Практика 4

1. Планирование и документирование адресного пространства.

R1 — основной маршрутизатор

R2 - DHCP-сервер

LAN1 — PC1, PC2 через switch1

LAN2 — PC3, PC4 через switch2

LAN3 — R1 и R2

Сеть	Диапазон	Шлюз	Назначение
LAN1	192.168.1.0/24	192.168.1.1	PC1, PC2
LAN2	192.168.2.0/24	192.168.2.1	PC3, PC4
LAN3	192.168.3.0/30		R1, R2

2. Настройка DHCP-сервера (R2) и DHCP-Relay (R1)

Настройка R2:

Интерфейс Fa0/0 (к R1)

```
en
conf t
interface Fa0/0
description Link to R1
ip address 192.168.3.2 255.255.255.252
exit
```

Создание DHCP для LAN1

```
ip dhcp pool LAN1_POOL
network 192.168.1.0 255.255.255.0
domain-name lan1.local
default-router 192.168.1.1
exit
```

Создание DHCP для LAN2

```
ip dhcp pool LAN2_POOL
network 192.168.2.0 255.255.255.0
domain-name lan2.local
default-router 192.168.2.1
exit
```

Исключение из пула адресов шлюза,

```
ip dhcp excluded-address 192.168.1.1
ip dhcp excluded-address 192.168.2.1
```

Настройка статической маршрутизации:

ip route 192.168.1.0 255.255.255.0 192.168.3.1
ip route 192.168.2.0 255.255.255.0 192.168.3.1
ip routing
end
write memory
DHCP-pool

```
R2#show ip dhcp pool

Pool LAN1_POOL :
 Utilization mark (high/low)    : 100 / 0
 Subnet size (first/next)       : 0 / 0
 Total addresses                : 254
 Leased addresses               : 0
 Pending event                  : none
 1 subnet is currently in the pool :
 Current index        IP address range                    Leased addresses
 192.168.1.1          192.168.1.1      - 192.168.1.254     0

Pool LAN2_POOL :
 Utilization mark (high/low)    : 100 / 0
 Subnet size (first/next)       : 0 / 0
 Total addresses                : 254
 Leased addresses               : 0
 Pending event                  : none
 1 subnet is currently in the pool :
 Current index        IP address range                    Leased addresses
 192.168.2.1          192.168.2.1      - 192.168.2.254     0
```

Таблица маршрутизации:

```
R2#show 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

S    192.168.1.0/24 [1/0] via 192.168.3.1
S    192.168.2.0/24 [1/0] via 192.168.3.1
     192.168.3.0/30 is subnetted, 1 subnets
C       192.168.3.0 is directly connected, FastEthernet0/0
```

Настройка R1 (как DHCP-Relay):

en
conf t
interface Fa1/0

description Link to R2
ip address 192.168.3.1 255.255.255.252
no shutdown
exit
interface Fa0/0
description LAN1 to Switch1
ip address 192.168.1.1 255.255.255.0
ip helper-address 192.168.3.2
no shutdown
exit
interface Fa2/0
description LAN2 to Switch2
ip address 192.168.2.1 255.255.255.0
ip helper-address 192.168.3.2
no shutdown
exit
ip routing
end
write memory

```
R1#show ip interface brief
Interface                  IP-Address      OK? Method Status                Prot
ocol
FastEthernet0/0            192.168.1.1     YES manual up                    up

FastEthernet1/0            192.168.3.1     YES manual up                    up

FastEthernet2/0            192.168.2.1     YES manual up                    up
```

3)Проверка DHCP:

