Number:	5. Assignment
Issued:	08.01.09
Tutorial:	15.01.09 & 16.01.09
Lecturer:	Prof. Dr. Güneş, Dipl.-Inf. Blywis
Contact:	{guenes, blywis}@inf.fu-berlin.de

General information about the exercises
Accompanying the lecture, we will give out some assignments. You shall do the exercises on your own but you do not have to submit your solutions. The solutions will be presented in the tutorial sessions. We expect each student to have solved the exercises and might ask anyone to present these.
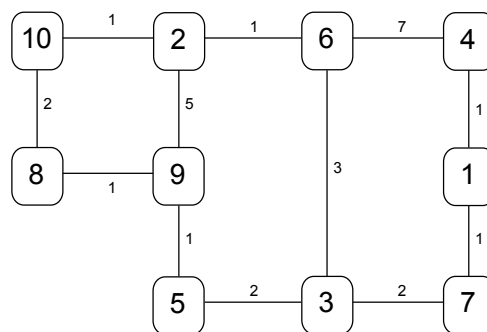
Exercise 1, Infrastructure Components:

Name the function(-s) of the following network components:

- Repeater
- Hub
- Switch
- Bridge
- Router
- Gateway

On which layer of the ISO/OSI reference model do they operate?

Exercise 2, Spanning Tree:

1. The spanning tree is an important connected graph of a computer network. On which layer of the ISO/OSI reference model is it created?

2. Why do we need to create a spanning tree? What is the important property?

3. Create the spanning tree for following network. The numbers at the edges specify the cost of each path; the number in the vertices specify the switch ID.

4. Name alternatives to the most simple spanning tree algorithm. What are the advantages resp. how do they optimize?

Exercise 3, Virtual LAN:

What is a Virtual LAN? How can Virtual LANs be constructed on the different layers of the ISO/OSI reference model?

Exercise 4, Protocolstack:

Recapitulate the notion of vertical and horizontal communication in the context of a protocol stack.

Exercise 5, Notion of Routing:

Elaborate the notion of routing. What are the services of the corresponding protocol layer?
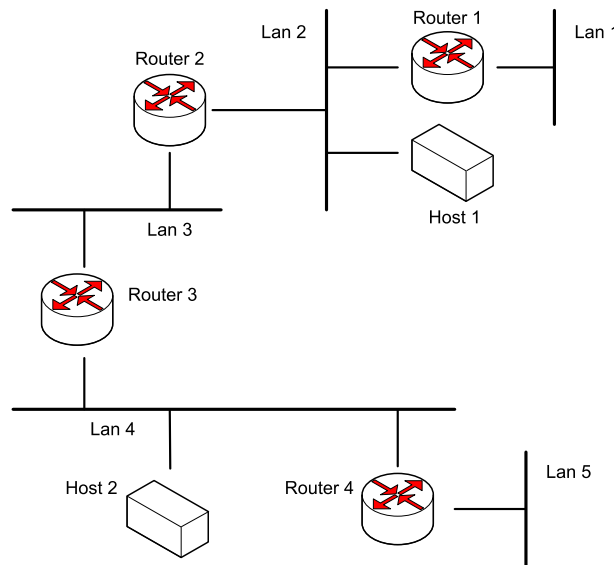
Exercise 6, Static vs. Dynamic Routing:

Discuss the advantages and disadvantages of static and dynamic routing.

Exercise 7, Routing Metrics:

List and explain at least five metrics that can be used by routing protocols.

Exercise 8, Subnets:

Consider the network shown above. You are provided with the Class-B address block: 137.226.x.x. Now, the network has to be configured; there is only one restriction: it has to work!

1. Choose appropriate subnet masks for the connected LANs and assign an IP range to each subnet. Assume that each router has an individual network interface card for each of the subnets it is connected with. Assign an IP address to each interface.

2. Give the routing tables of all routers. Assume that router 1 has an additional connection to the Internet. Based on the routing tables, each router should be able to determine where packets have to be relayed to.

Exercise 9, Checksum:

The Internet Protocol as well as other protocols use a common checksum algorithm.

1. How is the algorithm called?

2. Give a (pseudo) code implementation.

3. Calculate the checksum over the following sequence of bytes: 0x00, 0x01, 0xf2, 0x03, 0xf4, 0xf5, 0xf6, 0xf7

Exercise unrelated to Telematics. Solve the following brainteaser to train your brain.

Exercise 10, Magic Square:

?	?	4
?	?	?
?	1	?

Fill the seven remaining positions with numbers. Every string of three numbers either vertically, horizontally, or diagonal has to add up to the same total. Each number in the magic square has to be unique.

Exercise 11, Age of Siblings:

Brother and sister are discussing their age.
The brother states: "If I would be two years younger and you two years older, you are twice my age."
The sister replies: "If you would give me one more year on top of that, then I am three times your age."
How old are the siblings?