



Course name	<b>Network Architectures and Protocols / Computer networks</b>
The topic of the document	<b>Laboratory exercise booklet for university students</b>
Laboratory exercise booklet no.	<b>7.</b>
The title and the topic of the laboratory exercise	<b>Addressing and routing in IPv6</b>

### **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:

- IPv6 features (ppt slides of the lecture, slide no. 191.)
- IPv6 packet structure (ppt slides of the lecture, slide no. 193.)
- IPv6 address types (ppt slides of the lecture, slide no. 195.)
- 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](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:

- IPv6 compression rules (ppt slides of the lecture, slide no. 194.)
- EUI-64 method (ppt slides of the lecture, slide no. 196.)
- display and configuration of IPv6 interface parameters
- display and configuration of IPv6 routing table
- IPv6 traffic analysis with Wireshark network protocol analyzer

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

3.1.	IPv6 address compression
	Convert the following IPv6 address into the shortest form: 2001:0DB8:1000:0000:0BCD:0000:0000:0021

3.2.	Identification of IPv6 address types
	Name the following IPv6 addresses/address ranges/slash notations. ::/128, ::1/128, FF00::/8, FE80::/10, FF02::1, FF02::2, ::FFFF/96, 2001:ABCD::/32

3.3.	<p>Oracle VirtualBox <b>configuration 3.</b></p> <p><b>Routing 3: IPv6</b></p> <p>Network 1: 2001:DE23::/64 Network 2: 2001:DE14::/64 Network 3: 2001:DE10::/64 IP address: Hi : Ni</p>
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	<ul style="list-style-type: none"> <li>• Activate the necessary number of network adapters in the case of each VM.</li> <li>• Select the necessary network interface modes in the case of each VM.</li> <li>• Configure the network interface of the VM-s based on the specified network addresses/prefix lengths.</li> <li>• Allow the transfer of IP packets at the intermediate node.</li> <li>• Configure the necessary static routes</li> </ul>
3.4.	Routing table configuration 3.
	<ul style="list-style-type: none"> <li>• Display the routing table of all the VM-s and interpret them.</li> <li>• Perform ping tests between each VM pair.</li> <li>• Perform route tests between each VM pair.</li> </ul>

3.5.	<p>Oracle VirtualBox <b>configuration 4.</b></p> <p><b>Routing 4: IPv6</b></p> <p>Network 1: 2001:DE23::/64  Network 2: 2001:DE14::/64  Network 3: 2001:DE10::/64  Network 4: 2001:DE45::/64  IP address: Hi : Ni</p>
	<ul style="list-style-type: none"> <li>• Activate the necessary number of network adapters in the case of each VM.</li> <li>• Select the necessary network interface modes in the case of each VM.</li> <li>• Configure the network interface of the VM-s based on the specified network addresses/prefix lengths.</li> <li>• Allow the transfer of IP packets at the intermediate node.</li> <li>• Configure the necessary static routes.</li> </ul>

3.6.	Routing table configuration 4.
	<ul style="list-style-type: none"> <li>• Display the routing table of all the VM-s and interpret them.</li> <li>• Perform ping tests between each VM pair.</li> <li>• Perform route tests between each VM pair.</li> </ul>

**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?
4.4.	A) How many 16-bit fields does Ipv6 address in a preferred form contain?
	B) Which compression rules did you apply to shorten the Ipv6 address?
4.5.	A) How many IPv6 addresses does the network adapter of your VM have?
	B) In what way were the interface ID parts of the IPv6 addresses of the network adapter produced? Justify your answer.
4.6.	A) Can a routing table include static routes?
	B) What is the difference between the access of a remote network and that of a direct network?
4.7.	A) Above which protocol does the <i>tracert</i> command operate by default?
	B) What do the three asterisks (***) denote in the output of <i>tracert</i> command?