

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

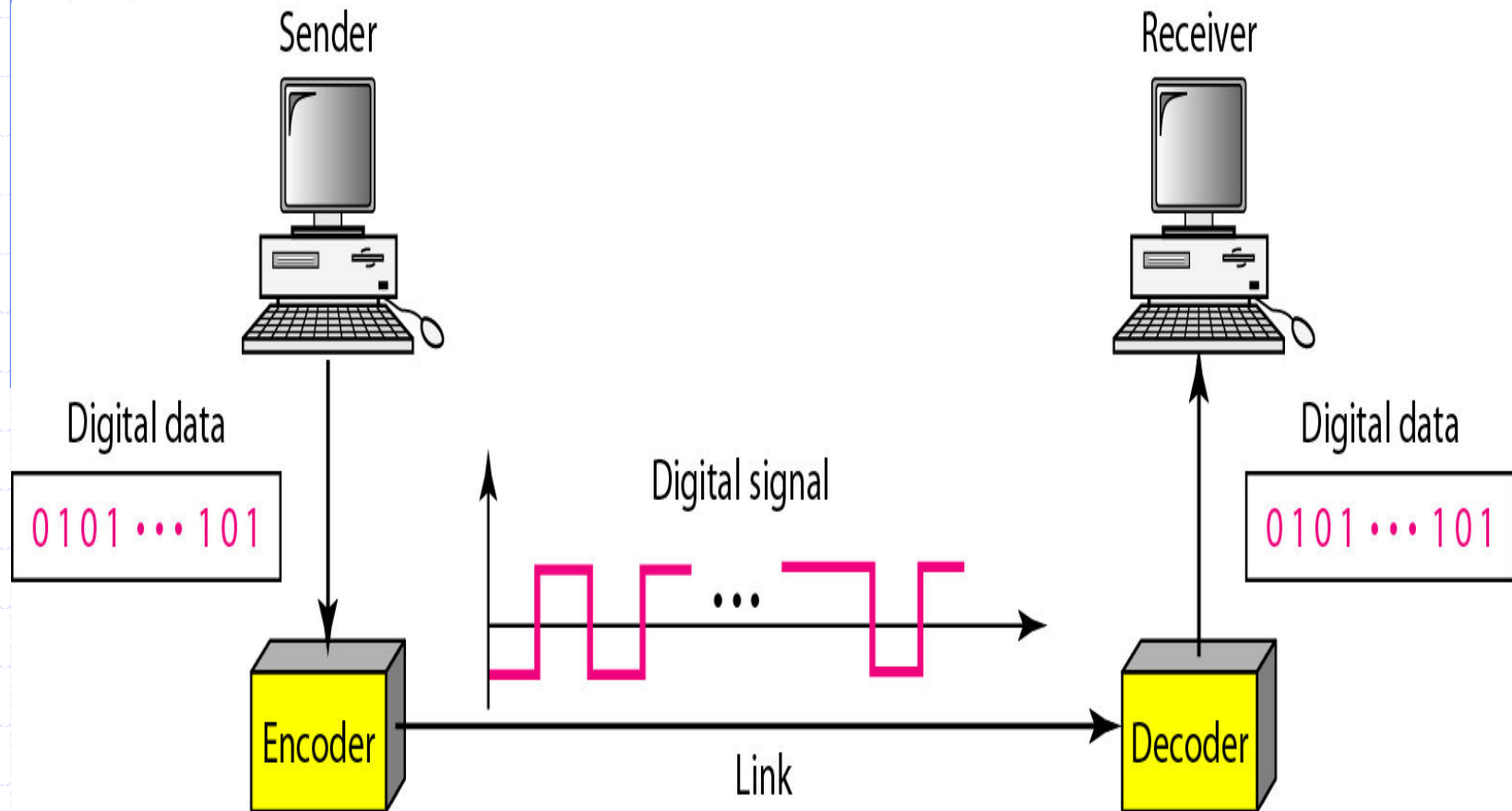
Digital Data, Digital Signal

- ◆ 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...

