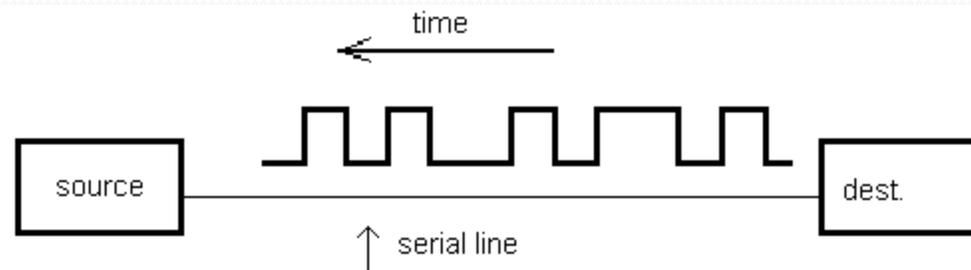


Serial Communications

Transmission modes

- Bit serial transmission:



Synchronization problem at: bit, word, frame level
Signal transitions occur according to a transmitter clock

- Two modes of operation:
 - asynchronous
 - synchronous

Serial Communications

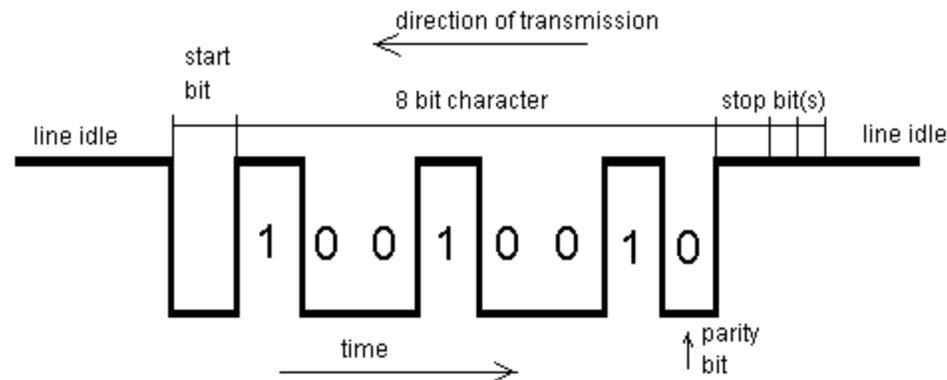
Transmission modes

- Two basic transmission modes:
 - asynchronous: transmitter and receiver clocks are independent
 - synchronous: transmitter and receiver are synchronized

Serial Communications

Asynchronous transmission

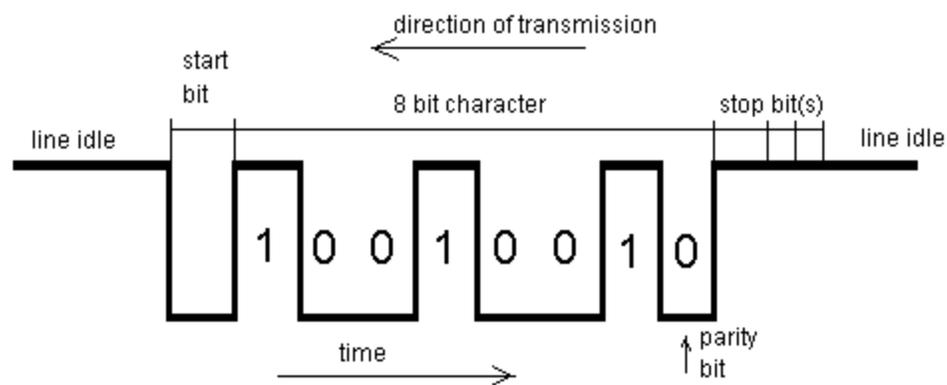
- Data word (octet) is encapsulated between:
 - start bit
 - stop bits(s)
- Receiver resynchronizes again at a start of each new word (or character) received



Serial Communications

Asynchronous transmission

- Transmission parameters:
 - transmission rate (9600bps, 19200bps, etc.) defines bit length in time
 - number of stop bits (1, 1.5, 2)
 - word length (usually 8 bits)



Serial Communications

Asynchronous transmission

- Error control: parity
 - In an N bit word: count number of 1s on the first N-1 positions
 - Insert 1 or 0 in the Nth position to get:
 - even (even parity - E)
 - odd (odd parity - O)
- Parity rather not used these days (parity none - N)

Serial Communications

Asynchronous transmission

- Convention:
 - Parameters of an asynchronous transmission are often presented in the following form:

$S\text{bps } xAz$

where:

- S is a connection speed (19200, 38400bps,...)
- bps: bits per second
- x is a number of bits in a word (usually 8)
- A is parity (usually none: N)
- z is a number of stopbits

38400bps 8N1 is a good bet :-)

Serial Communications

Synchronous transmission

- Transmitter and receiver clocks synchronized
- DTE accepts a clock signal generated by DCE
- Clock signal transmitted either:
 - over a separate line (see V.35, RS232 lines)
 - or encoded into the data (Manchester, differential Manchester encoding) to allow a single line for both data and clock
- No start, stop bits, but still frame synchronization words are needed

Serial Communications

Comparison of transmission modes

- Asynchronous:
 - suitable for data transmitted at random intervals (e.g. keyboard to computer)
 - large overhead (20% or more)
 - rather low data rates (up to 115.2 kbps, practically 38.4 kbps)
 - simplicity and availability: UART and RS232 are present in any PC
 - used in the great majority of dial-up connections
- Synchronous:
 - low overhead (long frames)
 - high rates
 - less prone to errors