

## Exercise 1

## Exercises Peer-to-Peer-Systems and Security (SS2011)

Monday 16.5 2011

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**Hand-in:** Monday 23.5. 2011 in lecture

Lehrstuhl für Netzarchitekturen und Netzdienste

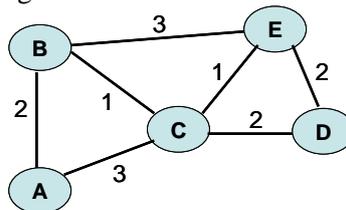
**Exercise:** Thursday 26. 5. 2011

Technische Universität München

*Rules: There will be five exercise sheets. You have to hand-in 70 % of the assignments, attend atleast 3 exercise courses and present a solution in the exercise course to get the 0.3 bonus.*

### Assignment 1 Clustering-Coefficient C and characteristic path length L

This assignment is about the clustering coefficient and the characteristic path length. Here is the graph.



Determine C, L as well as the diameter of the graph.

### Assignment 2 (2 Points) Clustering-Koeffizient C

In this assignment you should create an example graph with certain properties.

- A connected graph with 8 nodes and  $C=0.5$  (approx.). Prove your claim by calculating C.
- A connected graph with 5 nodes and at least 5 links and  $C=0$ . Calculate C for the graph.

### Assignment 3 P2P Protocol

A protocol for an unstructured network. Each node joins via some node it knows. Then it operates as follows:

- Every 10 s the node asks a neighbor for 10 other nodes. For each of the up to 10 nodes in the reply the node computes a random number. With probability  $p=25\%$  it will contact the node and create a connection, and add it to the list of known nodes. Otherwise, it ignores the node.
- Every 5 s it will contact a neighbor to see if it still exists. If not, the connection to the node will be closed and the neighbor will be removed from the list of known nodes.

Questions:

- What is the probability that none of the 10 nodes is contacted?
- Give an example for a problem of this protocol. How could you fix it?

### Assignment 4 CoolSpotsMunich I

Assume that the CoolSpotsMunich network is an unstructured network just as in the first slides of chapter 1.2 where the peers form an unstructured network and each peers stores its own data locally. Give an example on how to optimize the lookup for spots near your location in the network with unstructured methods (Do not add search structures!).

### Assignment 5 CoolSpotsMunich II

Just like in Assignment 4, use the description from the beginning of chapter 1.2 if you need information about the network's operation.

- If you look for a bakery, are you looking for nodes or for items?
- If you want to find spots that your friends recommend, are you looking for nodes or for items?
- What information do you need to add into the system so that you can detect that someone is your friend?
- Based on your proposal for c), how can you optimize the discovery of friends in the network?