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Кафедра «Компьютерные системы и сети»

ОТЧЁТ ПО ЛАБОРАТОРНОЙ РАБОТЕ №2

по дисциплине «Глобальные сети»

на тему

«Маршрутизация в глобальных сетях»

Стенд №3

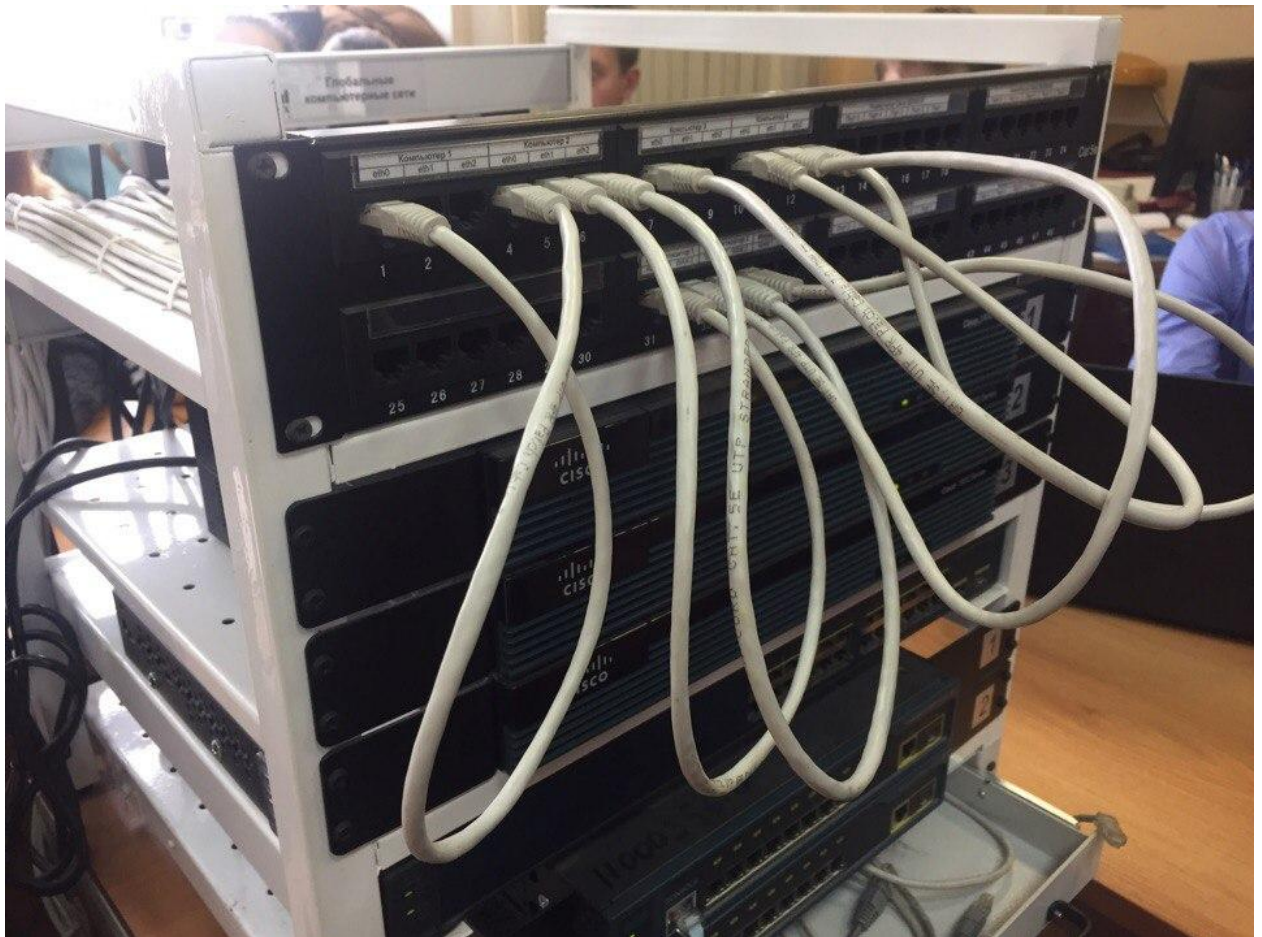
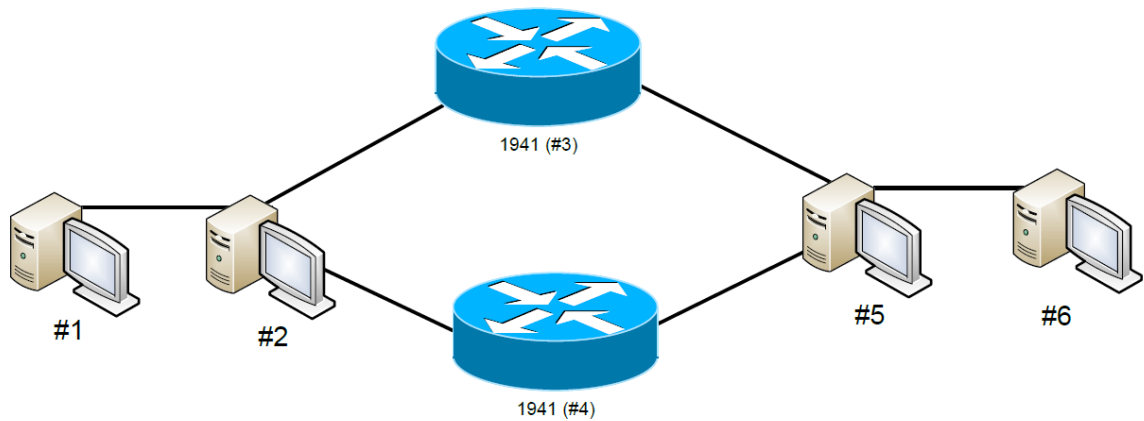
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СТАТИЧЕСКАЯ МАРШРУТИЗАЦИЯ

Цель работы: Получение навыков настройки программного маршрутизатора и построения статических маршрутов с использованием ОС Linux.

