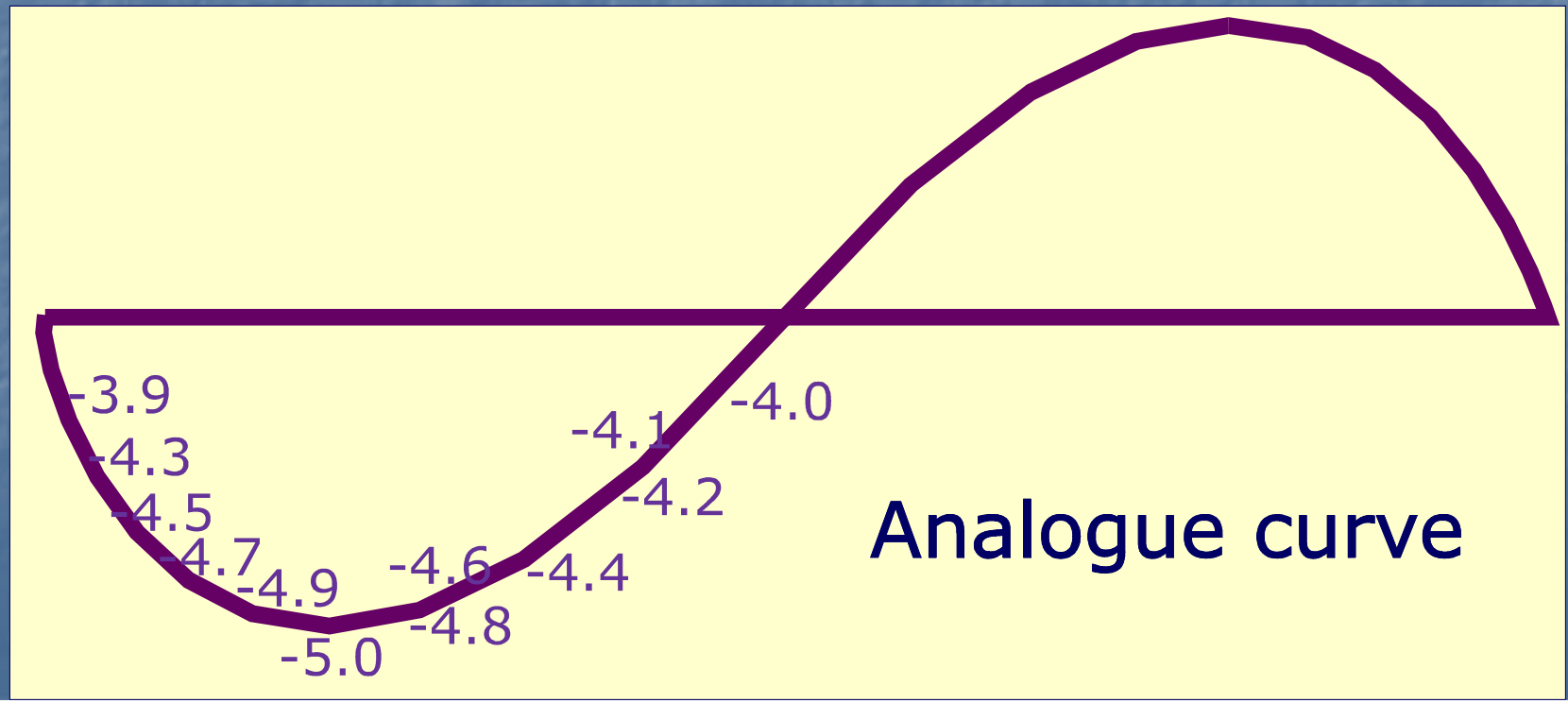


# Serial Transmission Rates

- Transmission measured in Bits Per Second (bps) or baud.
- 16550 UART may function up to 115,000 bps (115Kbps)
- Modems operate up to 33.6Kbps
- 56K modems don't give actual 56K speeds
- ISDN Terminal adapters function at 64Kbps
  - Channels may be bundled
- Compression speeds up actual throughput

