Encodings

The Physical Layer, Encoding Schemes:

-Physical Transmission of Bits-

Encoding

- Coding is the process of embedding clocks into a given data stream and producing a signal that can be transmitted over a selected media.
- Transmitter for encoding.
- Receiver for decoding.
- We must encode data to send them from one place to other.

Encoding Techniques

- Encoding schemes deal with how to transport bits over the physical media…
- We must deal and manage many issues to well represent and interpret the bits:
  - Timing of bits (start and end, duration, Signal levels)
  - Clocking (Synchronizing transmitter and receive, External clock, Sync mechanism based on signal)
  - Error detection, Signal interference and Noise immunity
  - Cost and complexity

Encoding Techniques

- Encoding techniques depend on the type of data to transmit and the medium being used:
  - Digital data on digital signal (our focus in this brief description...)
  - Analog data on digital signal
  - Digital data on analog signal
  - Analog data on analog signal

Digital Data, Digital Signal

- Digital signal:
  - Discrete, discontinuous voltage pulses
  - Each pulse is a signal element
  - Binary data encoded into signal elements

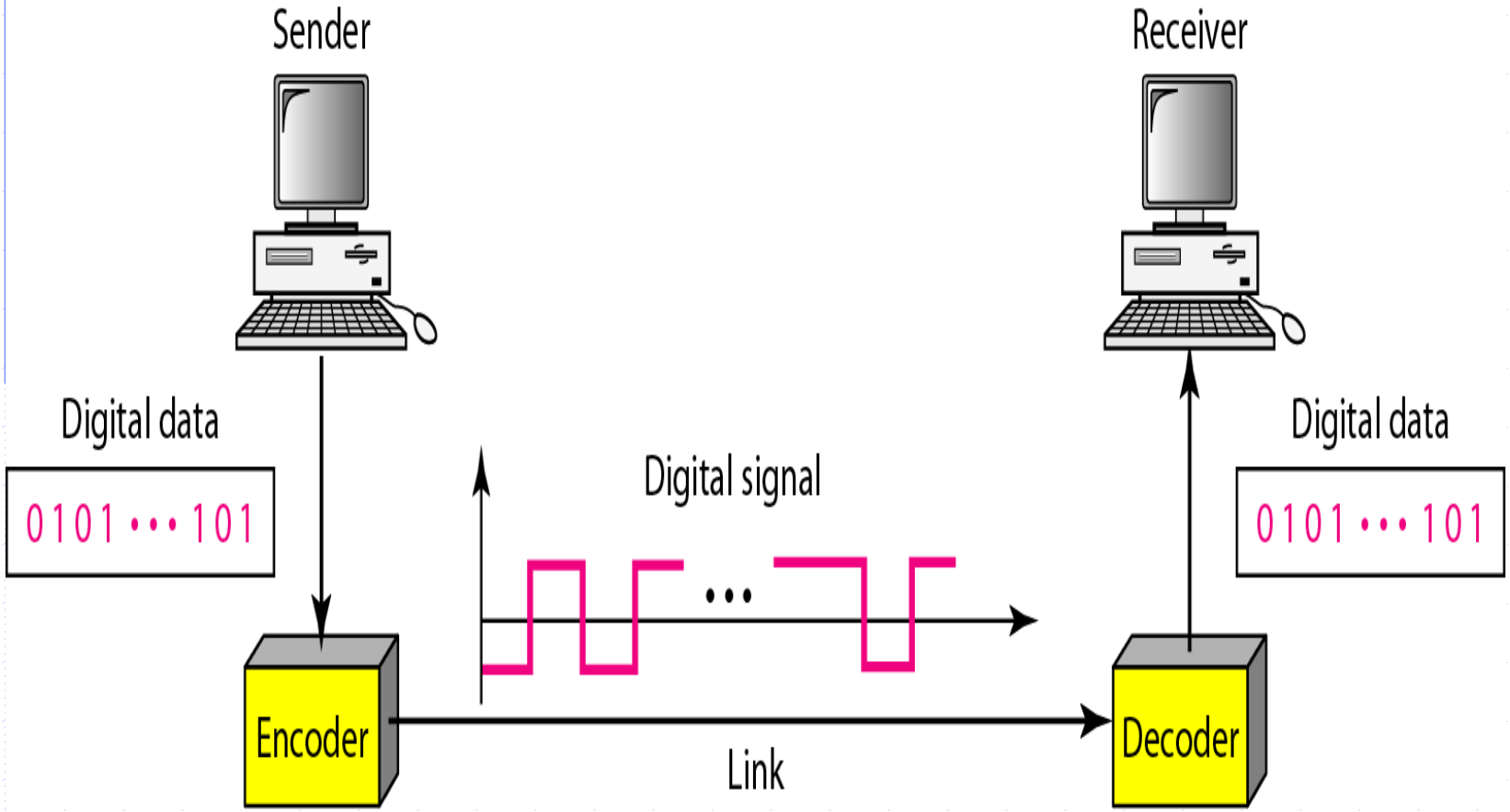
Digital Data, Digital Signal

- In this section, we see how we can represent digital data by using digital signals.
- The conversion involves three techniques: line coding, block coding, and scrambling.
- Line coding is always needed; block coding and scrambling may or may not be needed.

Line Coding

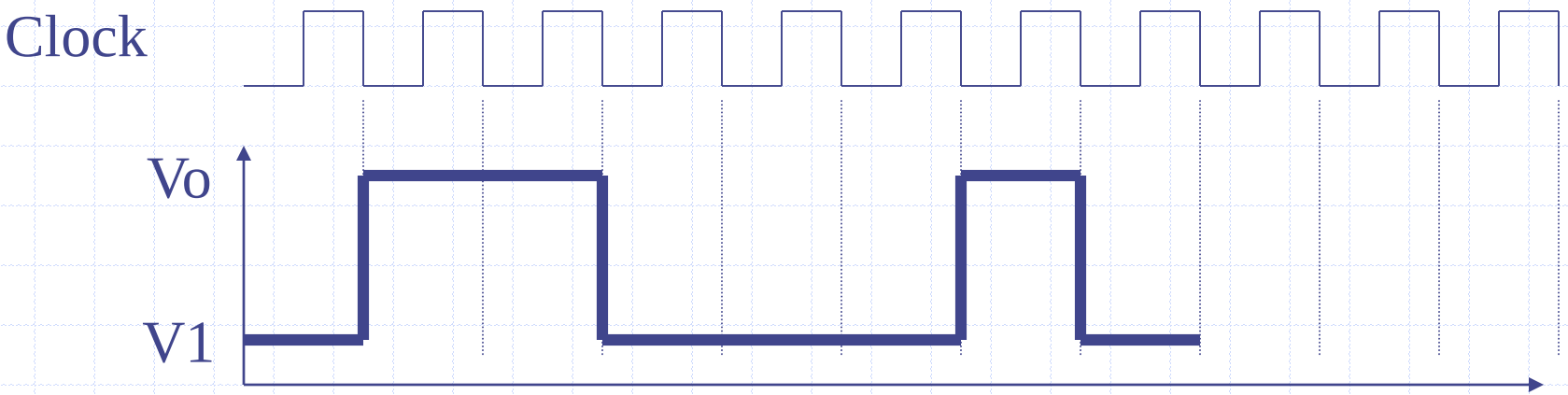
- Converting a string of 1's and 0's (digital data) into a sequence of signals that denote the 1's and 0's.
- For example a high voltage level (+V) could represent a "1" and a low voltage level (0 or -V) could represent a "0".

