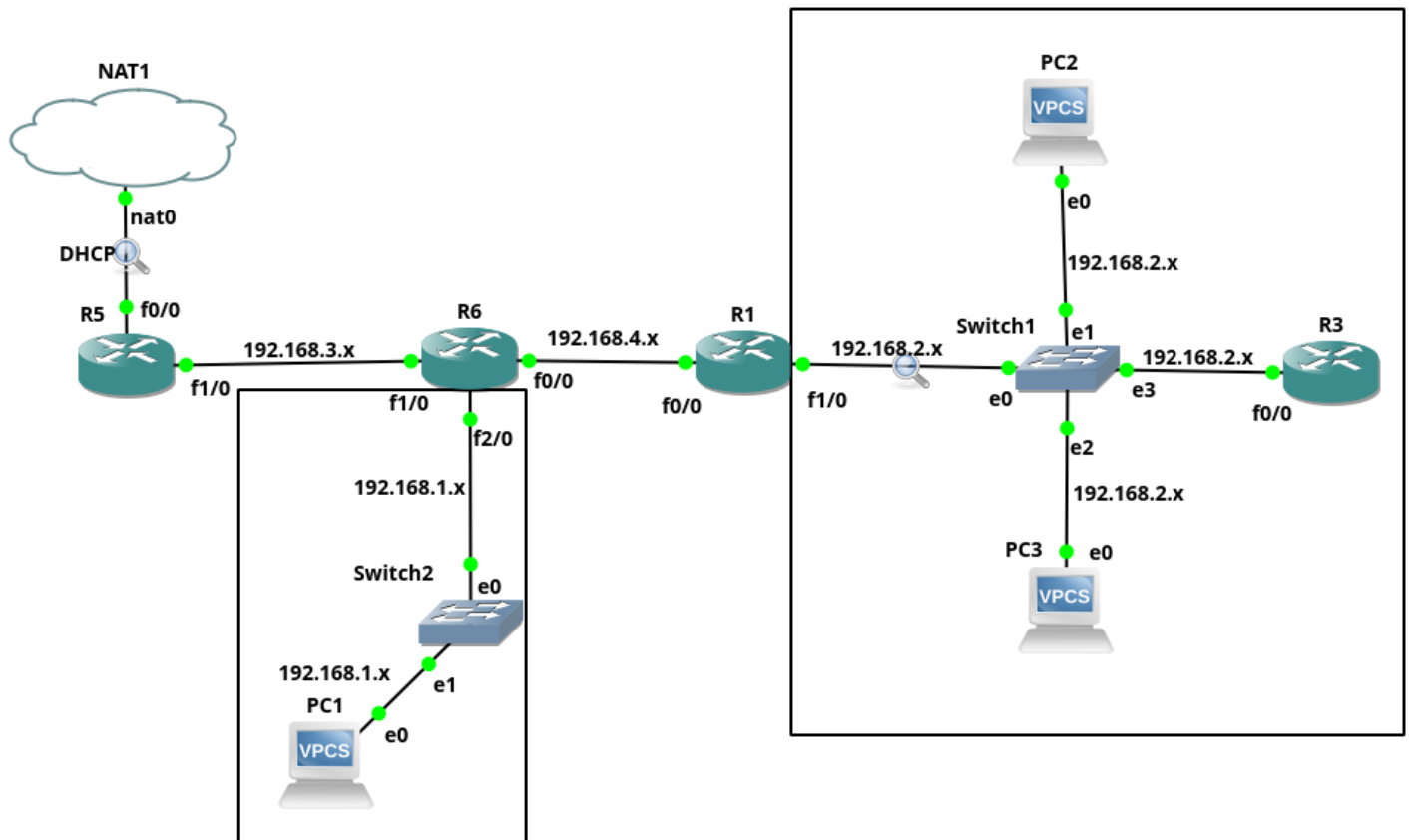# Technologie Sieciowe - Lista 4

Konfiguracja sieci

Do symulacji zostały wykorzystane wirtualne obrazy routerów Cisco 7200.

