

Exercise 1

for **Peer-to-Peer Networks** - winter term 2012/2013

(23.10.2012)

Deadline for submission: 30.10.2012

Guidelines

- Please submit your solutions during the next exercise in the coming week or beforehand in ?.
- Note that points are only given if your solution is clearly legible. Unreadable submissions will not be rated! (Machine written submissions are allowed)
- Written assignments are to be solved in group of 2-3 participants while programming assignments could be done in group of four up to six participants.
- Please always annotate your solutions with names and enrollment numbers.
- Please subscribe to the mailing list:
<https://mail.rbg.informatik.tu-darmstadt.de/mailman/listinfo.cgi/p2p-lecture-ws12>
- By submitting any processed exercises or program code you hereby commit to the “Grundregeln der wissenschaftlichen Ethik am Fachbereich Informatik” (see also <http://www.informatik.tu-darmstadt.de/de/sonstiges/plagiarismus/>).

H#1.1 Domain Name System (3 Pts.)

a) Hierarchical Structure

Draw the corresponding graph to the structure of the following domain names:

- lists.gnu.org
- de.wikipedia.org
- www.p2p.informatik.tu-darmstadt.de
- www.informatik.tu-darmstadt.de
- www.tk.informatik.tu-darmstadt.de

b) Zones

Domains can be split into zones according to that hierarchical structure of subdomains. Each zone can be managed by distinct servers, as presented in the lecture. Why is DNS not simply run by a set of central directory servers?

H#1.2 RFC (4 Pts.)

- a) What is an RFC (*Request for Comments*)? Read up on the history of RFCs and sketch how they are used today. (Consult the *RFC-Editor* if in doubt)
- b) Read RFC 2119. Why is it important to precisely define such words when talking about protocols?

For even more cookies: Read RFC 1149, 2549 and 3029

H#1.3 Modelling and Analysing Graphs (6 Pts.)

Draw a graph $G = (V, E)$ where nodes V represent courses you attended at the university (include at least 10 courses). A directed edge from A to B is inserted if material from course A was relevant for course B.

Additional Definitions:

in-degree of node $v \in V$: $|\{(u, v) \in E | u \in V\}|$

out-degree of node $v \in V$: $|\{(v, u) \in E | u \in V\}|$

- a) Are there cycles in your graph?
What meaning do they have in this model?
- b) What is the highest in-degree (out-degree) of a node in you graph?
What does this mean for the corresponding courses?
- c) Name all nodes of degree 0.

H#1.4 Failure Probability (6 Pts.)

Alice and Bob want to exchange notes through their classmates. There are $k = 5$ classmates between them and $n = 20$ students in class including Bob and Alice. It is assumed that events are independent.

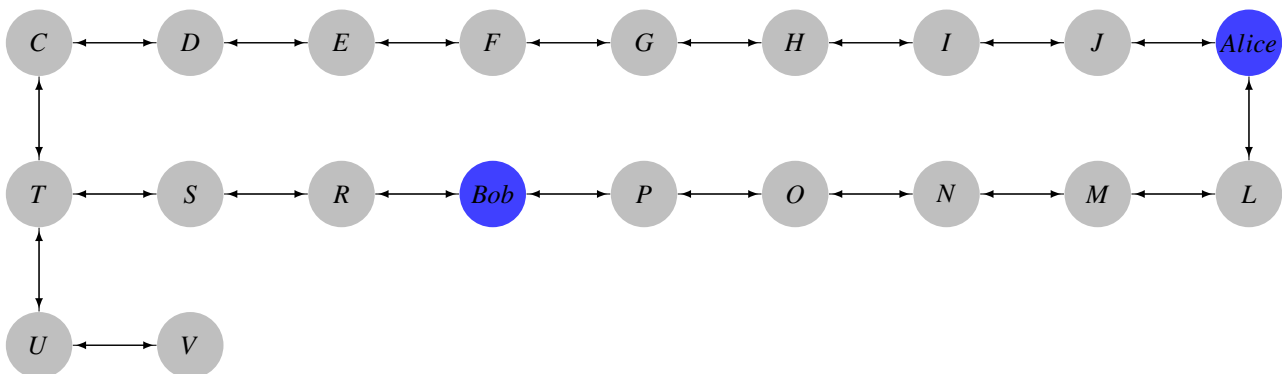


Figure 1: Sketch of the network

- a) How likely does a message reach Bob, if each student has a probability of $p = 0.1$ to get caught by the teacher while forwarding a message?
(Precisely think of how often the message is forwarded)
- b) Assume the teacher is not paying attention, but 2 students are squealers and will forward bypassing notes to the teacher. As Alice and Bob are new in class, they do not know who they are. Alice and Bob will not tell on each other. How high is the probability that a message reaches Bob under that assumption?
- c) How high is the probability if both assumptions are made?

Hint: It is appropriate to use the 'balls-in-bins' model (Urnenmodell).