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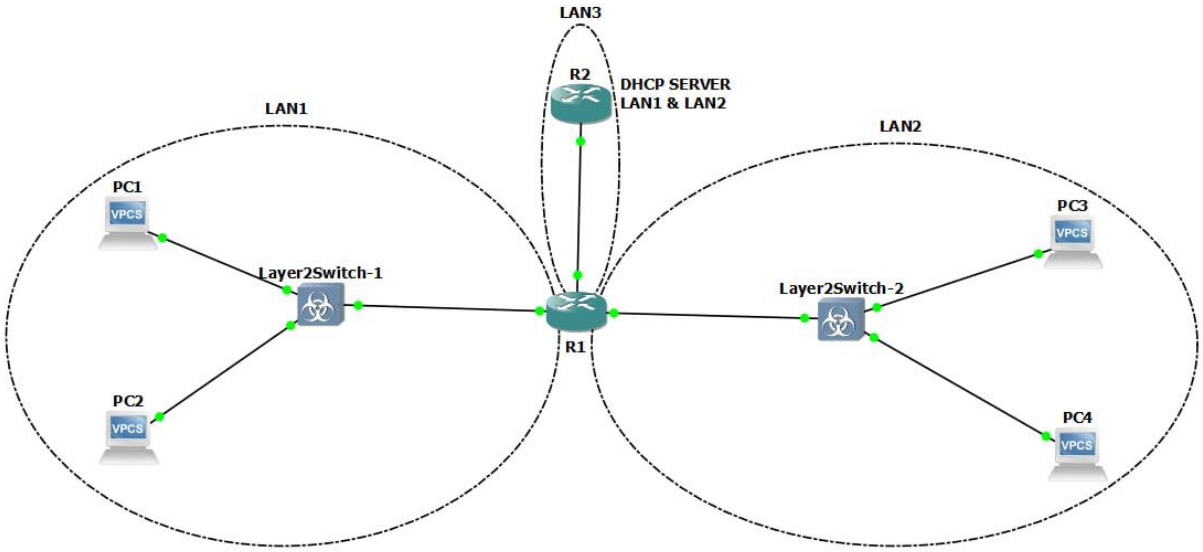
Практика №4

Тема: Настройка протокола DHCP

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



Планирование адресного пространства:

	LAN1	LAN2	LAN3
Подсеть	10.10.1.0/26	10.10.1.128/26	10.10.1.64/26
Маска	255.255.255.192	255.255.255.192	255.255.255.192
Диапазон адресов	.1 – .62	.129 – .190	.65 – .126
Broadcast	.63	.191	.127
Шлюз (Gateway)	10.10.1.5 (R1)	10.10.1.135 (R1)	10.10.1.65 (R1) 10.10.1.70 (R2)
DHCP Pool	10.10.1.0/26	10.10.1.128/26	—
Исключённые адреса	10.10.1.5	10.10.1.135	—

Настройка R1

configure terminal

interface FastEthernet0/0

ip address 10.10.1.5 255.255.255.192

no shutdown

exit

interface FastEthernet1/0

ip address 10.10.1.65 255.255.255.192

no shutdown

exit

interface FastEthernet2/0

ip address 10.10.1.135 255.255.255.192

no shutdown

exit

end

write memory

Настройка R2

configure terminal

interface FastEthernet0/0

ip address 10.10.1.70 255.255.255.192

no shutdown

exit

end

write memory

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

Настройка DHCP на R2 для LAN1 и LAN2

configure terminal

ip dhcp excluded-address 10.10.1.5

ip dhcp excluded-address 10.10.1.135

ip dhcp pool LAN1

network 10.10.1.0 255.255.255.192

default-router 10.10.1.5

dns-server 8.8.8.8

exit

ip dhcp pool LAN2

network 10.10.1.128 255.255.255.192

default-router 10.10.1.135

dns-server 8.8.8.8

exit

end

write memory

Настройка DHCP Relay на R1

configure terminal

interface FastEthernet0/0

ip helper-address 10.10.1.70

exit

interface FastEthernet2/0

ip helper-address 10.10.1.70

exit

end

write memory

3) Настроить статическую (nb!) маршрутизацию между подсетями

Настройка статической маршрутизации

На R1:

