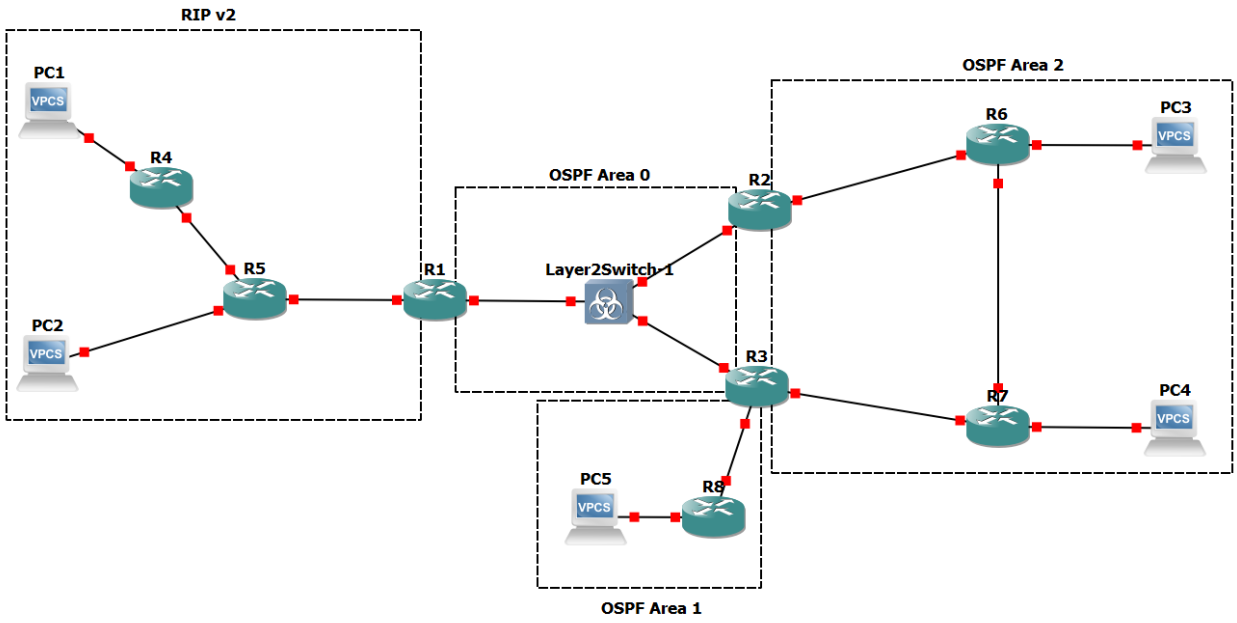
1) Для заданной на схеме schema-lab5 сети, состоящей из управляемых коммутаторов, маршрутизаторов и персональных компьютеров выполнить планирование и документирование адресного пространства и назначить статические адреса всем устройствам.

nb! Каждое соединение маршрутизатора с маршрутизатором - это отдельная сеть.

Подключим каждое устройство, как показано на схеме:



Каждому интерфейсу вручную назначим IP-адрес:

R1#enable
R1#configure terminal
R1(config)#interface Ethernet0/0
R1(config-if)#description to Switch
R1(config-if)#ip address 192.168.100.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#interface Ethernet0/1
R1(config-if)#description to R5
R1(config-if)#ip address 192.168.13.2 255.255.255.252
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#end

R2#enable
R2#configure terminal
R2(config)#interface Ethernet0/0
R2(config-if)#description to Switch

R2(config-if)#ip address 192.168.100.2 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface Ethernet0/1
R2(config-if)#description to R6
R2(config-if)#ip address 192.168.14.1 255.255.255.252
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#end

R3#enable
R3#configure terminal
R3(config)#interface Ethernet0/0
R3(config-if)#description to Switch
R3(config-if)#ip address 192.168.100.3 255.255.255.0
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#interface Ethernet0/1
R3(config-if)#description to R7
R3(config-if)#ip address 192.168.16.1 255.255.255.252
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#interface Ethernet0/2
R3(config-if)#description to R8
R3(config-if)#ip address 192.168.18.1 255.255.255.252
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#end

