Bangladesh Army University of Engineering & Technology

CSE-3215
Data Communication

Lecture-20

Ahmed Salman Tariq
Lecturer
Dept. of CSE

Block Coding

- Block codes operate on a block of bits. Using a preset algorithm, we take a group of bits and add a coded part to make a larger block. This block is checked at the receiver. The receiver then makes a decision about the validity of the received sequence..
- In general, block coding changes a block of m bits into a block of n bits, where n is larger than m.
- Block coding is referred to as an mB/nB encoding technique.

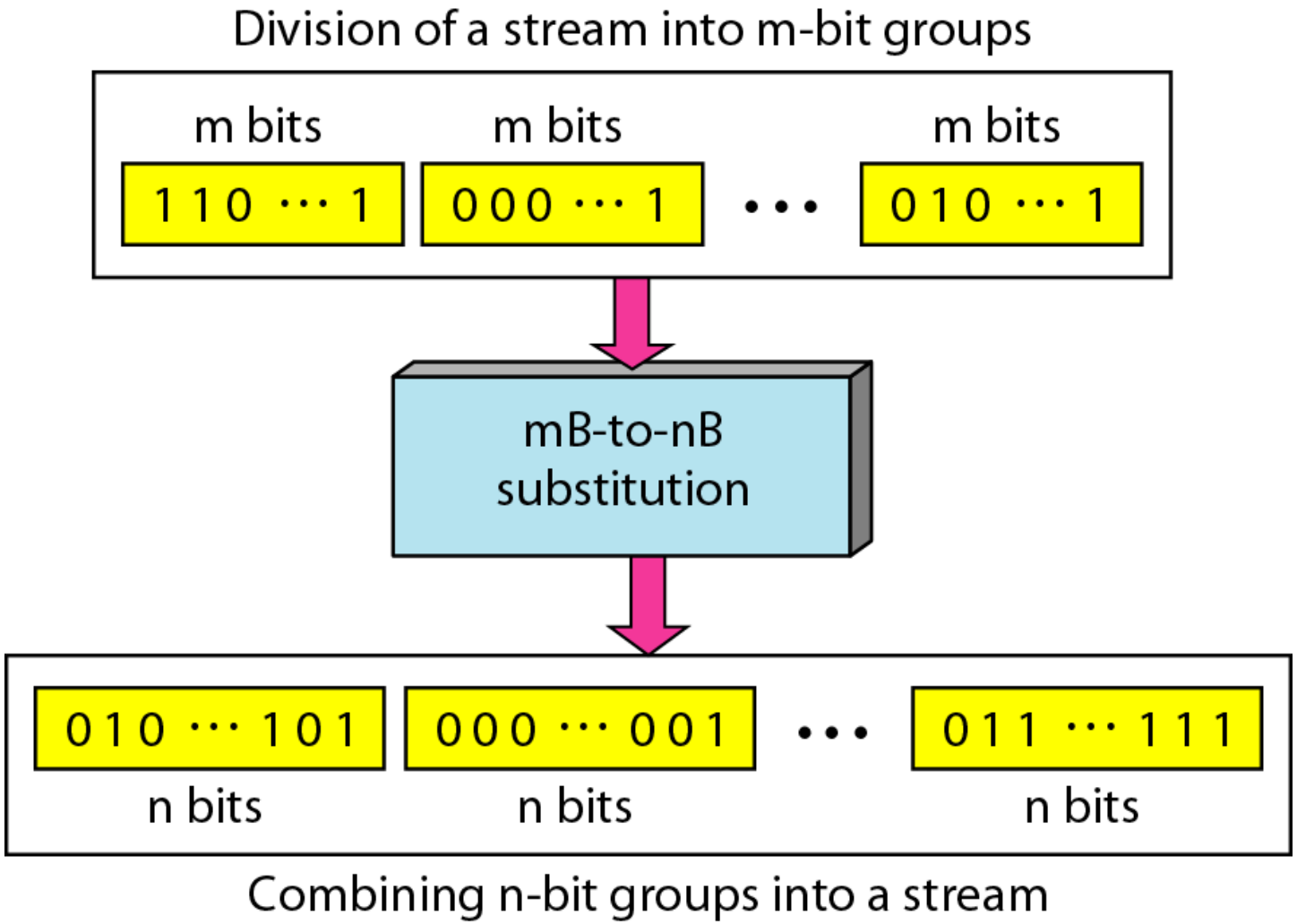


Figure 2 ***Block coding concept***

Note

