Computer Communication
EDA343, EDA342, DIT 420, EDA 460, TDA950, INN420, EDA 341

Time and Place: Thursday 17 December 2009, 14.00-18.00 V

Course Responsible: Marina Papatriantafilou (Tel: 772 5413)

Allowed material:

- English 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

CTH students registered for the earlier, 6 hp (4point) courses: 3: 24-35 p, 4: 36-47 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; number the pages and use only one side of each sheet of paper.
- 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: Monday 18 January 2010, 15.15-16.00, room 5128 (EDIT building, west wing)

Good Luck !!! Lycka till !!!!

1. Applications(9 p)

    (a) (6 p) Mention and explain the main properties of transport service that are of interest
        to applications. Mention examples of types of applications that are interested in each of
        these properties. Mention examples of internet protocols that provide such properties.

    (b) (3p) Is it possible for an organization's Web server and e-mail server to have exactly
        the same alias for a host name (e.g. someorg.org?) If not why? If yes, how?

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    answer hints:
    in book
    comment on reliability, timing/bandwidth (+ possibly security)
    RDT in Internet via TCP (http, ftp, smtp, etc)
    other (multimedia apps) via UDP and application-implemented methods

    in book;
    can be even same IP-addr (different ports)
    different IP-addr: DNS can distinguish
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2. Transport layer protocols and reliable data transfer (12p)

    (a) (5 p) Consider a sliding window protocol for flow control, in a connection where the
        Round Trip Time is 32 msec, the line capacity is 1 Gbps and segments are of size 4000
        bytes. How big should the window size need to be in order to have channel utilization
        at least 50%? Use space-time diagram to explain your answer.

    (b) (5 p) Consider the Go-Back-N protocol with a sender window size of 3 and a sequence
        number range of 1024. Suppose that at time t, the next-in-order packet that the receiver
        is expecting has a sequence number of k. Assume that the medium does not reorder
        messages.

        i. What are the possible sets of sequence numbers inside the sender's window at time
           t? Justify your answer.
        ii. What are all possible values of the ACK field in all possible messages propagating
            back to the sender at time t? Explain your answer.

    (c) (2 p) What may cause wrap-around in the sequence numbers used by TCP?

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    adaptation of ex. 3.15 discussed in class.

    ex. 3.14 discussed in class.

    cf. figure 3.27 for example of wraparound and apply fro TCP.
    also discussed in class:
    - numbers are exhausted before ack's for the fisrt messages
    arrive, i.e. large windows in combination with fast lines;
    fast links that may exhaust the numbers;
    - packets of earlier connections of the same hosts that have been
    inadvertedly buffered in the network.
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3. Network layer (9 p)

    (a) (3p) Describe the forwarding tables look in datagram networks and how in Virtual
        Circuit networks. Explain why they have the structure that you described.

    (b) (6p)

      i. Compare the algorithms of link state and distance vector in terms of communication requirements and deficiencies.

     ii. Describe what the following protocols are used for, what algorithms form their basis and why the latter is so: RIP (Routing Information protocol), OSFP (Open Shortest Path First) and BGP (Border Gateway Protocol). Include discussion of the issues of policy, scale and performance in your reply.

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in book
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4. Data Link Layer and Wireless (12p)
   We have studied CSMA algorithms for wired and wireless LAN. What does CSMA/CA and CSMA/CD stand for?

   (a) Write a CSMA/CA algorithm and explain why does it work.

   (b) Write a CSMA/CD algorithm and explain why does it work.

   (c) Can CSMA/CA and CSMA/CD solve the medium access problem in wired networks? Why? If yes, which one is better? If no, what are the problems?

   (d) Can CSMA/CA and CSMA/CD solve the medium access problem in wireless networks? Why? If yes, which one is better? If no, what are the problems?

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a,b in book
c,d: induced by book: due to collisions not being able to be detected at
the sender in wireless LANs, CD cannot work there. CA may not as efficient
option in wired LANs (think overhead vs throughput)
as the above assumption is true and the overhead
for avoiding collisions (CA) can be avoided.
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5. Congestion control (6 p)

   Discuss congestion control in TCP/IP networks. Include a description of TCP's algorithm for congestion control. How does that algorithm help control the congestion? What may be a result of extensive use of UDP? What are the options for congestion control inthe latter situation?

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TCP methods in book;
to compensate for UDP's "carelessness", an application (sublayer, protocol)
may care for CC and apply some e.g. rate-based CC at that level
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6. Security (6p)

   (a) What are the differences between message confidentiality and message integrity? Can you have one without the other? Justify your answer.

   (b) What is an important difference between a symmetric key system and a public key system?

   (c) What is the purpose of a nonce in an authentication protocol? What does it mean to say that a nonce is a once-in-a-lifetime value? In whose lifetime?

7. General, Overview (6 p)
   Consider a laptop connecting in an Ethernet-LAN. After connecting, the user invokes an HTTP client that wants to retrieve a Web document at a given URL. The laptop initailly has no IP address assigned to it. The web server's IP address is not known either. What link layer, network layer, transport and application-layer protocols besides HTTP are needed in this scenario. Describe their need and use in time sequence.

   `in book, chapter 5`