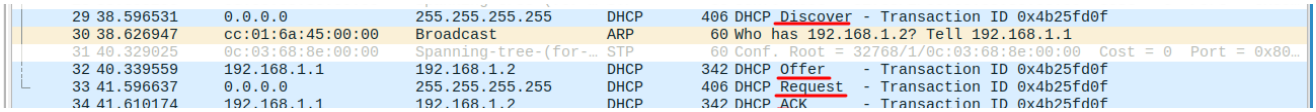
Выдача ip адреса ПК1

dhcp

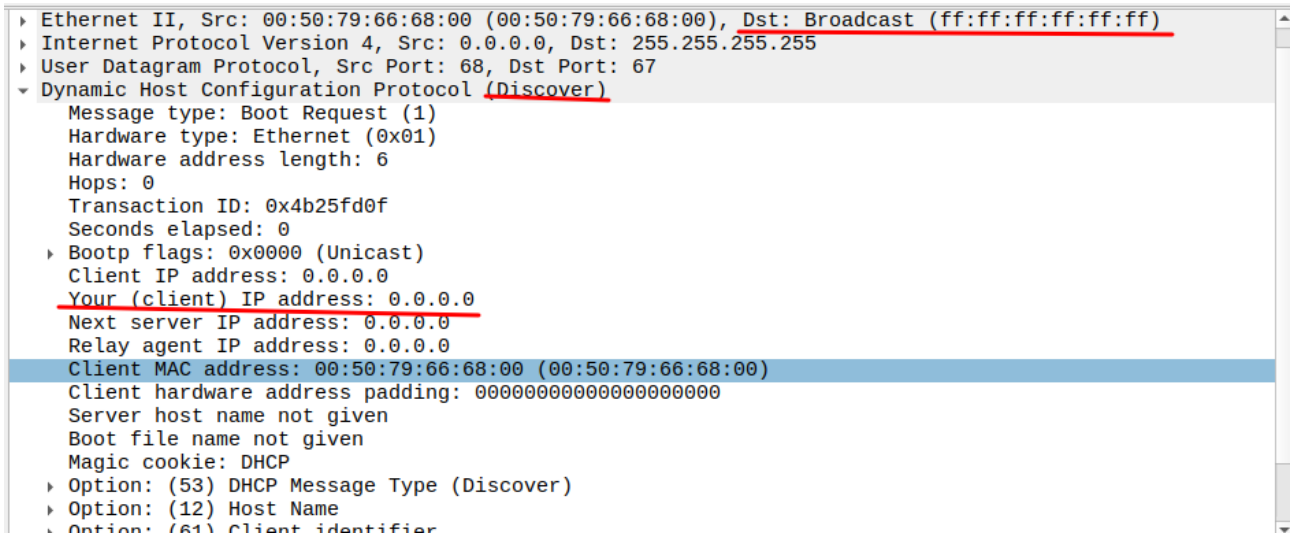
```
PC1> dhcp
DDORA IP 192.168.1.2/24 GW 192.168.1.1
PC1> show ip

NAME        : PC1[1]
IP/MASK     : 192.168.1.2/24
GATEWAY     : 192.168.1.1
DNS         :
DHCP SERVER : 192.168.3.2
DHCP LEASE  : 86390, 86400/43200/75600
DOMAIN NAME : lan1.local
MAC         : 00:50:79:66:68:00
LPORT       : 22126
RHOST:PORT  : 127.0.0.1:22127
MTU         : 1500
```