Block coding provides redundancy and paves the way for error detection

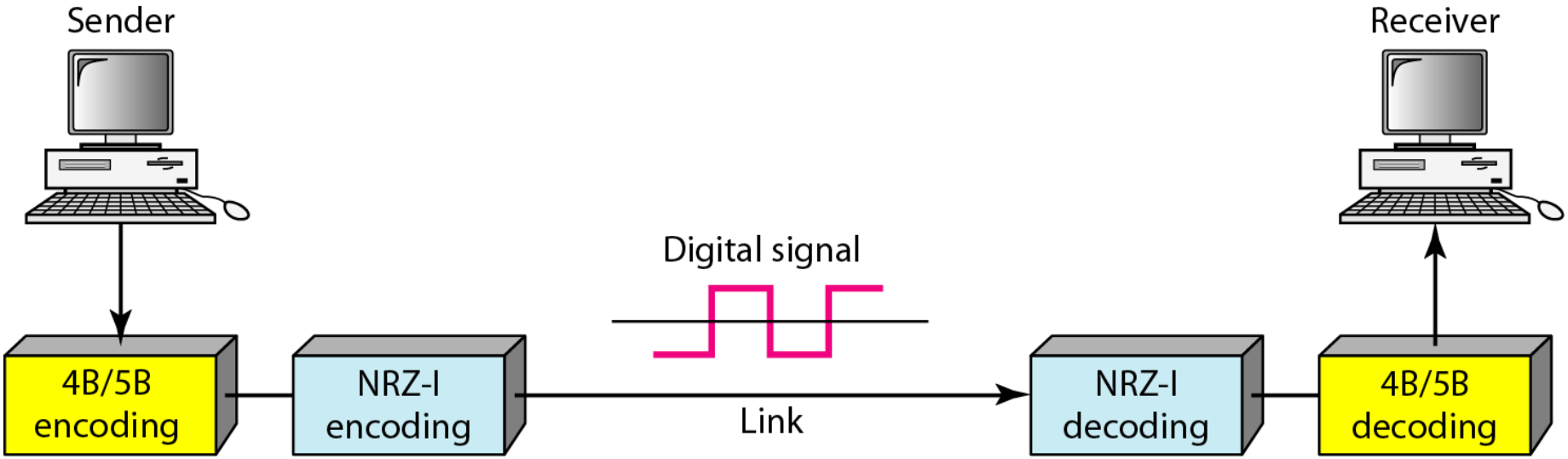


Figure 2 *Using block coding 4B/5B with NRZ-I line coding scheme*

# # #

We need to send data at a 1-Mbps rate. What is the minimum required bandwidth, using a combination of 4B/5B and NRZ-I or Manchester coding?

Solution

First 4B/5B block coding increases the bit rate to 1.25 Mbps. The minimum bandwidth using NRZ-I is N/2 or 625 kHz. The Manchester scheme needs a minimum bandwidth of 1.25 MHz. The first choice needs a lower bandwidth, but has a DC component problem; the second choice needs a higher bandwidth, but does not have a DC component problem.