Continue…

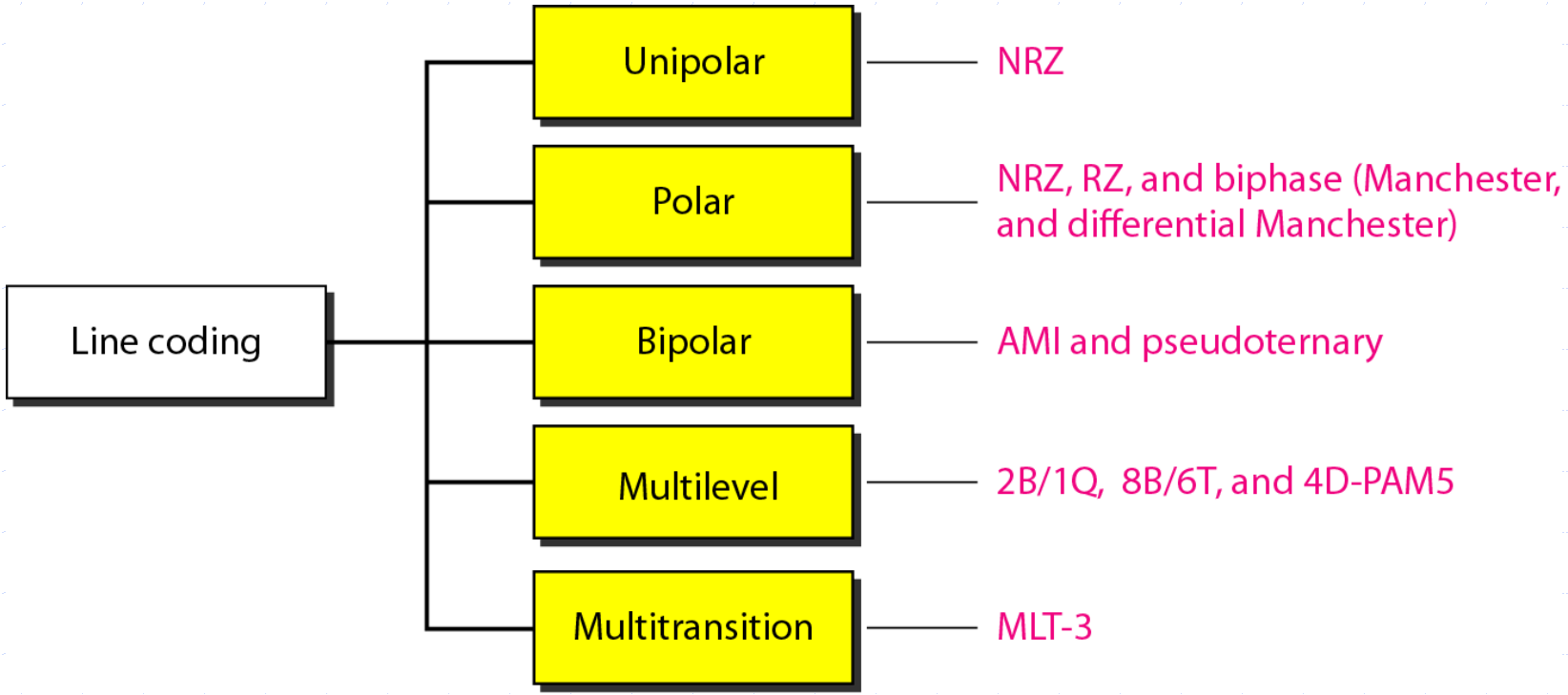

Sender
Receiver
Digital data
0101 ••• 101
Digital signal
Digital data
0101 ••• 101
Encoder
Link
Decoder

