



Försättsblad till skriftlig tentamen vid Linköpings Universitet

(fylls i av ansvarig)

Datum för tentamen	<i>2011-08-27</i>
Sal	
Tid	<i>14-18</i>
Kurskod	<i>TDTS04</i>
Provkod	<i>TEN1</i>
Kursnamn/benämning	Computer networks and distributed systems
Institution	<i>IDA</i>
Antal uppgifter som ingår i tentamen	<i>13</i>
Antal sidor på tentamen (inkl. försättsbladet)	<i>4</i>
Jour/Kursansvarig	<i>Niklas Carlsson</i>
Telefon under skrivtid	
Besöker salen ca kl.	<i>15:00 and 17:00</i>
Kursadministratör (namn + tfnr + mailadress)	<i>Madeleine Häger Dahlqvist 013-282360, madha@ida.liu.se</i>
Tillåtna hjälpmedel	<i>Dictionary from an official publisher. Hardcopy; not electronic.</i>
Övrigt (exempel när resultat kan ses på webben, betygsgränser, visning, övriga salar tentan går i m.m.)	<i>Grades: 5(36/40); 4(28/40); 3(20/40)</i>
Vilken typ av papper ska användas, rutigt eller linjerat	<i>Your choice.</i>
Antal exemplar i påsen	

TDTS04 – Computer networks and distributed systems (TEN1)

Final Examination: 14:00-18:00, Saturday, August 27, 2011

Time: 240 minutes

Total Marks: 40

Grade Requirements: three (20/40); four (28/40); and five (36/40).

Assistance: None (closed book, closed notes, and no electronics)

Instructor: Niklas Carlsson

Instructions:

- Read all instructions carefully (including these)!!!!
- The total possible marks granted for each question are given in parentheses. The entire test will be graded out of 40. This gives you 10 marks per hour, or six minutes per mark, plan your time accordingly.
- This examination consists of a total of 13 questions. Check to ensure that this exam is complete.
- When applicable, please explain how you derived your answers. Your final answers should be clearly stated.
- Write answers legibly; no marks will be given for answers that cannot be read easily.
- Where a discourse or discussion is called for, be concise and precise.
- If necessary, state any assumptions you made in answering a question. However, remember to read the instructions for each question carefully and answer the questions as precisely as possible. Solving the *wrong* question may result in deductions! It is better to solve the *right* question incorrectly, than the *wrong* question correctly.
- Please write your AID number, exam code, page numbers (even if the questions indicate numbers as well), etc. at the top/header of each page. (This ensures that marks always can be accredited to the correct individual, while ensuring that the exam is anonymous.)
- Answers can be provided in either English or Swedish. (If needed, feel free to bring a dictionary from an official publisher. Hardcopy, not electronic!! Also, your dictionary is not allowed to contain any notes; only the printed text by the publisher.)
- Good luck with the exam.

1) Question: Encapsulation (3)

Show the link-layer frame for a small packet (that fits in a single frame) when it is just to be passed down to the physical layer at the sender. You do not have to show all the details of the different headers; however, you should explain what protocols and network layer the different headers are associated with? Your answer should include an illustration of how the message is encapsulated. Assume that the packet contains a small image requested by a standard Web browser. Furthermore, you can assume that the source machine uses Ethernet.

2) Question: BitTorrent (3)

One of the more important mechanisms in BitTorrent is the tit-for-tat policy. Please explain what this policy does, what it achieves, and why it is important for the success of BitTorrent.

3) Question: Rendezvous points (2)

Please explain what a rendezvous point is, as well as how and why they are used in the Gnutella join process.

4) Question: TCP (2)

Please explain what a triple duplicate ACK is and what action typically is taken at such an event.

5) Question: TCP fairness (4)

Please explain (and show) how the throughput of two TCP flows with the *different* round trip time (RTT) converges as they compete for the bandwidth of a shared link. Please assume that the one connection has twice the RTT of the other, and that they share the same bottleneck link. (Again, an illustration will help.)

6) Question: Multicast delivery (3)

Please explain the main difference between PIM sparse mode and PIM dense mode.

7) Question: Switching fabric (2)

Give an example of head-of-line (HOL) queuing on a router. (Hint: It may help with a figure.)

8) Question: ALOHA (4)

For this question you are asked to (i) define pure ALOHA, and (ii) calculate the channel efficiency of pure ALOHA. Please make any necessary assumptions clearly.

9) Question: MAC vs IP (2)

Why do we need both an IP and a MAC address?

10) Question: Centralized directory service (4)

Napster was one of the first to use peer-to-peer technology for file sharing. It used a centralized directory approach. Please explain how this works in the peer-to-peer context, and what some of the advantages and disadvantages with this approach may be.

11) Question: Transparency (4)

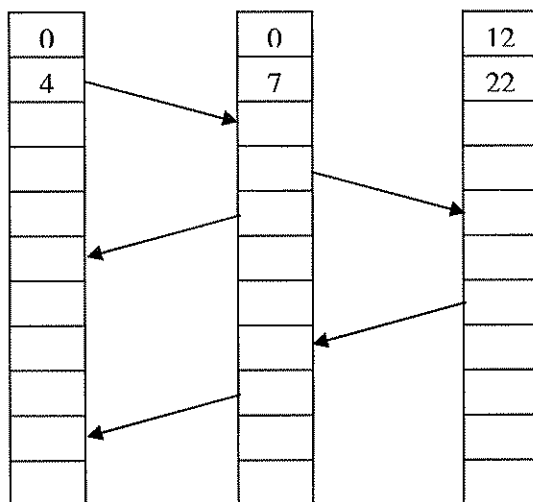
Please name and explain five different types of transparency? Also, explain why transparency is important in distributed systems.

12) Question: Corba (3)

What part of a Corba client is responsible for marshalling? Please explain the task of this component of the client.

13) Question: Lamport's clock (4)

Assume that you have three processes p1, p2, and p3. These processes each have their own clock. The clocks run at different rates: 4, 7, and 10, respectively, where the rates are the number of time units it takes to transfer a message from one process to the next. An example is illustrated in the figure below. Please complete the figure below and explain how the processes would adjust their clocks if using Lamport's logical clocks.



Good luck!!