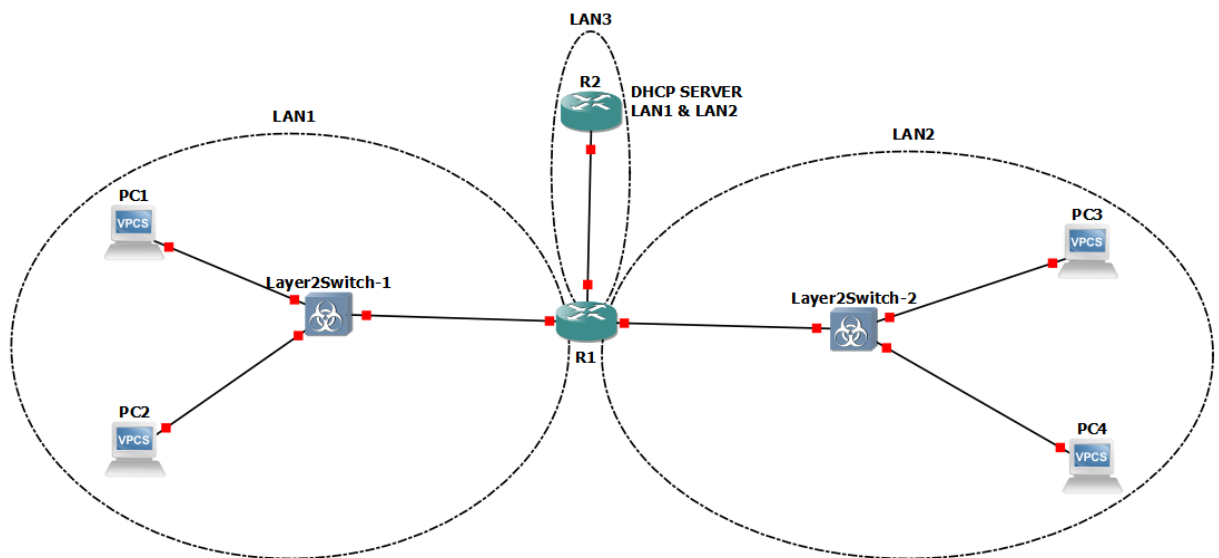


## Модуль 4, Лабораторная работа 4

1) Для заданной на схеме schema-lab4 сети, состоящей из управляемых коммутаторов, маршрутизаторов и персональных компьютеров выполнить планирование и документирование адресного пространства в подсетях LAN1, LAN2, LAN3 и назначить статические адреса маршрутизаторам и динамическое конфигурирование адресов для VPC

Схема сети:



LAN1 (подсеть коммутатора 1): 10.0.1.0/24

- Маршрутизатор R1 (интерфейс к LAN1): 10.0.1.1
- DHCP-пул: 10.0.1.10 – 10.0.1.254

LAN2 (подсеть коммутатора 2): 10.0.2.0/24

- Маршрутизатор R1 (интерфейс к LAN2): 10.0.2.1
- DHCP-пул: 10.0.2.10 – 10.0.2.254

LAN3 (между R1 и R2): 10.0.3.0/24

- R1 (интерфейс к LAN3): 10.0.3.1
- R2 (интерфейс к LAN3): 10.0.3.2

Назначение статических IP маршрутизаторам:

R1:

LAN1:

R1(config)#interface fa0/0

R1(config-if)#ip address 10.0.1.1 255.255.255.0

R1(config-if)#no shut

LAN3:

R1(config)#interface fa1/0

R1(config-if)#ip address 10.0.3.1 255.255.255.0

R1(config-if)#no shut

LAN2:

R1(config)#interface fa2/0

R1(config-if)#ip address 10.0.2.1 255.255.255.0

R1(config-if)#no shut

```
R1(config)#do sh ip interface brief
Interface                IP-Address      OK? Method Status  Protocol
FastEthernet0/0          10.0.1.1        YES manual up      up
FastEthernet1/0          10.0.3.1        YES manual up      up
FastEthernet2/0          10.0.2.1        YES manual up      up
R1(config)#
```

R2:

R2(config)#int fa0/0

R2(config-if)#ip address 10.0.3.2 255.255.255.0

R2(config-if)#no shut

```
R2(config-if)#do sh ip interface brief
Interface                IP-Address      OK? Method Status  Protocol
FastEthernet0/0          10.0.3.2        YES manual up      up
R2(config-if)#
```