Собрали топологию сети, представленную на рисунке ниже



Настройка компьютеров:

Исходя из схемы, у первого компьютера включен только 1 интерфейс:

```
[root@host-1 ~]# ifconfig
eth0      Link encap:Ethernet  Hwaddr 6C:62:6D:60:CE:54
          inet addr:192.168.1.1 Bcast:192.168.1.255 Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:21 errors:0 dropped:0 overruns:0 frame:0
          TX packets:21 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1906 (1.8 Kb)  TX bytes:1834 (1.7 Kb)
          Interrupt:42 Base address:0x6000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1 Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:94 errors:0 dropped:0 overruns:0 frame:0
          TX packets:94 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:9752 (9.5 Kb)  TX bytes:9752 (9.5 Kb)
```

У второго компьютера все три (на примере второго ПК показано выключение/включение интерфейсов перед работой)

```
[root@host-2 ~]# ifconfig eth0 down
[root@host-2 ~]# ifconfig eth1 down
[root@host-2 ~]# ifconfig eth2 down
[root@host-2 ~]# ifconfig eth2 up
[root@host-2 ~]# ifconfig eth1 up
[root@host-2 ~]# ifconfig eth0 up
```

```
eth0      Link encap:Ethernet  Hwaddr 6C:62:6D:60:D0:20
          inet addr:192.168.1.2 Bcast:192.168.1.255 Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)
          Interrupt:42 Base address:0x6000

eth1      Link encap:Ethernet  Hwaddr 00:11:6B:98:AB:38
          inet addr:192.168.2.2 Bcast:192.168.2.255 Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:9 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b)  TX bytes:540 (540.0 b)
          Interrupt:16 Base address:0xc00

eth2      Link encap:Ethernet  Hwaddr 00:11:6B:98:A1:BD
          inet addr:192.168.6.2 Bcast:192.168.6.255 Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)
          Interrupt:17 Base address:0x4c00

lo        Link encap:Local Loopback
          inet addr:127.0.0.1 Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:26 errors:0 dropped:0 overruns:0 frame:0
          TX packets:26 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:2136 (2.0 Kb)  TX bytes:2136 (2.0 Kb)

[root@host-2 ~]#
```


У третьего:

```
[root@host-4 ~]# ifconfig
eth0      Link encap:Ethernet  HWaddr 6C:62:6D:60:CF:27
          inet addr:192.168.4.4  Bcast:192.168.4.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)
          Interrupt:42 Base address:0x6000

eth1      Link encap:Ethernet  HWaddr 00:11:6B:98:9E:C5
          inet addr:192.168.3.3  Bcast:192.168.3.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)
          Interrupt:16 Base address:0x2c00

eth2      Link encap:Ethernet  HWaddr 00:11:6B:98:A1:44
          inet addr:192.168.5.3  Bcast:192.168.5.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)
          Interrupt:17 Base address:0x6c00

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
```

У четвертого – как и у первого – один интерфейс включен

```
[root@host-3 ~]# ifconfig
eth0      Link encap:Ethernet  HWaddr 6C:62:6D:60:D0:27
          inet addr:192.168.4.3  Bcast:192.168.4.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:5 errors:0 dropped:0 overruns:0 frame:0
          TX packets:11 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:414 (414.0 b)  TX bytes:630 (630.0 b)
          Interrupt:42 Base address:0x2000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:14 errors:0 dropped:0 overruns:0 frame:0
          TX packets:14 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:1072 (1.0 Kb)  TX bytes:1072 (1.0 Kb)

[root@host-3 ~]#
```

Настройка роутеров (интерфейсов gi0/1 и gi0/0):

На «Верхнем» роутере:

```
Router(config)#interface gi0/0
Router(config-if)#ip address 192.168.2.1 255.255.255.0
Router(config-if)#exit
Router(config)#interface gi0/1
Router(config-if)#ip address 192.168.3.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
*Oct 15 09:18:51.859: %LINK-3-UPDOWN: Interface GigabitEthernet0/1, changed state to down
Router(config)#no shutdown
*Oct 15 09:18:55.219: %LINK-3-UPDOWN: Interface GigabitEthernet0/1, changed state to up
*Oct 15 09:18:56.219: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed interface g
i0/0
Router(config-if)#ip address 192.168.2.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
*Oct 15 09:19:19.683: %LINK-3-UPDOWN: Interface GigabitEthernet0/0, changed state to down
```

На «Нижнем» роутере:

```
Router>
Router>enable
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface gi0/1
Router(config-if)#ip address 192.168.5.4 255.255.255.0
Router(config-if)#interface gi0/0
Router(config-if)#ip address 192.168.^Z4 255.255.255.0
Router#
*Oct 15 08:07:11.195: %SYS-5-CONFIG_I: Configured from console by console
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface gi0/0
Router(config-if)#ip address 192.168.6.4 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#
```

Проверка пинга с первого на второй ПК – успешно

```
[root@host-1 ~]# ping 192.168.2.1
PING 192.168.2.1 (192.168.2.1) 56(84) bytes of data.
64 bytes from 192.168.2.1: icmp_seq=1 ttl=64 time=0.020 ms
64 bytes from 192.168.2.1: icmp_seq=2 ttl=64 time=0.021 ms
64 bytes from 192.168.2.1: icmp_seq=3 ttl=64 time=0.025 ms
^C
--- 192.168.2.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.020/0.022/0.025/0.002 ms
[root@host-1 ~]# ping 192.168.6.4
```

Ip route - Первый компьютер:

```
Router#ping 192.168.3.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.3.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
Router#ping 192.168.2.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.2.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
Router#
```

Ip route (второй компьютер):

```
Router#ping 192.168.6.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.6.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
Router#ping 192.168.5.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.5.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
Router#
```

Команда route

- С первого компьютера

```
[root@host-1 ~]# route add default gw 192.168.1.2
[root@host-1 ~]# route
Kernel IP routing table
Destination    Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.1.0    *               255.255.255.0   U      0      0      0 eth0
default        192.168.1.2    0.0.0.0         UG     0      0      0 eth0
```