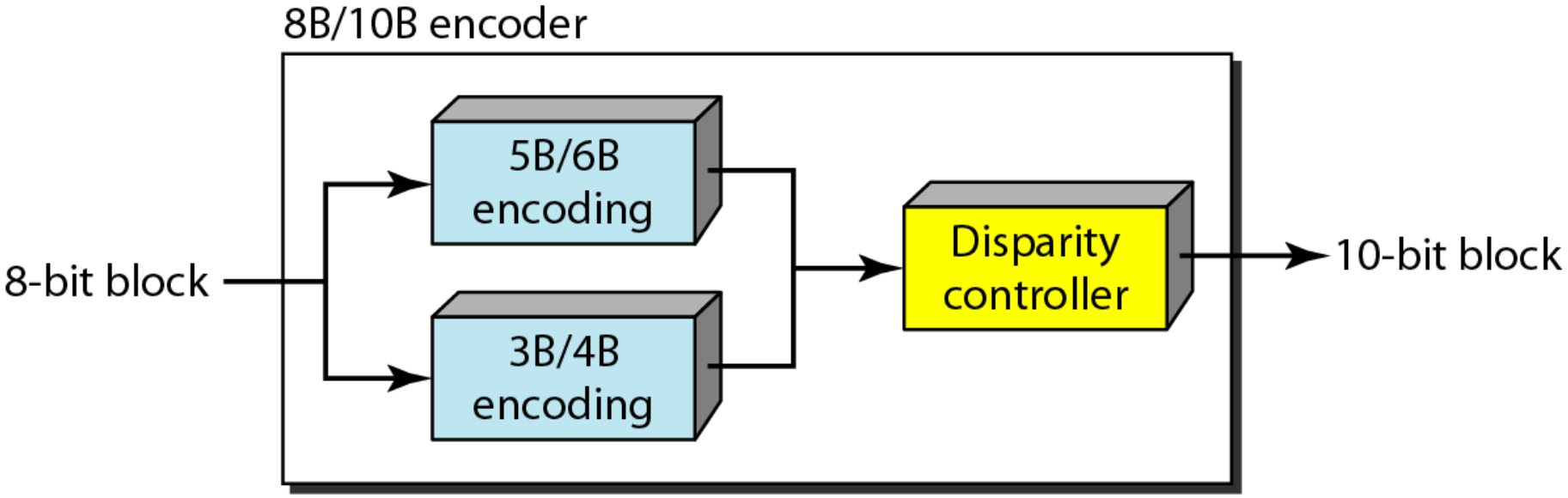


Figure 3 ***8B/10B block encoding***

Scrambling

- The line and block coding is modified to include scrambling, as shown in Figure.
- Note that scrambling, as opposed to block coding, is done at the same time as encoding. The system needs to insert the required pulses based on the defined scrambling rules.
- Two common scrambling techniques are B8ZS and HDB3.

