Exercise No. 4
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) Which data entity does the network layer deal with?

A) Frame

B) Byte

C) Packet

D) NLDDU

E) Bit

b) Which of the following statements is true?

I) In a packet switched connection each datagram holds the address of the destination.

II) In a circuit switched connection each datagram holds the address of the destination.

III) In a virtual circuit each datagram holds the address of the destination.

A) Only I

B) I and II

C) I, II and III

D) Only II

E) II and III

c) Which of the following is not a type of switching?

A) Router Switching

B) Circuit switching

C) Message switching

D) Packet switching

E) Switching by virtual circuit

d) Which of the following statements is false?

I) Connectionless services have more overhead than connection-oriented services

II) It is easier to implement flow control in connection-oriented services than in connectionless services

III) Internet Protocol IP is a connection-oriented protocol

IV) Transmission Control Protocol TCP is a connectionless protocol

A) Only I

B) I and II

C) I, II and III

D) Only II

E) I, III and IV

Problem 2 - Switching, Connectionless and Connection-oriented Services

a) Briefly explain the four types of switching. Why is message switching not recommended at all?

b) Briefly compare connection oriented to connectionless services. Give an application scenario for each one of them.

c) What is the main difference between circuit switching and virtual circuit switching?

d) What is the difference between full-duplex, half-duplex and simplex operations? Why is a duplex connection required in the context of connection-oriented services?

e) User Datagram Protocol UDP is an L4 connectionless transmission protocol. Give an application scenario where UDP is used as a transmission protocol.

Problem 3 - Congestion Avoidance

a) What is the meaning of the word "isarithmic" in the context of isarithmic congestion control? Explain it based on the operations of isarithmic congestion control.

b) For congestion control, the algorithms Leaky Bucket and Token Bucket are used.

   I) Classify these algorithms within the methods of congestion control.
   II) Briefly state the difference between the two algorithms. Which one is better suited for Internet as we have it today?

c) Does the isarithmic congestion control approach avoid congestion completely? Explain why?

d) The network connection of a computer to a 10 Mbit/s network is regulated by a Token Bucket algorithm. The bucket is filled with a rate of 1 Mbit/s and initialized with tokens for 9 Mbit. How long can the computer send with the full rate of 10 Mbit/s?

Problem 4 - Congestion Control – Reaction and Correction

a) Why is it critical to drop an acknowledgement packet?

b) Why is the Content-related packet dropping not recommended?

c) How could an end system be disadvantaged in the context of Choke Packets algorithm?

d) Why is a duplex connection with a connection-oriented service a prerequisite for Random Early Detection (RED)?

e) Internet is based on a best effort service. Explain why is it called best effort and give a reason why it is realized this way?