configure terminal

ip route 10.10.1.0 255.255.255.192 10.10.1.70

ip route 10.10.1.128 255.255.255.192 10.10.1.70

end

write memory

На R2:

configure terminal

ip route 10.10.1.0 255.255.255.192 10.10.1.65

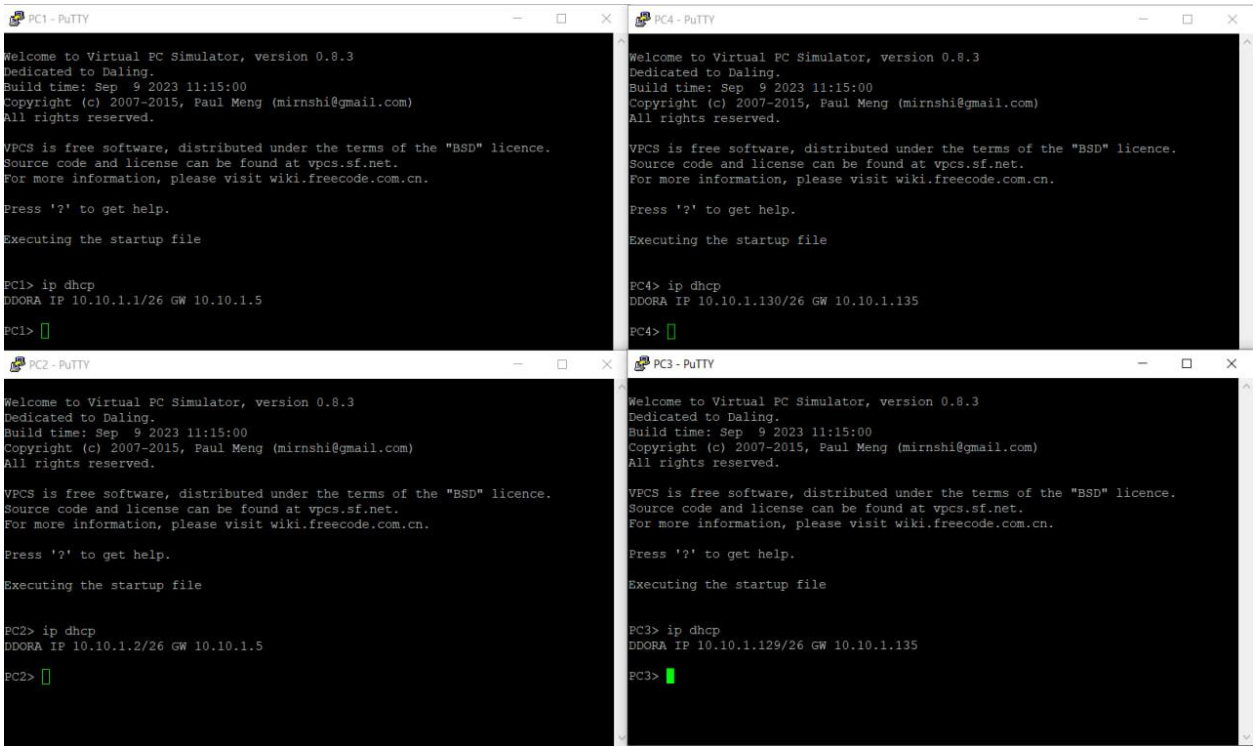
ip route 10.10.1.128 255.255.255.192 10.10.1.65

end

write memory

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

Выдача адресов всем устройствам командой ip dhcp:



Проверка связности:

PC1

```
PC1> show ip

NAME        : PC1[1]
IP/MASK     : 10.10.1.1/26
GATEWAY     : 10.10.1.5
DNS         : 8.8.8.8
DHCP SERVER : 10.10.1.70
DHCP LEASE  : 84521, 86400/43200/75600
MAC         : 00:50:79:66:68:00
LPORT       : 24647
RHOST:PORT  : 127.0.0.1:24648
MTU         : 1500

PC1> ping 10.10.1.2

84 bytes from 10.10.1.2 icmp_seq=1 ttl=64 time=5.056 ms
84 bytes from 10.10.1.2 icmp_seq=2 ttl=64 time=0.610 ms
84 bytes from 10.10.1.2 icmp_seq=3 ttl=64 time=0.576 ms
84 bytes from 10.10.1.2 icmp_seq=4 ttl=64 time=2.597 ms
84 bytes from 10.10.1.2 icmp_seq=5 ttl=64 time=0.619 ms

PC1> ping 10.10.1.129

84 bytes from 10.10.1.129 icmp_seq=1 ttl=63 time=29.608 ms
84 bytes from 10.10.1.129 icmp_seq=2 ttl=63 time=17.562 ms
84 bytes from 10.10.1.129 icmp_seq=3 ttl=63 time=14.571 ms
84 bytes from 10.10.1.129 icmp_seq=4 ttl=63 time=16.675 ms
84 bytes from 10.10.1.129 icmp_seq=5 ttl=63 time=16.178 ms

PC1> ping 10.10.1.130

84 bytes from 10.10.1.130 icmp_seq=1 ttl=63 time=21.319 ms
84 bytes from 10.10.1.130 icmp_seq=2 ttl=63 time=18.386 ms
84 bytes from 10.10.1.130 icmp_seq=3 ttl=63 time=14.931 ms
84 bytes from 10.10.1.130 icmp_seq=4 ttl=63 time=17.621 ms
84 bytes from 10.10.1.130 icmp_seq=5 ttl=63 time=17.147 ms
```

PC2

```
PC2> show ip

NAME        : PC2[1]
IP/MASK     : 10.10.1.2/26
GATEWAY     : 10.10.1.5
DNS         : 8.8.8.8
DHCP SERVER : 10.10.1.70
DHCP LEASE  : 84406, 86400/43200/75600
MAC         : 00:50:79:66:68:01
LPORT       : 24655
RHOST:PORT  : 127.0.0.1:24656
MTU         : 1500

PC2> ping 10.10.1.1

84 bytes from 10.10.1.1 icmp_seq=1 ttl=64 time=1.710 ms
84 bytes from 10.10.1.1 icmp_seq=2 ttl=64 time=6.408 ms
84 bytes from 10.10.1.1 icmp_seq=3 ttl=64 time=0.765 ms
84 bytes from 10.10.1.1 icmp_seq=4 ttl=64 time=5.392 ms
84 bytes from 10.10.1.1 icmp_seq=5 ttl=64 time=1.707 ms

PC2> ping 10.10.1.129

84 bytes from 10.10.1.129 icmp_seq=1 ttl=63 time=21.042 ms
84 bytes from 10.10.1.129 icmp_seq=2 ttl=63 time=15.225 ms
84 bytes from 10.10.1.129 icmp_seq=3 ttl=63 time=15.762 ms
84 bytes from 10.10.1.129 icmp_seq=4 ttl=63 time=16.858 ms
84 bytes from 10.10.1.129 icmp_seq=5 ttl=63 time=17.378 ms

PC2> ping 10.10.1.130

84 bytes from 10.10.1.130 icmp_seq=1 ttl=63 time=18.539 ms
84 bytes from 10.10.1.130 icmp_seq=2 ttl=63 time=16.203 ms
84 bytes from 10.10.1.130 icmp_seq=3 ttl=63 time=15.642 ms
84 bytes from 10.10.1.130 icmp_seq=4 ttl=63 time=15.375 ms
84 bytes from 10.10.1.130 icmp_seq=5 ttl=63 time=15.932 ms
```