DHCP-сервер выдал правильный ip адрес из пула LAN1

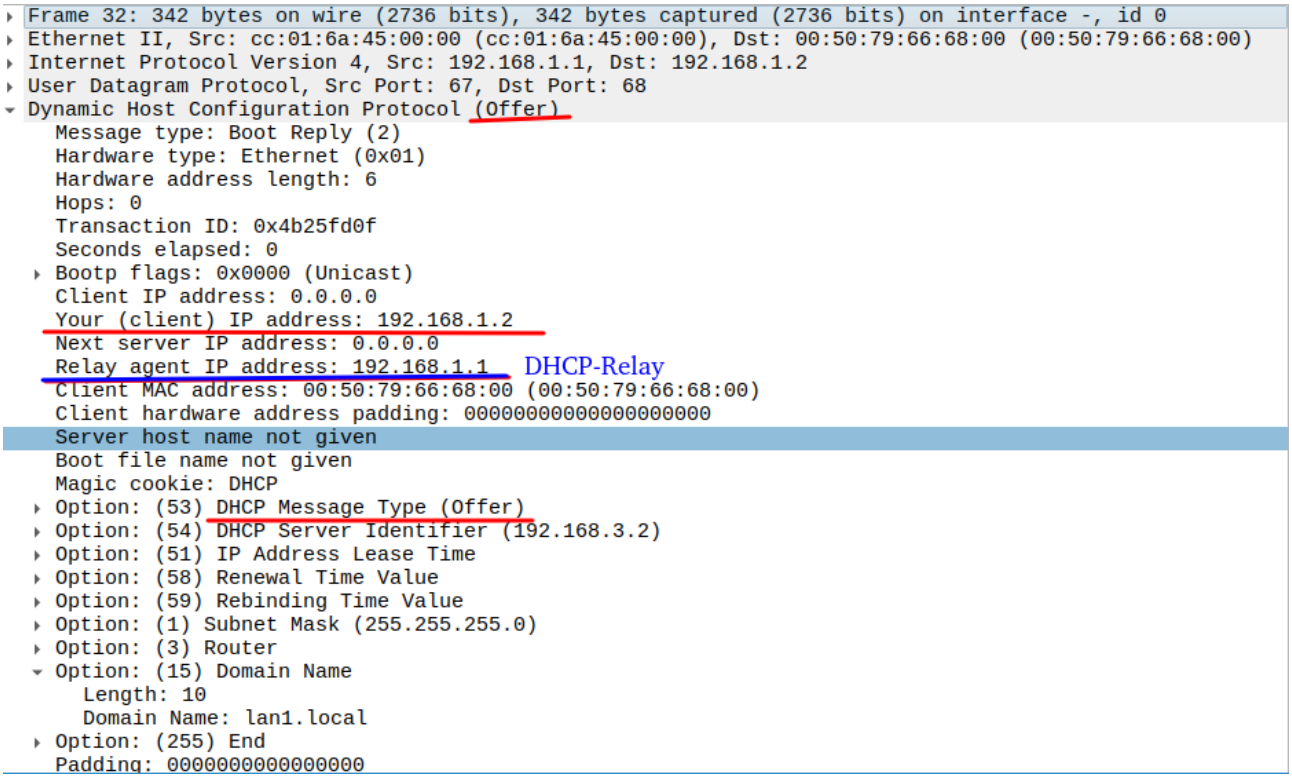
Проверим передачу пакетов в wireshark



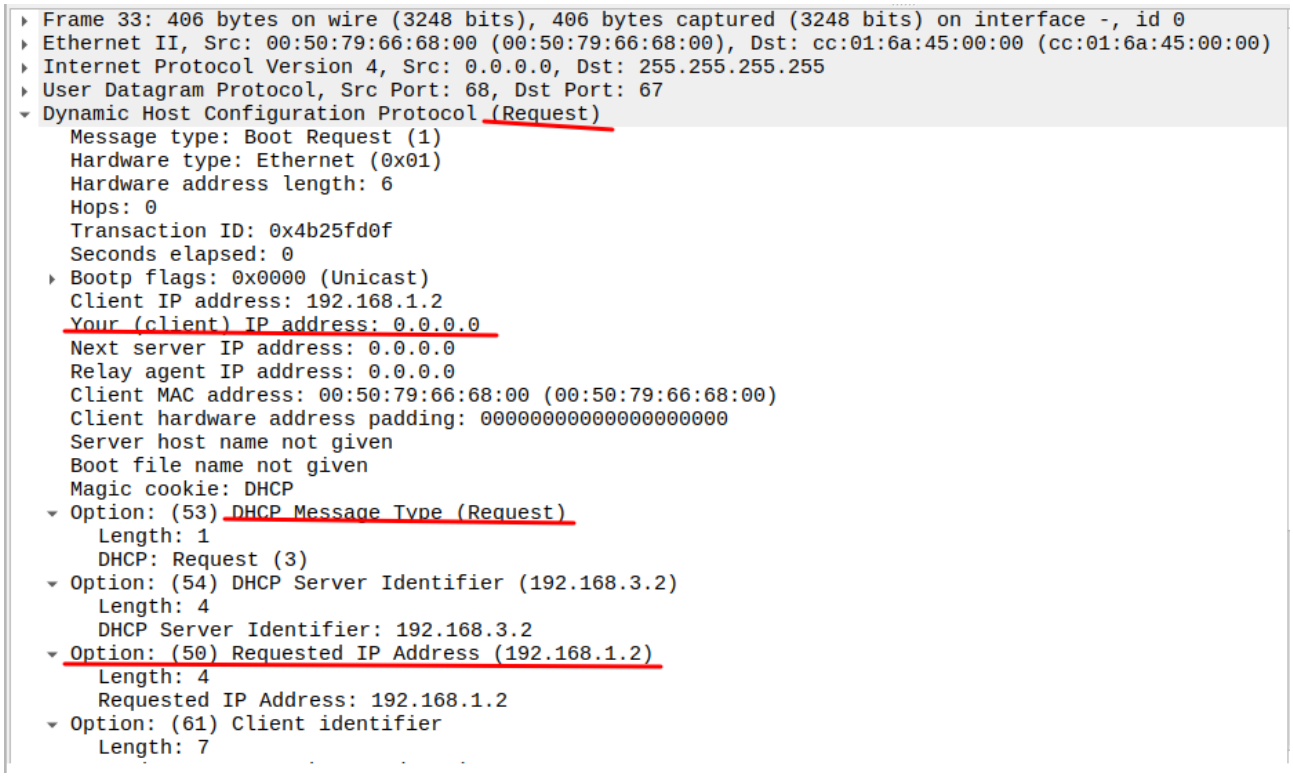
Сначала ПК1 отправляет широковещательный запрос DISCOVER (ищет DHCP-сервер). IP адресс 0.0.0.0, т. к. ПК1 еще не получил адрес от DHCP-сервера.



