Exercise No. 5
Communication Networks I
Summer Term 2015

TECHNISCHE UNIVERSITÄT DARMSTADT

Prof. Dr.-Ing. Ralf Steinmetz
Multimedia Communications Lab
Institut für Datentechnik
Fachbereich Elektrotechnik und Informationstechnik
Fachbereich Informatik (Zweitmitglied)

Published at:	02.06.2015
Tutorial date:	11.06.2015

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) How long is the IP header in minimum?

A) 32 bit
B) 20 bit
C) 32 byte
D) 20 byte
E) 40 bit

b) Which field does not belong to the IPv4 Datagram Format?

A) Version
B) Total Length
C) Time to Live
D) Protocol
E) Payload Length

c) Which of the following is a class C IP address?

A) 168.192.1.1
B) 172.192.11.1
C) 192.168.11.1
D) 11.192.168.1
E) 1.168.192.11

d) If station A sends out a RARP_REQUEST, what is station A trying to learn?

A) its own physical address
B) its own logical address
C) physical address of another station
D) logical address of another station
E) DNS address of another station

e) What is not an IP routing protocol?

A) BGP
B) EGP
C) OSPF
D) RIP
E) LLC

f) What to do with a packet for a Station which is not on the local network?

A) Send packet to gateway specified in the routing table.
B) Discard packet.
C) Use ARP to get physical address of the Station and send packet directly.
D) Send packet to all stations using broadcast.
E) Flood packet into all directions.

g) What is not an advantage of IPv6?

A) longer addresses

B) mobility is supported
C) increased security
D) better checksum algorithms
E) support of realtime data traffic

h) Which IP protocol is used to implement “ping”?

A) IGMP
B) ICMP
C) CGMP
D) BGP
E) RARP

Problem 2 - Internet Protocols

a) A host in a subnet has the IP address 130.83.126.10. How many hosts can be addressed in this subnet?

b) A sub-function of the Network Layer is segmentation/reassembling of packets.

I) Why is segmentation needed?

II) Which additional information in the header (of each fragment) is needed for segmentation?

III) Which type of segmentation is used in IPv4?

IV) Where can packets be fragmented in IPv4, where are they reassembled?

V) Which additional overhead can occure when using segmentation?

VI) Typically reassembly algorithms use timeouts so that when fragments are lost the rest of the paket is removed from the memory. Assume that 3 of 4 fragments of a paket arrived and were deleted after the timeout since the $4th$ was delayed. If now the $4th$ fragment arrives, what happens?

c) One of the Internet control protocols is ICMP.

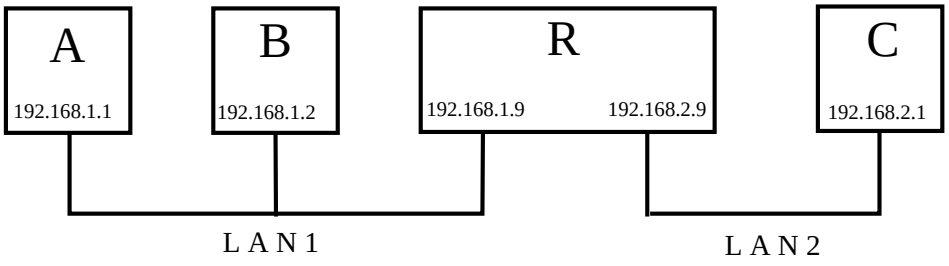
I) What is ICMP used for?

II) Give at least 3 types of ICMP messages!

III) What other Internet control protocols do you know?

Problem 3 - ARP - RARP

Look at the following network topology:



a) When station A wants to send data to station B. What does A need to send the data to B?

b) A knows only B's IP address (there is no entry for B in the ARP cache). How does A determine B's Ethernet address?

c) Where is the problem, when A wants to send data to C?

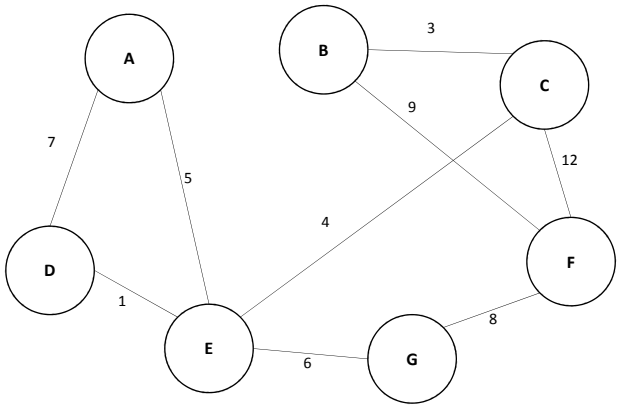
d) How can this problem be solved?

e) What about the following statement: "ARP offers a service to the Network Layer and is therefore a part of the Data Link Layer"?

f) ARP and RARP map address spaces and are therefore similar. What is the big difference in the implementation?

Problem 4 - Graph Theory

a) Calculate the shortest paths from vertex G to all the other vertices by using Dijkstra's Shortest Path Algorithm



	P	A	B	C	D	E	F
1	{G}	∞	∞	∞	∞	6	8
2	{G,E}						
3							
4							
5							
6							
7							