Course name	**Network Architectures and Protocols / Computer networks**
The topic of the document	**Laboratory exercise booklet for university students**
Laboratory exercise booklet no.	**6.**
The title and the topic of the laboratory exercise	**Routing in end nodes**

1. Preparation and implementation requirements:

- The student is obliged to read in advance the content of the present laboratory exercise booklet, to do the preparations for the laboratory and to observe the rules defined for the laboratory.
- The students should read the description of the special terms, mechanisms listed in the „Theoretical background information" chapter to accomplish the laboratory tasks successfully.
- The appearance happens at the beginning of the laboratory, delay can be allowed only in justified cases.
- The use of students' own mobile phone and PC is forbidden in the laboratory, except the case when the laboratory leader permits their use for the students because of the type of the laboratory exercise to be done.
- Browsers can be used exclusively for the access to information which is necessary for the accomplishment of the laboratory exercise, in the case of the laboratory leader's permission or instruction.
- By the end of the class the laboratory leader evaluates each participant's activity based on the composed questions which are included in this present material and further possible questions.
- The laboratory will be successful, if the student provides a correct answer to each question on the basis of the laboratory exercises which are carried out on the premises.
- The replacement of the laboratory is possible at dates of time determined by the laboratory leader.

2. Theoretical background information:

During the laboratory the following special terms will be used in practice:

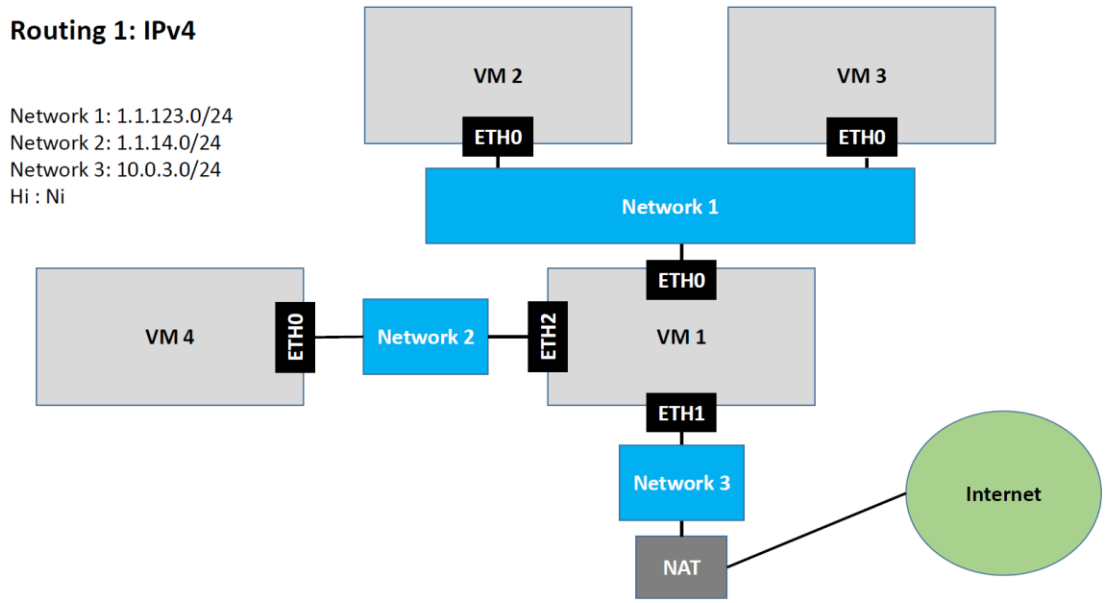
- IP subnets and aggregated supernets – ppt slides of the lecture, slide no. 166-172
- IP routing algorithm – ppt slides of the lecture, slide no. 164
- Linux commands
  - route – https://man7.org/linux/man-pages/man8/route.8.html
  - ping – https://man7.org/linux/man-pages/man8/ping.8.html
  - ifconfig – https://man7.org/linux/man-pages/man8/ifconfig.8.html
- Windows commands