- Со второго компьютера

```
[root@host-2 ~]# route add -net 192.168.3.0 netmask 255.255.255.0 dev eth1
[root@host-2 ~]# route add -net 192.168.5.0 netmask 255.255.255.0 dev eth1
[root@host-2 ~]# route add -net 192.168.4.0 netmask 255.255.255.0 dev eth1
[root@host-2 ~]# route
Kernel IP routing table
Destination    Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.6.0    *               255.255.255.0   U      0      0      0 eth2
192.168.5.0    *               255.255.255.0   U      0      0      0 eth1
192.168.4.0    *               255.255.255.0   U      0      0      0 eth1
192.168.3.0    *               255.255.255.0   U      0      0      0 eth1
192.168.2.0    *               255.255.255.0   U      0      0      0 eth1
192.168.1.0    *               255.255.255.0   U      0      0      0 eth0
[root@host-2 ~]#
```

- С третьего:

```
[root@host-4 ~]# route add -net 192.168.6.0 netmask 255.255.255.0 dev eth2
[root@host-4 ~]# route add -net 192.168.2.0 netmask 255.255.255.0 dev eth2
[root@host-4 ~]# route add -net 192.168.1.0 netmask 255.255.255.0 dev eth2
[root@host-4 ~]# route
Kernel IP routing table
Destination    Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.6.0    *               255.255.255.0   U      0      0      0 eth2
192.168.5.0    *               255.255.255.0   U      0      0      0 eth2
192.168.4.0    *               255.255.255.0   U      0      0      0 eth0
192.168.3.0    *               255.255.255.0   U      0      0      0 eth1
192.168.2.0    *               255.255.255.0   U      0      0      0 eth2
192.168.1.0    *               255.255.255.0   U      0      0      0 eth2
```

- С четвертого:

```
[root@host-3 ~]# man route
[root@host-3 ~]# route add default gw 192.168.4.4
[root@host-3 ~]# route
Kernel IP routing table
Destination    Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.4.0    *               255.255.255.0   U      0      0      0 eth0

default        192.168.4.4    0.0.0.0         UG     0      0      0 eth0
[root@host-3 ~]#
```

Задание маршрутов в нашей сети (на роутерах)

С первого:

```
Router(config)#ip route 192.168.4.0 255.255.255.0 192.168.3.3
Router(config)#
```

Со второго компьютера прописка маршрутов:

```
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 192.168.2.0 255.255.255.0 192.168.6.2
Router(config)#ip route 192.168.3.0 255.255.255.0 192.168.5.3
Router(config)#ip route 192.168.4.0 255.255.255.0 192.168.5.3
Router(config)#^Z
Router#
```


Тестирование с помощью передачи пакетов:

Пропинговали со второго компьютера 4-ый и выполнили traceroute.

```
root@host-2 ~]# ping 192.168.4.3
PING 192.168.4.3 (192.168.4.3) 56(84) bytes of data.
64 bytes from 192.168.4.3: icmp_seq=1 ttl=62 time=0.417 ms
64 bytes from 192.168.4.3: icmp_seq=2 ttl=62 time=0.342 ms
64 bytes from 192.168.4.3: icmp_seq=3 ttl=62 time=0.350 ms
^C
--- 192.168.4.3 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1999ms
rtt min/avg/max/mdev = 0.342/0.369/0.417/0.040 ms
root@host-2 ~]# traceroute 192.168.4.3
traceroute to 192.168.4.3 (192.168.4.3), 30 hops max, 40 byte packets
 1 192.168.2.1 (192.168.2.1)  0.393 ms  0.254 ms  0.246 ms
 2 192.168.5.3 (192.168.5.3)  0.320 ms  0.277 ms  0.285 ms
 3 192.168.4.3 (192.168.4.3)  0.315 ms  0.299 ms  0.292 ms
root@host-2 ~]#
```

Пропинговали с первого – третий:

```
root@host-1 ~]# ping 192.168.3.3
PING 192.168.3.3 (192.168.3.3) 56(84) bytes of data.
64 bytes from 192.168.3.3: icmp_seq=1 ttl=62 time=2.40 ms
64 bytes from 192.168.3.3: icmp_seq=2 ttl=62 time=0.331 ms
64 bytes from 192.168.3.3: icmp_seq=3 ttl=62 time=0.363 ms
64 bytes from 192.168.3.3: icmp_seq=4 ttl=62 time=0.330 ms
^C
--- 192.168.3.3 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 2999ms
rtt min/avg/max/mdev = 0.330/0.857/2.407/0.895 ms
```

```
root@host-1 ~]# traceroute 192.168.3.3
traceroute to 192.168.3.3 (192.168.3.3), 30 hops max, 40 byte packets
 1 192.168.1.2 (192.168.1.2)  0.091 ms  0.072 ms  0.043 ms
 2 * * *
 3 192.168.3.3 (192.168.3.3)  0.383 ms  0.381 ms  0.300 ms
root@host-1 ~]# traceroute 192.168.4.4
traceroute to 192.168.4.4 (192.168.4.4), 30 hops max, 40 byte packets
 1 192.168.1.2 (192.168.1.2)  0.118 ms  0.064 ms  0.045 ms
 2 * * *
 3 192.168.4.4 (192.168.4.4)  0.397 ms  0.391 ms  0.297 ms
root@host-1 ~]# traceroute 192.168.4.4
traceroute to 192.168.4.4 (192.168.4.4), 30 hops max, 40 byte packets
 1 192.168.1.2 (192.168.1.2)  0.089 ms  0.078 ms  0.042 ms
 2 * * *
 3 192.168.4.4 (192.168.4.4)  0.404 ms  0.368 ms  0.297 ms
root@host-1 ~]#
```

Пропинговали с третьего первый:

```
root@host-4 ~]# ping 192.168.1.1 -c 3
PING 192.168.1.1 (192.168.1.1) 56(84) bytes of data.
64 bytes from 192.168.1.1: icmp_seq=1 ttl=62 time=3.44 ms
64 bytes from 192.168.1.1: icmp_seq=2 ttl=62 time=0.358 ms
64 bytes from 192.168.1.1: icmp_seq=3 ttl=62 time=0.345 ms
^C
--- 192.168.1.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.345/1.381/3.440/1.455 ms
root@host-4 ~]# ping 192.168.6.2 -c 3
PING 192.168.6.2 (192.168.6.2) 56(84) bytes of data.
64 bytes from 192.168.6.2: icmp_seq=1 ttl=63 time=3.53 ms
64 bytes from 192.168.6.2: icmp_seq=2 ttl=63 time=0.298 ms
64 bytes from 192.168.6.2: icmp_seq=3 ttl=63 time=0.296 ms
^C
--- 192.168.6.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.296/1.375/3.531/1.524 ms
root@host-4 ~]# traceroute 192.168.1.1
traceroute to 192.168.1.1 (192.168.1.1), 30 hops max, 40 byte packets
 1 192.168.5.4 (192.168.5.4)  0.415 ms  0.250 ms  0.235 ms
 2 192.168.2.2 (192.168.2.2)  0.350 ms  0.288 ms  0.272 ms
 3 192.168.1.1 (192.168.1.1)  0.325 ms  0.303 ms  0.297 ms
root@host-4 ~]# route
```


