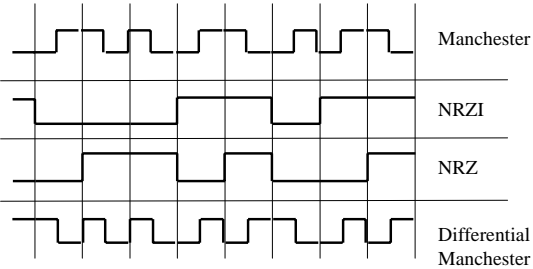


Sample Encodings

Encodings of 10010110



1

4B/5B Encoding

- ❑ Encode groups of bits rather than a single bit
 - Amortize overhead of ensuring signal transitions over multiple bits
- ❑ Each 4 bit sequence is encoded as a 5 bit code; the 5 bit code is transmitted using a simpler mechanism, such as NRZI
 - Use the translation of 4 bit sequence to 5 bit code to overcome the deficiencies of the simpler mechanism

2

4B/5B Encoding

❑ Data	❑ Encoding	❑ Data	❑ Encoding
❑ 0000	❑ 11110	❑ 1000	❑ 10010
❑ 0001	❑ 01001	❑ 1001	❑ 10011
❑ 0010	❑ 10100	❑ 1010	❑ 10110
❑ 0011	❑ 10101	❑ 1011	❑ 10111
❑ 0100	❑ 01010	❑ 1100	❑ 11010
❑ 0101	❑ 01011	❑ 1101	❑ 11011
❑ 0110	❑ 01110	❑ 1110	❑ 11100
❑ 0111	❑ 01111	❑ 1111	❑ 11001

3

Analog Encodings

- ❑ Adjust the characteristics of a basic signal:
 - Amplitude-shift keying (ASK)
 - Frequency-shift keying (FSK)
 - Phase-shift keying (PSK)
- ❑ Can also combine variants
 - Quadrature amplitude modulation (QAM) combines both phase and amplitude shifts

4

Noise

- ❑ Environmental effects on the communication medium can affect the sampling of the signal
 - Attenuation can decrease signal strength
 - Transitions not instantaneous
 - Voltage levels fluctuate based on medium, power source, sender's hardware, ...
- ❑ Noise can appear as a burst of contiguous errors or as individual bit errors

5

Noise

- ❑ Simultaneous transmission can also appear be detected as noise
- ❑ Can data correction be done and is it worth it?

6

Framing

- ❑ The process of grouping bits into a logical unit (frame)
- ❑ Involves
 - Synchronization
 - Detection of frame start and end
 - Error detection
- ❑ Two categories of framing techniques
 - Byte-oriented
 - Bit-oriented

7