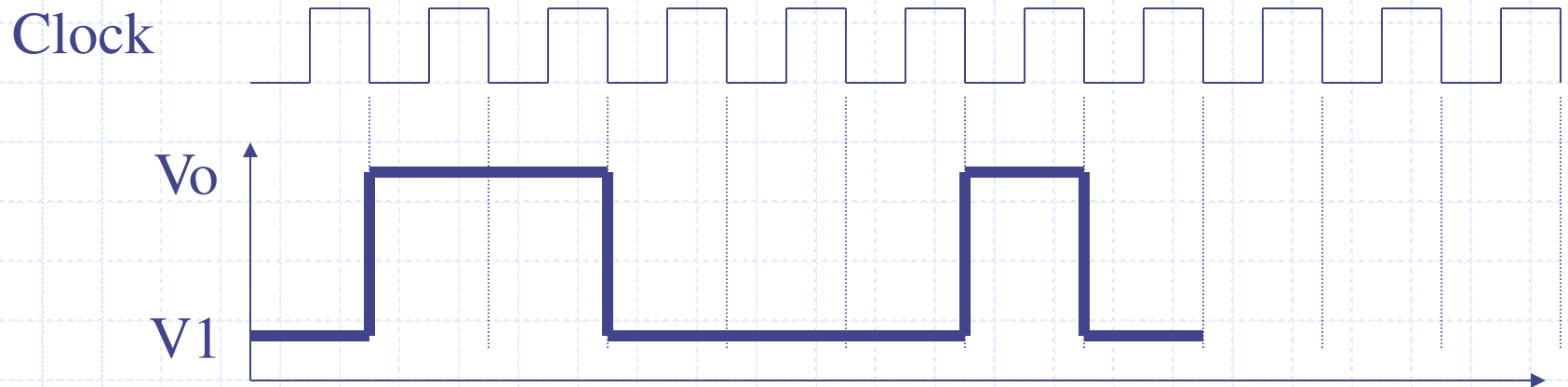


A Simple Encoding Scheme

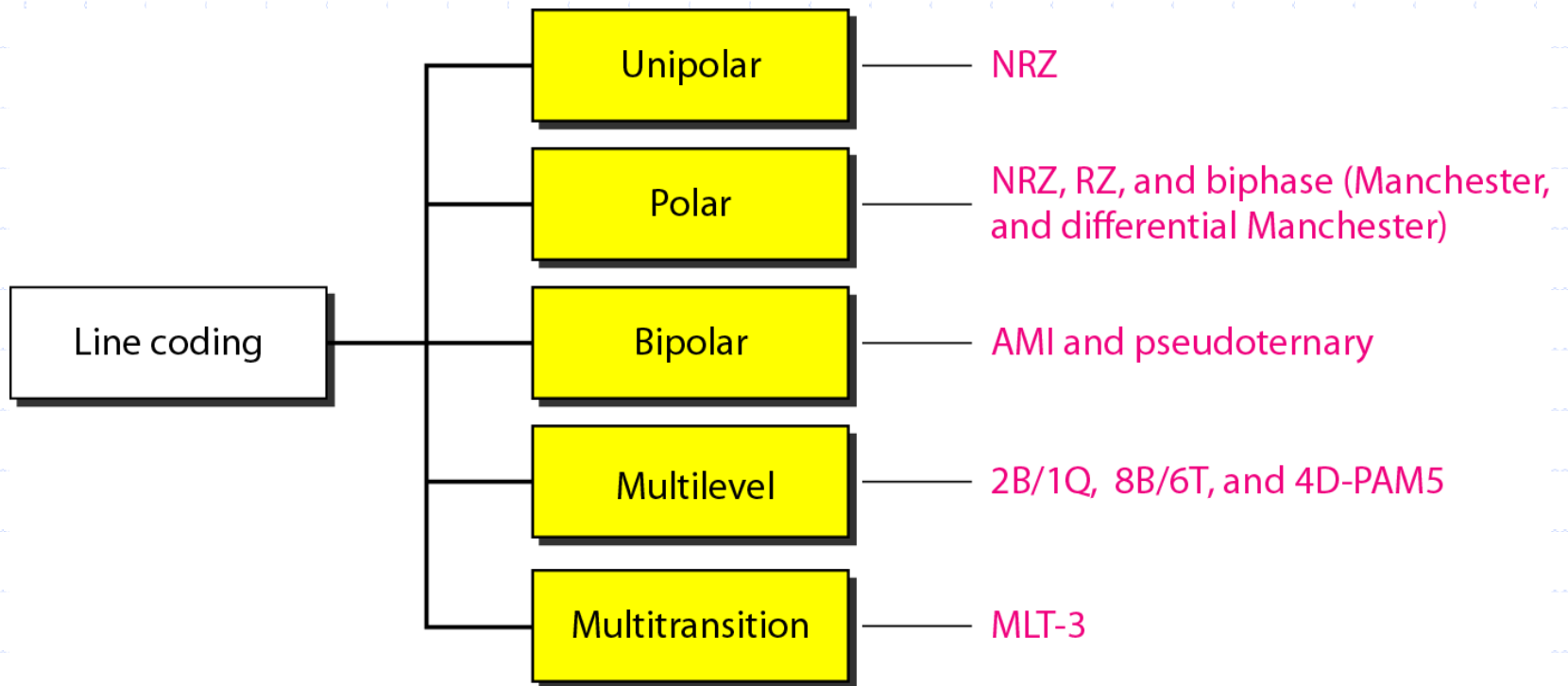
- ◆ 0 is V_0 (some voltage)