1. Podłączenie routera `R5` do sieci zewnętrznej `nat0` przez interfejs `f0/0` za pomocą DHCP:

```
R5# configure terminal
R5(config)# interface FastEthernet 0/0
R5(config-if)# ip address dhcp
R5(config-if)# no shutdown
R5(config-if)# end
```

Ustawienie serwera DNS routerów:

```
R5# configure terminal
R5(config)# ip domain-lookup
```

```
R5(config)# ip name-server 8.8.8.8
R5(config)# end
```

2. Ustawienie Routerom adresu lokalnego na każdym z interfejsów sieciowych w sieci wewnętrznej:

```
R5(config)# interface FastEthernet 1/0
R5(config-if)# ip address 192.168.3.5 255.255.255.0
R5(config-if)# no shutdown
R5(config-if)# exit
R1(config)#
```

(Router RX otrzymuje adres 192.168.P.X w podsieci P)

3. Ustawienie Routerom protokołu OSPF na każdym z interfejsów sieciowych w sieci wewnętrznej:

```
R6(config)# router ospf 1
R6(config-router)# network 192.168.3.0 0.0.0.255 area 0
R6(config-router)# default-information originate
R6(config-router)# end
```

(interfejsy f2/0 routera R6 oraz f1/0 R1 , f0/0 R3 są area 1)

4. Konfiguracja NAT Routera `R5` oraz ustawienie dostępu podsieciom do sieci zewnętrznej:

```
R5# configure terminal
R5(config)# interface FastEthernet 0/0
R5(config-if)# ip nat outside
R5(config-if)# interface FastEthernet 0/1
R5(config-if)# ip nat inside
R5(config)# ip nat inside source list 1 interface
FastEthernet 0/0 overload
R5(config)# access-list 1 permit 192.168.0.0 0.0.255.255
```

```
R5(config)# end
R5# write memory
```

5. Konfiguracja komputerów PCX (w pliku ustawień startowych):

```
ip 192.168.1.11
ip dns 8.8.8.8
set pcname PC1
```

6. Testy ping:

- PC1 - Cloud

```
PC1> ping google.com
google.com resolved to 142.250.203.142

84 bytes from 142.250.203.142 icmp_seq=1 ttl=115 time=39.419 ms
84 bytes from 142.250.203.142 icmp_seq=2 ttl=115 time=37.951 ms
84 bytes from 142.250.203.142 icmp_seq=3 ttl=115 time=37.892 ms
84 bytes from 142.250.203.142 icmp_seq=4 ttl=115 time=37.086 ms
84 bytes from 142.250.203.142 icmp_seq=5 ttl=115 time=38.103 ms
```

- PC1 - PC2

```
PC1> #pc2
PC1> ping 192.168.2.12

84 bytes from 192.168.2.12 icmp_seq=1 ttl=62 time=49.879 ms
84 bytes from 192.168.2.12 icmp_seq=2 ttl=62 time=27.140 ms
84 bytes from 192.168.2.12 icmp_seq=3 ttl=62 time=37.399 ms
84 bytes from 192.168.2.12 icmp_seq=4 ttl=62 time=27.285 ms
84 bytes from 192.168.2.12 icmp_seq=5 ttl=62 time=27.051 ms
```

- R3 - Cloud

```
Translating "google.com"...domain server (8.8.8.8) [OK]

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 142.250.203.206, timeout is 2 seconc
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/52/68 m
R3#
```

- R3 - PC3

```
R3##pc3
R3#ping 192.168.2.13
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.2.13, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/6/8 ms
R3#
```

Przechwycenie i analiza pakietów

Przechwycenie pakietów odbyło się między:

- ## Cloud i R5

14 22.637034	192.168.122.152	8.8.8.8	DNS	70 Standard query 0x3a8f A google.…
15 22.668217	8.8.8.8	192.168.122.152	DNS	86 Standard query response 0x3a8f …
16 22.707524	192.168.122.152	142.250.203.206	ICMP	98 Echo (ping) request id=0x3c4c,…
17 22.720842	142.250.203.206	192.168.122.152	ICMP	98 Echo (ping) reply id=0x3c4c,…
18 23.755215	192.168.122.152	142.250.203.206	ICMP	98 Echo (ping) request id=0x3d4c,…
19 23.769083	142.250.203.206	192.168.122.152	ICMP	98 Echo (ping) reply id=0x3d4c,…
21 24.802733	192.168.122.152	142.250.203.206	ICMP	98 Echo (ping) request id=0x3e4c,…
22 24.816227	142.250.203.206	192.168.122.152	ICMP	98 Echo (ping) reply id=0x3e4c,…
23 25.849667	192.168.122.152	142.250.203.206	ICMP	98 Echo (ping) request id=0x3f4c,…
24 25.863403	142.250.203.206	192.168.122.152	ICMP	98 Echo (ping) reply id=0x3f4c,…
27 26.896837	192.168.122.152	142.250.203.206	ICMP	98 Echo (ping) request id=0x404c,…
28 26.910482	142.250.203.206	192.168.122.152	ICMP	98 Echo (ping) reply id=0x404c,…
29 27.733373	52:54:00:f7:9a:eb	ca:02:96:2f:00:00	ARP	42 Who has 192.168.122.152? Tell 1…
30 27.743343	ca:02:96:2f:00:00	52:54:00:f7:9a:eb	ARP	60 192.168.122.152 is at ca:02:96:…

- ## R5 i R6

1 0.000000	192.168.3.5	224.0.0.5	OSPF	94 Hello Packet
2 1.282540	192.168.3.6	224.0.0.5	OSPF	94 Hello Packet
5 14.690375	ca:02:96:2f:00:1c	CDP/VTP/DTP/PAgP/UD…	CDP	368 Device ID: R5 Port ID: FastEthernet1/0
6 14.943875	192.168.2.13	8.8.8.8	DNS	70 Standard query 0x3a8f A google.com
7 14.992765	8.8.8.8	192.168.2.13	DNS	86 Standard query response 0x3a8f A google.com A 142.250.203.206
8 15.014542	192.168.2.13	142.250.203.206	ICMP	98 Echo (ping) request id=0x3c4c, seq=1/256, ttl=62 (reply in 9)
9 15.043077	142.250.203.206	192.168.2.13	ICMP	98 Echo (ping) reply id=0x3c4c, seq=1/256, ttl=116 (request in 8)
10 15.325127	192.168.3.5	224.0.0.5	OSPF	94 Hello Packet
11 16.063373	192.168.2.13	142.250.203.206	ICMP	98 Echo (ping) request id=0x3d4c, seq=2/512, ttl=62 (reply in 12)
12 16.090823	142.250.203.206	192.168.2.13	ICMP	98 Echo (ping) reply id=0x3d4c, seq=2/512, ttl=116 (request in 11)
13 17.110714	192.168.2.13	142.250.203.206	ICMP	98 Echo (ping) request id=0x3e4c, seq=3/768, ttl=62 (reply in 14)
14 17.138311	142.250.203.206	192.168.2.13	ICMP	98 Echo (ping) reply id=0x3e4c, seq=3/768, ttl=116 (request in 13)
15 17.755448	192.168.3.6	224.0.0.5	OSPF	94 Hello Packet
16 18.158018	192.168.2.13	142.250.203.206	ICMP	98 Echo (ping) request id=0x3f4c, seq=4/1024, ttl=62 (reply in 17)
17 18.185285	142.250.203.206	192.168.2.13	ICMP	98 Echo (ping) reply id=0x3f4c, seq=4/1024, ttl=116 (request in 16)
19 19.205060	192.168.2.13	142.250.203.206	ICMP	98 Echo (ping) request id=0x404c, seq=5/1280, ttl=62 (reply in 20)
20 19.232400	142.250.203.206	192.168.2.13	ICMP	98 Echo (ping) reply id=0x404c, seq=5/1280, ttl=116 (request in 19)
22 31.939664	192.168.3.5	224.0.0.5	OSPF	94 Hello Packet
23 35.502255	192.168.3.6	224.0.0.5	OSPF	94 Hello Packet

