**Freie Universität Berlin**
Computer Science
Computer Systems & Telematics
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# Telematics – Exercises No. 9

*Winter Term 2012/13, December 14th, 2012*

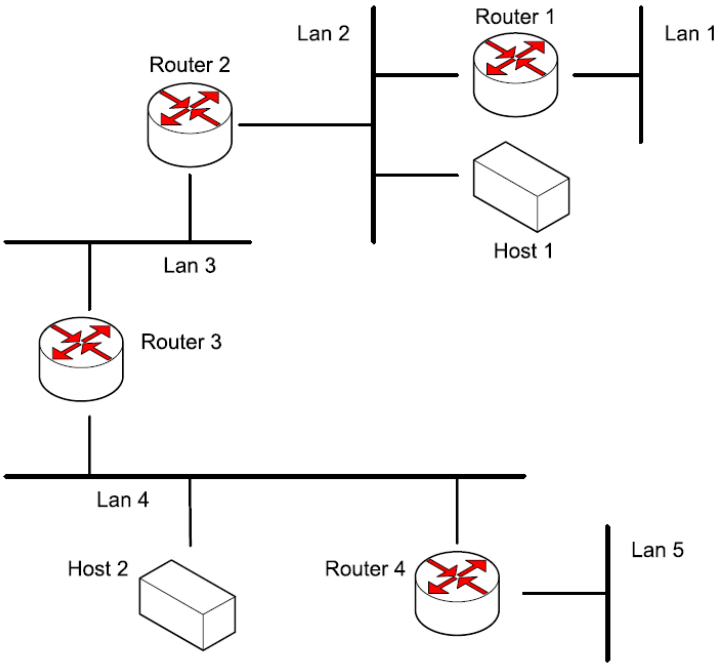
## Exercise 1, MTU:

What is the Maximum Transfer Unit (MTU) and why is it relevant for bridging and routing?

## Exercise 2, Network Layer:

Discuss the tasks of the network layer and how it differs from the lower and upper layers. Name network layer protocols and their historical as well as current relevance.

## Exercise 3, Subnets:




Assign IP addresses for the devices in the network depicted above. You have the IP block 137.226.0.0/16 available and should come up with a good assignment of addresses for the networks. Assume that Router 1 has an additional connection to the Internet. Based on the routing information, each router should be able to determine where all packets have to be forwarded to.

1. Specify the routing tables of all routers.
2. Host 2 wants to send a packet to Host 1. Which source and which destination MAC address does it use?
3. Host 2 wants to send a packet to an arbitrary host in the Internet. Which source and which destination MAC address does it use?

## Exercise 4, Internet Protocol Version 4:

Answer the following questions regarding the Internet Protocol (IP):

1. How large are IPv4 datagrams usually? Capture some datagrams with Wireshark and evaluate your sample.
2. What is the maximum size of IPv4 datagrams?
3. What happens when datagrams get very large?
4. Consider the following scenario. 13.5 kbyte of data shall be sent from host A to host B using IP as network layer protocol. How large is the protocol overhead? What happens when the datagrams have to pass a network with an MTU of 500 byte and how does this change the overhead?
5. How are datagrams handled by routers when the DF flag is set in the flag field?
6. What purpose had the original Type of Service (TOS) field in the IP header? Check how it is defined today – what is its purpose today? What are the remaining two bits used for today? Hint: Search for DSCP and ECN.

## Exercise 5, 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 6, Address Resolution Protocol:

Answer the following questions regarding the Address Resolution Protocol (ARP):

1. What is the task of ARP?
2. How does the protocol work?
3. Are there security issues?

## Exercise 7, Self-Configuration:

How can hosts self-configure their network layer address? Name and discuss three protocols.

## Exercise 8, Tracing:

How can IP be used to trace the route between two hosts? Discuss different approaches and if they always work!