R4#enable
R4#configure terminal
R4(config)#interface Ethernet0/0
R4(config-if)#description to R5
R4(config-if)#ip address 192.168.11.1 255.255.255.252
R4(config-if)#no shutdown
R4(config-if)#exit
R4(config)#interface Ethernet0/1
R4(config-if)#description to PC1
R4(config-if)#ip address 192.168.10.1 255.255.255.0
R4(config-if)#no shutdown
R4(config-if)#exit
R4(config)#end

R5#enable
R5#configure terminal
R5(config)#interface Ethernet0/0
R5(config-if)#description to R1
R5(config-if)#ip address 192.168.13.1 255.255.255.252
R5(config-if)#no shutdown
R5(config-if)#exit
R5(config)#interface Ethernet0/1
R5(config-if)#description to R4
R5(config-if)#ip address 192.168.11.2 255.255.255.252
R5(config-if)#no shutdown
R5(config-if)#exit
R5(config)#interface Ethernet0/2
R5(config-if)#description to PC2
R5(config-if)#ip address 192.168.12.1 255.255.255.0
R5(config-if)#no shutdown
R5(config-if)#exit
R5(config)#end

R6#enable
R6#configure terminal
R6(config)#interface Ethernet0/0
R6(config-if)#description to R2
R6(config-if)#ip address 192.168.14.2 255.255.255.252
R6(config-if)#no shutdown
R6(config-if)#exit
R6(config)#interface Ethernet0/1
R6(config-if)#description to R7
R6(config-if)#ip address 192.168.22.1 255.255.255.252
R6(config-if)#no shutdown
R6(config-if)#exit
R6(config)#interface Ethernet0/2
R6(config-if)#description to PC3
R6(config-if)#ip address 192.168.15.1 255.255.255.0
R6(config-if)#no shutdown
R6(config-if)#exit
R6(config)#end

R7#enable
R7#configure terminal
R7(config)#interface Ethernet0/0
R7(config-if)#description to R3
R7(config-if)#ip address 192.168.16.2 255.255.255.252

R7(config-if)#no shutdown
R7(config-if)#exit
R7(config)#interface Ethernet0/1
R7(config-if)#description to R6
R7(config-if)#ip address 192.168.22.2 255.255.255.252
R7(config-if)#no shutdown
R7(config-if)#exit
R7(config)#interface Ethernet0/2
R7(config-if)#description to PC4
R7(config-if)#ip address 192.168.17.1 255.255.255.0
R7(config-if)#no shutdown
R7(config-if)#exit
R7(config)#end

R8#enable
R8#configure terminal
R8(config)#interface Ethernet0/0
R8(config-if)#description to R3
R8(config-if)#ip address 192.168.18.2 255.255.255.252
R8(config-if)#no shutdown
R8(config-if)#exit
R8(config)#interface Ethernet0/1
R8(config-if)#description to PC5
R8(config-if)#ip address 192.168.19.1 255.255.255.0
R8(config-if)#no shutdown
R8(config-if)#exit
R8(config)#end

PC1> ip 192.168.10.2 255.255.255.0 192.168.10.1
Checking for duplicate address...
PC1 : 192.168.10.2 255.255.255.0 gateway 192.168.10.1

PC2> ip 192.168.12.2 255.255.255.0 192.168.12.1
Checking for duplicate address...
PC2 : 192.168.12.2 255.255.255.0 gateway 192.168.12.1

PC3> ip 192.168.15.2 255.255.255.0 192.168.15.1
Checking for duplicate address...
PC3 : 192.168.15.2 255.255.255.0 gateway 192.168.15.1

PC4> ip 192.168.17.2 255.255.255.0 192.168.17.1
Checking for duplicate address...
PC4 : 192.168.17.2 255.255.255.0 gateway 192.168.17.1

PC5> ip 192.168.19.2 255.255.255.0 192.168.19.1
Checking for duplicate address...
PC5 : 192.168.19.2 255.255.255.0 gateway 192.168.19.1

2) Настроить протокол динамической маршрутизации RIP v2 для области, указанной на схеме schema-lab5.

R4#configure terminal
R4(config)#router rip
R4(config-router)#version 2
R4(config-router)#no auto-summary
R4(config-router)#network 192.168.10.0
R4(config-router)#network 192.168.11.0
R4(config-router)#exit
R4(config)#end

R5#configure terminal
R5(config)#router rip
R5(config-router)#version 2
R5(config-router)#no auto-summary
R5(config-router)#network 192.168.11.0
R5(config-router)#network 192.168.12.0
R5(config-router)#network 192.168.13.0
R5(config-router)#exit
R5(config)#end

R1#configure terminal
R1(config)#router rip
R1(config-router)#version 2
R1(config-router)#no auto-summary
R1(config-router)#network 192.168.13.0
R1(config-router)#exit
R1(config)#end

3) Настроить протокол динамической маршрутизации OSPF для зон 0, 1, 2. Зону 1 настроить как полностью (nb!) тупиковую.