- ## Switch1 i R1

1 0.000000	192.168.2.3	224.0.0.5	OSPF	94 Hello Packet
2 4.174653	192.168.2.1	224.0.0.5	OSPF	94 Hello Packet
4 9.308999	192.168.2.13	8.8.8.8	DNS	70 Standard query 0x3a8f A google.…
5 9.376398	8.8.8.8	192.168.2.13	DNS	86 Standard query response 0x3a8f …
6 9.376854	192.168.2.13	142.250.203.206	ICMP	98 Echo (ping) request id=0x3c4c,…
7 9.426721	142.250.203.206	192.168.2.13	ICMP	98 Echo (ping) reply id=0x3c4c,…
8 10.428182	192.168.2.13	142.250.203.206	ICMP	98 Echo (ping) request id=0x3d4c,…
9 10.474687	142.250.203.206	192.168.2.13	ICMP	98 Echo (ping) reply id=0x3d4c,…
10 11.475049	192.168.2.13	142.250.203.206	ICMP	98 Echo (ping) request id=0x3e4c,…
11 11.522931	142.250.203.206	192.168.2.13	ICMP	98 Echo (ping) reply id=0x3e4c,…
12 12.524066	192.168.2.13	142.250.203.206	ICMP	98 Echo (ping) request id=0x3f4c,…
13 12.571743	142.250.203.206	192.168.2.13	ICMP	98 Echo (ping) reply id=0x3f4c,…
14 13.572852	192.168.2.13	142.250.203.206	ICMP	98 Echo (ping) request id=0x404c,…
15 13.619068	142.250.203.206	192.168.2.13	ICMP	98 Echo (ping) reply id=0x404c,…
16 18.359386	192.168.2.3	224.0.0.5	OSPF	94 Hello Packet
17 20.521989	192.168.2.1	224.0.0.5	OSPF	94 Hello Packet

Za pomocą polecenia `ping google.com` z komputera PC2. Zostały przechwycone 4 istotne rodzaje pakietów:

- DNS

- ICMP

- OSPF i ARP - sprawdzenie czy sąsiednie urządzenia są aktywne

  Analizując ICMP i DNS, pomiędzy tymi samymi pakietami przechwyconymi w różnych fragmentach sieci istotną różnicę stanowi odczytane źródło nadania.

  Przykładowy pakiet ICMP wychodzący z PC2, wysłany do google.com:

- Pomiędzy Switch1 i R1:

```
     6 9.376854        192.168.2.13          142.250.203.206        ICMP        98 Echo (ping) request  id
Frame 6: 98 bytes on wire (784 bits), 98 bytes captured (784 bits)
Ethernet II, Src: 00:50:79:66:68:01 (00:50:79:66:68:01), Dst: ca:01:8b:6d:00:1c (ca:01:8b:6d:00:1c)
```

- Pomiędzy R6 i R5:

```
     8 15.014542       192.168.2.13          142.250.203.206        ICMP        98 Echo (ping) request  id
Frame 8: 98 bytes on wire (784 bits), 98 bytes captured (784 bits)
Ethernet II, Src: ca:06:89:2f:00:1c (ca:06:89:2f:00:1c), Dst: ca:02:96:2f:00:1c (ca:02:96:2f:00:1c)
```

- Pomiędzy R5 i Cloud:

```
    16 22.707524       192.168.122.152       142.250.203.206        ICMP        98 Echo (ping) request  id
Frame 16: 98 bytes on wire (784 bits), 98 bytes captured (784 bits)
Ethernet II, Src: ca:02:96:2f:00:00 (ca:02:96:2f:00:00), Dst: 52:54:00:f7:9a:eb (52:54:00:f7:9a:eb)
```

Można zauważyć zmianę adresów MAC oraz że w sieci zewnętrznej adres IP PC2 jest zastąpiony adresem DHCP routera R5.