
Computer Communication
EDA344, DIT423 - Re-exam for Study Period 3 students

Time and Place: Tuesday 4 June, 2019, 08.30-12.30 SB-MU/H

Course Responsible: Marina Papatrantaflou (Tel: 772 5413), Ali Salehson (Tel 772 5746)

Allowed material:

- English-X (X can be French, German, Swedish, etc) dictionary
- *No other books, no notes, no calculators, no electronic devices.*

Grading (the scale is different compared to the main exam; proportions are preserved):

CTH - EDA344: 3: 18-25 p, 4: 26-31 p, 5: 32-40 p

GU - DIT423: G 18-29, VG 30-40 p

Instructions

- Write clearly your course-code (EDA344/DIT423)
- Start answering each assignment on a new page; use only one side of each sheet of paper; please sort and number the sheets according to the question-ordering.
- Write in a **clear manner** and **motivate** (explain, justify) your answers. If it is not clear what is written for some answer, it will be considered wrong. If some answer is not explained/justified, it will get **significantly lower or zero** marking. If you make any **assumptions** in answering any item, do not forget to clearly state what you assume.
- A good rule-of-thumb for the extend of detail to provide, is to include enough information/explanation so that a person, whose knowledge on computer communication is at the level of our introductory lecture, can understand.
- Please answer in English, if possible. If you have large difficulty with that and you think that your grade might be affected, feel-free to answer any question in Swedish.
- Inspection of exam: upon request
- **Good Luck !!! Lycka till !!!!**

Questions

1. General questions, applications, security (8 p)

- (a) (2p) Explain what we mean by the term "cookies" in data communication applications and how cookies-mechanisms work.
- (b) (2p) i. Explain how web caching can reduce the delay in receiving a requested object.
ii. Can it reduce delay for all objects or only some? Why?
- (c) (4p) i. What is a Message Authentication Code (MAC)? How would you use a hash function to implement a Message Authentication Code?
ii. Explain the concept of public-key cryptography. Given a public-key cipher, how can you generate and verify digital signatures?

2. Reliable Data Transfer and Transport layer (8 p)

- (a) (3p) i. Define what are the requirements of reliable data transfer.
 - ii. Describe how to solve the problem of reliable data transfer using acknowledgements, over an unreliable channel that can introduce errors but does not lose messages.
 - iii. Describe how to solve the problem of reliable data transfer, using acknowledgements, over an unreliable channel that can introduce errors and can lose messages.
- (b) (3p) Explain the addressing and de-multiplexing provided by UDP and by TCP. Accompany your explanations with appropriate figures.
- (c) (2p) If two end-systems are connected through multiple routers and the data-link layer between them ensures reliable data delivery, is transport-layer reliability necessary? why/why not?

3. Multimedia, Congestion Control and Internet in evolution (8 p)

- (a) (3p) Assume host H is streaming and playing a video from Server S and that the network suddenly becomes very congested. What are the consequences if the connection uses UDP and what if it uses TCP? How can the application handle such situations?
- (b) (3p) What is a Content Distribution Network (CDN)? Explain how it is organized and give an example of how a user request gets served using a CDN.
- (c) (2p) Describe the difference between (i) routing and forwarding, as well as (ii) control plane and data plane functions. (iii) What are the network devices responsible for each of the above?

4. Data Link Layer and Wireless (8 p)

- (a) (2 p) Suppose that error detection is handled by some link layer protocol by adding cyclic redundancy check bits R to a datagram D . An error is detected on reception while no errors occurred within the D datagram. Is this situation possible? Explain why or why not.
- (b) (4 p) What are the approaches taken to handle (i) bit errors and (ii) medium sharing in Ethernet and 802.11 link layer protocols? Compare and justify briefly the choices made in each case.
- (c) (2 p) Describe briefly how mobility is handled by direct and indirect routing.

5. Network Layer (8 p)

- (a) (4p) Describe an advantage and a disadvantage when using a centralized routing algorithm and when using a distributed one. Provide an example algorithm for each paradigm.
- (b) (3p) Consider a network that is assigned the IPv4 prefix 33.22.20.0/23. The network shall optimally and fully, be divided into three subnets, one large and two equal-size smaller subnets. The large subnet must have double address space compared to each of the two smaller subnets.

Hint: The decimal value of binary "1" with position k within byte is 2^k as follows:

	MSB							LSB
k	7	6	5	4	3	2	1	0
value	128	64	32	16	8	4	2	1

When answering the following questions, please explain your answers and calculations carefully. For each subnet give: address and subnet mask in decimal form; the number of valid host addresses that each subnet has room for; the first and last valid host address; appropriate address to configure the default gateway.

- (c) (1p) What is meant by the term "default route"? What is the decimal representation of IPv4 default route?