

# Exercise 1

## Exercises Peer-to-Peer-Systems and Security (SS2010)

Monday 26.4 2010

**Hand-in:** Monday 10.5. 2010 in lecture

**Exercise:** Thursday 20. 5. 2010

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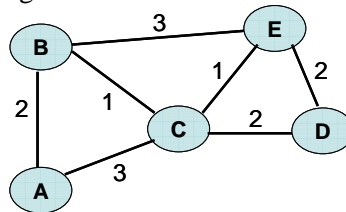
Lehrstuhl für Netzarchitekturen und Netzdienste

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*Rules:* There will be five exercise sheets with each 10 points. You have to achieve 50 % of the points and present a solution in the exercise course to get the 0.3 bonus.

### Assignment 1 (2 Points) 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 (2 Points) From the lecture...

Here are three questions that you should answer with your knowledge from the lecture. Please justify your answer.

- Usually, all nodes in a Peer-to-Peer network are able to communicate via IP and they also have an IP address. Why do Peer-to-Peer networks create their own protocol and identity and not use IP as protocol and the IP address as identity?
- What is the advantage when a Peer-to-Peer network achieves k-connectivity? How can the network achieve such a property?
- In unstructured networks, can you be sure that entity 73 does not exist when your search for it did not find the entity?

### Assignment 4 (2 Points) 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 5 (2 Points) CoolSpotsMunich I

Assume that the CoolSpotsMunich network is an unstructured network. Search requests are limited to 10 messages while 100 nodes contribute. You are allowed to utilize caching, replication of user entries (cool spot data) as well as state from previous queries. Describe a method to find cool spots near a given GPS coordinate and assess the required state.