Исключение статических адресов из DHCP-пулов:

```
R2(config)#ip dhcp excluded-address 10.0.1.1 10.0.1.9
R2(config)#ip dhcp excluded-address 10.0.2.1 10.0.2.9
R2(config)#ip dhcp excluded-address 10.0.3.1
R2(config)#ip dhcp excluded-address 10.0.3.2
```

Настройка DHCP Relay на R1:

```
R1(config)#int fa0/0
R1(config-if)#ip helper-address 10.0.3.2
```

```
R1(config)#int fa2/0
R1(config-if)#ip helper-address 10.0.3.2
```

2) Настроить сервер DHCP на маршрутизаторе R2 для обслуживания адресных пулов адресного пространства подсетей LAN1 и LAN2

```
R2(config)#ip dhcp pool LAN1_POOL
R2(dhcp-config)#network 10.0.1.0 255.255.255.0
R2(dhcp-config)#default-router 10.0.1.1
```

```
R2(config)#ip dhcp pool LAN2_POOL
R2(dhcp-config)#network 10.0.2.0 255.255.255.0
R2(dhcp-config)#default-router 10.0.2.1
```

3) Настроить статическую маршрутизацию между подсетями

```
R2(config)#ip route 10.0.1.0 255.255.255.0 10.0.3.1
R2(config)#ip route 10.0.2.0 255.255.255.0 10.0.3.1
```

```

R2(config)#do sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

    10.0.0.0/24 is subnetted, 3 subnets
S       10.0.2.0 [1/0] via 10.0.3.1
C       10.0.3.0 is directly connected, FastEthernet0/0
S       10.0.1.0 [1/0] via 10.0.3.1

```

4) Проверить работоспособность протокола DHCP и маршрутизации, выполнив ping между всеми VPC

Полученные адреса для:

PC1 - 10.0.1.11

PC2 - 10.0.1.12

PC3 - 10.0.2.11

PC4 - 10.0.2.12

```

R2(config)#do sh ip dhcp binding
Bindings from all pools not associated with VRF:
IP address      Client-ID/      Lease expiration      Type
                  Hardware address/
                  User name
10.0.1.11       0100.5079.6668.00    Mar 02 2002 12:38 AM    Automatic
10.0.1.12       0100.5079.6668.01    Mar 02 2002 12:38 AM    Automatic
10.0.2.11       0100.5079.6668.02    Mar 02 2002 12:38 AM    Automatic
10.0.2.12       0100.5079.6668.03    Mar 02 2002 12:38 AM    Automatic
R2(config)#

```

Связь PC1 с остальными PC:

```
PC1> ping 10.0.1.12
84 bytes from 10.0.1.12 icmp_seq=1 ttl=64 time=2.766 ms
84 bytes from 10.0.1.12 icmp_seq=2 ttl=64 time=9.334 ms
84 bytes from 10.0.1.12 icmp_seq=3 ttl=64 time=7.756 ms
84 bytes from 10.0.1.12 icmp_seq=4 ttl=64 time=6.986 ms
84 bytes from 10.0.1.12 icmp_seq=5 ttl=64 time=0.591 ms

PC1> ping 10.0.2.12
84 bytes from 10.0.2.12 icmp_seq=1 ttl=63 time=29.445 ms
84 bytes from 10.0.2.12 icmp_seq=2 ttl=63 time=14.883 ms
84 bytes from 10.0.2.12 icmp_seq=3 ttl=63 time=14.743 ms
84 bytes from 10.0.2.12 icmp_seq=4 ttl=63 time=15.633 ms
84 bytes from 10.0.2.12 icmp_seq=5 ttl=63 time=15.410 ms

PC1> ping 10.0.2.11
84 bytes from 10.0.2.11 icmp_seq=1 ttl=63 time=23.105 ms
84 bytes from 10.0.2.11 icmp_seq=2 ttl=63 time=20.402 ms
84 bytes from 10.0.2.11 icmp_seq=3 ttl=63 time=20.140 ms
84 bytes from 10.0.2.11 icmp_seq=4 ttl=63 time=14.898 ms
84 bytes from 10.0.2.11 icmp_seq=5 ttl=63 time=14.244 ms
```