PC3

```
PC3> show ip

NAME        : PC3[1]
IP/MASK     : 10.10.1.129/26
GATEWAY     : 10.10.1.135
DNS         : 8.8.8.8
DHCP SERVER : 10.10.1.70
DHCP LEASE  : 84223, 86400/43200/75600
MAC         : 00:50:79:66:68:02
LPORT       : 24657
RHOST:PORT  : 127.0.0.1:24658
MTU         : 1500

PC3> ping 10.10.1.1

84 bytes from 10.10.1.1 icmp_seq=1 ttl=63 time=29.891 ms
84 bytes from 10.10.1.1 icmp_seq=2 ttl=63 time=15.959 ms
84 bytes from 10.10.1.1 icmp_seq=3 ttl=63 time=16.976 ms
84 bytes from 10.10.1.1 icmp_seq=4 ttl=63 time=16.611 ms
84 bytes from 10.10.1.1 icmp_seq=5 ttl=63 time=16.053 ms

PC3> ping 10.10.1.2

84 bytes from 10.10.1.2 icmp_seq=1 ttl=63 time=29.333 ms
84 bytes from 10.10.1.2 icmp_seq=2 ttl=63 time=15.724 ms
84 bytes from 10.10.1.2 icmp_seq=3 ttl=63 time=16.037 ms
84 bytes from 10.10.1.2 icmp_seq=4 ttl=63 time=16.193 ms
84 bytes from 10.10.1.2 icmp_seq=5 ttl=63 time=16.616 ms

PC3> ping 10.10.1.130

84 bytes from 10.10.1.130 icmp_seq=1 ttl=64 time=9.286 ms
84 bytes from 10.10.1.130 icmp_seq=2 ttl=64 time=0.897 ms
84 bytes from 10.10.1.130 icmp_seq=3 ttl=64 time=0.756 ms
84 bytes from 10.10.1.130 icmp_seq=4 ttl=64 time=6.951 ms
84 bytes from 10.10.1.130 icmp_seq=5 ttl=64 time=0.863 ms
```

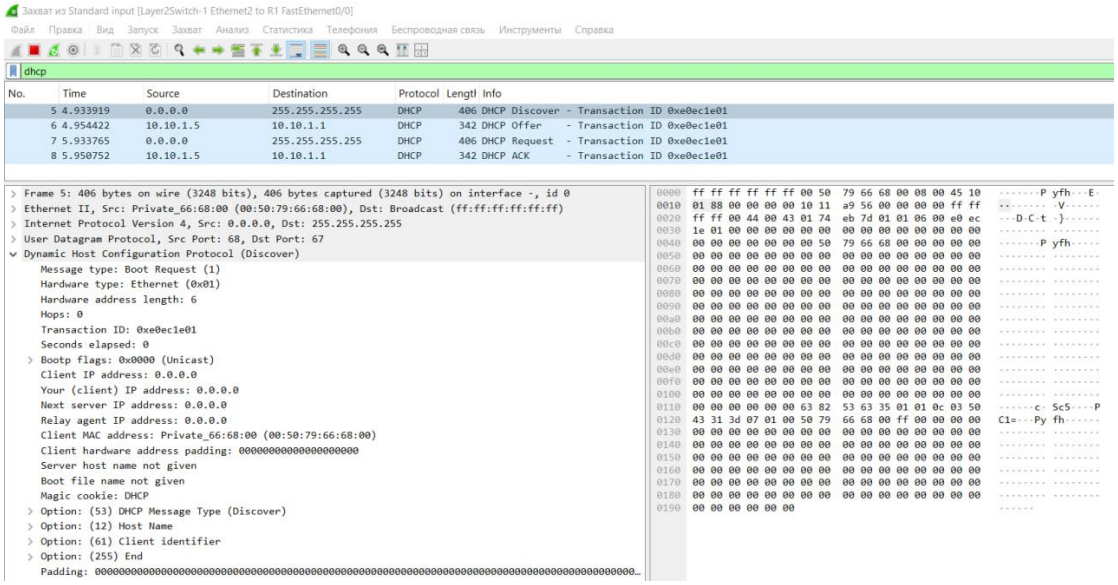
PC4

```
PC4> show ip

NAME        : PC4[1]
IP/MASK     : 10.10.1.130/26
GATEWAY     : 10.10.1.135
DNS         : 8.8.8.8
DHCP SERVER : 10.10.1.70
DHCP LEASE  : 83414, 86400/43200/75600
MAC         : 00:50:79:66:68:03
LPORT       : 24659
RHOST:PORT  : 127.0.0.1:24660
MTU         : 1500

PC4> ping 10.10.1.1

84 bytes from 10.10.1.1 icmp_seq=1 ttl=63 time=29.660 ms
84 bytes from 10.10.1.1 icmp_seq=2 ttl=63 time=16.321 ms
84 bytes from 10.10.1.1 icmp_seq=3 ttl=63 time=15.466 ms
84 bytes from 10.10.1.1 icmp_seq=4 ttl=63 time=15.576 ms
84 bytes from 10.10.1.1 icmp_seq=5 ttl=63 time=16.563 ms

PC4> ping 10.10.1.2

84 bytes from 10.10.1.2 icmp_seq=1 ttl=63 time=30.432 ms
84 bytes from 10.10.1.2 icmp_seq=2 ttl=63 time=16.604 ms
84 bytes from 10.10.1.2 icmp_seq=3 ttl=63 time=16.787 ms
84 bytes from 10.10.1.2 icmp_seq=4 ttl=63 time=16.964 ms
84 bytes from 10.10.1.2 icmp_seq=5 ttl=63 time=16.346 ms

PC4> ping 10.10.1.129

84 bytes from 10.10.1.129 icmp_seq=1 ttl=64 time=0.683 ms
84 bytes from 10.10.1.129 icmp_seq=2 ttl=64 time=0.707 ms
84 bytes from 10.10.1.129 icmp_seq=3 ttl=64 time=0.752 ms
84 bytes from 10.10.1.129 icmp_seq=4 ttl=64 time=4.682 ms
84 bytes from 10.10.1.129 icmp_seq=5 ttl=64 time=7.029 ms
```