Область 0:
R1#configure terminal
R1(config)#router ospf 1
R1(config-router)#network 192.168.100.0 0.0.0.255 area 0
R1(config-router)#exit
R1(config)#end

R2#configure terminal
R2(config)#router ospf 1
R2(config-router)#network 192.168.100.0 0.0.0.255 area 0
R2(config-router)#exit
R2(config)#end

R3#configure terminal
R3(config)#router ospf 1
R3(config-router)#network 192.168.100.0 0.0.0.255 area 0
R3(config-router)#exit
R3(config)#end

Область 2:
R2#configure terminal
R2(config)#router ospf 1
R2(config-router)#network 192.168.14.0 0.0.0.3 area 2
R2(config-router)#exit
R2(config)#end

R6#configure terminal
R6(config)#router ospf 1
R6(config-router)#network 192.168.14.0 0.0.0.3 area 2
R6(config-router)#network 192.168.15.0 0.0.0.255 area 2
R6(config-router)#network 192.168.22.0 0.0.0.3 area 2
R6(config-router)#exit
R6(config)#end

R7#configure terminal
R7(config)#router ospf 1
R7(config-router)#network 192.168.22.0 0.0.0.3 area 2
R7(config-router)#network 192.168.22.0 0.0.0.3 area 2
R7(config-router)#network 192.168.17.0 0.0.0.255 area 2
R7(config-router)#network 192.168.16.0 0.0.0.3 area 2
R7(config-router)#exit
R7(config)#end

Область 1 (тупиковая):
R3#configure terminal
R3(config)#router ospf 1
R3(config-router)#network 192.168.18.0 0.0.0.3 area 1
R3(config-router)#area 1 stub
R3(config-router)#exit
R3(config)#end

R8#configure terminal
R8(config)#router ospf 1
R8(config-router)#network 192.168.18.0 0.0.0.3 area 1
R8(config-router)#network 192.168.19.0 0.0.0.255 area 1
R8(config-router)#exit
R8(config)#end

4) Настроить редистрибуцию маршрутов между протоколами RIP v2 и OSPF.

R1#configure terminal
R1(config)#router rip
R1(config-router)#redistribute ospf 1 metric 1
R1(config-router)#exit
R1(config)#router ospf 1
R1(config-router)#redistribute rip subnets
R1(config-router)#exit
R1(config)#end

5) Проверить работоспособность маршрутизации, выполнив ping VPC "все между всеми" (nb!: в обе стороны).

На ПК1:
PC1> ping 192.168.10.2

192.168.10.2 icmp_seq=1 ttl=64 time=0.001 ms
192.168.10.2 icmp_seq=2 ttl=64 time=0.001 ms
192.168.10.2 icmp_seq=3 ttl=64 time=0.001 ms
192.168.10.2 icmp_seq=4 ttl=64 time=0.001 ms
192.168.10.2 icmp_seq=5 ttl=64 time=0.001 ms

PC1> ping 192.168.12.2

192.168.12.2 icmp_seq=1 timeout
84 bytes from 192.168.12.2 icmp_seq=2 ttl=62 time=27.260 ms
84 bytes from 192.168.12.2 icmp_seq=3 ttl=62 time=26.686 ms
84 bytes from 192.168.12.2 icmp_seq=4 ttl=62 time=25.004 ms
84 bytes from 192.168.12.2 icmp_seq=5 ttl=62 time=25.495 ms

PC1> ping 192.168.15.2

192.168.15.2 icmp_seq=1 timeout
84 bytes from 192.168.15.2 icmp_seq=2 ttl=59 time=57.408 ms
84 bytes from 192.168.15.2 icmp_seq=3 ttl=59 time=55.118 ms
84 bytes from 192.168.15.2 icmp_seq=4 ttl=59 time=55.112 ms

