Computer Communication
EDA343, EDA342, DIT 420

Time and Place: Thursday 15 December 2011, 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.

- A good rule-of-thumb for the extend of detail to provide, is to include enough information/explanation so that a person, whose knowledge on computer communication is at the level of our introductory lecture, can understand.

- 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 16 January 2012, 13.00-13.30, room 5128 (EDIT building, west wing)

Good Luck !!! Lycka till !!!!

1. Network edge (10 p)

   (a) (5p) Describe the basics steps of a simple execution between a pair of HTTP client and server for establishing connection and downloading an object. Use a space-time diagram and make sure that you mention the major steps of application-layer and transport-layer protocols involved.

   (b) (5p) (i) Describe the Napster and Gnutella peer-to-peer file sharing protocols. (ii) Compare them carefully. (iii) What is the major difference between the BitTorrent protocol and the aforementioned protocols?

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   HINTS:
   - slidesHTTP section 2 + summary(part of "synthesis")
   - centralized server versus distributed queries; bittorrent focuses on fetching
   efficiency rather than query efficiency
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2. Overview(20 p)

   (a) (4p) What is flow control and what congestion control? What is common and what is different between these problems?

   (b) (6p) How are flow control and congestion control solved by TCP? Describe the methods carefully and argue why they can solve the problems.

   (c) (4p) How does TCP's and UDP's sending and receiving rates vary over time? Justify your answer. How do they compare with the desired flow rate of a voice streaming application?

   (d) (3p) How do Internet voice streaming applications deal with the issue in the previous question?

   (e) (3p) Consider the issue of Network Address Translation at the network level (NAT) in a context of peer-to-peer applications. Suppose a peer A discovers through querying that a peer B has a file it wants to download. Also suppose that B and A are both behind NAT. Is it possible for A to establish a TCP connection with B? If yes describe the method, if no explain why. Make sure that you mention and justify any assumptions that you need for your arguments.

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   HINTS:
   - caring for sender-receiver flow vs caring for flow/congestion in the network
   - from book, chapter on transport layer, the two algorithms (ack+window based; combined approac
   - TCP: sending curve is tooth-like receiving curve depends also on congestion; UDP; sender rate
   not limited, receiving rate depends on congestion; desired is constant (or nearly so;
   guaranteed bandwidth)
   - they buffer and applyplayout delay; also forward error control to deal with loss
   that can affect receiver's rate.
   - NAT provides an entry for A only after A sends something; same for B; hence hard
   to intitiate contact (addresses not known); one way to bypass problem: relay
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3. Network core (15p)

   (a) (4p) Describe the main components in a router and how they interact and function together. Where and how can packet delays and loss be introduced in a router?

   (b) (4p) What is subnet? What is subnet masking? Illustrate/accompany your description using an example.

   (c) (2p) Explain the differences between routers and link-layer switches.

(d) (2p) Why does the OSPF routing protocol provide authentication options? Explain/motivate your answer.

(e) (3p) Explain how the provisioning of quality-of-service for timing/bandwidth guarantees depends on network congestion control.

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HINTS
- in book, chapter network layer
- in book, chapter network layer; also related to lab 2
- in book, chapter network layer and link layer (routing versus
flooding+learning+selective_ forwarding
- to authenticate receipt of info when updating routing tables; else security problems:
e.g. redirection, DoS, ...
- multimedia lecture notes: no CC => harder to "guarantee" any deadlines
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4. Data Link Layer and Wireless (10p)

(a) (6p) Describe the methods of Code-Division Multiple Access (CDMA), Carrier-Sense Multiple Access with Collision Detection and with Collision Avoidance (CSMA/CD, CSMA/CA) for medium access control.

(b) (4p) Compare the above methods from the point of view of suitability for different types of media and of bandwidth efficiency.

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HINTS
- in book, chapters data-link and wireless
- comment about collision detection possibilities, predictability of transmission times,
bandwidth efficiency
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5. Security issues (5 p)

(a) (5p) Describe the RSA method for encryption and decryption. Why is the RSA method secure?

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in book chapter security
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