Связь PC2 с остальными PC:

```
PC2> ping 10.0.1.11
84 bytes from 10.0.1.11 icmp_seq=1 ttl=64 time=8.810 ms
84 bytes from 10.0.1.11 icmp_seq=2 ttl=64 time=0.565 ms
84 bytes from 10.0.1.11 icmp_seq=3 ttl=64 time=5.885 ms
84 bytes from 10.0.1.11 icmp_seq=4 ttl=64 time=7.121 ms
84 bytes from 10.0.1.11 icmp_seq=5 ttl=64 time=0.539 ms

PC2> ping 10.0.2.11
84 bytes from 10.0.2.11 icmp_seq=1 ttl=63 time=29.627 ms
84 bytes from 10.0.2.11 icmp_seq=2 ttl=63 time=14.494 ms
84 bytes from 10.0.2.11 icmp_seq=3 ttl=63 time=15.236 ms
84 bytes from 10.0.2.11 icmp_seq=4 ttl=63 time=15.120 ms
84 bytes from 10.0.2.11 icmp_seq=5 ttl=63 time=15.317 ms

PC2> ping 10.0.2.12
84 bytes from 10.0.2.12 icmp_seq=1 ttl=63 time=30.704 ms
84 bytes from 10.0.2.12 icmp_seq=2 ttl=63 time=15.716 ms
84 bytes from 10.0.2.12 icmp_seq=3 ttl=63 time=15.788 ms
84 bytes from 10.0.2.12 icmp_seq=4 ttl=63 time=15.635 ms
84 bytes from 10.0.2.12 icmp_seq=5 ttl=63 time=15.485 ms
```

Связь PC3 с остальными PC:

```
PC3> ping 10.0.1.11

84 bytes from 10.0.1.11 icmp_seq=1 ttl=63 time=22.758 ms
84 bytes from 10.0.1.11 icmp_seq=2 ttl=63 time=14.952 ms
84 bytes from 10.0.1.11 icmp_seq=3 ttl=63 time=14.969 ms
84 bytes from 10.0.1.11 icmp_seq=4 ttl=63 time=14.998 ms
84 bytes from 10.0.1.11 icmp_seq=5 ttl=63 time=15.811 ms

PC3> ping 10.0.1.12

84 bytes from 10.0.1.12 icmp_seq=1 ttl=63 time=22.491 ms
84 bytes from 10.0.1.12 icmp_seq=2 ttl=63 time=15.610 ms
84 bytes from 10.0.1.12 icmp_seq=3 ttl=63 time=16.041 ms
84 bytes from 10.0.1.12 icmp_seq=4 ttl=63 time=14.942 ms
84 bytes from 10.0.1.12 icmp_seq=5 ttl=63 time=15.071 ms

PC3> ping 10.0.2.12

84 bytes from 10.0.2.12 icmp_seq=1 ttl=64 time=6.840 ms
84 bytes from 10.0.2.12 icmp_seq=2 ttl=64 time=2.156 ms
84 bytes from 10.0.2.12 icmp_seq=3 ttl=64 time=6.761 ms
84 bytes from 10.0.2.12 icmp_seq=4 ttl=64 time=7.029 ms
84 bytes from 10.0.2.12 icmp_seq=5 ttl=64 time=1.043 ms
```

Связь PC4 с остальными PC:

```
PC4> ping 10.0.1.11

84 bytes from 10.0.1.11 icmp_seq=1 ttl=63 time=12.604 ms
84 bytes from 10.0.1.11 icmp_seq=2 ttl=63 time=15.672 ms
84 bytes from 10.0.1.11 icmp_seq=3 ttl=63 time=25.906 ms
84 bytes from 10.0.1.11 icmp_seq=4 ttl=63 time=15.222 ms
84 bytes from 10.0.1.11 icmp_seq=5 ttl=63 time=14.903 ms

PC4> ping 10.0.1.12

84 bytes from 10.0.1.12 icmp_seq=1 ttl=63 time=29.734 ms
84 bytes from 10.0.1.12 icmp_seq=2 ttl=63 time=14.518 ms
84 bytes from 10.0.1.12 icmp_seq=3 ttl=63 time=16.901 ms
84 bytes from 10.0.1.12 icmp_seq=4 ttl=63 time=14.730 ms
84 bytes from 10.0.1.12 icmp_seq=5 ttl=63 time=15.642 ms

PC4> ping 10.0.2.11

84 bytes from 10.0.2.11 icmp_seq=1 ttl=64 time=5.416 ms
84 bytes from 10.0.2.11 icmp_seq=2 ttl=64 time=6.765 ms
84 bytes from 10.0.2.11 icmp_seq=3 ttl=64 time=6.264 ms
84 bytes from 10.0.2.11 icmp_seq=4 ttl=64 time=8.709 ms
84 bytes from 10.0.2.11 icmp_seq=5 ttl=64 time=6.790 ms
```

5) Перехватить в Wireshark диалог одного из VPC с сервером DHCP, разобрать с комментариями

[illegible]

Клиент ищет доступные DHCP-серверы, его ip адрес отсутствует, для поиска сервера используется широковещательный канал.

