Instructions for TDTS04 exam, 4 hours (closed book, at LiU campus)

The exam will include 3 long and 2 short questions, randomly chosen among the questions below.

- Long questions are worth 10 points with answers expected to be around 0.5 – 1 page.
- Short questions are worth 5 points with answers expected to be around 0.25 – 0.5 pages.

(The average one-spaced, hand-written page usually contains around 250 words.)

Answers can be written in English or Swedish.

The only allowed aid is an English-to/from-other-language dictionary (printed, not electronic).

The grading is U, 3, 4, 5, based on the completeness (w.r.t. the course material), correctness and clarity of answers, and displayed understanding of the material. The answer lengths are guidelines to indicate how extensive the answer should typically be for full score. Grading will not be directly based on the length of answers.

The grade limits are 3: 20p; 4: 28p; 5: 35p. The maximum score is 40p.

Possible exam questions

Long questions (0.5 – 1 page)

Computer Networks

1. Why do we need protocol layering? Describe the role of each layer.
2. Describe the functioning of the HTTP protocol. Summarize different versions discussed in the course.
3. Compare recursive and iterative DNS resolvers. What are security challenges in DNS?
4. Compare go-back-N vs selective repeat mechanisms. Which one is used in TCP?
5. Explain the role and functioning of ARP.
6. Describe the typical architecture and functions of a router.
7. On a high level, explain how link state and distance vector routing works. Explain the pros and cons of each approach.
8. Describe slow start and fast retransmit mechanisms in TCP Reno.
9. Describe CSMA/CD in Ethernet. How does it differ from CSMA/CA used in WiFi? Why doesn't WiFi use CSMA/CD?
10. Explain the reasons why different routing protocols are used for intra and inter-AS routing.
11. Explain how the optimal value for the retransmission timeout is computed in TCP.
12. How are certificates used to secure WWW?
13. What is user mobility and how it is implemented in WLANs vs cellular networks?
14. What is congestion collapse? How is it avoided in TCP?
15. In the course, we discussed three different approaches for Medium Access Control. Describe these, including their pros and cons.

16. What is the longest prefix matching and how is it used? Explain using an example.
17. Describe the source and effect of queuing, propagation, and transmission delays.
18. What information is typically obtained via DHCP? Explain the process for obtaining this information?
19. Describe the role and functioning of NAT.
20. Explain how a web page with 3 local images (i.e., on the same server) and 3 remote images (i.e., on a different server) is downloaded by a web browser using persistent connections with pipelining.

Distributed Systems

1. What does transparency mean in distributed systems? Describe three types of transparency.
2. What does scalability mean in distributed systems? Name one type of scalability, the challenges with it, and techniques for achieving it.
3. What are the differences between structured and unstructured P2P systems?
4. Illustrate (with figure(s)) and explain how a basic RPC operation involving a client and a server machine works.
5. Illustrate (with figure(s)) and explain how logical clocks work using messages passed between three processes.
6. Illustrate (with figure(s)) and explain how a coordinator is decided using one of the election algorithms.

Short questions (0.25 – 0.5 page):

Computer Networks

1. Which transport protocols are used by HTTP and DNS, respectively? In each case, explain the reasoning behind the choice of transport protocol.
2. How does a self-learning switch make its table?
3. What is encapsulation/decapsulation and tunneling?
4. Compare P2P versus client-server model. What are strong & weak sides?
5. Describe the differences between flow and congestion control.
6. What is an MTU? What are typical values? What is the difference to MSS?
7. Explain the functioning of HTTP Adaptive Streaming.
8. What is a network prefix? Give an example for a subnet of 254 hosts.
9. Which problem is the poison reverse technique solving and how?
10. What is the hidden terminal problem? How is it solved in WiFi?
11. What are pros and cons of Generalized Forwarding?
12. Describe the principle behind store-and-forward. Why is this approach necessary?
13. What are CDNs, and why are those needed?

14. IPv6 removes a number of features from IP. Which and why?
15. Compare the properties of symmetric and asymmetric cryptography.
16. Explain the concept of SDN.

Distributed Systems

1. What does openness mean in distributed systems?
2. Name and briefly describe three basic operations of RESTful architectures.
3. Compare transient vs. persistent and synchronous vs. asynchronous communication. Give examples of the different combinations.
4. Describe the concept of naming in distributed systems, including one approach to identify an entity's current address.
5. Why is replication used in distributed systems? Describe one type of content replication.