

# Sieci komputerowe

## Warsztaty 8

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17 czerwca 2020

### 1 Pierwsze zadanie do zaprezentowania

Pierwszym etapem było stworzenie trzech maszyn wirtualnych. Pierwsza z nich miała jedną kartę sieciową (sieć wewnętrzna emp-rem0), drugie dwie karty (sieci wewnętrzne emp-rem0 oraz emp-loc0), a trzecie miała jedną kartę sieciową (sieć wewnętrzna emp-loc0). Następnie skonfigurowałem interfejsy za pomocą poleceń:

- V1#> ip link set enp0s3 name emp-rem0
- V1#> ip link set up dev emp-rem0
- V1#> ip addr add 192.168.1.1/24 dev emp-rem0
- V2#> ip link set enp0s3 name emp-rem0
- V2#> ip link set up dev emp-rem0
- V2#> ip addr add 192.168.1.2/24 dev emp-rem0
- V2#> ip link set enp0s8 name emp-loc0
- V2#> ip link set up dev emp-loc0
- V2#> ip addr add 172.16.0.1/24 dev emp-loc0
- V3#> ip link set enp0s3 name emp-loc0
- V3#> ip link set up dev emp-loc0
- V3#> ip addr add 172.16.0.2/24 dev emp-loc0

Następnie sprawdziłem, że z maszyny Virbian2 mogę pingować obie sąsiednie maszyny:

```
user@virbian: ~  
user@virbian:~$ sudo ip link set up dev enp-rem0  
user@virbian:~$ sudo ip addr add 192.168.1.2/24 dev enp-rem0  
user@virbian:~$ sudo ip link set enp0s8 name enp-loc0  
user@virbian:~$ sudo ip link set up dev enp-loc0  
user@virbian:~$ sudo ip addr add 172.16.0.1/24 dev enp-loc0  
user@virbian:~$ ping 192.168.1.1  
PING 192.168.1.1 (192.168.1.1) 56(84) bytes of data.  
64 bytes from 192.168.1.1: icmp_seq=1 ttl=64 time=0.650 ms  
64 bytes from 192.168.1.1: icmp_seq=2 ttl=64 time=0.431 ms  
64 bytes from 192.168.1.1: icmp_seq=3 ttl=64 time=0.340 ms  
^C  
--- 192.168.1.1 ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 44ms  
rtt min/avg/max/mdev = 0.340/0.473/0.650/0.132 ms  
user@virbian:~$ ping 172.16.0.2  
PING 172.16.0.2 (172.16.0.2) 56(84) bytes of data.  
64 bytes from 172.16.0.2: icmp_seq=1 ttl=64 time=0.724 ms  
64 bytes from 172.16.0.2: icmp_seq=2 ttl=64 time=0.414 ms  
64 bytes from 172.16.0.2: icmp_seq=3 ttl=64 time=0.329 ms  
^C  
--- 172.16.0.2 ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 30ms  
rtt min/avg/max/mdev = 0.329/0.489/0.724/0.169 ms  
user@virbian:~$
```

Następnie ustawiłem bramę domyślną na maszynie Virbian3 za pomocą polecenia:

- V3#> ip route add default via 172.16.0.1

oraz sprawdziłem, że z maszyny Virbian3 mogę pingować oba interfejsy maszyny Virbian2:

```
user@virbian: ~  
user@virbian:~$ sudo ip link set up dev enp-loc0  
user@virbian:~$ sudo ip addr add 172.16.0.2/24 dev enp-loc0  
user@virbian:~$ sudo ip route add default via 172.16.0.1  
user@virbian:~$ pinf 172.16.0.1  
bash: pinf: command not found  
user@virbian:~$ ping 172.16.0.1  
PING 172.16.0.1 (172.16.0.1) 56(84) bytes of data.  
64 bytes from 172.16.0.1: icmp_seq=1 ttl=64 time=0.397 ms  
64 bytes from 172.16.0.1: icmp_seq=2 ttl=64 time=0.314 ms  
64 bytes from 172.16.0.1: icmp_seq=3 ttl=64 time=0.354 ms  
^C  
--- 172.16.0.1 ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 45ms  
rtt min/avg/max/mdev = 0.314/0.355/0.397/0.033 ms  
user@virbian:~$ ping 192.168.1.2  
PING 192.168.1.2 (192.168.1.2) 56(84) bytes of data.  
64 bytes from 192.168.1.2: icmp_seq=1 ttl=64 time=0.370 ms  
64 bytes from 192.168.1.2: icmp_seq=2 ttl=64 time=0.347 ms  
64 bytes from 192.168.1.2: icmp_seq=3 ttl=64 time=0.374 ms  
^C  
--- 192.168.1.2 ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 32ms  
rtt min/avg/max/mdev = 0.347/0.363/0.374/0.025 ms  
user@virbian:~$
```

Następnie spróbowałem z maszyny Virbian3 pingować maszynę Virbian1. W Wiresharku na kolejnych maszynach zaobserwowałem następujące pakiety:

Virbian3:

Wireshark interface showing network traffic capture on interface 0. The packet list shows 8 packets:

No.	Time	Source	Destination	Protocol	Length	Info
2	1.024515792	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507
3	2.048664539	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507
4	3.072654000	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507
5	4.097248185	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507
6	5.120919470	PcsCompu_fd:e6:39	192.168.1.1	ARP	44	Who has 172.16.0.1? Tell 172.16.0.2
7	5.121015594	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507
8	5.121208610	PcsCompu_93:b7:79	192.168.1.1	ARP	62	172.16.0.1 is at 08:00:27:93:b7

