Communications and Computer Networks

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Exercise 2

1 Data transmission

1. You have a 129MB mp4-video file and would like to transmit it over a 300KBit/s communication channel. How long will it take to transfer the file (without any interferences or noises on the carrier)?

2. What is the data transfer rate according to the Nyquist theorem at a bandwidth from 4MHz at 8 signal levels achievable?

3. Calculate the maximum data transmission rate of an ADSL-carrier with the following parameters:

   - SNR = 20dB
   - B = 1MHz

4. The provider wants to eradicate this limitation, describe two possibilities to reach a maximum data transmission rate of 16MBit/s!

2 Encoding

5. What are the main problems when transmitting data over an unmanaged carrier?

6. What is the main purpose of line encoding?

7. Draw the resulting NRZ and NRZI-Code of the bit sequence *1011011101*:

8. You have the given signal of a 4B5B encoded signal, decode the original bit-stream
11100101110111001010101001010110101111100 1001

9. Fast Ethernet uses a combination of two different line codes. At first, the bit-stream is encoded with 4B5B, the resulting stream is encoded with MLT-3. Convert the following sequence according to this scheme:
1101001000010111010 11!

3 Tools

10. Use *Wireshark* to capture network traffic of your wifi network connection **and** (if available) of a cable based network connection. Use the following parameters for the capturing:

    - Duration: 2 minutes
      or
    - 10.000 network packets

    Store the wifi capture in a file named *wifi.pcapng* and the cable based capture in a file named *cable.pcapng*. These files will be used later in the course.

4 Hardware

11. A hub sends all network data to all connected network hosts. What is the main problem of this type of network traffic steering?

12. How can this problem be solved?