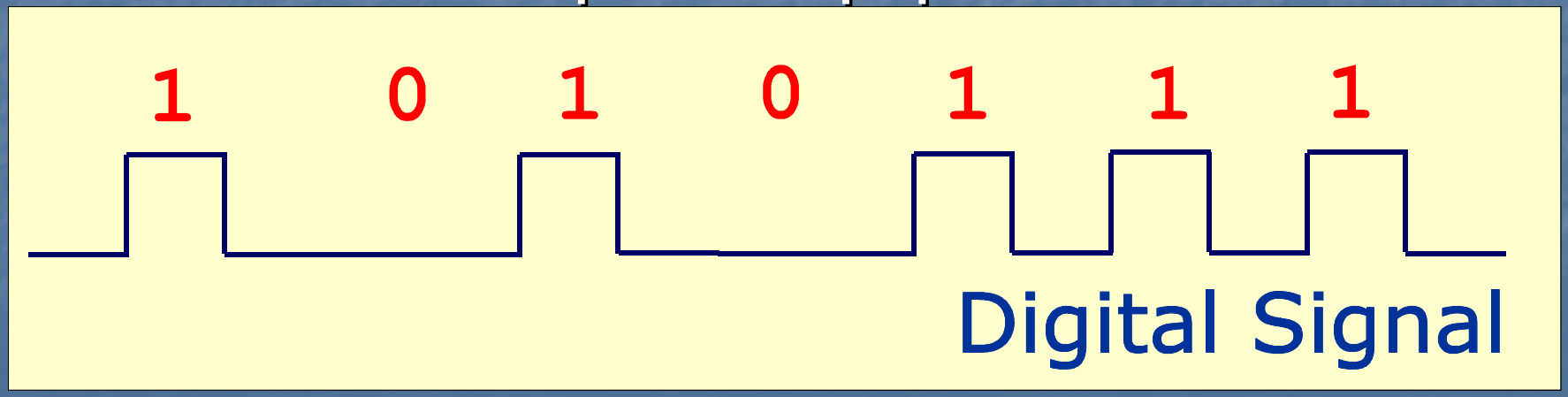
# Analogue Signals

- Analogue signals are a continuously varying series of electrical current values - used on telephone lines