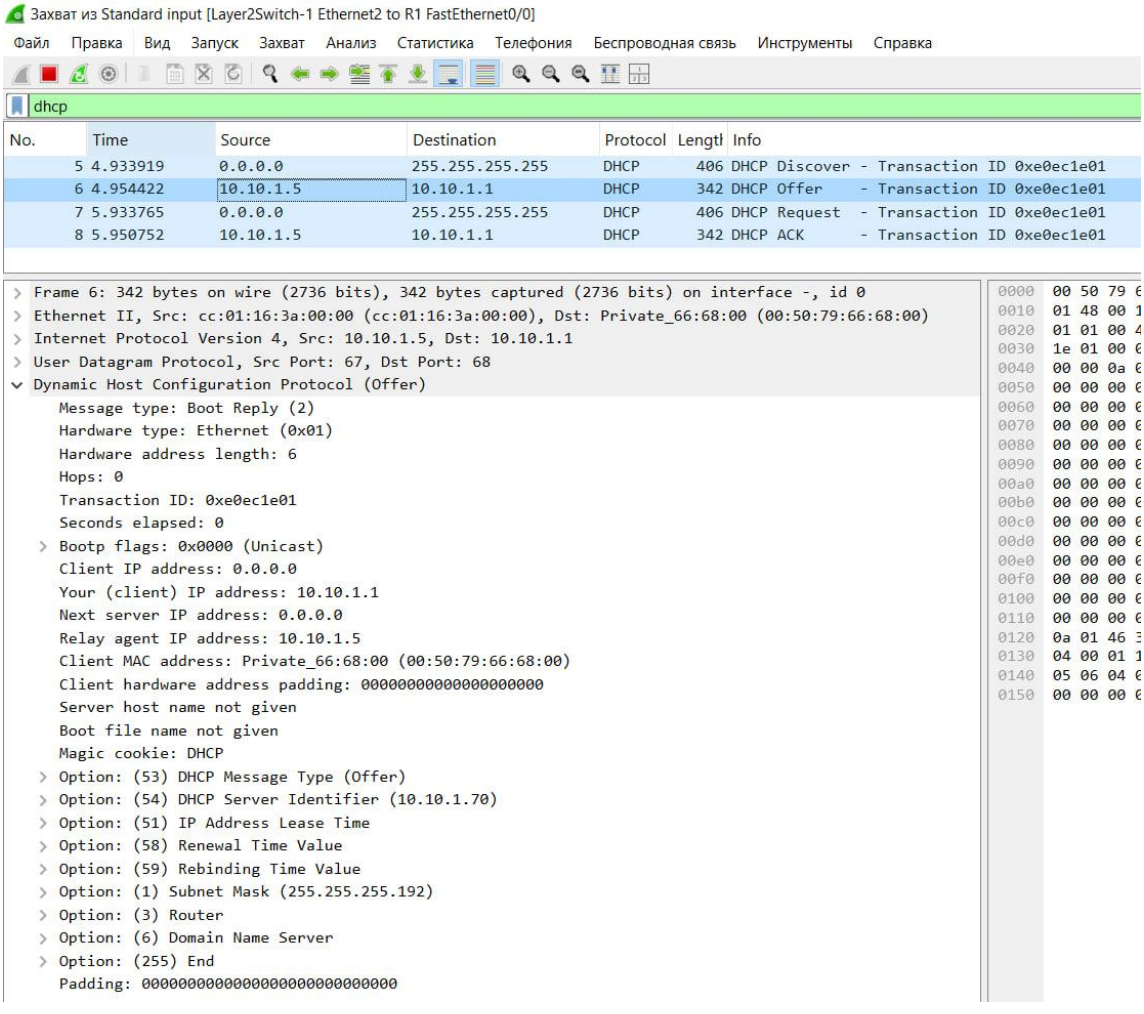
5) Перехватить в wireshark диалог одного из VPC с сервером DHCP, разобрать с комментариями

