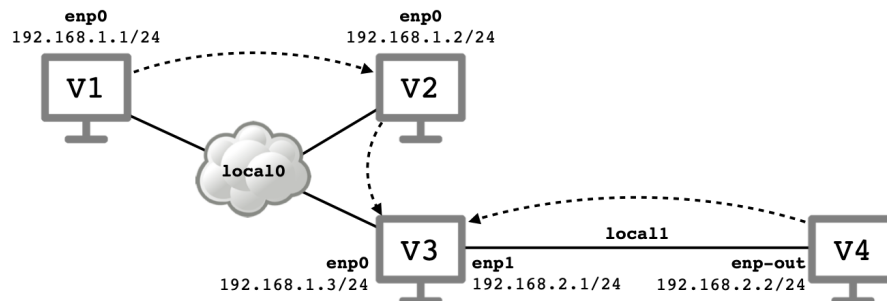# Warsztaty 4

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Poniższe zadanie należy wykonywać samodzielnie na jednym komputerze. Twoim celem jest konfiguracja adresów i routingu dla topologii sieci przedstawionej na rysunku poniżej.

Zadanie 1

Skonfiguruj 4 maszyny wirtualne Virbian1 – Virbian4, tak aby korzystały z sieci local0 i local1, tak jak zaznaczono na rysunku powyżej. Nazwij ich interfejsy tak, jak na rysunku (enp0, enp1 i enp-out).

Zadanie 2

Przypisz trzem interfejsom podłączonym do wirtualnej sieci local0 adresy z sieci 192.168.1.0/24 takie jak na rysunku. Przypisz dwóm interfejsom podłączonym do wirtualnej sieci local1 adresy z sieci 192.168.2.0/24 takie jak na rysunku.

Virbian1:
```
sudo ip link set enp0s3 name enp0
sudo ip link set up dev enp0
sudo ip addr add 192.168.1.1/24 dev enp0
```

Virbian2:
```
sudo ip link set enp0s3 name enp0
sudo ip link set up dev enp0
sudo ip addr add 192.168.1.2/24 dev enp0
```

Virbian3:
```
sudo ip link set enp0s3 name enp0
sudo ip link set up dev enp0
sudo ip addr add 192.168.1.3/24 dev enp0
sudo ip link set enp0s8 name enp1
sudo ip link set up dev enp1
sudo ip addr add 192.168.2.1/24 dev enp1
```

Virbian4:
```
sudo ip link set enp0s3 name enp-out
sudo ip link set up dev enp-out
sudo ip addr add 192.168.2.2/24 dev enp-out
```

Zadanie 3

Poleceniem ping sprawdź wzajemną osiągalność maszyn podłączonych do tej samej sieci local0 i maszyn podłączonych do tej samej sieci local1.

```
sieć local0:
> ping V1 -> V2: ![](https://i.imgur.com/6AkKAPa.png)
> ping V1 -> V3: ![](https://i.imgur.com/uMV7dLB.png)
> ping V2 -> V3: ![](https://i.imgur.com/nfmw44T.png)
>
sieć local1:
> ping V3 -> V4: ![](https://i.imgur.com/1ouaPTM.png)
```

Zadanie 4

- I Na maszynach Virbian1, Virbian2 i Virbian4 dodaj trasy domyślne, które na rysunku powyżej zaznaczone są przerywanymi strzałkami. Przykładowo trasa domyślna z maszyny Virbian2 powinna prowadzić przez adres 192.168.1.3.

Virbian1:

```
sudo ip route add default via 192.168.1.2
```

Virbian2:

```
sudo ip route add default via 192.168.1.3
```

Virbian4:

```
sudo ip route add default via 192.168.2.1
```

Zadanie 5

Włącz Wiresharka na wszystkich maszynach. Następnie z maszyny Virbian1 pingnij maszynę Virbian4. Zaobserwuj, że maszyna jest osiągalna, ale oprócz komunikatów ICMP reply maszyna Virbian1 otrzymuje również komunikaty ICMP redirect. Są one wysyłane przez maszynę Virbian2 i informują o tym, że routing na maszynie Virbian1 jest prawdopodobnie źle skonfigurowany. Odpowiedz na następujące pytania:

ping V1->V4:

```
user@virbian:~$ ping 192.168.2.2
PING 192.168.2.2 (192.168.2.2) 56(84) bytes of data.
From 192.168.1.2: icmp_seq=1 Redirect Host(New nexthop: 192.168.1.3)
64 bytes from 192.168.2.2: icmp_seq=1 ttl=63 time=3.91 ms
From 192.168.1.2: icmp_seq=2 Redirect Host(New nexthop: 192.168.1.3)
64 bytes from 192.168.2.2: icmp_seq=2 ttl=63 time=3.35 ms
From 192.168.1.2: icmp_seq=3 Redirect Host(New nexthop: 192.168.1.3)
64 bytes from 192.168.2.2: icmp_seq=3 ttl=63 time=0.802 ms
From 192.168.1.2: icmp_seq=4 Redirect Host(New nexthop: 192.168.1.3)
64 bytes from 192.168.2.2: icmp_seq=4 ttl=63 time=1.04 ms
```

