CTH, GU Computer Science and Engineering

Computer Communication
EDA343, EDA342, DIT 420

Time and Place: Thursday 16 December 2010, 14.00-18.00 M

Course Responsible: Marina Papatriantafilou (Tel: 772 5413 -in case of need 0768-563132)

Allowed material:

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

Grading:

CTH students registered for the EDA342 or EDA343 course, 7.5 hp: 3: 30-38 p, 4: 39-47 p, 5: 48-60 p

GU (DIT 420): Godkänd 30-47, Väl godkänd 48-60 p

Instructions

- **Write clearly what course you are attending (EDA343, etc.)**
- **Start answering each assignment on a new page; use only one side of each sheet of paper; sort the sheets according to the question-ordering and number them.**
- 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 marking.
- If you make any **assumptions** in answering any item, do not forget to clearly state what you assume.
- Please answer in English, if possible. If you have large difficulty with that (with all or some of the questions) and you think that your grade might be affected, feel-free to write in Swedish.
- Results, inspection of exam: Friday 14 January 2011, 13.30-14.30, room 5128 (EDIT building, west wing)

Good Luck !!! Lycka till !!!!

1. Network edge (15 p)

   (a) (3p) If all the links in the Internet were to provide reliable delivery service, would the TCP reliable delivery service be redundant? Why or why not?

   (b) (3p) Suppose you wanted to make a transaction from a remote client to a server as fast as possible. Would you use UDP or TCP? Why?

   (c) (3p) Why do HTTP, FTP, SMTP run on top of TCP rather than on UDP?

   (d) (2p) What is an overlay network?

   (e) (2p) File sharing and file distribution are two applications suitable for peer-to-peer architectures. List at least two other applications that are suitable for such architectures.

   (f) (2p) In reliable data transfer, what is the motivation for introducing sequence numbers and timers?

```
- think of loss/reordering at routers
-  if reliability not an issue, udp
- care for reliability + provided in tcp
- network building on another network's infrastructure
- collaborative computing, collaboratinve distributing streaming, skype-like, etc
- ordering, tiemout for retransmissions (or requests)
```

2. Network core (15p)

   (a) (4p) Describe and compare possibilities for providing Quality of Service in TCP/IP (datagram) networks versus Virtual Circuit networks.

   (b) (3p) What are the most used intra-AS and inter-AS routing protocols in the Internet? What routing methods do they use?

   (c) (3p) What is Network Address Translation (NAT)? How does it work? (Hint use an example to demonstrate the latter).

   (d) (3p) Consider a datagram network using 32-bit host addresses. Suppose a router has 4 links, numbered 0-3 and packets are to be forwarded to the link interfaces as follows:

   - destination addresses 11001000 00010111 00010000 00000000 through 11001000 00010111 00010111 11111111 to interface 0
   - destination addresses 11001000 00010111 00011000 00000000 through 11001000 00010111 00011000 11111111 to interface 1
   - destination addresses 11001000 00010111 00011001 00000000 through 11001000 00010111 00011111 11111111 to interface 2
   - other to interface 3

   Provide a forwarding table with 4 entries that uses longest prefix matching and forwards packets to the correct interfaces.

   (e) (2p) How can packet loss occur in a router?

```
- think of meeting deadlines, hence controlling uncertaity due to congestion;
which are the cong-ctrl options in the two types of networks?
- in book, chapter network layer
- in book, chapter network layer
- in book, chapter network layer
- lack of queue space in input/output, congestion/speeds mismatch
```

3. Data Link Layer and Wireless (15p)

(a) (5p) Suppose two nodes, X and Y are attached to opposite ends of a m meters long cable and that X has one frame of B bits to send to Y, using CSMA/CD. Suppose there are four repeaters between them, each inserting a b-bit delay each. Assume the transmission rate is R Mbps, and no collisions happen. (a) What is the one-way propagation delay (including repeater delays)? Assume the signal propagation speed is p m/sec. (b) At what time is X's packet completely delivered at Y? (c) Now suppose that the repeaters are replaced with switches. Suppose that each switch has a b-bit processing delay in addition to a store-and-forward delay. At what time is X's packet delivered at Y?

(b) (4p) What are the differences between routers and link-layer switches?

(c) (3p) Explain the handoff-process with common Mobile Switching Center.

(d) (3p) In the context of mobile IP, explain how do direct and indirect routing work.

```
- adaptation of ex. 5.16 discussed in class.
- in book, also related to lab2
- in book, cf also slide 6-66
- in book, cf also slides 6-49 to 6-56
```

4. Security and overview issues (15 p)

(a) (5p) What are the five layers in the Internet protocol stack? What are the principal responsibilities of each of them?

(b) (4p) Consider sending a packet from a source host to a destination host over a fixed route. List the delay components in the end-to-end delay. Which of these are fixed and which are variable? Explain your answers.

(c) (2p) What is the difference between end-to-end delay and jitter? What are the causes of jitter?

(d) (2p) What is an important difference between a symmetric key system and a public key system?

(e) (2p) Suppose A and B are sending packets to each other over a communication network and that C is positioned in the network so that it can capture all the packets from A to B (respectively from B to A) and sent whatever it wants to B (respectively A). Describe a couple of malicious things that C can do.

```
in book chapters 1, 8 and overview knowledge.
```