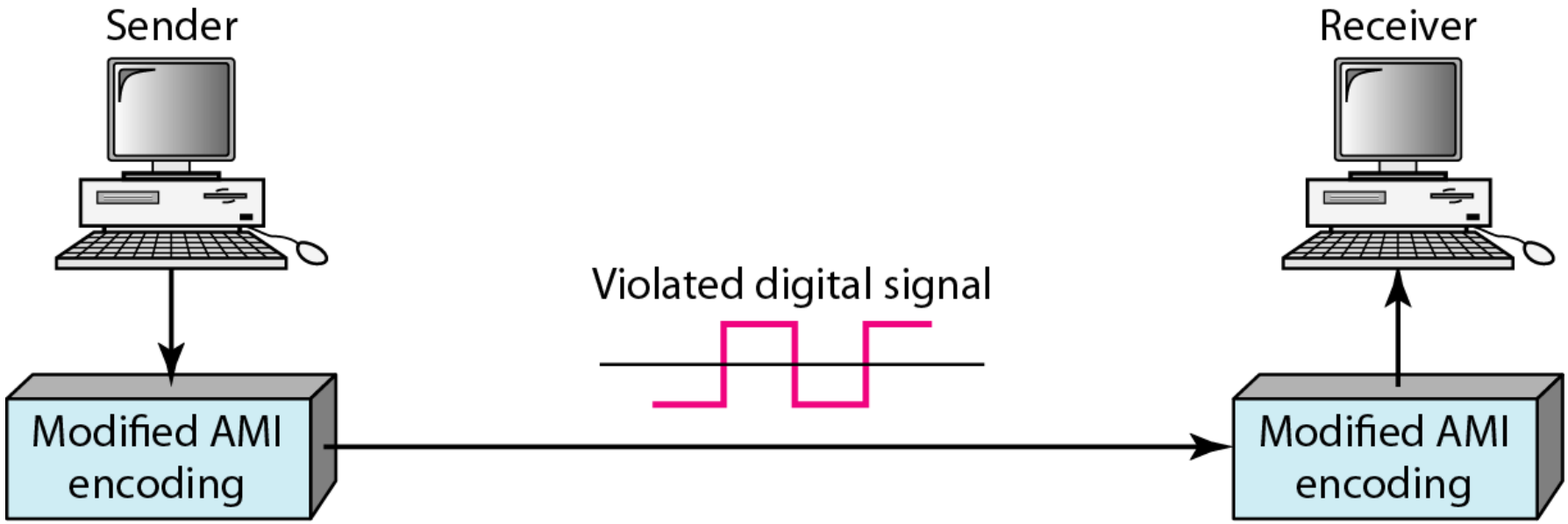
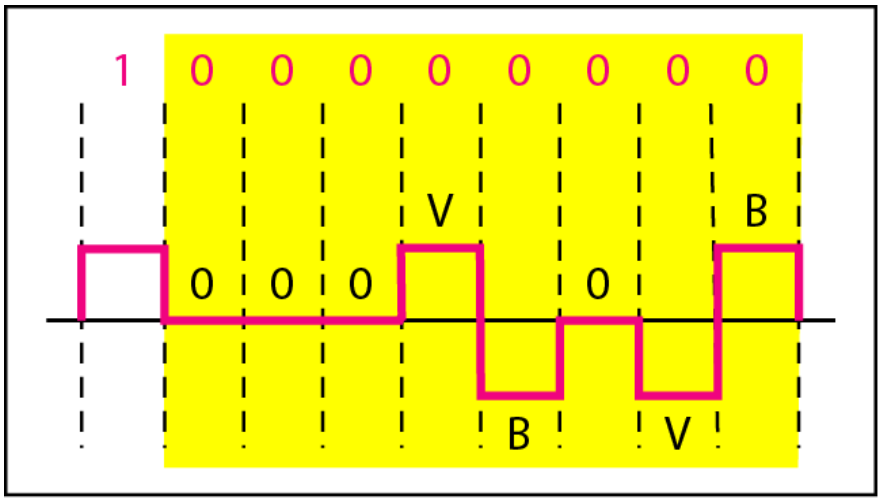


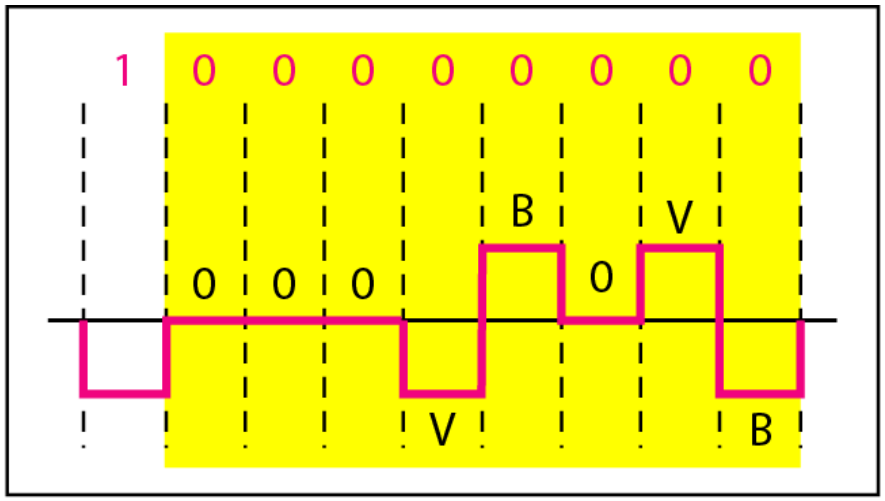
Figure 4 ***AMI used with scrambling***

Note

B8ZS (Bipolar 8 Zero Substitution) substitutes eight consecutive zeros with 000VB0VB.



a. Previous level is positive.



b. Previous level is negative.