84 bytes from 192.168.15.2 icmp_seq=5 ttl=59 time=54.744 ms

PC1> ping 192.168.17.2

84 bytes from 192.168.17.2 icmp_seq=1 ttl=58 time=62.324 ms
84 bytes from 192.168.17.2 icmp_seq=2 ttl=58 time=64.926 ms
84 bytes from 192.168.17.2 icmp_seq=3 ttl=58 time=65.355 ms
84 bytes from 192.168.17.2 icmp_seq=4 ttl=58 time=85.939 ms
84 bytes from 192.168.17.2 icmp_seq=5 ttl=58 time=65.340 ms

PC1> ping 192.168.19.2

****192.168.10.1 icmp_seq=1 ttl=255 time=6.666 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.10.1 icmp_seq=2 ttl=255 time=5.007 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.10.1 icmp_seq=3 ttl=255 time=5.533 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.10.1 icmp_seq=4 ttl=255 time=4.705 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.10.1 icmp_seq=5 ttl=255 time=5.264 ms (ICMP type:3, code:1, Destination host unreachable)***

На ПК2:
PC2> ping 192.168.10.2

84 bytes from 192.168.10.2 icmp_seq=1 ttl=62 time=39.562 ms
84 bytes from 192.168.10.2 icmp_seq=2 ttl=62 time=25.436 ms
84 bytes from 192.168.10.2 icmp_seq=3 ttl=62 time=25.019 ms
84 bytes from 192.168.10.2 icmp_seq=4 ttl=62 time=25.442 ms
84 bytes from 192.168.10.2 icmp_seq=5 ttl=62 time=24.885 ms

PC2> ping 192.168.12.2

192.168.12.2 icmp_seq=1 ttl=64 time=0.001 ms
192.168.12.2 icmp_seq=2 ttl=64 time=0.001 ms
192.168.12.2 icmp_seq=3 ttl=64 time=0.001 ms
192.168.12.2 icmp_seq=4 ttl=64 time=0.001 ms
192.168.12.2 icmp_seq=5 ttl=64 time=0.001 ms

PC2> ping 192.168.15.2

84 bytes from 192.168.15.2 icmp_seq=1 ttl=60 time=53.669 ms

84 bytes from 192.168.15.2 icmp_seq=2 ttl=60 time=45.563 ms
84 bytes from 192.168.15.2 icmp_seq=3 ttl=60 time=44.863 ms
84 bytes from 192.168.15.2 icmp_seq=4 ttl=60 time=45.288 ms
84 bytes from 192.168.15.2 icmp_seq=5 ttl=60 time=46.223 ms

PC2> ping 192.168.17.2

84 bytes from 192.168.17.2 icmp_seq=1 ttl=59 time=61.332 ms
84 bytes from 192.168.17.2 icmp_seq=2 ttl=59 time=55.110 ms
84 bytes from 192.168.17.2 icmp_seq=3 ttl=59 time=54.953 ms
84 bytes from 192.168.17.2 icmp_seq=4 ttl=59 time=55.969 ms
84 bytes from 192.168.17.2 icmp_seq=5 ttl=59 time=56.045 ms

PC2> ping 192.168.19.2

****192.168.12.1 icmp_seq=1 ttl=255 time=6.874 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.12.1 icmp_seq=2 ttl=255 time=5.138 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.12.1 icmp_seq=3 ttl=255 time=5.552 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.12.1 icmp_seq=4 ttl=255 time=4.921 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.12.1 icmp_seq=5 ttl=255 time=4.951 ms (ICMP type:3, code:1, Destination host unreachable)***

На ПК3:
PC3> ping 192.168.10.2

84 bytes from 192.168.10.2 icmp_seq=1 ttl=59 time=78.673 ms
84 bytes from 192.168.10.2 icmp_seq=2 ttl=59 time=65.511 ms
84 bytes from 192.168.10.2 icmp_seq=3 ttl=59 time=76.053 ms
84 bytes from 192.168.10.2 icmp_seq=4 ttl=59 time=76.252 ms
84 bytes from 192.168.10.2 icmp_seq=5 ttl=59 time=65.183 ms

PC3> ping 192.168.12.2

84 bytes from 192.168.12.2 icmp_seq=1 ttl=60 time=56.342 ms
84 bytes from 192.168.12.2 icmp_seq=2 ttl=60 time=44.934 ms
84 bytes from 192.168.12.2 icmp_seq=3 ttl=60 time=45.496 ms
84 bytes from 192.168.12.2 icmp_seq=4 ttl=60 time=44.961 ms
84 bytes from 192.168.12.2 icmp_seq=5 ttl=60 time=45.383 ms