Выполним команду ip dhcp на PC1 чтобы захватить DHC пакеты в Wireshark

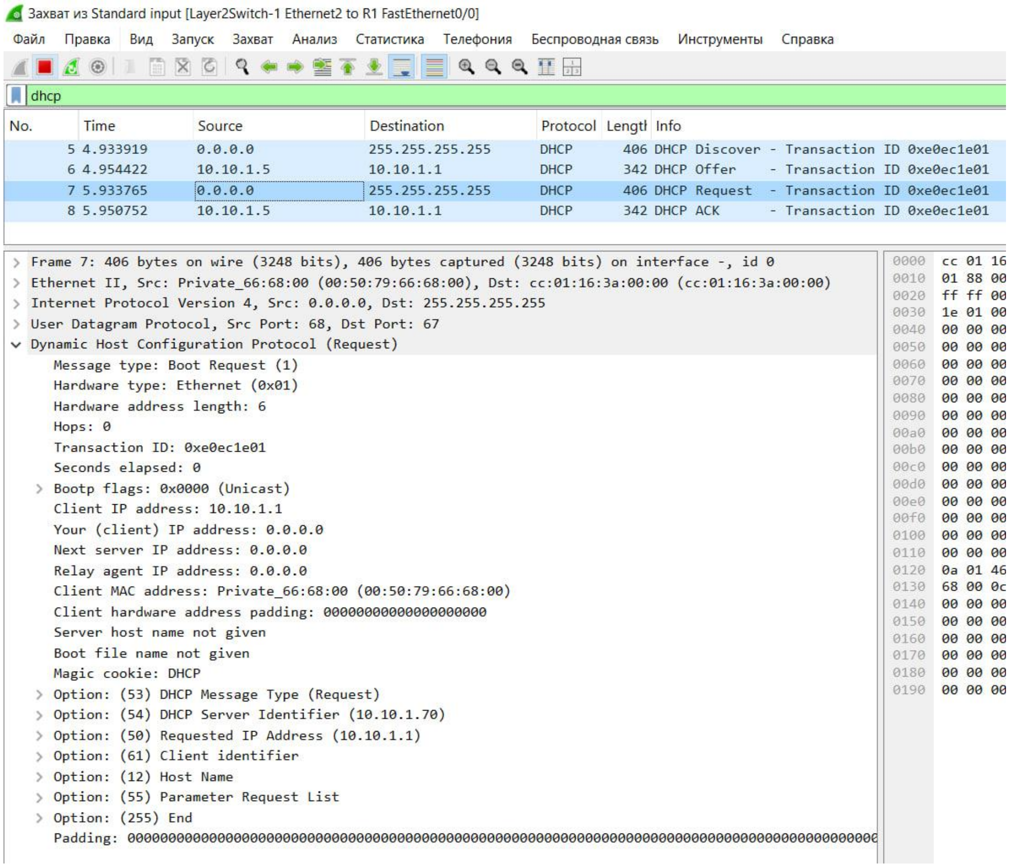
Discover



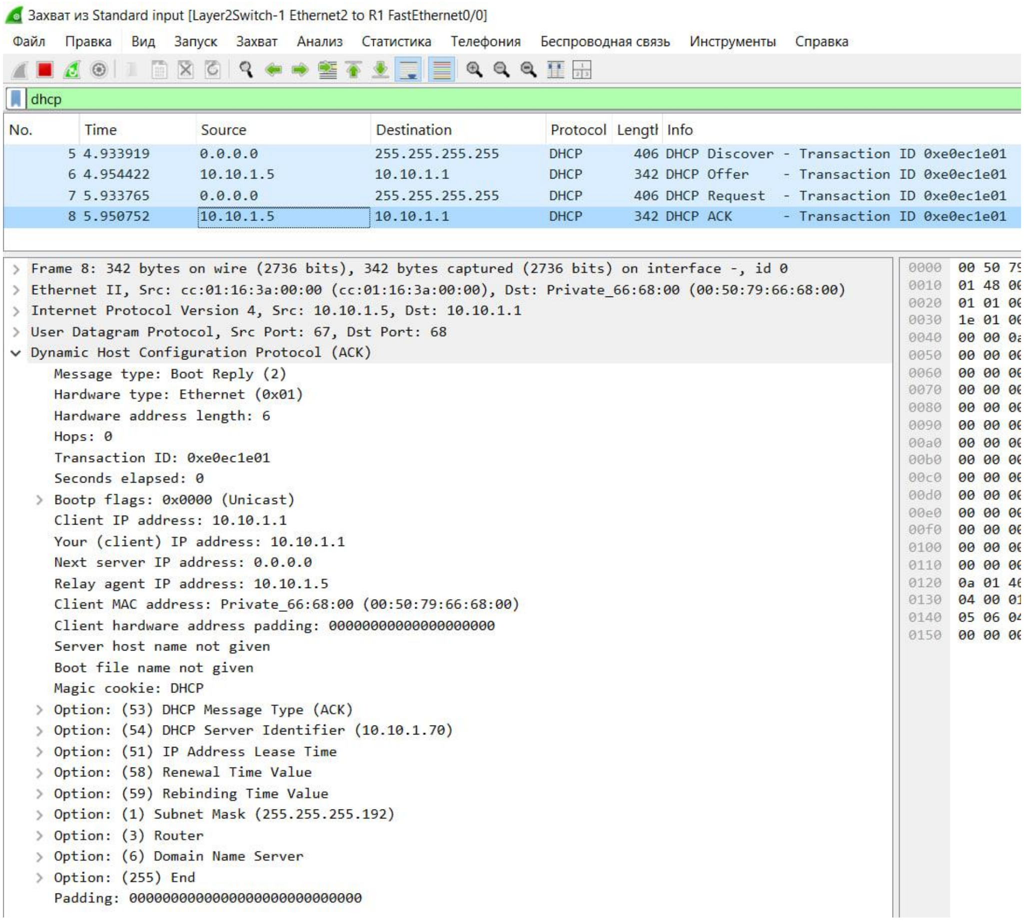
Offer

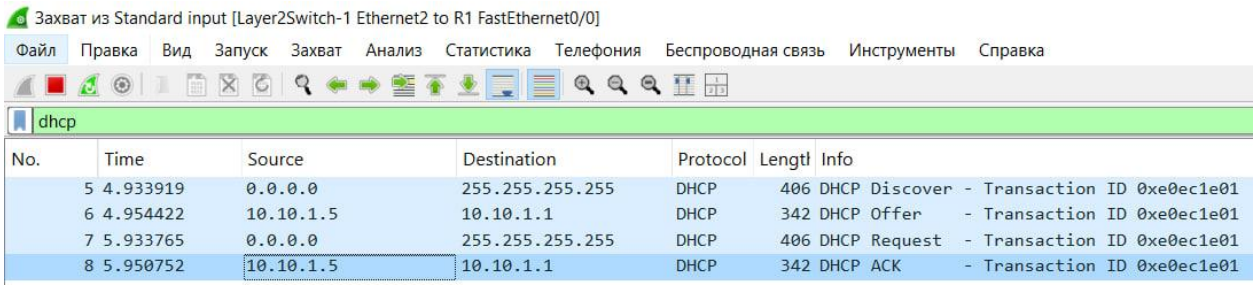


Request


Захват из Standard input [Layer2Switch-1 Ethernet2 to R1 FastEthernet0/0]
Файл Правка Вид Запуск Захват Анализ Статистика Телефония Беспроводная связь Инструменты Справка
dhcp
No. Time Source Destination Protocol Length Info
5 4.933919 0.0.0.0 255.255.255.255 DHCP 406 DHCP Discover - Transaction ID 0xe0ec1e01
6 4.954422 10.10.1.5 10.10.1.1 DHCP 342 DHCP Offer - Transaction ID 0xe0ec1e01
7 5.933765 0.0.0.0 255.255.255.255 DHCP 406 DHCP Request - Transaction ID 0xe0ec1e01
8 5.950752 10.10.1.5 10.10.1.1 DHCP 342 DHCP ACK - Transaction ID 0xe0ec1e01
Frame 7: 406 bytes on wire (3248 bits), 406 bytes captured (3248 bits) on interface -, id 0
Ethernet II, Src: Private_66:68:00 (00:50:79:66:68:00), Dst: cc:01:16:3a:00:00 (cc:01:16:3a:00:00)