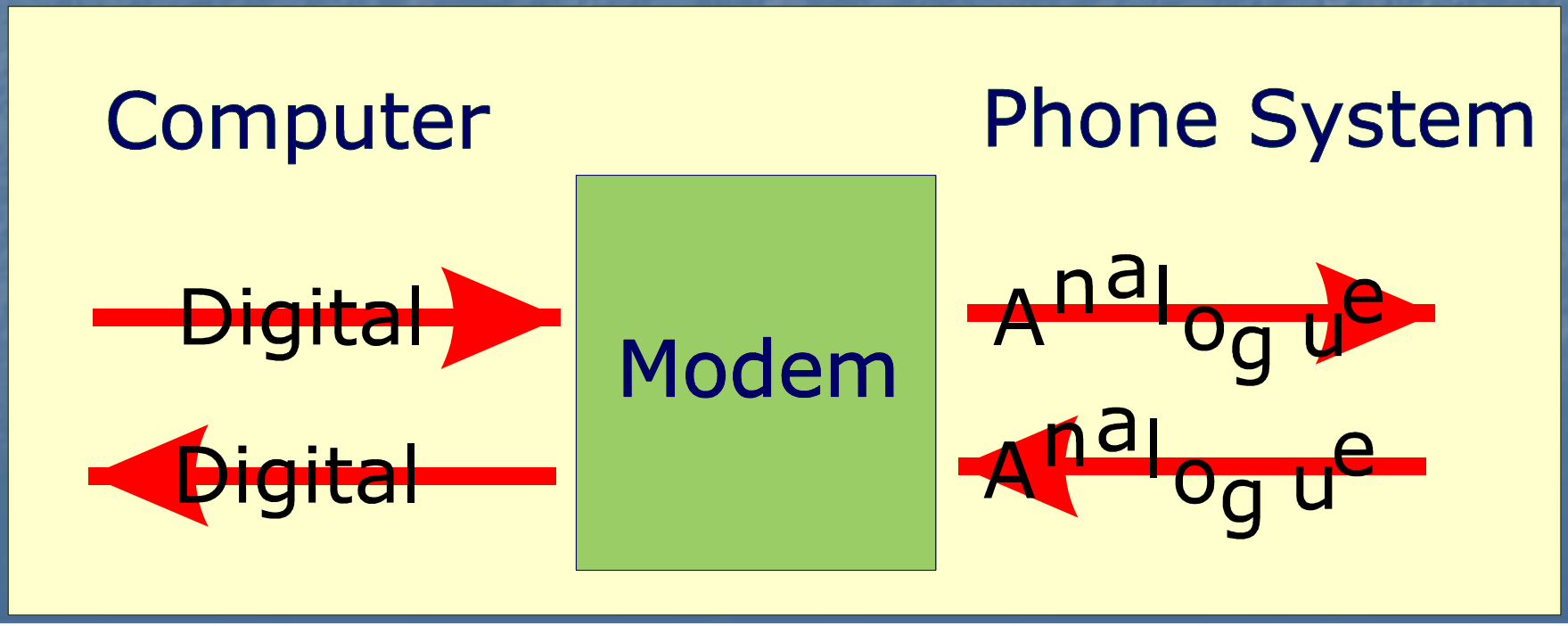
# Digital Signals

- Digital signals are a precisely changing series of electrical voltage values
- Used in computer equipment



# Modems

- Modulator/Demodulator
- Converts digital to analogue
- Digital signals become sounds on the phone line



# Purpose Of A Modem

- Enables the standard phone lines (POTS) to be used for computer communication
- Most Internet users use modems
- ISDN and cable modems becoming other options
- Referred to as DCE (Data Communications Equipment)
- Computer is DTE (Data Terminal Equipment)

# ISDN

- **I**ntegrated **S**ervices **D**igital **N**etwork
- Higher bandwidth than POTS
- Will replace standard **P**acket **S**witched **T**elephone **N**etwork (PSTN)
- Can support video-conferencing *etc*
- Becoming more affordable and available in Ireland
- **T**erminal **A**dapters (TA) and **N**etwork **T**erminators (NT) used instead of modem and standard phone socket

# Broadband

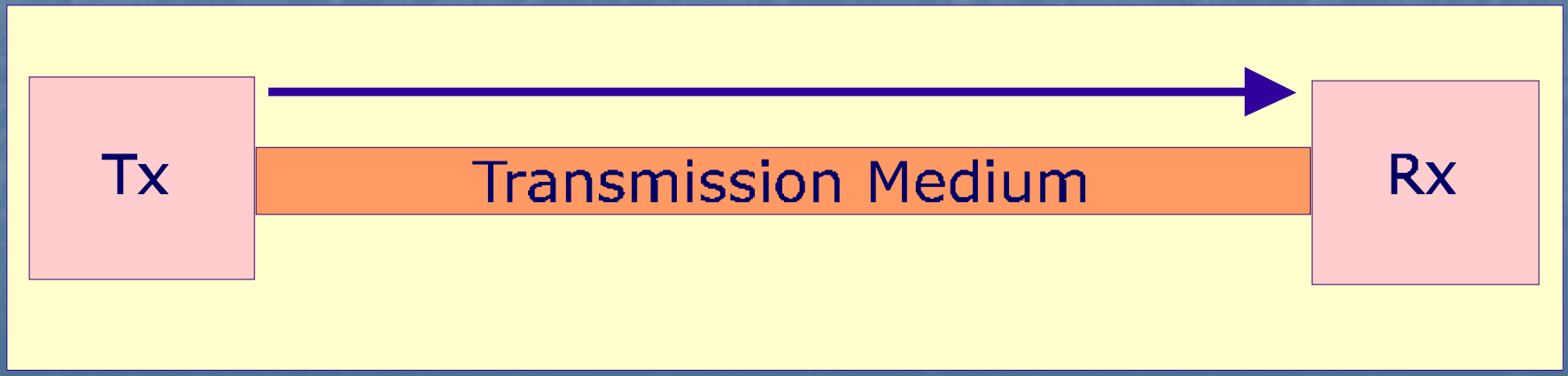
- May use cable modems
  - Transmission achieved using TV cable system
  - Shared bandwidth
- May use existing phone lines
  - Transmission using signal splitter at higher frequencies cannot be 'seen' by existing phone
  - DSL Digital Subscriber Line
  - Not shared bandwidth
- Typical speeds from 256-512Kbps (download)
  - Also called **A**DSL (upload not as fast)
- Always on, fixed costs

# Transmission Modes

- Serial
- Parallel
- Simplex
- Duplex
- Half-Duplex
- Asynchronous
- Synchronous