- ◆ 1 is V_1

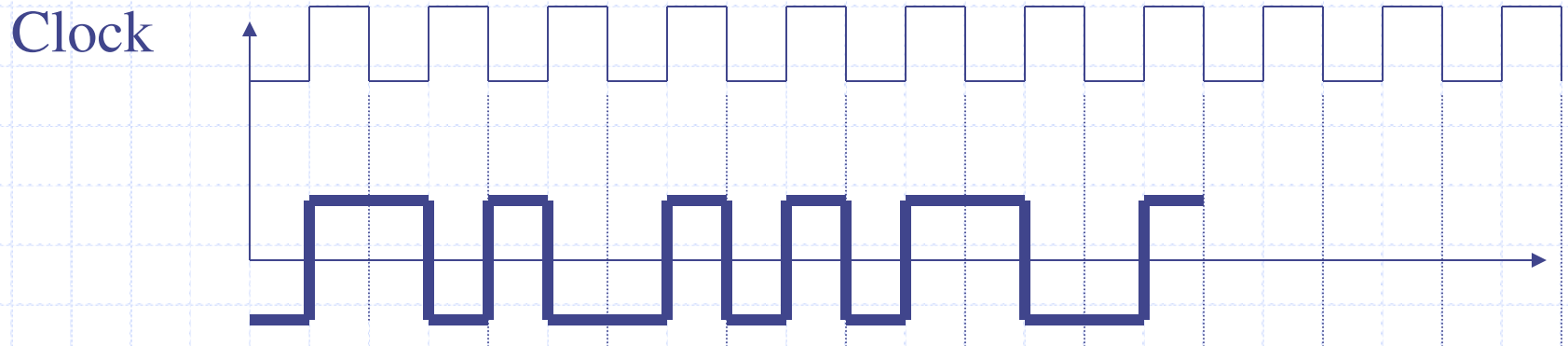
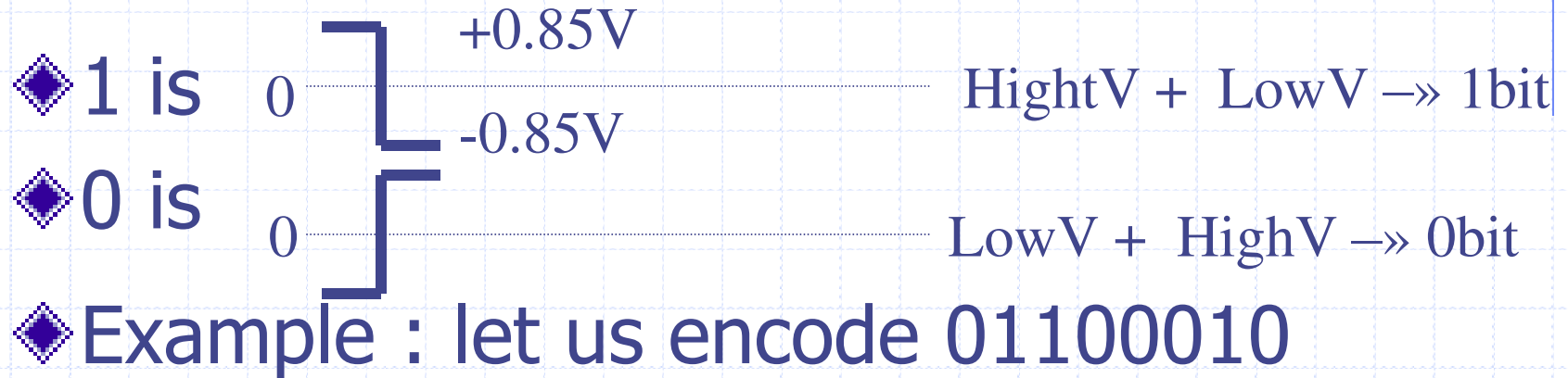
- ◆ Example : let us encode 10011101