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: 0xe0ec1e01
Seconds elapsed: 0
Bootp flags: 0x0000 (Unicast)
Client IP address: 10.10.1.1
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_66:68:00 (00:50:79:66:68:00)
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 (10.10.1.70)
Option: (50) Requested IP Address (10.10.1.1)
Option: (61) Client identifier
Option: (12) Host Name
Option: (55) Parameter Request List
Option: (255) End
Padding: 000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000

ACK


Захват из Standard input [Layer2Switch-1 Ethernet2 to R1 FastEthernet0/0]
Файл Правка Вид Запуск Захват Анализ Статистика Телефония Беспроводная связь Инструменты Справка
dhcp
No. Time Source Destination Protocol Length Info
5 4.933919 0.0.0.0 255.255.255.255 DHCP 406 DHCP Discover - Transaction ID 0xe0ec1e01
6 4.954422 10.10.1.5 10.10.1.1 DHCP 342 DHCP Offer - Transaction ID 0xe0ec1e01
7 5.933765 0.0.0.0 255.255.255.255 DHCP 406 DHCP Request - Transaction ID 0xe0ec1e01
8 5.950752 10.10.1.5 10.10.1.1 DHCP 342 DHCP ACK - Transaction ID 0xe0ec1e01
Frame 8: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface -, id 0
Ethernet II, Src: cc:01:16:3a:00:00 (cc:01:16:3a:00:00), Dst: Private_66:68:00 (00:50:79:66:68:00)
Internet Protocol Version 4, Src: 10.10.1.5, Dst: 10.10.1.1
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: 0xe0ec1e01
Seconds elapsed: 0
Bootp flags: 0x0000 (Unicast)
Client IP address: 10.10.1.1
Your (client) IP address: 10.10.1.1
Next server IP address: 0.0.0.0
Relay agent IP address: 10.10.1.5
Client MAC address: Private_66:68:00 (00:50:79:66:68:00)
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 (10.10.1.70)
Option: (51) IP Address Lease Time
Option: (58) Renewal Time Value
Option: (59) Rebinding Time Value
Option: (1) Subnet Mask (255.255.255.192)
Option: (3) Router
Option: (6) Domain Name Server
Option: (255) End
Padding: 0000000000000000000000000000



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