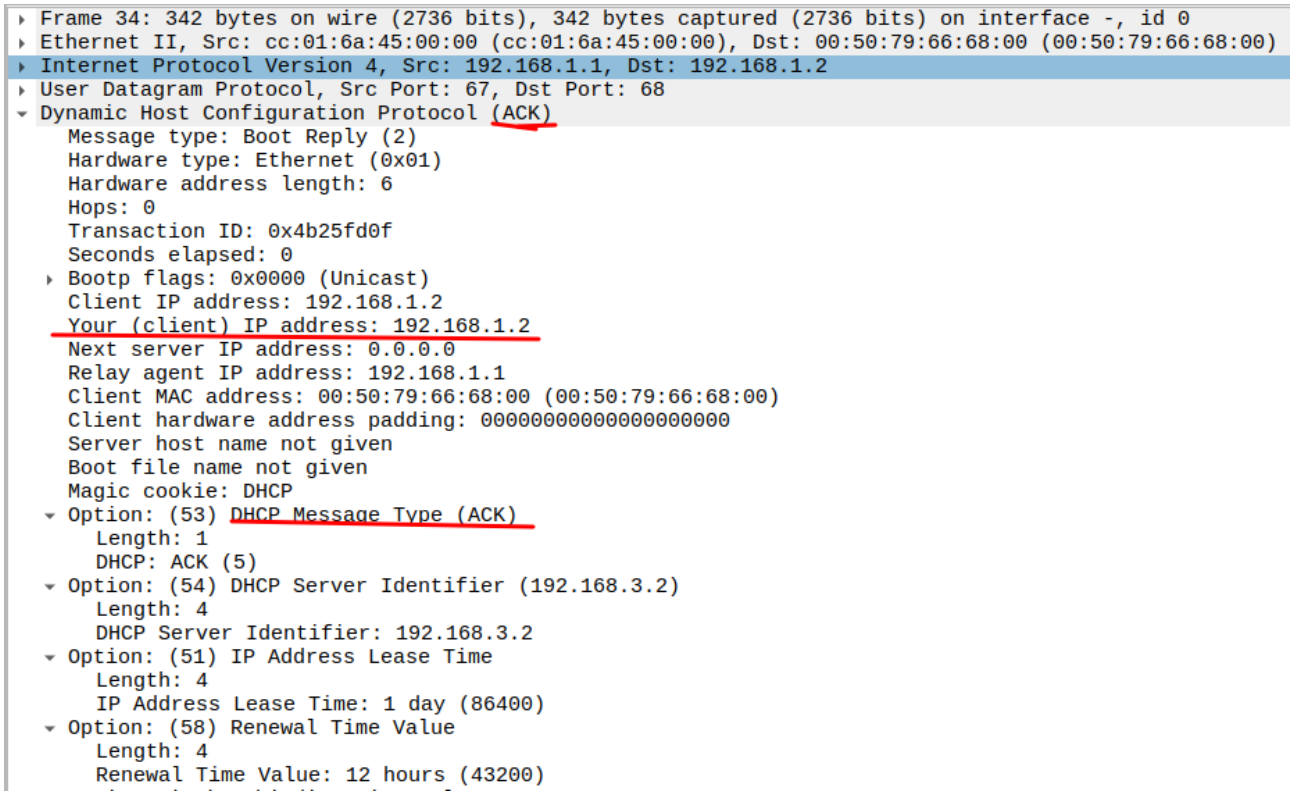
Затем DHCP-сервер высылает OFFER. выбирает доступный IP-адрес из пула (192.168.1.2) и отправляет его клиенту. R1 служит как DHCP-Relay.



ПК1 посылает REQUEST, он принимает предложение и отправляет серверу запрос на использование предложенных параметров. Ip-адрес все еще 0.0.0.0, т. к. сервер еще не подтвердил запрос.



DHCP-сервер посылает ACK, подтверждает запрос и закрепляет у ПК1 выданный ip-адрес.



Проверим выдачу ip-адресов на других ПК

ПК2:

dhcp

```
PC2> dhcp
DDORA IP 192.168.1.3/24 GW 192.168.1.1

PC2> show ip

NAME        : PC2[1]
IP/MASK     : 192.168.1.3/24
GATEWAY     : 192.168.1.1
DNS         :
DHCP SERVER : 192.168.3.2
DHCP LEASE  : 86389, 86400/43200/75600
DOMAIN NAME : lan1.local
MAC         : 00:50:79:66:68:01
LPORT       : 22128
RHOST:PORT  : 127.0.0.1:22129
MTU         : 1500
```

ПК3:

dhcp

```
PC3> dhcp
DDORA IP 192.168.2.2/24 GW 192.168.2.1

PC3> show ip

NAME        : PC3[1]
IP/MASK     : 192.168.2.2/24
GATEWAY     : 192.168.2.1
DNS         :
DHCP SERVER : 192.168.3.2
DHCP LEASE  : 86393, 86400/43200/75600
DOMAIN NAME : lan2.local
MAC         : 00:50:79:66:68:02
LPORT       : 22130
RHOST:PORT  : 127.0.0.1:22131
MTU         : 1500
```

ПК4:

dhcp

```
PC4> dhcp
DDORA IP 192.168.2.3/24 GW 192.168.2.1

PC4> show ip

NAME        : PC4[1]
IP/MASK     : 192.168.2.3/24
GATEWAY     : 192.168.2.1
DNS         :
DHCP SERVER : 192.168.3.2
DHCP LEASE  : 86393, 86400/43200/75600
DOMAIN NAME : lan2.local
MAC         : 00:50:79:66:68:03
LPORT       : 22138
RHOST:PORT  : 127.0.0.1:22139
MTU         : 1500
```

DHCP-сервер выдает правильный IP-адреса, можно сделать вывод, что он работает правильно.