Пропинговали с четвертого компьютера первый и выполнили traceroute

```
[root@host-3 ~]# ping 192.168.1.1
PING 192.168.1.1 (192.168.1.1) 56(84) bytes of data.
64 bytes from 192.168.1.1: icmp_seq=1 ttl=61 time=6.93 ms
64 bytes from 192.168.1.1: icmp_seq=2 ttl=61 time=0.371 ms
64 bytes from 192.168.1.1: icmp_seq=3 ttl=61 time=0.436 ms
64 bytes from 192.168.1.1: icmp_seq=4 ttl=61 time=0.375 ms
64 bytes from 192.168.1.1: icmp_seq=5 ttl=61 time=0.376 ms
64 bytes from 192.168.1.1: icmp_seq=6 ttl=61 time=0.370 ms
^C
--- 192.168.1.1 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5005ms
rtt min/avg/max/mdev = 0.370/1.477/6.934/2.440 ms

[root@host-3 ~]# traceroute 192.168.1.1
traceroute to 192.168.1.1 (192.168.1.1), 30 hops max, 40 byte packets
 1 192.168.4.4 (192.168.4.4) 0.103 ms 0.072 ms 0.040 ms
 2 192.168.5.4 (192.168.5.4) 0.408 ms 0.335 ms 0.252 ms
 3 192.168.2.2 (192.168.2.2) 0.350 ms 0.363 ms 0.296 ms
 4 192.168.1.1 (192.168.1.1) 0.370 ms 0.401 ms 0.319 ms
```

Route

- со второго компьютера:

```
Router>show ip route
Codes: L - local, 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, + - replicated route

Gateway of last resort is not set

S    192.168.1.0/24 [1/0] via 192.168.6.2
S    192.168.2.0/24 [1/0] via 192.168.6.2
S    192.168.3.0/24 [1/0] via 192.168.5.3
S    192.168.4.0/24 [1/0] via 192.168.5.3
     192.168.5.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.5.0/24 is directly connected, GigabitEthernet0/1
L    192.168.5.4/32 is directly connected, GigabitEthernet0/1
     192.168.6.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.6.0/24 is directly connected, GigabitEthernet0/0
L    192.168.6.4/32 is directly connected, GigabitEthernet0/0
Router>show ip int br
Interface      IP-Address      OK? Method Status      Protocol
GigabitEthernet0/0  192.168.6.4     YES manual up          up
GigabitEthernet0/1  192.168.5.4     YES manual up          up
Router>
```

Route -n :

С первого компьютера:

```
[root@host-1 ~]# route -n
Kernel IP routing table
Destination      Gateway          Genmask         Flags Metric Ref    Use Iface
192.168.1.0      0.0.0.0         255.255.255.0   U      0      0      0 eth0
0.0.0.0          192.168.1.2    0.0.0.0         UG     0      0      0 eth0
[root@host-1 ~]#
```

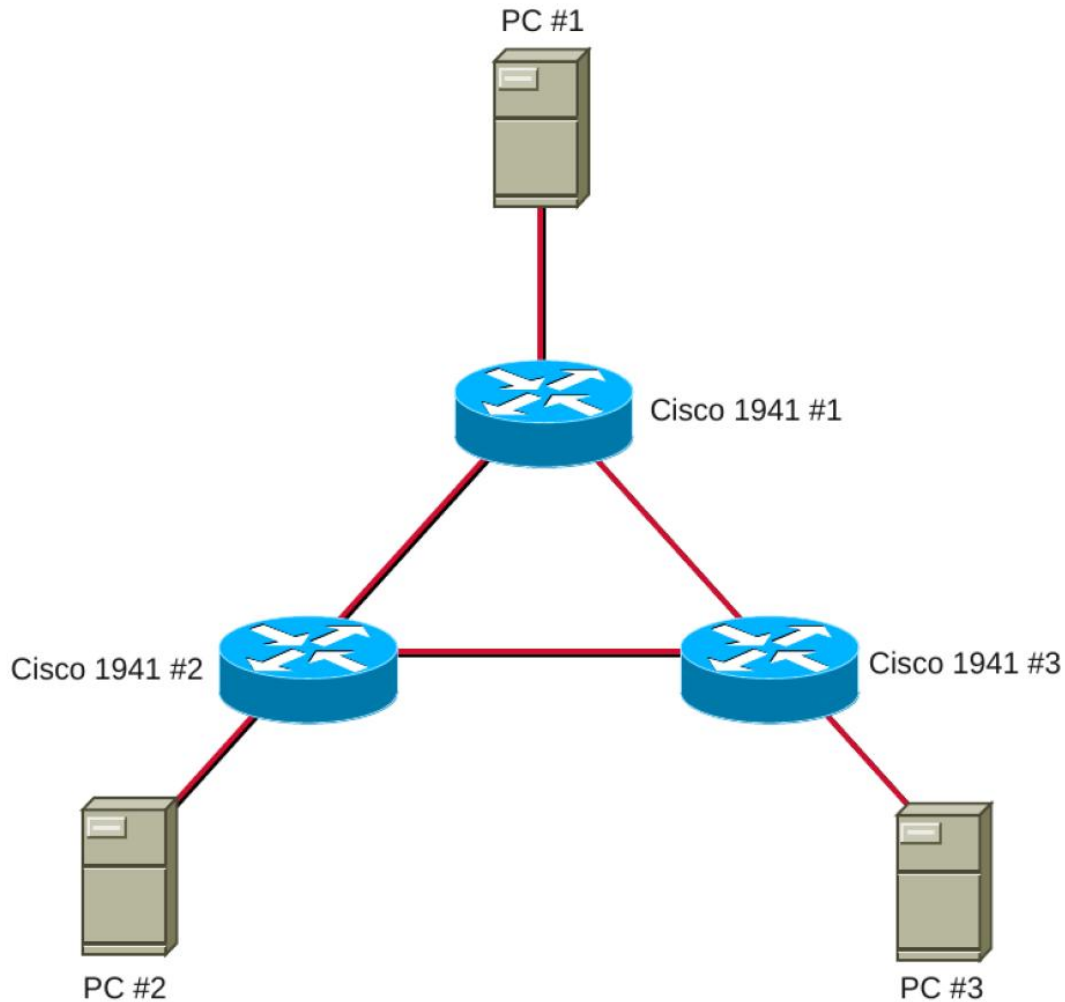
Со второго компьютера

```
[root@host-2 ~]# route -n
Kernel IP routing table
Destination      Gateway          Genmask         Flags Metric Ref    Use Iface
192.168.6.0      0.0.0.0         255.255.255.0   U      0      0      0 eth2
192.168.5.0      0.0.0.0         255.255.255.0   U      0      0      0 eth1
192.168.4.0      0.0.0.0         255.255.255.0   U      0      0      0 eth1
192.168.3.0      0.0.0.0         255.255.255.0   U      0      0      0 eth1
192.168.2.0      0.0.0.0         255.255.255.0   U      0      0      0 eth1
192.168.1.0      0.0.0.0         255.255.255.0   U      0      0      0 eth0
[root@host-2 ~]#
```