The screenshot displays the Wireshark network traffic analysis interface. The top menu bar includes File, Правка (Edit), Вид (View), Запуск (Run), Захват (Capture), Анализ (Analyze), Статистика (Statistics), Телефония (Telephony), Беспроводная связь (Wireless), Инструменты (Tools), and Справка (Help). The toolbar contains icons for file operations, capture, analysis, and search.

The packet list pane on the left shows a list of captured packets. The selected packet is packet 12, which is a DHCP Offer from 10.0.2.1 to 10.0.2.1. The packet details pane on the right shows the structure of the DHCP Offer message, including the Transaction ID (0x7e14682f), Message type (Boot Reply), and various options like DHCP Message Type (Offer) and DHCP Server Identifier (10.0.3.2).

The packet bytes pane on the right shows the raw data of the selected packet, displayed in hexadecimal and ASCII format.

No.	Time	Source	Destination	Protocol	Length	Info
6	6.453092	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0x7e14682f
8	7.453127	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0x7e14682f
12	10.040684	10.0.2.1	10.0.2.11	DHCP	342	DHCP Offer - Transaction ID 0x7e14682f
13	10.040721	10.0.2.1	10.0.2.11	DHCP	342	DHCP Offer - Transaction ID 0x7e14682f
14	10.453109	0.0.0.0	255.255.255.255	DHCP	406	DHCP Request - Transaction ID 0x7e14682f
15	10.473100	10.0.2.1	10.0.2.11	DHCP	342	DHCP ACK - Transaction ID 0x7e14682f

Frame 12: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface -, id 0  
Ethernet II, Src: cc:01:72:75:00:20 (cc:01:72:75:00:20), Dst: Private\_66:68:03 (00:50:79:66:68:03)  
Internet Protocol Version 4, Src: 10.0.2.1, Dst: 10.0.2.11  
User Datagram Protocol, Src Port: 67, Dst Port: 68  
Dynamic Host Configuration Protocol (Offer)  
Message type: Boot Reply (2)  
Hardware type: Ethernet (0x01)  
Hardware address length: 6  
Hops: 0  
Transaction ID: 0x7e14682f  
Seconds elapsed: 0  
Bootp flags: 0x0000 (Unicast)  
Client IP address: 0.0.0.0  
Your (client) IP address: 10.0.2.11  
Next server IP address: 0.0.0.0  
Relay agent IP address: 10.0.2.1  
Client MAC address: Private\_66:68:03 (00:50:79:66:68:03)  
Client hardware address padding: 00000000000000000000  
Server host name not given  
Boot file name not given  
Magic cookie: DHCP  
Option: (53) DHCP Message Type (Offer)  
Option: (54) DHCP Server Identifier (10.0.3.2)  
Option: (51) IP Address Lease Time  
Length: 4  
IP Address Lease Time: 1 day (86400)  
Option: (58) Renewal Time Value  
Option: (59) Rebinding Time Value

Сервер предлагает IP адрес 10.0.2.11/24. для передачи используется MAC-адрес полученный ранее.

\*Standard input [R1 FastEthernet2/0 to Layer2Switch-2 Ethernet0]

ФайлПравкаВидЗапускЗахватАнализСтатистикаТелефонияБеспроводная связьИнструментыСправка

dhc

No.	Time	Source	Destination	Protocol	Length	Info
6	6.453092	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0x7e14682f
8	7.453127	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0x7e14682f
12	10.040684	10.0.2.1	10.0.2.11	DHCP	342	DHCP Offer - Transaction ID 0x7e14682f
13	10.040721	10.0.2.1	10.0.2.11	DHCP	342	DHCP Offer - Transaction ID 0x7e14682f
14	10.453109	0.0.0.0	255.255.255.255	DHCP	406	DHCP Request - Transaction ID 0x7e14682f
15	10.473100	10.0.2.1	10.0.2.11	DHCP	342	DHCP ACK - Transaction ID 0x7e14682f

Frame 14: 406 bytes on wire (3248 bits), 406 bytes captured (3248 bits) on interface -, id 0

