



03SM22BI0006 - Computer Networks and Distributed Systems (CNDS)

E3 - Reliable Transmission

Recap

In the exercise session, only a high-level summary of the lecture is provided. Please send us specific questions that you would like to see discussed in the exercise session.

Topics and questions can be submitted here:

<https://forms.gle/Zu2qUadRiehoBzrg7>

1 Basic Reliability Concepts

1. Draw the NRZ, Manchester, and NRZI encodings for the provided signal.

Input Signal (digital)	0	1	1	1	0	1	0	1	0	0	0	1
Clock												
NRZ												
NRZI												
Manchester												

2. What is layer-2 framing, and why is it needed?

3. Which approaches exist to provide layer-2 framing? Describe at least two approaches briefly.

4. Assume that character stuffing is used in a transmission with the control following characters:

0110 Data Link Escape

0100 Start of Text

1010 End of Text

How would the following data stream consisting of 6 characters be framed **and** stuffed so that it can be sent? Recall that "Start of Text" and "End of Text" do not need to be escaped in the frame header/trailer – only consider character stuffing for special characters in the payload.

0001 0100 0100 0100 1111 0101

5. Briefly describe error control and flow control.

6. If a transmission is controlled with a sliding window mechanism, how can a receiver explicitly inform the sender that multiple frames were successfully received? For example, assume that a receiver received frames 1, 2, 3, 4, and 5 and would like to explicitly inform the sender.

7. Assume that for a transmission, odd parity checks are used to detect errors.

(i) You just received the following sequence of bits: 11111111. Were there any errors during transmission? With which certainty can you answer this question?

(ii) This time, you received the following sequence of bits: 11111110. Again, were there any errors during transmission and with which certainty can you make this statement?

8. Why are Cyclic Redundancy Checks more powerful than simple Parity Checks?

9. Which of the following statements about Forward Error Correction (FEC) are true?

☐ FEC increases the amount of data to be sent.

☐ FEC requires that all of the data elements that were passed to the decoder were successfully transmitted.

☐ FEC is advantageous if the path is lossy and the receiver is computationally capable.

☐ FEC can only correct but not detect errors.

10. (i) Assume that FEC is used for error correction of 2 bit sequences. Data units C and D are defined as follows:

$$C = A + B$$

$$D = A + 10 \times B$$

Now, the sender would like to send $A = 11$ and $B = 01$. Which data units will the sender actually transmit?

Note: In an exam setting, the addition and multiplication tables from the slides would be provided, too.

(ii) Unfortunately, although A, B, C, and D were transmitted, only B and D arrived on the receiver's end. How can the receiver reconstruct data unit A?

Submission Guidelines

Please use the OLAT system to submit your exercise. For more information on the exercise class, please visit our web page.