Written examination in
TDTS43 Computer Networks and Distributed Systems
2004-03-13 at 14–18

Localities
R35, R36, R37, U11, U14, and U15.

Permissible aids
A calculator (with memory erased) and an English dictionary.

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

Points
Maximum 40 points for 9 questions, 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.

Teachers on duty
Juha Takkinen, who visits the hall at 14.00–14.20 and around 17 o’clock.

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.

“Never underestimate the bandwidth
of a station wagon full of tapes hurtling down the highway.”

Good luck!
1. For each statement below, tell if it is true or false and also why. Furthermore, briefly (one sentence) explain the terms involved:
   a. Sliding window is a medium access control protocol. (2 p.)
   b. Congestion control is another name for flow control. (2 p.)
   c. Routers exchange routing tables using the file transfer protocol. (2 p.)

2. The Internet protocol
   a. Suppose the IP address of your host is 135.104.192.100/21. What is the network number and the host number for your IP address? How many networks can be addressed and how many hosts in each network? (2 p.)
   b. During normal IP-packet forwarding, which of the following IP-packet header fields are updated and why? (2 p.)
      Source address, Destination address, TTL, Checksum, Source UDP address, Destination UDP address.

3. Assume hosts A and B are connected to each other via the store-and-forward routers R1 and R2 as shown in the figure below.

   ![Diagram of network connections]

   Host A uses a stop-and-wait protocol. Assume no packet loss and infinite buffer size. All the links are full-duplex. The bandwidth and propagation delay in each link are as follows:
   
<table>
<thead>
<tr>
<th>Link</th>
<th>Bandwidth</th>
<th>Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>A – R1</td>
<td>10 Mbps</td>
<td>5 ms</td>
</tr>
<tr>
<td>R1 – R2</td>
<td>2 Mbps</td>
<td>30 ms</td>
</tr>
<tr>
<td>R1 – B</td>
<td>10 Mbps</td>
<td>5 ms</td>
</tr>
</tbody>
</table>

   a. Host A sends a packet of size 10,000 bits to host B. How long will it take for the whole packet to reach host B? Assume host B replies with a 1,000-bit acknowledgement immediately after receiving the data packet; what is the round-trip time? (2 p.)
   b. Assume the original packet is fragmented into 1,000-bit fragments and each fragment is sent as a separate packet by host A to host B. You can ignore the extra packet overhead. What is the new round-trip delay, including a 1,000-bit acknowledge from host B to host A? (2 p.)

4. Quality of Service
   a. What is the purpose of the RSVP protocol in Integrated Services? (2 p.)
   b. What is the difference between scheduling and policing? Also, give one example mechanism for implementing each. (2 p.)
5. CSMA/CD
   a. Draw a diagram or use pseudocode to show the operation of the CSMA/CD algorithm. Make sure to include a successful transmission, as well as an unsuccessful transmission in the description. (3 p.)
   b. Why is it important for a transmitting station to be able to detect a collision before it completes a transmission? (2 p.)

6. Routing
   a. For the network given in the figure below, show in steps how the link-state algorithm builds the routing table for node D. Assume that the link-state information has been correctly received by all routers. (2 p.)
   
   ![Network Diagram]

   b. Assume the Bellman-Ford (distance vector) algorithm is used instead, and that each router starts with a cost of infinity to reach any other router. Use a sequence of tables (one table for each time the routers exchange their routing tables) to show how each router learns the next-hop and cost to reach router F. (2 p.)

   Distributed systems

7. CORBA
   a. Explain what marshalling/unmarshalling is. Where can it be found in the CORBA framework? (2 p.)
   b. What is the role of IDL in CORBA? (2 p.)

8. General
   a. Explain what is meant by a two-tiered architecture. What is meant by the three-tiered architecture? (2 p.)
   b. What is the purpose of transparency in a distributed system? Give two examples of transparency. (2 p.)

9. DCOM
   a. Explain how the naming service is supported and organized in DCOM, assuming you are using Windows 2000. (3 p.)
   b. What does it mean that DCOM only has transient objects? (2 p.)