PC3> ping 192.168.15.2

192.168.15.2 icmp_seq=1 ttl=64 time=0.001 ms
192.168.15.2 icmp_seq=2 ttl=64 time=0.001 ms
192.168.15.2 icmp_seq=3 ttl=64 time=0.001 ms
192.168.15.2 icmp_seq=4 ttl=64 time=0.001 ms
192.168.15.2 icmp_seq=5 ttl=64 time=0.001 ms

PC3> ping 192.168.17.2

84 bytes from 192.168.17.2 icmp_seq=1 ttl=62 time=26.638 ms
84 bytes from 192.168.17.2 icmp_seq=2 ttl=62 time=24.797 ms
84 bytes from 192.168.17.2 icmp_seq=3 ttl=62 time=25.192 ms
84 bytes from 192.168.17.2 icmp_seq=4 ttl=62 time=25.508 ms
84 bytes from 192.168.17.2 icmp_seq=5 ttl=62 time=24.998 ms

PC3> ping 192.168.19.2

****192.168.15.1 icmp_seq=1 ttl=255 time=0.774 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.15.1 icmp_seq=2 ttl=255 time=5.442 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.15.1 icmp_seq=3 ttl=255 time=4.750 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.15.1 icmp_seq=4 ttl=255 time=4.906 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.15.1 icmp_seq=5 ttl=255 time=5.377 ms (ICMP type:3, code:1, Destination host unreachable)***

На ПК4:
PC4> ping 192.168.10.2

84 bytes from 192.168.10.2 icmp_seq=1 ttl=58 time=80.220 ms
84 bytes from 192.168.10.2 icmp_seq=2 ttl=58 time=75.994 ms
84 bytes from 192.168.10.2 icmp_seq=3 ttl=58 time=65.783 ms
84 bytes from 192.168.10.2 icmp_seq=4 ttl=58 time=65.278 ms
84 bytes from 192.168.10.2 icmp_seq=5 ttl=58 time=66.004 ms

PC4> ping 192.168.12.2

84 bytes from 192.168.12.2 icmp_seq=1 ttl=59 time=62.968 ms
84 bytes from 192.168.12.2 icmp_seq=2 ttl=59 time=55.676 ms
84 bytes from 192.168.12.2 icmp_seq=3 ttl=59 time=55.386 ms

84 bytes from 192.168.12.2 icmp_seq=4 ttl=59 time=65.452 ms
84 bytes from 192.168.12.2 icmp_seq=5 ttl=59 time=55.866 ms

PC4> ping 192.168.15.2

84 bytes from 192.168.15.2 icmp_seq=1 ttl=62 time=32.686 ms
84 bytes from 192.168.15.2 icmp_seq=2 ttl=62 time=25.592 ms
84 bytes from 192.168.15.2 icmp_seq=3 ttl=62 time=24.937 ms
84 bytes from 192.168.15.2 icmp_seq=4 ttl=62 time=25.633 ms
84 bytes from 192.168.15.2 icmp_seq=5 ttl=62 time=25.052 ms

PC4> ping 192.168.17.2

192.168.17.2 icmp_seq=1 ttl=64 time=0.001 ms
192.168.17.2 icmp_seq=2 ttl=64 time=0.001 ms
192.168.17.2 icmp_seq=3 ttl=64 time=0.001 ms
192.168.17.2 icmp_seq=4 ttl=64 time=0.001 ms
192.168.17.2 icmp_seq=5 ttl=64 time=0.001 ms

PC4> ping 192.168.19.2

****192.168.17.1 icmp_seq=1 ttl=255 time=2.436 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.17.1 icmp_seq=2 ttl=255 time=5.135 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.17.1 icmp_seq=3 ttl=255 time=5.668 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.17.1 icmp_seq=4 ttl=255 time=5.048 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.17.1 icmp_seq=5 ttl=255 time=5.221 ms (ICMP type:3, code:1, Destination host unreachable)***

На ПК5:
PC5> ping 192.168.10.2

****192.168.19.1 icmp_seq=1 ttl=255 time=9.313 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.19.1 icmp_seq=2 ttl=255 time=5.398 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.19.1 icmp_seq=3 ttl=255 time=4.789 ms (ICMP type:3, code:1, Destination host unreachable)***
****192.168.19.1 icmp_seq=4 ttl=255 time=5.297 ms (ICMP type:3, code:1, Destination host unreachable)***