- route – https://docs.microsoft.com/en-us/windows-server/administration/windows-commands/route_ws2008
- ping – https://docs.microsoft.com/en-us/windows-server/administration/windows-commands/ping
- ipconfig – https://docs.microsoft.com/en-us/windows-server/administration/windows-commands/ipconfig

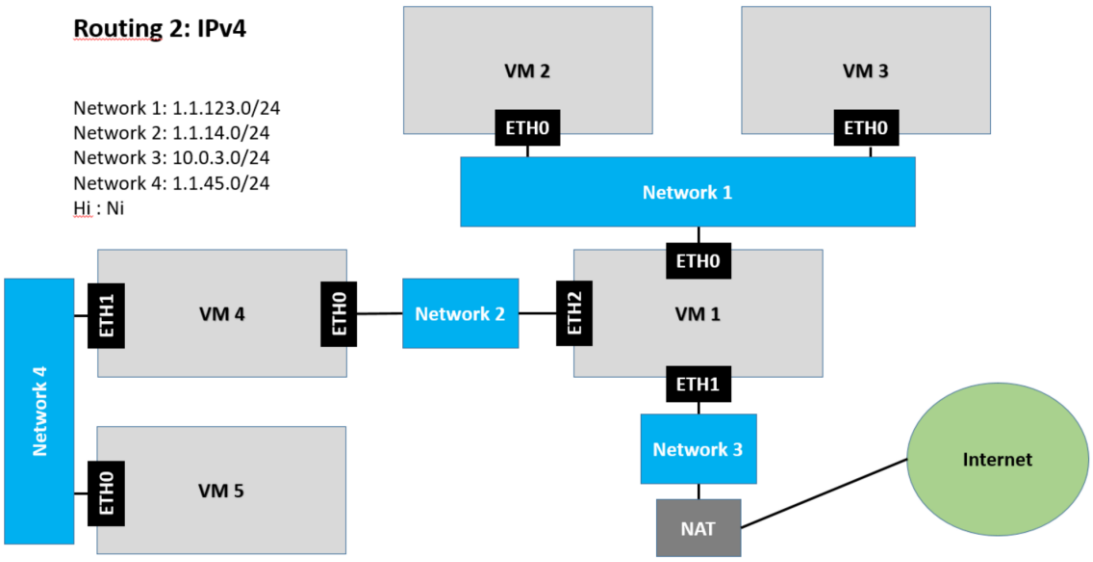
During the laboratory the following mechanisms/technics will be used in practice:

- Routing between networks with the same size and different size – ppt slides of the lecture, slide no. 169-172
- The operation of the routing – ppt slides of the lecture, slide no. 199-200

3. The following tasks have to be performed on the site:

3.1.	Oracle VirtualBox **configuration 1**. 
	• Activate the necessary number of network adapters in the case of each VM. • Select the necessary network interface modes in the case of each VM. • Configure the network interface of the VM-s based on the specified network addresses/prefix lengths. • Allow the transfer of IP packets at the intermediate node. • Configure the necessary static routes.

3.2.	Routing table configuration 1.
	• Display the routing table of all the VM-s and interpret them. • Perform ping tests between each VM pair. • Perform route tests between each VM pair.

3.3.	Oracle VirtualBox **configuration 2.** 
	• Activate the necessary number of network adapters in the case of each VM. • Select the necessary network interface modes in the case of each VM. • Configure the network interface of the VM-s based on the specified network addresses/prefix lengths. • Allow the transfer of IP packets at the intermediate node. • Configure the necessary static routes.

3.4.	Routing table configuration 4.
	• Display the routing table of all the VM-s and interpret them. • Perform ping tests between each VM pair • Perform route tests between each VM pair.

4. The following questions have to be answered by the end of the laboratory:

4.1.	A) What modes do we have to configure on each network adapter?
	B) What command the IP addresses can be configured with?

4.2.	A) What is the meaning of the routing table?
	B) What command the access of a direct network can be configured with?
	C) What command the access of a remote network can be configured with?

4.3.	A) How can we find the number of routers between two nodes? Determine the command.
	B) What does RTT (Round-Trip Time) value prove?