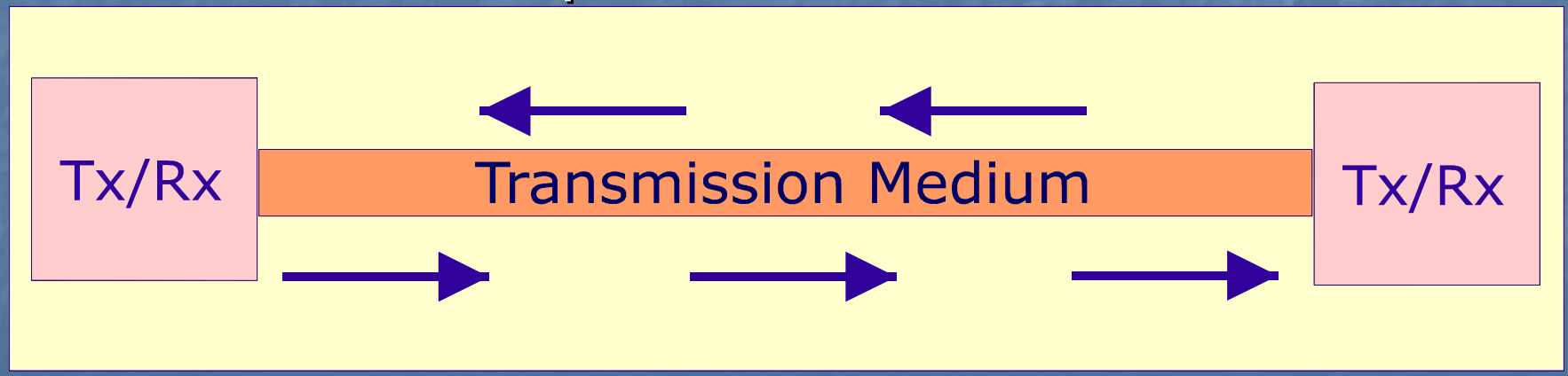
# Simplex

- One device can transmit
- One device can receive
- Transmission is uni-directional only
- Used in TeleText systems



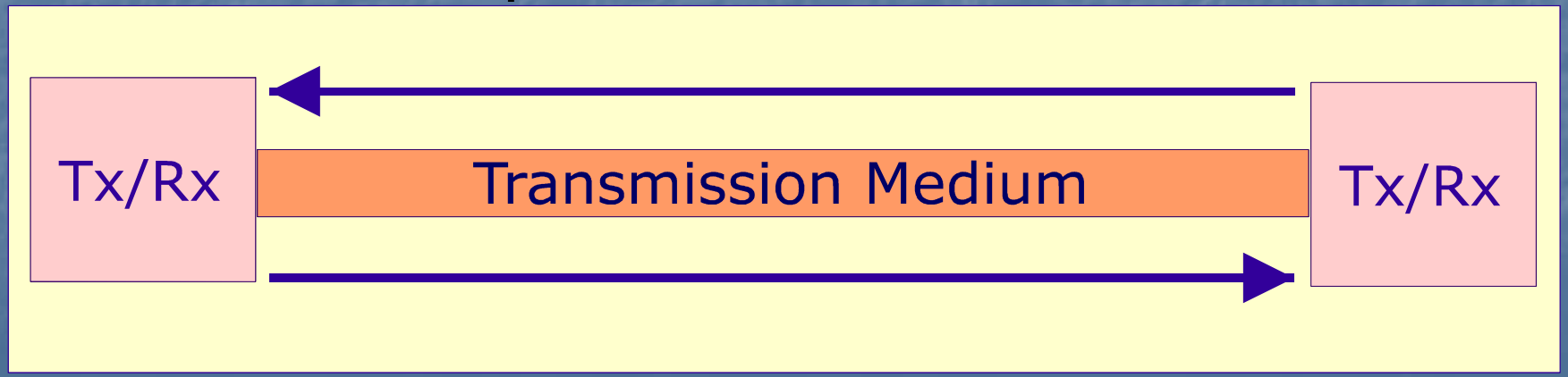
# Half Duplex

- Both devices capable of transmitting and receiving
- Transmission occurs in one direction at a time
- Used in radio-phones & walkie-talkies



# Full Duplex

- Both devices capable of transmitting and receiving
- Transmission can occur in both directions simultaneously
- Used where possible on the internet



# Error Detection

- Need to verify accuracy of received data
- Signal data may be malformed by electrical spikes or magnetic variations
- Double transmission can catch many errors but is twice as costly
- Parity bits may be added at the end of transmitted character data
- Checksums can be used for more complicated error detection

# Parity Bits

- Parity bits are very commonly used
- The receiving system will request retransmission if parity bits don't match
- Even parity ensures an even number of 1s in a character transmission
- Odd parity does similar
- Doesn't correct errors, just detects them
- Long range transmissions includes error correction data