4) Проверка ping

Проверка доступности ПК2, ПК3, ПК4 с ПК1

ping 192.168.1.3
ping 192.168.2.2
ping 192.168.2.3

```
PC1> ping 192.168.1.3

84 bytes from 192.168.1.3 icmp_seq=1 ttl=64 time=1.767 ms
84 bytes from 192.168.1.3 icmp_seq=2 ttl=64 time=2.544 ms
84 bytes from 192.168.1.3 icmp_seq=3 ttl=64 time=9.185 ms
84 bytes from 192.168.1.3 icmp_seq=4 ttl=64 time=0.859 ms
84 bytes from 192.168.1.3 icmp_seq=5 ttl=64 time=0.735 ms

PC1> ping 192.168.2.2

84 bytes from 192.168.2.2 icmp_seq=1 ttl=63 time=30.172 ms
84 bytes from 192.168.2.2 icmp_seq=2 ttl=63 time=20.414 ms
84 bytes from 192.168.2.2 icmp_seq=3 ttl=63 time=14.934 ms
84 bytes from 192.168.2.2 icmp_seq=4 ttl=63 time=17.887 ms
84 bytes from 192.168.2.2 icmp_seq=5 ttl=63 time=17.173 ms

PC1> ping 192.168.2.3

84 bytes from 192.168.2.3 icmp_seq=1 ttl=63 time=30.591 ms
84 bytes from 192.168.2.3 icmp_seq=2 ttl=63 time=16.441 ms
84 bytes from 192.168.2.3 icmp_seq=3 ttl=63 time=18.151 ms
84 bytes from 192.168.2.3 icmp_seq=4 ttl=63 time=28.323 ms
84 bytes from 192.168.2.3 icmp_seq=5 ttl=63 time=17.839 ms
```

Проверка доступности ПК1, ПК2, ПК3 с ПК4

ping 192.168.1.2
ping 192.168.1.3
ping 192.168.2.2

```
PC4> ping 192.168.1.2

84 bytes from 192.168.1.2 icmp_seq=1 ttl=63 time=33.212 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=63 time=15.696 ms
84 bytes from 192.168.1.2 icmp_seq=3 ttl=63 time=17.001 ms
84 bytes from 192.168.1.2 icmp_seq=4 ttl=63 time=17.880 ms
84 bytes from 192.168.1.2 icmp_seq=5 ttl=63 time=17.992 ms

PC4> ping 192.168.1.3

84 bytes from 192.168.1.3 icmp_seq=1 ttl=63 time=37.644 ms
84 bytes from 192.168.1.3 icmp_seq=2 ttl=63 time=16.655 ms
84 bytes from 192.168.1.3 icmp_seq=3 ttl=63 time=26.587 ms
84 bytes from 192.168.1.3 icmp_seq=4 ttl=63 time=17.765 ms
84 bytes from 192.168.1.3 icmp_seq=5 ttl=63 time=17.280 ms

PC4> ping 192.168.2.2

84 bytes from 192.168.2.2 icmp_seq=1 ttl=64 time=0.444 ms
84 bytes from 192.168.2.2 icmp_seq=2 ttl=64 time=0.696 ms
84 bytes from 192.168.2.2 icmp_seq=3 ttl=64 time=3.567 ms
84 bytes from 192.168.2.2 icmp_seq=4 ttl=64 time=2.798 ms
84 bytes from 192.168.2.2 icmp_seq=5 ttl=64 time=2.237 ms
```

Все ПК успешно пингуются.