ПРОТОКОЛ МАРШРУТИЗАЦИИ EIGRP

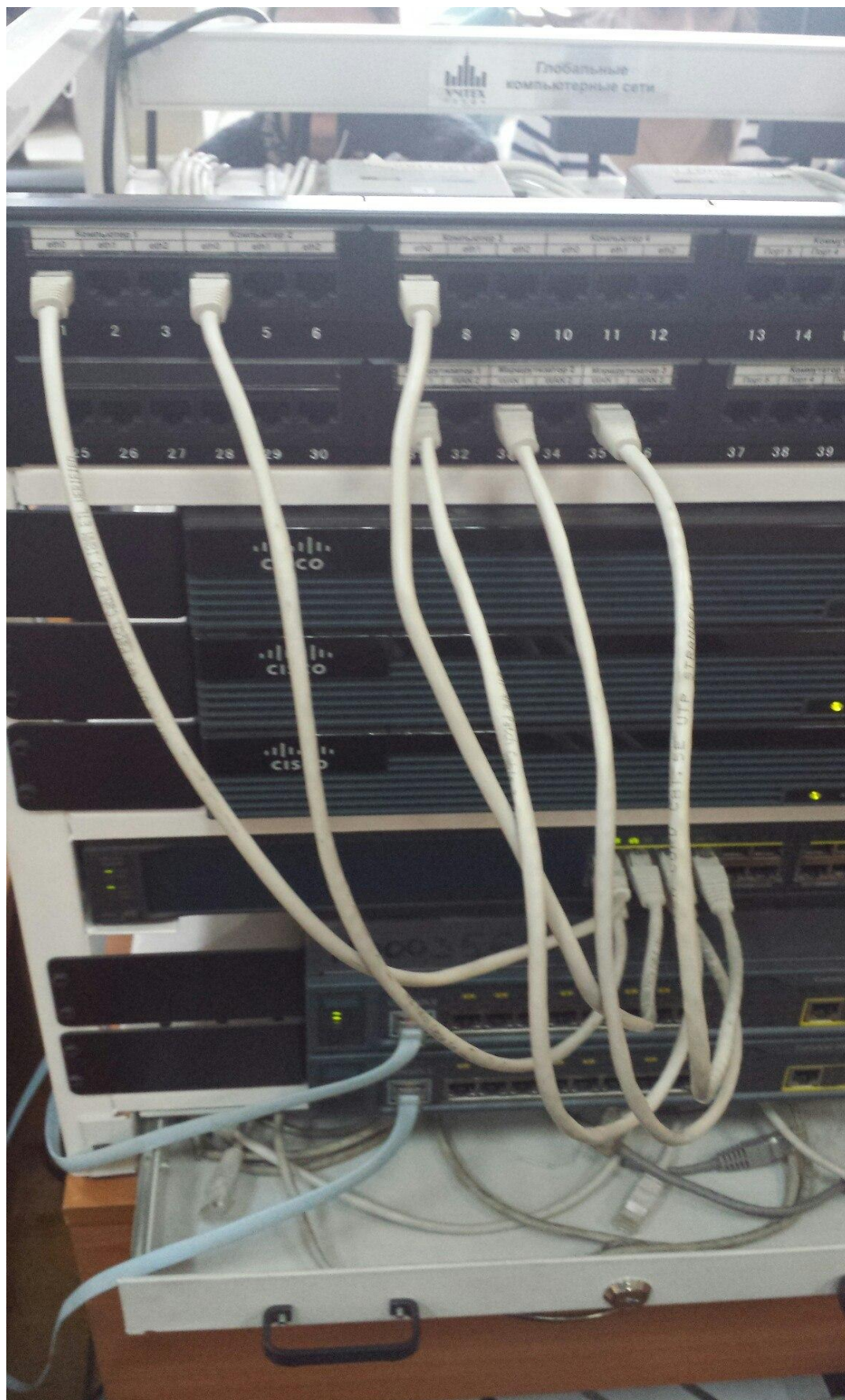
Цель работы: Изучить протокол EIGRP. Получить практические навыки в построения маршрутизирующих сетей на базе протокола EIGRP. Порядок выполнения работы:

1. Соберите топологию



Топология сети

Количество портов роутера ограничено, для построения данной сети был использован коммутатор, к которому были подключены все элементы.



Подключение к коммутатору

На коммутаторе было создано 6 vlan (Vlan 10,20...60).