Frame 1: 100 bytes on wire (800 bits), 100 bytes captured (800 bits) on interface 0  
 Linux cooked capture  
 Internet Protocol Version 4, Src: 172.16.0.2, Dst: 192.168.1.1  
 Internet Control Message Protocol

Packet bytes:

```

0000 00 04 00 01 00 06 00 27 fd e6 39 00 00 08 00 .....9....
0010 45 00 00 54 ea 98 40 00 40 01 e2 54 ac 10 00 02 E..T..@..T...
0020 c0 a8 01 01 08 00 33 01 05 07 00 01 25 e8 e9 5e .....^
0030 00 00 00 00 8e ce 03 00 00 00 00 10 11 12 13 .....!*#
0040 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 .....
0050 24 25 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 %&'()*+,-./0123
0060 34 35 36 37 .....4567
  
```

any: <live capture in progress> Packets: 8 · Displayed: 8 (100.0%) Profile: Default

```

user@virbian:~$ ping 192.168.1.1
PING 192.168.1.1 (192.168.1.1) 56(84) bytes of data.
^C
--- 192.168.1.1 ping statistics ---
6 packets transmitted, 0 received, 100% packet loss, time 126ms
user@virbian:~$
  
```

Virbian2:

Capturing from any						
No.	Time	Source	Destination	Protocol	Length	Info
1	0.00000000	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=1/256, ttl=64 (no response found!)
2	0.000014814	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=2/512, ttl=63 (no response found!)
3	1.024532738	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=2/512, ttl=63 (no response found!)
4	1.024546538	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=2/512, ttl=63 (no response found!)
5	2.048648909	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=3/768, ttl=64 (no response found!)
6	2.048662291	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=3/768, ttl=63 (no response found!)
7	3.072661029	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=4/1024, ttl=64 (no response found!)
8	3.072676417	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=4/1024, ttl=63 (no response found!)
9	4.097207056	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=5/1280, ttl=64 (no response found!)
10	4.097221867	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=5/1280, ttl=63 (no response found!)
11	5.085946883	PcsCompu_2d:f6:e1		ARP	44	Who has 192.168.1.1? Tell 192.168.1.2
12	5.086307156	PcsCompu_93:6e:1c		ARP	62	192.168.1.1 is at 08:00:27:93:6e:1c
13	5.120805804	PcsCompu_f6:e6:39		ARP	62	Who has 172.16.0.1? Tell 172.16.0.2
14	5.120900069	PcsCompu_93:b7:79		ARP	44	172.16.0.1 is at 08:00:27:93:b7:79
15	5.120916471	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=6/1536, ttl=64 (no response found!)
16	5.120921151	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=6/1536, ttl=63 (no response found!)

▶ Frame 1: 100 bytes on wire (800 bits), 100 bytes captured (800 bits) on interface 0  
 ▶ Linux cooked capture  
 ▶ Internet Protocol Version 4, Src: 172.16.0.2, Dst: 192.168.1.1  
 ▶ Internet Control Message Protocol

0000 00 00 00 01 00 06 08 00 27 fd e6 39 00 00 08 00 .....T.@?T....  
 0010 45 00 00 54 ea 98 a8 00 40 01 e2 54 ac 10 00 02 E..T.@?T....  
 0020 c0 a8 01 01 08 00 93 0f 05 07 00 01 25 e8 e9 5e .....  
 any: -live capture in progress>

Packets: 16 - Displayed: 16 (100.0%) Profile: Default

Virbian1:

Capturing from any						
No.	Time	Source	Destination	Protocol	Length	Info
1	0.00000000	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=1/256, ttl=64 (no response found!)
2	1.024514447	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=2/512, ttl=63 (no response found!)
3	2.048639937	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=3/768, ttl=63 (no response found!)
4	3.072632639	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=4/1024, ttl=63 (no response found!)
5	4.097297494	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=5/1280, ttl=63 (no response found!)
6	5.085944659	PcsCompu_2d:f6:e1		ARP	62	Who has 192.168.1.1? Tell 192.168.1.2
7	5.085959185	PcsCompu_93:6e:1c		ARP	44	192.168.1.1 is at 08:00:27:93:6e:1c
8	5.120903192	172.16.0.2	192.168.1.1	ICMP	100	Echo (ping) request id=0x0507, seq=6/1536, ttl=63 (no response found!)

▶ Frame 1: 100 bytes on wire (800 bits), 100 bytes captured (800 bits) on interface 0  
 ▶ Linux cooked capture  
 ▶ Internet Protocol Version 4, Src: 172.16.0.2, Dst: 192.168.1.1  
 ▶ Internet Control Message Protocol

0000 00 00 00 01 00 06 08 00 27 2d f6 e1 00 00 08 00 .....T.@?T....  
 0010 45 00 00 54 ea 98 a8 00 3f 01 e3 54 ac 10 00 02 E..T.@?T....  
 0020 c0 a8 01 01 08 00 93 0f 05 07 00 01 25 e8 e9 5e .....  
 0030 00 00 00 00 8e ce 03 00 00 00 00 00 11 12 13 .....  
 0040 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 .....  
 0050 24 25 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 \$%&'()\*+,-./:;@  
 0060 34 35 36 37 4567

any: -live capture in progress>

Packets: 8 - Displayed: 8 (100.0%) Profile: Default

Jak widać echo request dociera do maszyny Virbian1, ale maszyna nie odpowiada. Dzieje się tak, ponieważ maszyna Virbian1 nie wie na jaki adres powinna odpowiedzieć, żeby odpowiedź dotarła do sieci 172.16.0.2/24. Ta sieć jest dla niej całkiem obca.