Wireshark V1:

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) request id=0x01f4, seq=1/256, ttl=64 (reply in 3)
2	0.000846562	192.168.1.2	192.168.1.1	ICMP	126	Redirect (Redirect for host)
3	0.000863294	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x01f4, seq=1/256, ttl=63 (request in 1)
4	1.001403394	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f4, seq=2/512, ttl=64 (reply in 6)
5	1.001876411	192.168.1.2	192.168.1.1	ICMP	126	Redirect (Redirect for host)
6	1.002547495	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x01f4, seq=2/512, ttl=63 (request in 4)
7	2.003141887	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f4, seq=3/768, ttl=64 (reply in 9)
8	2.003823519	192.168.1.2	192.168.1.1	ICMP	126	Redirect (Redirect for host)
9	2.004466802	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x01f4, seq=3/768, ttl=63 (request in 7)
10	3.005132726	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f4, seq=4/1024, ttl=64 (reply in 12)
11	3.005515883	192.168.1.2	192.168.1.1	ICMP	126	Redirect (Redirect for host)
12	3.006136027	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x01f4, seq=4/1024, ttl=63 (request in 10)
13	5.144544154	PcsCompu_62:56:60	PcsCompu_51:15:69	ARP	60	Who has 192.168.1.1? Tell 192.168.1.2
14	5.144561527	PcsCompu_51:15:69	PcsCompu_62:56:60	ARP	42	192.168.1.1 is at 08:00:27:51:15:69
15	5.153831067	PcsCompu_51:15:69	PcsCompu_62:56:60	ARP	42	Who has 192.168.1.2? Tell 192.168.1.1
16	5.154169147	PcsCompu_62:56:60	PcsCompu_51:15:69	ARP	60	192.168.1.2 is at 08:00:27:62:56:60
17	5.221809780	PcsCompu_2d:fb:c2	PcsCompu_51:15:69	ARP	60	Who has 192.168.1.1? Tell 192.168.1.3
18	5.221824542	PcsCompu_51:15:69	PcsCompu_2d:fb:c2	ARP	42	192.168.1.1 is at 08:00:27:51:15:69

Wireshark V2:

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f0, seq=1/256, ttl=64 (no response found!)
2	0.000023821	192.168.1.2	192.168.1.1	ICMP	126	Redirect (Redirect for host)
3	0.000038433	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f0, seq=1/256, ttl=63 (no response found!)
4	1.001054185	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f0, seq=2/512, ttl=64 (no response found!)
5	1.001090368	192.168.1.2	192.168.1.1	ICMP	126	Redirect (Redirect for host)
6	1.00127726	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f0, seq=2/512, ttl=63 (no response found!)
7	1.836542168	fe80:a00:27ff:fe51…	ff02::2	ICMPv6	70	Router Solicitation from 08:00:27:51:15:69
8	2.002745707	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f0, seq=3/768, ttl=64 (no response found!)
9	2.002775724	192.168.1.2	192.168.1.1	ICMP	126	Redirect (Redirect for host)
10	2.002799344	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f0, seq=3/768, ttl=63 (no response found!)
11	5.155406539	PcsCompu_62:56:60	PcsCompu_2d:fb:c2	ARP	42	Who has 192.168.1.3? Tell 192.168.1.2
12	5.155490135	PcsCompu_62:56:60	PcsCompu_51:15:69	ARP	42	Who has 192.168.1.1? Tell 192.168.1.2
13	5.155884113	PcsCompu_2d:fb:c2	PcsCompu_62:56:60	ARP	60	192.168.1.3 is at 08:00:27:2d:fb:c2
14	5.155905381	PcsCompu_51:15:69	PcsCompu_62:56:60	ARP	60	192.168.1.1 is at 08:00:27:51:15:69
15	5.164758212	PcsCompu_51:15:69	PcsCompu_62:56:60	ARP	60	Who has 192.168.1.2? Tell 192.168.1.1
16	5.164776135	PcsCompu_62:56:60	PcsCompu_51:15:69	ARP	42	192.168.1.2 is at 08:00:27:62:56:60

Wireshark V3 (enp0):