192.168.19.1 icmp_seq=5 ttl=255 time=5.780 ms (ICMP type:3, code:1, Destination host unreachable)

PC5> ping 192.168.12.2

192.168.19.1 icmp_seq=1 ttl=255 time=2.930 ms (ICMP type:3, code:1, Destination host unreachable)
192.168.19.1 icmp_seq=2 ttl=255 time=5.532 ms (ICMP type:3, code:1, Destination host unreachable)
192.168.19.1 icmp_seq=3 ttl=255 time=4.929 ms (ICMP type:3, code:1, Destination host unreachable)
192.168.19.1 icmp_seq=4 ttl=255 time=5.418 ms (ICMP type:3, code:1, Destination host unreachable)
192.168.19.1 icmp_seq=5 ttl=255 time=4.907 ms (ICMP type:3, code:1, Destination host unreachable)

PC5> ping 192.168.15.2

192.168.19.1 icmp_seq=1 ttl=255 time=0.652 ms (ICMP type:3, code:1, Destination host unreachable)
192.168.19.1 icmp_seq=2 ttl=255 time=5.298 ms (ICMP type:3, code:1, Destination host unreachable)
192.168.19.1 icmp_seq=3 ttl=255 time=5.659 ms (ICMP type:3, code:1, Destination host unreachable)
192.168.19.1 icmp_seq=4 ttl=255 time=4.931 ms (ICMP type:3, code:1, Destination host unreachable)
192.168.19.1 icmp_seq=5 ttl=255 time=5.080 ms (ICMP type:3, code:1, Destination host unreachable)

PC5> ping 192.168.17.2

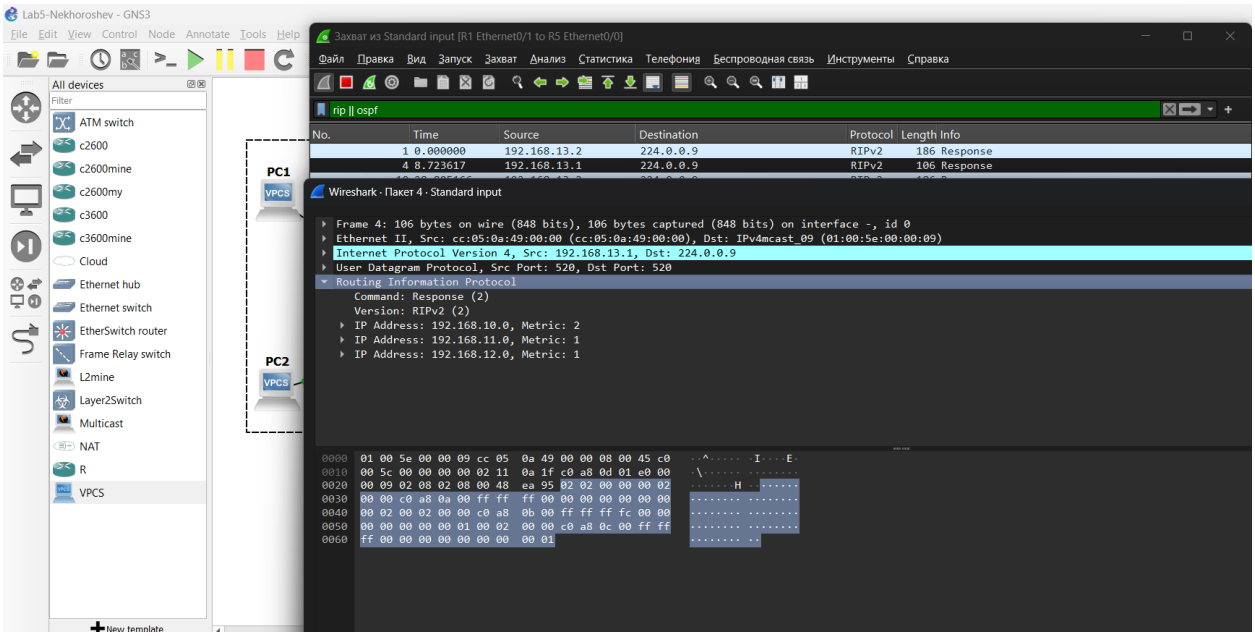
192.168.19.1 icmp_seq=1 ttl=255 time=6.159 ms (ICMP type:3, code:1, Destination host unreachable)
192.168.19.1 icmp_seq=2 ttl=255 time=5.503 ms (ICMP type:3, code:1, Destination host unreachable)
192.168.19.1 icmp_seq=3 ttl=255 time=4.946 ms (ICMP type:3, code:1, Destination host unreachable)
192.168.19.1 icmp_seq=4 ttl=255 time=5.470 ms (ICMP type:3, code:1, Destination host unreachable)
192.168.19.1 icmp_seq=5 ttl=255 time=4.523 ms (ICMP type:3, code:1, Destination host unreachable)