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/6, Fa0/7, Fa0/8 Fa0/9, Fa0/10, Fa0/11, Fa0/12 Fa0/13, Fa0/14, Fa0/15, Fa0/16 Fa0/17, Fa0/18, Fa0/19, Fa0/20 Fa0/21, Fa0/22, Fa0/23, Fa0/24 Gi0/1, Gi0/2
2	VLAN0002	active	
3	VLAN0003	active	
10	VLAN0010	active	
20	VLAN0020	active	
30	VLAN0030	active	
40	VLAN0040	active	
50	VLAN0050	active	
60	VLAN0060	active	

Вывод команды show vlan

Далее мы настроили порты коммутатора. Порты подключенные к PC, т. е. конечным хостам, перевели в Access состояние, а подключенные к маршрутизаторам в Trunk.

```
Switch(config)#interface fa0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#
```

Настройка порта коммутатора в Access

```
Switch(config)#interface fa0/7
Switch(config-if)#switchport trunk encapsulation dot1q
Switch(config-if)#switchport mode trunk
Switch(config-if)#switchport trunk allowed vlan add 20
Switch(config-if)#switchport trunk allowed vlan add 30
Switch(config-if)#switchport trunk allowed vlan add 40
Switch(config-if)#no shutdown
Switch(config-if)#^Z
Switch#
```

Настройка порта коммутатора в Trunk

Чтобы убедиться, что порты в нужных **vlan's** **используется команда**: show vlan. Порты, переведенные в Access, появились в выводе vlan'ов:

2	VLAN0002	active	
3	VLAN0003	active	
10	VLAN0010	active	Fa0/1
20	VLAN0020	active	
30	VLAN0030	active	Fa0/3
40	VLAN0040	active	
50	VLAN0050	active	Fa0/2
60	VLAN0060	active	

Далее произведена настройка роутеров. Физический интерфейс включен командой **no shutdown**. Далее произведена настройка **sub-interfaces** : После команды *encapsulation dot1Q* указали номер **vlan** и адрес с той же под-сети что и у оборудования, подключенного к портам коммутатора соответствующего **vlan**. Процесс изображен на рисунках:

```
Router(config)#int gi0/0.1
Router(config-subif)#encapsulation dot1q 10
Router(config-subif)#ip address 192.168.1.10
% Incomplete command.

Router(config-subif)#ip address 192.168.1.10 255.255.255.0
Router(config-subif)#exit
Router(config)#int gi0/0.2
Router(config-subif)#encapsulation dot1q 20
Router(config-subif)#ip address 192.168.2.10 255.255.255.0
Router(config-subif)#exit
Router(config)#int gi0/0.3
Router(config-subif)#encapsulation dot1q 60
Router(config-subif)#ip address 192.168.6.10 255.255.255.0
Router(config-subif)#exit
```

Настройка роутера №1

```
GigabitEthernet0/0.1 is up, line protocol is up
  Hardware is CN Gigabit Ethernet, address is 5475.d08d.e660 (bia 5475.d08d.e660)
  Internet address is 192.168.5.20/24
  MTU 1500 bytes, BW 100000 Kbit/sec, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation 802.1Q Virtual LAN, Vlan ID 50.
  Keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
  Last clearing of "show interface" counters never
GigabitEthernet0/0.2 is up, line protocol is up
  Hardware is CN Gigabit Ethernet, address is 5475.d08d.e660 (bia 5475.d08d.e660)
  Internet address is 192.168.4.20/24
  MTU 1500 bytes, BW 100000 Kbit/sec, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation 802.1Q Virtual LAN, Vlan ID 40.
  Keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
  Last clearing of "show interface" counters never
GigabitEthernet0/0.3 is up, line protocol is up
  Hardware is CN Gigabit Ethernet, address is 5475.d08d.e660 (bia 5475.d08d.e660)
  Internet address is 192.168.6.20/24
  MTU 1500 bytes, BW 100000 Kbit/sec, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation 802.1Q Virtual LAN, Vlan ID 60.
```

Результат настройки роутера №2

Роутеры уже видят друг друга, а компьютеры нет.

```
Router#ping 192.168.6.20

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.6.20, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 1/1/1 ms
Router#ping 192.168.6.20

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.6.20, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
Router#ping 192.168.2.30

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.2.30, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Для возможности передавать данные между компьютерами оставалось настроить маршрут по умолчанию

