Computer Networks

1 General remarks

After you download this document, please switch computer into laboratory mode using following command `sudo netmode lab`. During these classes, ethernet card `eth1` of computer $2i-1$ is connected to `eth1` of computer $2i$ (for $1 \leq i \leq 8$).

2 Exercises

Zadanie 1. Assign IP `10.0.0.computer_no` to network card `eth1`. Compare the output of:

```
#> ifconfig
```

and

```
#> ip addr
```

The latter command is a modern tool for network interface management. Display current routing table using:

```
#> route -n
```

The table should contain only one entry. Ping the loopback address `127.0.0.1`. Note that you may do this even though there is no corresponding entry in the routing table! Actually, there is an appropriate entry, but it is not displayed by `route -n` command. In order to display all entries use:

```
#> routel
```

Try to ping: (a) your own IP address, (b) existing IP address from your network, (c) non-existing IP address from your network and (d) IP address outside of your network. Compare the `ping` output and reaction times.

Zadanie 2. Display the ARP table:

```
#> arp
```

Delete all entries using

```
#> arp -d ip-address-for-removal
```

Run *wireshark* and track the `eth1` interface. If you are flooded by stream of packets, you can choose to filter them out. Click right mouse button on victim packet, choose *prepare as filter — not selected* from the context menu, and finalize setting with *apply* button.

Observe, that when you run `ping`, your computer sends ARP query first, gets a reply, and sends *ICMP echo* messages afterwards. Check your ARP table, after you received ARP response packet.

Display the messages described above, paying close attention to the information stored in respective layers. By clicking on this information, you mey check what is its actual hexadecimal representation. In particular, try to answer the following questions.

- Is ICMP protocol encapsulated directly in Ethernet frames?
- What is the *data* of the ICMP protocol? What is the *data* of ARP queries?
- If you execute `ping -b 10.255.255.255`, what is the chosen Ethernet destination address?
- Are ARP queries broadcast or unicast? What about ARP replies?

Zadanie 3. This excersise should be performed in pairs. Both parties should have *wireshark* running. Let A be number of first computer and B of second one. Person A should launch following command:

```
$> ping 10.0.0.B
```

. . . and keep in running as long as necessary. In *wireshark* you should observe as *ICMP echo request* packets are being sent by A and *ICMP echo request* responses being sent as answer.

Now. . . person B should change her IP number to `10.0.1.B`:

```
$> ifconfig eth1 10.0.1.B
```

Wait for several seconds. Then person A should stop `ping` command. Check *wireshark* for changes resulting from the IP address change by B. This exercise is essential for understanding stateless protocols and data exchange between protocol layers. Make sure you understand it!

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