Ethernet II, Src: Private\_66:68:03 (00:50:79:66:68:03), Dst: cc:01:72:75:00:20 (cc:01:72:75:00:20)

Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255

User Datagram Protocol, Src Port: 68, Dst Port: 67

Dynamic Host Configuration Protocol (Request)

Message type: Boot Request (1)

Hardware type: Ethernet (0x01)

Hardware address length: 6

Hops: 0

Transaction ID: 0x7e14682f

Seconds elapsed: 0

Bootp flags: 0x0000 (Unicast)

Client IP address: 10.0.2.11

Your (client) IP address: 0.0.0.0

Next server IP address: 0.0.0.0

Relay agent IP address: 0.0.0.0

Client MAC address: Private\_66:68:03 (00:50:79:66:68:03)

Client hardware address padding: 00000000000000000000

Server host name not given

Boot file name not given

Magic cookie: DHCP

Option: (53) DHCP Message Type (Request)

Option: (54) DHCP Server Identifier (10.0.3.2)

Option: (50) Requested IP Address (10.0.2.11)

Option: (61) Client identifier

Option: (12) Host Name

Option: (55) Parameter Request List

Option: (255) End

0000cc 01 72 75

001001 88 00 00

0020ff ff 00 44

003068 2f 00 00

004000 00 00 00

005000 00 00 00

006000 00 00 00

007000 00 00 00

008000 00 00 00

009000 00 00 00

00a000 00 00 00

00b000 00 00 00

00c000 00 00 00

00d000 00 00 00

00e000 00 00 00

00f000 00 00 00

010000 00 00 00

011000 00 00 00

012000 03 02 37

013068 03 0c 03

014000 00 00 00

015000 00 00 00

016000 00 00 00

017000 00 00 00

018000 00 00 00

019000 00 00 00

Ethernet (eth), 14 байтов

Пакеты: 33 · Отображено: 6 (18.2%) · Потеряно: 0 (0.0%)

Клиент подтверждает запрос на получения IP адреса взятый из offer, устанавливается DHCP Server Identifier.



\*Standard input [R1 FastEthernet2/0 to Layer2Switch-2 Ethernet0]

Файл Правка Вид Запуск Захват Анализ Статистика Телефония Беспроводная связь Инструменты Справка

dhcp

No.	Time	Source	Destination	Protocol	Length	Info
6	6.453092	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0x7e14682f
8	7.453127	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0x7e14682f
12	10.040684	10.0.2.1	10.0.2.11	DHCP	342	DHCP Offer - Transaction ID 0x7e14682f
13	10.040721	10.0.2.1	10.0.2.11	DHCP	342	DHCP Offer - Transaction ID 0x7e14682f
14	10.453109	0.0.0.0	255.255.255.255	DHCP	406	DHCP Request - Transaction ID 0x7e14682f
15	10.473100	10.0.2.1	10.0.2.11	DHCP	342	DHCP ACK - Transaction ID 0x7e14682f

Frame 15: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface ~, id 0

Ethernet II, Src: cc:01:72:75:00:20 (cc:01:72:75:00:20), Dst: Private\_66:68:03 (00:50:79:66:68:03)

Internet Protocol Version 4, Src: 10.0.2.1, Dst: 10.0.2.11

User Datagram Protocol, Src Port: 67, Dst Port: 68

Dynamic Host Configuration Protocol (ACK)

Message type: Boot Reply (2)

Hardware type: Ethernet (0x01)

Hardware address length: 6

Hops: 0

Transaction ID: 0x7e14682f

Seconds elapsed: 0

Bootp flags: 0x0000 (Unicast)

Client IP address: 10.0.2.11

Your (client) IP address: 10.0.2.11

Next server IP address: 0.0.0.0

Relay agent IP address: 10.0.2.1

Client MAC address: Private\_66:68:03 (00:50:79:66:68:03)

Client hardware address padding: 00000000000000000000

Server host name not given

Boot file name not given

Magic cookie: DHCP

Option: (53) DHCP Message Type (ACK)

Option: (54) DHCP Server Identifier (10.0.3.2)

Option: (51) IP Address Lease Time

Option: (58) Renewal Time Value

Option: (59) Rebinding Time Value

Option: (1) Subnet Mask (255.255.255.0)

Option: (3) Router

Ethernet (eth), 14 байтов

Пакеты: 33 · Отображено: 6 (18.2%) · Потеряно: 0 (0.)

Сервер подтверждает выделение адреса, устанавливает время аренды равное одному дню.

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

Папка config