Written examination in
TDTS43 Computer Networks and Distributed Systems
2003-08-28 at 8–12

Localities
Kårallen.

Permissible aids
A calculator (with memory erased), an English dictionary, and 4 pages of hand-written notes on A4-sized paper are allowed.

Results
Published within twelve working days from the examination date in LADOK.

Points
Maximum 40 points, with no requirements for a specific amount of points in each part. For a passed examination ca 20 p. are needed. For grades 4 and 5 ca 28 p. and ca 36 p. respectively are needed.

Teacher on duty
Juha Takkinen, 013-28 26 03, who visits the hall at 9 and 11.

Instructions
Read the questions carefully before you answer and make sure you understand them. Justify your answers and state explicitly any assumptions that you make. The use of figures is encouraged. You can use either English or Swedish when you write your answers. Please, see also the instructions on the front of the folder that this examination was contained in.

Good luck!
1. Protocols, general
   a. The stop-and-wait protocol is one of the simplest protocols for reliable transfer of data. Explain how the protocol works! (2 p.)
   b. Without sequence numbers there can be problems with the stop-and-wait protocol. Explain when, how and why! (2 p.)
   c. Explain what is meant by service and protocol for a given layer of the OSI reference model! (2 p.)

2. Transport layer protocols
   Argue for or against the following propositions:
   a. “Due to its high overheads TCP is not suitable for client-server applications.” (2 p.)
   b. “Internet telephony typically uses UDP as the underlying transport level protocol because UDP can provide the end-to-end delay guarantee” (2 p.)

3. Network layer
   a. In the beginning of the 1990s there was a fear that the IP address space would be exhausted. What was the reason and how was the problem solved, at least temporary? (3 p.)
   b. What is packet fragmentation? Why is it used? (2 p.)

4. A 1 Mbit message is to be sent from A to D through the following path (see below). The propagation delay of each link is negligible, and the data rates of all of the links are all 2 Mbps.

   A____________B____________C____________D
   2 Mbps         2 Mbps         2 Mbps

   a. Assume circuit switching is used in transmitting the message and the circuit setup time is 100 msec. What is the time to transmit the message? (2 p.)
   b. Assume packet switching is used instead. The packet size is 250 bytes plus header size 50 bytes. What is the time for transmitting the message? (2 p.)

5. Congestion control
   a. What is the purpose of the Slow Start algorithm? Explain how it works in TCP. (3 p.)
   b. When and why is a Fast Retransmission triggered in the TCP congestion control mechanism? (2 p.)
6. Routing algorithms
A network of 4 routers A, B, C, and D is arranged as shown below. The routers use the distance vector routing, using the number of hops as the metric. The value 8 is used by all routers to indicate infinity (to conclude that a router is unreachable).

A__________B__________C__________D
3 2 1

a. The link C-D goes down. How many exchanges would it require for each of them to conclude that D is unreachable? At each exchange, show the distances all the routers maintain to router D. (2 p.)
b. How can the count-to-infinity problem be solved, at least for some cases? (2 p.)

Distributed systems

7. Distributed systems in general:
   a. Describe how the Domain Name System has solved the problem of scalability for distributed systems. (6 p.)
   b. Give an example of a distributed system with a horizontal distribution of its functionality/software. (2 p.)

8. CORBA and DCOM:
   a. One operation offered by an ORB in CORBA is to find the services available to a process, or in other words, to provide a means to obtain an initial reference to an object pointing to an object implementing a specific CORBA service. Name one example of such a service. (2 p.)
   b. How does one specify objects and services in CORBA? (2 p.)