A Simple Encoding Scheme

- 0 is Vo (some voltage)
- 1 is V1
- Example : let us encode 10011101

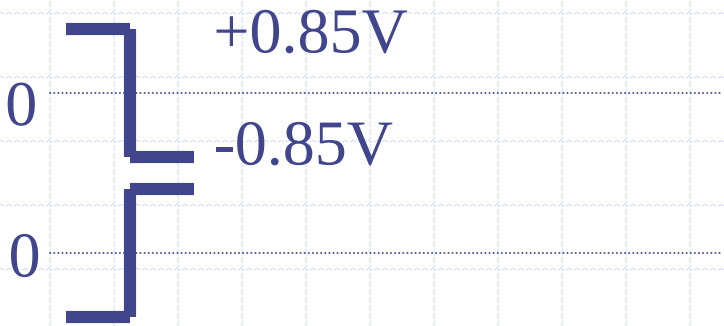


Line coding schemes



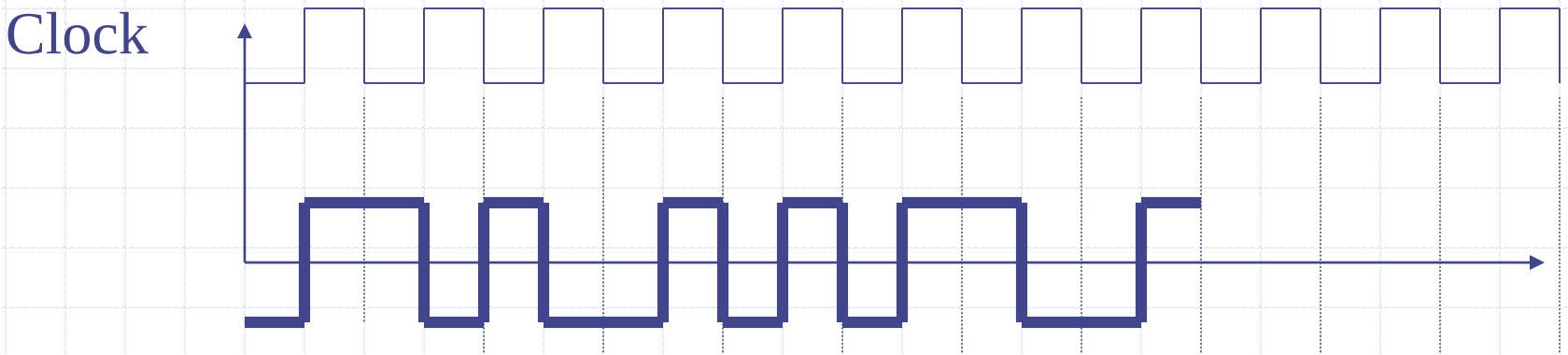
Alternative 1: NRZ-Manchester Encoding

- 1 is
- 0 is
- Example : let us encode 01100010



HightV + LowV –» 1bit

LowV + HighV –» 0bit

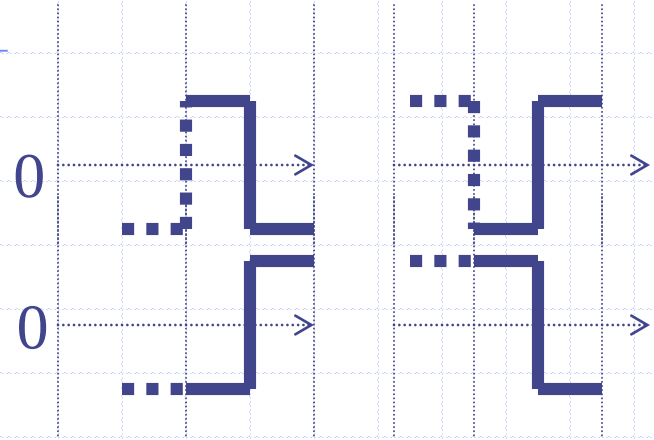


Alternative 2: Differential Encoding

- Data represented by changes trends rather than levels of voltage
- More reliable detection of transition rather than level
- In complex transmission layouts it is easy to lose sense of polarity

Differential Manchester Encoding

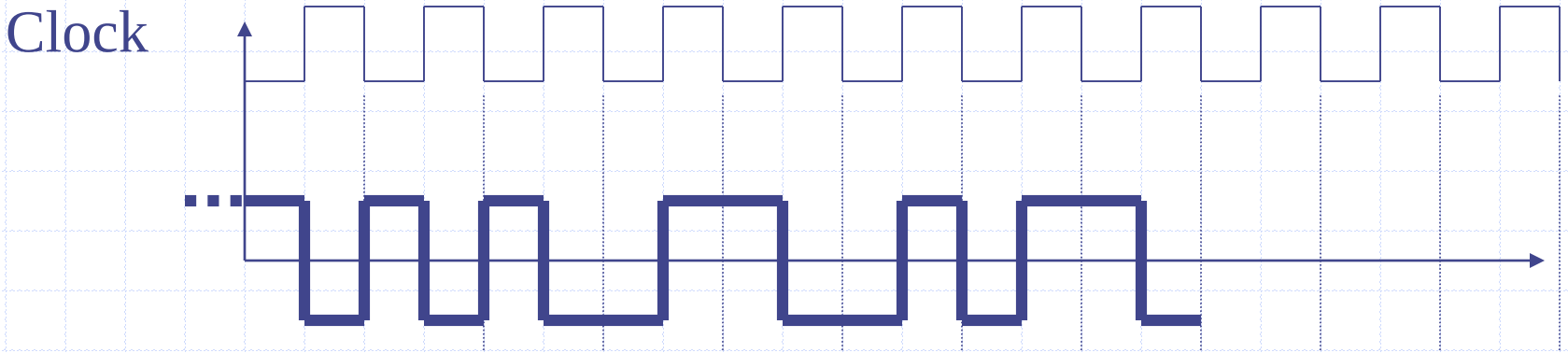
- 0 is
- 1 is



(Presence of transition)

(Abscence of transition)

- A transition in the middle of the bit is required anyway… Example : let us encode 10011101



IEEE 802.11

- Frequency Hopping(FHSS)
- Direct Sequence(DSSS)

Wireless LAN

- Problem :