Figure 5 *Two cases of B8ZS scrambling technique*

Note

HDB3 (High Density Bipolar 3) substitutes four consecutive zeros with 000V or B00V depending on the number of nonzero pulses after the last substitution.

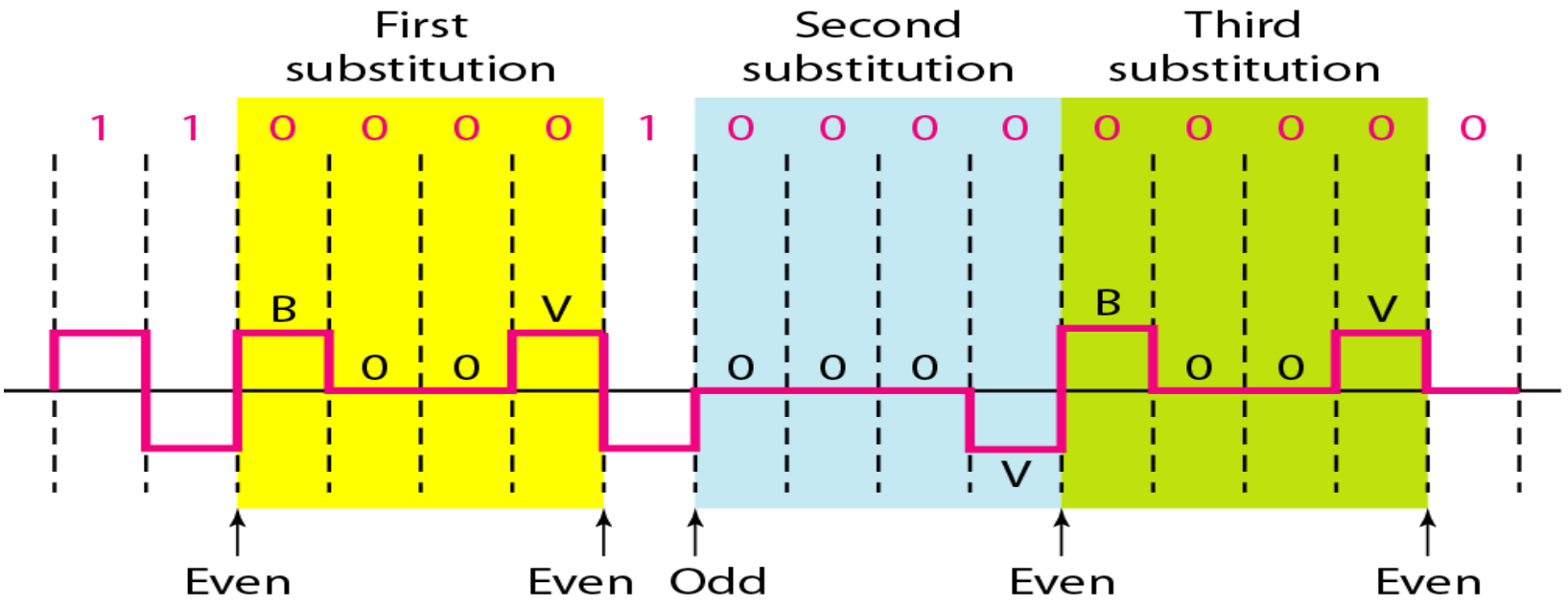


Figure 6 *Different situations in HDB3 scrambling technique*

Note:

- In case of scrambling technique, V follows the last non-zero pulse and B works like Bipolar scheme (alternate pulse).
- Scrambling removes the DC component problem.
- WAN uses – Scrambling (B8ZS, HDB3)

That's all for today

Thank You