
Exercise No. 3

Communication Networks I

Summer Term 2015



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General Remarks

Welcome to the exercise for Communication Networks I. Please adhere to the following general remarks regarding the organization of the exercise during this summer term.

- One week before the tutorial, a new exercise will be published at the Exercise area of the KN1 Moodle (<https://moodle.tu-darmstadt.de/course/view.php?id=5268>)
- The exercise serves as your hands-on experience in addition to the lecture and as a preparation for the exam
- The questions in the exercise can be discussed at the tutorial date
- The sample solution for the exercise is available at the Exercise area of KN1 Moodle in addition to the corresponding tutorial. Nevertheless, we encourage students to try to solve the exercise themselves before the tutorial date without looking into the solution as a good practice to understand the subject of the lecture

Problem 1 - Multiple Choice

a) What does the Binary Exponential Backoff Algorithm do?

- A) Sets and resets the Backoff bit
- B) Determines whether the token runs clockwise or counter-clockwise.
- C) Determines the waiting time of a station after a collision.
- D) Searches a specific station in an Ethernet
- E) Counts the stations in an Ethernet

b) Which of the following access control procedures has central coordination?

- A) pure ALOHA
- B) TDMA (Time Division Multiple Access)
- C) Reservation
- D) Token procedure
- E) Polling

c) Which Channel Allocation algorithm does not work with time slots?

- A) 1-persistent CSMA
- B) Slotted ALOHA
- C) TDMA with reservation
- D) TDMA with Master
- E) p-persistent CSMA

d) Which of the following fields is not part of the frame format of the IEEE 802.3 protocol?

- A) Frame control
- B) Start frame delimiter
- C) Source address
- D) Length
- E) Destination address

e) Which of the following statements are/is true?

- I) There is a maximum length for Ethernet frames.
 - II) In an Ethernet, channel utilization is higher when frames are shorter.
 - III) There is a minimum length for Ethernet frames.
- A) Only II
 - B) Only I
 - C) I, II and III
 - D) I and II
 - E) I and III

f) Which transmission encoding does 802.5 Token Ring use?

- A) Manchester Encoding
- B) Differential Manchester Encoding
- C) Advanced Binary Encoding
- D) IBM Baseband Encoding
- E) Binary Encoding

g) Which of the following protocols does not support random access control?

- A) Pure ALOHA
- B) Carrier Sense Multiple Access with Collision Detection
- C) Slotted ALOHA
- D) TDMA (Time Division Multiple Access)

Problem 2 - Access Control Procedures

- a) Name different access control procedures and classify them (type of access, type of coordination, synchronous/asynchronous ...).
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- b) Explain the advantages and disadvantages of TDMA (Time Division Multiple Access) in comparison to CSMA (Carrier Sense Multiple Access). Give two examples where it is better to use TDMA.
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- c) Now compare the following access control procedures: ALOHA, CSMA 0, 1 and p-persistent and CSMA/CD and answer the following questions:
- Do they use any mechanisms to divide the medium?
 - Do they check the channel at any time?
 - What is the behaviour when a collision occurs?
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Problem 3 - LAN – ALOHA

- a) Give an example of a communication scenario in which pure ALOHA overcomes slotted ALOHA. Describe why?
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- b) Several stations share a channel with a bandwidth of 30000 bps. The following is a list of send requests on a time axis. For simplification, unsuccessful send requests are not buffered. Which of the Frames are transmitted correctly if pure ALOHA is used?
- I) Send request after 10 msec (Length: 180 bit)
 - II) Send request after 20 msec (Length: 300 bit)
 - III) Send request after 40 msec (Length: 100 bit)
 - IV) Send request after 44 msec (Length: 70 bit)
 - V) Send request after 95 msec (Length: 360 bit)
 - VI) Send request after 111 msec (Length: 80 bit)
 - VII) Send request after 120 msec (Length: 200 bit)
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- c) Which of the Frames are transmitted correctly if slotted ALOHA with a time slot of 20msec is used?
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Problem 4 - FDDI

a) Name the differences between Token Ring and FDDI.

b) An FDDI ring has the following configuration: 3 stations, TTRT = 12 time units (TU), synchronous traffic per station: 1 TU. Sending time for asynchronous traffic is always used before the time for synchronous traffic is used. The buffer on the network interface card is unlimited. Complete the following table. *Send* denotes data, that is sent from the network layer (the amount of data, the station **wants** to send, converted in TU), *Buf* denotes data that is buffered on the network interface card (because it could not yet be sent). In the column *TRT* the current Token Rotation Time has to be entered, in the fields *syn* and *asyn* the amount of data actually sent in synchronous resp. asynchronous mode (everything converted in TU)

Station A					Station B					Station C				
Send	Buf	TRT	syn	asyn	Send	Buf	TRT	syn	asyn	Send	Buf	TRT	syn	asyn
10	0	0	0	10	18	0	10	1	2	12	0	13	1	0
12	0				0	15				12	11			
4					0					13				
0					0					0				
0					0					0				
0					0					0				
0					0					0				
0					0					0				
0					0					0				
12					20					7				
0					0					0				
0					0					0				
0					0					0				
13					0					0				
0					0					0				
0					0					0				
0					0					0				

c) Why do exist two rings at Layer 1 of the FDDI topology?

d) Describe what the "Early Token Release" in FDDI does!