```
[root@host-2 ~]# ping 192.168.3.3
connect: Network is unreachable
[root@host-2 ~]# route add default gw 192.168.5.20
[root@host-2 ~]# ping 192.168.3.3
PING 192.168.3.3 (192.168.3.3) 56(84) bytes of data.
64 bytes from 192.168.3.3: icmp_seq=1 ttl=62 time=3.02 ms
64 bytes from 192.168.3.3: icmp_seq=2 ttl=62 time=0.637 ms
64 bytes from 192.168.3.3: icmp_seq=3 ttl=62 time=0.705 ms
^C
--- 192.168.3.3 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.637/1.456/3.027/1.111 ms
```

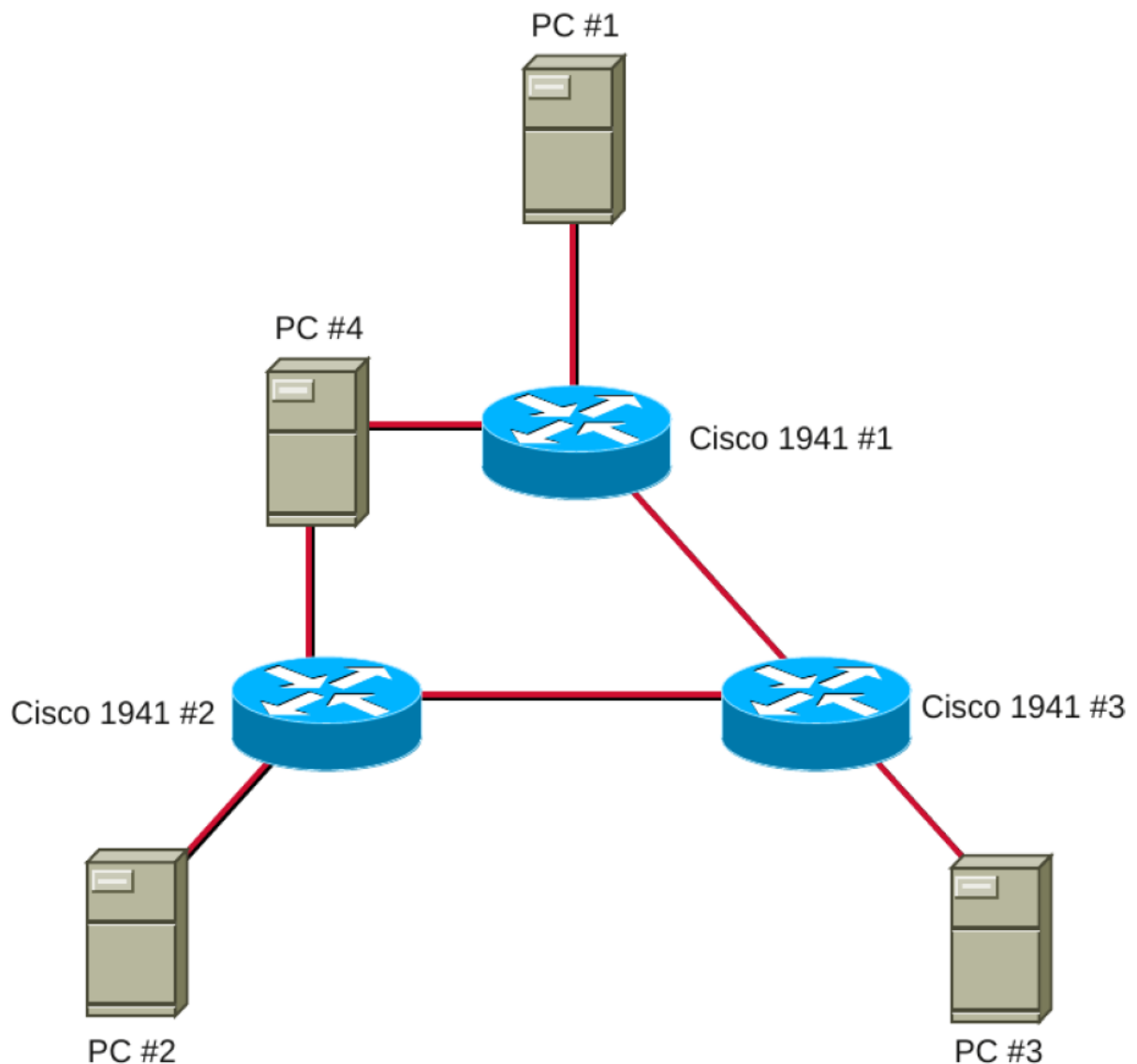
Для проверки динамической маршрутизации соединение между роутерами 1 и 3 было разорвано.

```
[root@host-1 ~]# traceroute 192.168.3.3 -n
traceroute to 192.168.3.3 (192.168.3.3), 30 hops max, 40 byte packets
 1 192.168.1.10 0.334 ms 0.275 ms 0.270 ms
 2 192.168.2.30 0.585 ms 0.521 ms 0.518 ms
 3 192.168.3.3 0.614 ms 0.588 ms 0.579 ms
[root@host-1 ~]# traceroute 192.168.3.3 -n
traceroute to 192.168.3.3 (192.168.3.3), 30 hops max, 40 byte packets
 1 192.168.1.10 0.364 ms 0.276 ms 0.267 ms
 2 192.168.6.20 0.576 ms 0.511 ms 0.505 ms
 3 * 192.168.4.30 0.876 ms 0.767 ms
 4 192.168.3.3 0.858 ms 0.839 ms 0.829 ms
[root@host-1 ~]# traceroute 192.168.3.3 -n
traceroute to 192.168.3.3 (192.168.3.3), 30 hops max, 40 byte packets
 1 192.168.1.10 0.327 ms 0.270 ms 0.270 ms
 2 192.168.2.30 0.557 ms 0.512 ms 0.505 ms
 3 192.168.3.3 0.607 ms 0.575 ms 0.576 ms
```


Пакет идет в обход разрыва и достигает конечной точки, пройдя через второй маршрутизатор. Затем мы восстановили соединение и все вернулось на свои места.

ПРОСМОТР СООБЩЕНИЙ EIGRP

1. Соберите топологию



Теперь разорвём соединение между 2 и 1 роутером и создадим соединение между ними через мост, в качестве которого выступает компьютер №4.

Для того, чтобы настроить компьютер, как логический мост, используется команда `brctl`:

```
# brctl addbr br0 Определяем логический мост
```

```
# brctl addif br0 eth0 Определяем интерфейс eth0
```

```
# brctl addif br0 eth1 Определяем интерфейс eth1
```

Создание дополнительного vlan, настройка switch для работы с PC4

```
switch(config)#vlan 70
```

```
switch(config)# interface fa0/9
```

```
switch(config-if)# switchport mode access
```

```
switch(config-if)# switchport access vlan 70
```

Для роутера 2:

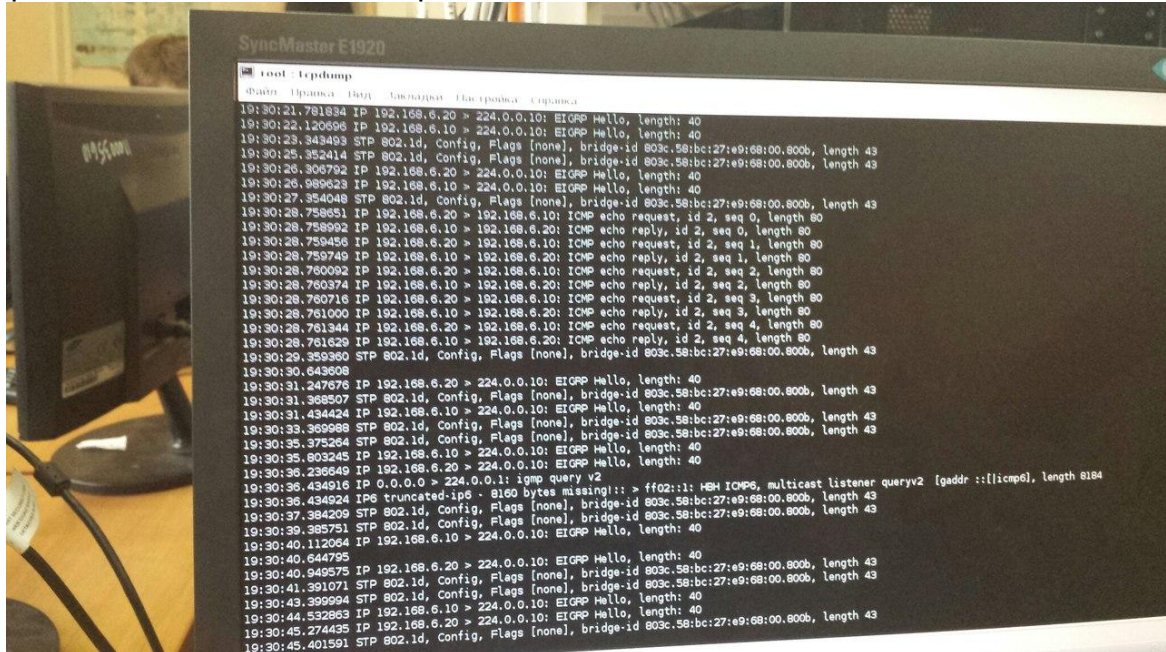
```
Router(config)#int gi0/0.3
```