Line coding schemes



Alternative 1: NRZ-Manchester Encoding



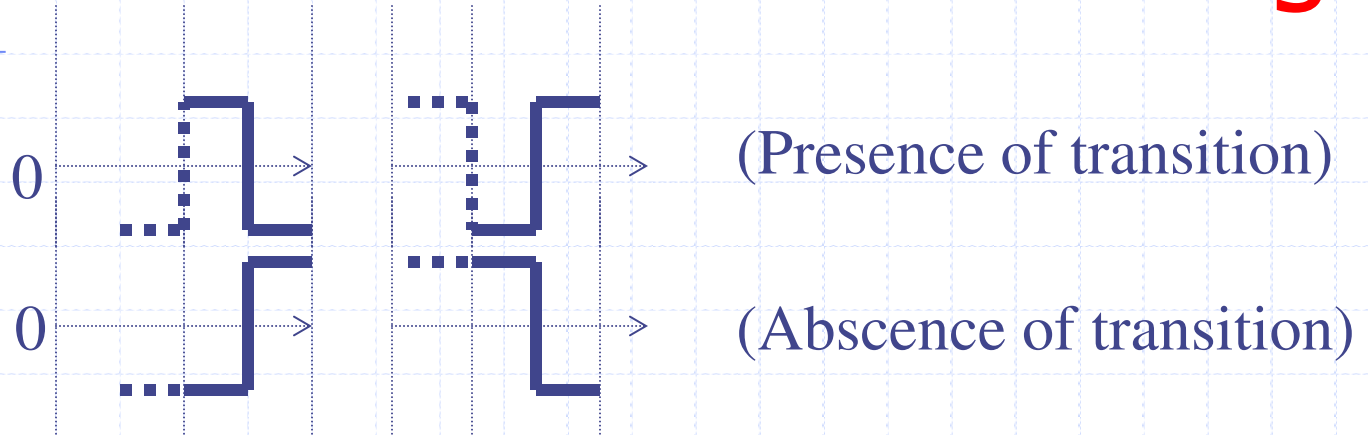
Alternative 2: Differential Encoding

- ◆ 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

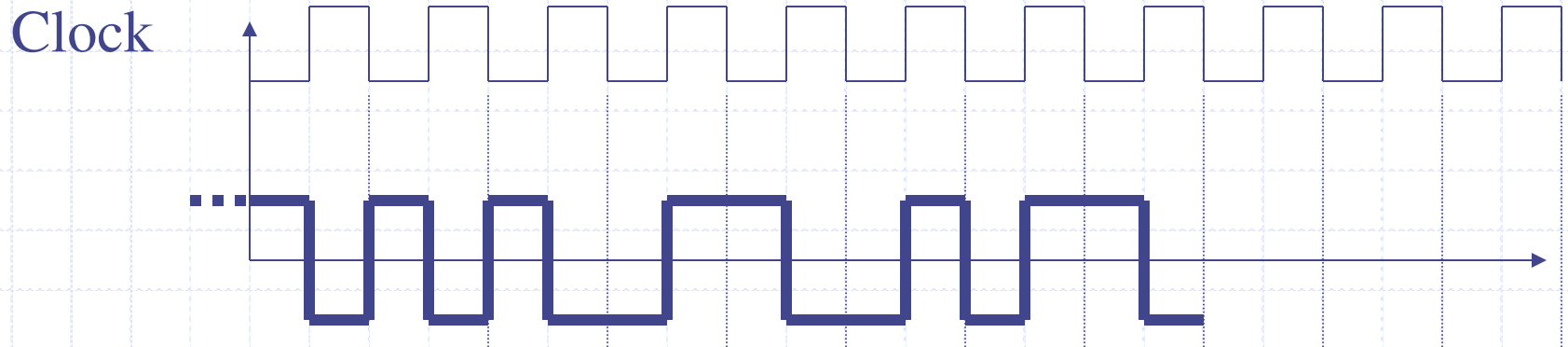
Differential Manchester Encoding

◆ 0 is

◆ 1 is



◆ 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 :