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f0, seq=1/256, ttl=63 (reply in 2)
2	0.000320296	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x01f0, seq=1/256, ttl=63 (request in 1)
3	1.001087329	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f0, seq=2/512, ttl=63 (reply in 4)
4	1.001653525	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x01f0, seq=2/512, ttl=63 (request in 3)
5	1.836217554	fe80:a00:27ff:fe51…	ff02::2	ICMPv6	70	Router Solicitation from 08:00:27:51:15:69
6	2.002726966	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f0, seq=3/768, ttl=63 (reply in 7)
7	2.003197306	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x01f0, seq=3/768, ttl=63 (request in 6)
8	5.154347274	PcsCompu_62:56:60	PcsCompu_2d:fb:c2	ARP	60	Who has 192.168.1.3? Tell 192.168.1.2
9	5.155366022	PcsCompu_2d:fb:c2	PcsCompu_62:56:60	ARP	42	192.168.1.3 is at 08:00:27:2d:fb:c2
10	5.231889751	PcsCompu_2d:fb:c2	PcsCompu_51:15:69	ARP	42	Who has 192.168.1.1? Tell 192.168.1.3
11	5.232184717	PcsCompu_51:15:69	PcsCompu_2d:fb:c2	ARP	60	192.168.1.1 is at 08:00:27:51:15:69

Wireshark V3 (enp1):

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f6, seq=1/256, ttl=62 (reply in 2)
2	0.000290056	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x01f6, seq=1/256, ttl=64 (request in 1)
3	1.010293794	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f6, seq=2/512, ttl=62 (reply in 4)
4	1.010755194	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x01f6, seq=2/512, ttl=64 (request in 3)
5	2.012050453	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f6, seq=3/768, ttl=62 (reply in 6)
6	2.012514926	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x01f6, seq=3/768, ttl=64 (request in 5)
7	3.014294725	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f6, seq=4/1024, ttl=62 (reply in 8)
8	3.014756504	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x01f6, seq=4/1024, ttl=64 (request in 7)
9	5.023486967	PcsCompu_cd:d6:be	PcsCompu_9e:ae:c3	ARP	60	Who has 192.168.2.1? Tell 192.168.2.2
10	5.023506222	PcsCompu_9e:ae:c3	PcsCompu_cd:d6:be	ARP	42	192.168.2.1 is at 08:00:27:9e:ae:c3
11	5.205239946	PcsCompu_9e:ae:c3	PcsCompu_cd:d6:be	ARP	42	Who has 192.168.2.2? Tell 192.168.2.1
12	5.205437125	PcsCompu_cd:d6:be	PcsCompu_9e:ae:c3	ARP	60	192.168.2.2 is at 08:00:27:cd:d6:be

Wireshark V4:

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f0, seq=1/256, ttl=62 (reply in 2)
2	0.000060178	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x01f0, seq=1/256, ttl=64 (request in 1)
3	1.001139161	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f0, seq=2/512, ttl=62 (reply in 4)
4	1.001163123	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x01f0, seq=2/512, ttl=64 (request in 3)
5	2.002775934	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x01f0, seq=3/768, ttl=62 (reply in 6)
6	2.002811755	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x01f0, seq=3/768, ttl=64 (request in 5)
7	5.049749503	PcsCompu_cd:d6:be	PcsCompu_9e:ae:c3	ARP	42	Who has 192.168.2.1? Tell 192.168.2.2
8	5.050393630	PcsCompu_9e:ae:c3	PcsCompu_cd:d6:be	ARP	60	192.168.2.1 is at 08:00:27:9e:ae:c3
9	5.231988322	PcsCompu_9e:ae:c3	PcsCompu_cd:d6:be	ARP	60	Who has 192.168.2.2? Tell 192.168.2.1
10	5.232072838	PcsCompu_cd:d6:be	PcsCompu_9e:ae:c3	ARP	42	192.168.2.2 is at 08:00:27:cd:d6:be
11	88.688160352	fe80::a00:27ff:fe9e…	ff02::2	ICMPv6	70	Router Solicitation from 08:00:27:9e:ae:c3

- Jaka jest sugerowana przez maszynę Virbian2 modyfikacja tablicy routingu na maszynie Virbian1 ?

Sugerowana przez maszynę Virbian 2 modyfikacja tablicy routingu Virbian 1 to wysyłanie bezpośrednio wszystkiego do Virbian3.

- Dlaczego taka zmiana ma sens?

Bezpośrednia trasa do Virbian3 jest krótsza niż przechodzenie po drodze przez Virbian2.

- W jaki sposób maszyna Virbian2 mogła wykryć powyższy problem?

Virbian2 jest podłączone do local0 stąd wie, że Virbian1 i Virbian3 też są w tej sieci więc mogą się komunikować ze sobą bezpośrednio.