```
Router(config-subif)#encapsulation dot1q 70
```

```
Router(config-subif)#ip address 192.168.7.10 255.255.255.0
```

```
Router(config-subif)#exit
```

С помощью команды `tcpdump` прослушиваем канал, во время пинга по сети отправляются ICMP пакеты через логический мост



```
root - tcpdump
Файлы: Провиски Байд... Записки... Настройка... Страница
19:30:21.781834 IP 192.168.6.20 > 224.0.0.10: EIGRP Hello, length: 40
19:30:22.120896 IP 192.168.6.10 > 224.0.0.10: EIGRP Hello, length: 40
19:30:23.349493 STP 802.1d, Config, Flags [none], bridge-id 803c.58:bc:27:e9:68:00:00b, length 43
19:30:25.352414 STP 802.1d, Config, Flags [none], bridge-id 803c.58:bc:27:e9:68:00:00b, length 43
19:30:26.806792 IP 192.168.6.20 > 224.0.0.10: EIGRP Hello, length: 40
19:30:26.989623 IP 192.168.6.10 > 224.0.0.10: EIGRP Hello, length: 40
19:30:27.354048 STP 802.1d, Config, Flags [none], bridge-id 803c.58:bc:27:e9:68:00:00b, length 43
19:30:28.758651 IP 192.168.6.20 > 192.168.6.10: ICMP echo request, id 2, seq 0, length 80
19:30:28.758992 IP 192.168.6.10 > 192.168.6.20: ICMP echo reply, id 2, seq 0, length 80
19:30:28.759456 IP 192.168.6.20 > 192.168.6.10: ICMP echo request, id 2, seq 1, length 80
19:30:28.759749 IP 192.168.6.10 > 192.168.6.20: ICMP echo reply, id 2, seq 1, length 80
19:30:28.760092 IP 192.168.6.20 > 192.168.6.10: ICMP echo request, id 2, seq 2, length 80
19:30:28.760374 IP 192.168.6.10 > 192.168.6.20: ICMP echo reply, id 2, seq 2, length 80
19:30:28.760716 IP 192.168.6.20 > 192.168.6.10: ICMP echo request, id 2, seq 3, length 80
19:30:28.761000 IP 192.168.6.10 > 192.168.6.20: ICMP echo reply, id 2, seq 3, length 80
19:30:28.761344 IP 192.168.6.20 > 192.168.6.10: ICMP echo request, id 2, seq 4, length 80
19:30:28.761629 IP 192.168.6.10 > 192.168.6.20: ICMP echo reply, id 2, seq 4, length 80
19:30:29.359360 STP 802.1d, Config, Flags [none], bridge-id 803c.58:bc:27:e9:68:00:00b, length 43
19:30:30.643608
19:30:31.247676 IP 192.168.6.20 > 224.0.0.10: EIGRP Hello, length: 40
19:30:31.368507 STP 802.1d, Config, Flags [none], bridge-id 803c.58:bc:27:e9:68:00:00b, length 43
19:30:31.438424 IP 192.168.6.10 > 224.0.0.10: EIGRP Hello, length: 40
19:30:33.369968 STP 802.1d, Config, Flags [none], bridge-id 803c.58:bc:27:e9:68:00:00b, length 43
19:30:35.375264 STP 802.1d, Config, Flags [none], bridge-id 803c.58:bc:27:e9:68:00:00b, length 43
19:30:35.803245 IP 192.168.6.10 > 224.0.0.10: EIGRP Hello, length: 40
19:30:36.236649 IP 192.168.6.20 > 224.0.0.10: EIGRP Hello, length: 40
19:30:36.434916 IP 0.0.0.0 > 224.0.0.1: igmp query v2
19:30:36.434924 IP6 truncated: ip6 - 8160 bytes missing! > ff02::1: HSM ICMP6, multicast listener queryv2 [qaddr ::[icmp6], length 8164
19:30:37.384209 STP 802.1d, Config, Flags [none], bridge-id 803c.58:bc:27:e9:68:00:00b, length 43
19:30:39.385751 STP 802.1d, Config, Flags [none], bridge-id 803c.58:bc:27:e9:68:00:00b, length 43
19:30:40.112054 IP 192.168.6.10 > 224.0.0.10: EIGRP Hello, length: 40
19:30:40.644795
19:30:40.949575 IP 192.168.6.20 > 224.0.0.10: EIGRP Hello, length: 40
19:30:41.391071 STP 802.1d, Config, Flags [none], bridge-id 803c.58:bc:27:e9:68:00:00b, length 43
19:30:43.399994 STP 802.1d, Config, Flags [none], bridge-id 803c.58:bc:27:e9:68:00:00b, length 43
19:30:43.532863 IP 192.168.6.10 > 224.0.0.10: EIGRP Hello, length: 40
19:30:44.274435 IP 192.168.6.20 > 224.0.0.10: EIGRP Hello, length: 40
19:30:45.401591 STP 802.1d, Config, Flags [none], bridge-id 803c.58:bc:27:e9:68:00:00b, length 43
```