PC5> ping 192.168.19.2

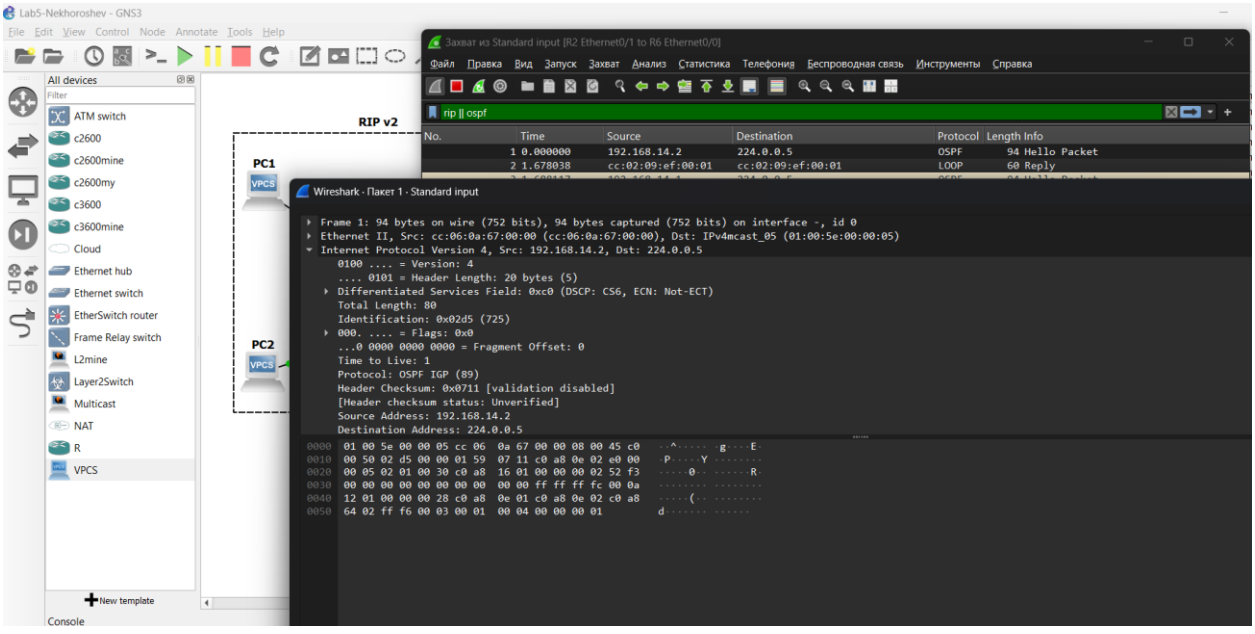
192.168.19.2 icmp_seq=1 ttl=64 time=0.001 ms
192.168.19.2 icmp_seq=2 ttl=64 time=0.001 ms
192.168.19.2 icmp_seq=3 ttl=64 time=0.001 ms
192.168.19.2 icmp_seq=4 ttl=64 time=0.001 ms
192.168.19.2 icmp_seq=5 ttl=64 time=0.001 ms

6) Перехватить в wireshark сообщения протоколов RIP v2 и OSPF, идентифицировать их тип и содержание.

Тип Response у RIPv2 (маршрутизатор отправляет свою таблицу маршрутов):



Тип Hello у OSPF (обнаружение соседей):



7) Сохранить в отдельные файлы с префиксом rt_ и именем маршрутизатора таблицы маршрутизации всех маршрутизаторов.

*На каждом маршрутизаторе выполним команду **show ip route** и сохраним таблицу маршрутизации.*

8) Сохранить файлы конфигураций устройств в виде набора файлов с именами, соответствующими именам устройств.