

– Foundations of the Web –

Exercise 1 (Ethernet):

[20 Points]

Two computers A and B with 100 Mbit/s Ethernet cards are connected via a cable with a length of 45 m. How long would it take to transfer 50 bytes of data from A to B via the cable?

Exercise 2 (Collision Detection):

[60 Points]

a) Create a small Java program to discretely simulate a simplified form of collision detection in an Ethernet network with 2 up to 100 computers.

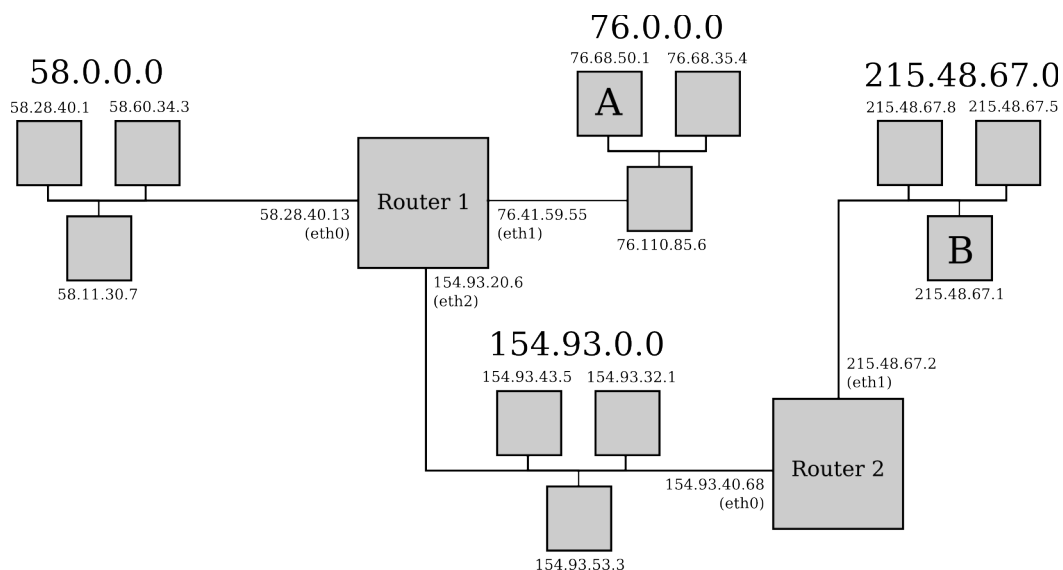
- Simulate one hundredth of a second of network traffic (which corresponds to 10^6 simulation steps – assuming 1 step corresponds to one cycle of 10 nanoseconds)
- During the simulation each computer permanently tries to send minimal Ethernet frames (of size 512 bits).
- If a collision is detected (two or more computers are sending at the same time), the colliding computers wait for a random period and their sending process is reset (according to the collision detection algorithm presented in the Web Science MOOC).
- At the end of the simulation the transfer rate should be calculated (Mbit/s) and printed to the console.
- The simulation should be repeated starting with 2 computers up to 100 computers connected to the network.

b) Provide a plot with the number of computers on the x-axis and the transfer rate (Mbit/s) on the y-axis.

Exercise 3 (Routing):

[20 Points]

Consider the following network in which computer A sends data to computer B:



- a) Give the relevant routing table entries (according to the corresponding video of the Web Science MOOC) for A, B, Router 1 and Router 2 that allow the data only to be sent from A to B.
- b) Explain step by step the route of the data according to the previously created routing tables (also considering the ARP were needed).