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Факультет физико-математических и естественных наук
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ОТЧЕТ
ПО ЛАБОРАТОРНОЙ РАБОТЕ № 15

дисциплина: Администрирование локальных сетей

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Группа: НФИ-бд-03-19

МОСКВА

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Цель работы:

Настроить динамическую маршрутизацию между территориями организации.

Задание

1. Настроить динамическую маршрутизацию по протоколу OSPF на маршрутизаторах msk-donskaya-gw-1, msk-q42-gw-1, msk-hostel-gw-1, sch-sochi-gw-1 (см. раздел 15.4.1).
2. Настроить связь сети квартала 42 в Москве с сетью филиала в г. Сочи напрямую (см. раздел 15.4.2).
3. В режиме симуляции отследить движение пакета ICMP с ноутбука администратора сети на Донской в Москве (Laptop-PT admin) до компьютера пользователя в филиале в г. Сочи pc-sochi-1.
4. На коммутаторе провайдера отключить временно vlan 6 и в режиме симуляции убедиться в изменении маршрута прохождения пакета ICMP с ноутбука администратора сети на Донской в Москве (Laptop-PT admin) до компьютера пользователя в филиале в г. Сочи pc-sochi-1.
5. На коммутаторе провайдера восстановить vlan 6 и в режиме симуляции убедиться в изменении маршрута прохождения пакета ICMP с ноутбука администратора сети на Донской в Москве (Laptop-PT admin) до компьютера пользователя в филиале в г. Сочи pc-sochi-1.
6. При выполнении работы необходимо учитывать соглашение об именовании (см. раздел 2.5).

Последовательность выполнения работы

15.4.1. Настройка OSPF

15.4.1.1. Настроила маршрутизатор msk-donskaya-gw-1

```
msk-donskaya-gw-1>enable
```

```
msk-donskaya-gw-1#configure terminal
```

```
msk-donskaya-gw-1(config)#router ospf 1
```

```
msk-donskaya-gw-1(config-router)#router-id 10.128.254.1
```

```
msk-donskaya-gw-1(config-router)#network 10.0.0.0 0.255.255.255 area 0
```

```
msk-donskaya-gw-1(config-router)#exit
```

```
%LINEPROTO-5-UPDOWN: Line protocol on interface FastEthernet0/1.4, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1.5, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1.6, changed state to up

User Access Verification

Password:
msk-donskaya-vmshutenko-gw-1>en
Password:
msk-donskaya-vmshutenko-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-donskaya-vmshutenko-gw-1(config)#router ospf 1
msk-donskaya-vmshutenko-gw-1(config-router)#router-id 10.128.254.1
msk-donskaya-vmshutenko-gw-1(config-router)#network 10.0.0.0 0.255.255.255 area 0
msk-donskaya-vmshutenko-gw-1(config-router)#exit
msk-donskaya-vmshutenko-gw-1(config)#^Z
msk-donskaya-vmshutenko-gw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr mem
Building configuration...
[OK]
msk-donskaya-vmshutenko-gw-1#
```

Command+F6 to exit CLI focus Copy Paste

Top

Рисунок 1. Настройка маршрутизатора msk-donskaya-gw-1

15.4.1.2. Проверила состояния протокола OSPF на маршрутизаторе

msk-donskaya-gw-1

msk-donskaya-gw-1>enable

msk-donskaya-gw-1#sh ip ospf

msk-donskaya-gw-1#sh ip ospf neighbor

msk-donskaya-gw-1#sh ip route

msk-donskaya-vmshutenko-gw-1

Physical Config **CLI** Attributes

IOS Command Line Interface

```
wr mem
Building configuration...
[OK]
msk-donskaya-vmshutenko-gw-1#
msk-donskaya-vmshutenko-gw-1#sh ip ospf
  Routing Process "ospf 1" with ID 10.128.254.1
  Supports only single TOS(TOS0) routes
  Supports opaque LSA
  SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
  Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
  Number of external LSA 0. Checksum Sum 0x000000
  Number of opaque AS LSA 0. Checksum Sum 0x000000
  Number of DCbitless external and opaque AS LSA 0
  Number of DoNotAge external and opaque AS LSA 0
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  External flood list length 0
    Area BACKBONE(0)
      Number of interfaces in this area is 8
      Area has no authentication
      SPF algorithm executed 1 times
      Area ranges are
        Number of LSA 1. Checksum Sum 0x00312a
        Number of opaque link LSA 0. Checksum Sum 0x000000
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0

msk-donskaya-vmshutenko-gw-1#
```

Command+F6 to exit CLI focus

Top

```
msk-donskaya-vmshutenko-gw-1#sh ip ospf neighbor

msk-donskaya-vmshutenko-gw-1#sh 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, E - EGP
      i - IS-IS, 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 198.51.100.1 to network 0.0.0.0

  10.0.0.0/8 is variably subnetted, 18 subnets, 4 masks
C    10.128.0.0/24 is directly connected, FastEthernet0/0.3
L    10.128.0.1/32 is directly connected, FastEthernet0/0.3
C    10.128.1.0/24 is directly connected, FastEthernet0/0.2
L    10.128.1.1/32 is directly connected, FastEthernet0/0.2
C    10.128.3.0/24 is directly connected, FastEthernet0/0.101
L    10.128.3.1/32 is directly connected, FastEthernet0/0.101
C    10.128.4.0/24 is directly connected, FastEthernet0/0.102
L    10.128.4.1/32 is directly connected, FastEthernet0/0.102
C    10.128.5.0/24 is directly connected, FastEthernet0/0.103
L    10.128.5.1/32 is directly connected, FastEthernet0/0.103
C    10.128.6.0/24 is directly connected, FastEthernet0/0.104
L    10.128.6.1/32 is directly connected, FastEthernet0/0.104
C    10.128.255.0/30 is directly connected, FastEthernet0/1.5
L    10.128.255.1/32 is directly connected, FastEthernet0/1.5
C    10.128.255.4/30 is directly connected, FastEthernet0/1.6
L    10.128.255.5/32 is directly connected, FastEthernet0/1.6
S    10.129.0.0/16 [1/0] via 10.128.255.2

Command+F6 to exit CLI focus
```

Copy Paste

Рисунки 2-3. Проверка состояния протокола OSPF на маршрутизаторе

15.4.1.3. Настроила маршрутизатор msk-q42-gw-1

```
msk-q42-gw-1>enable
msk-q42-gw-1#configure terminal
msk-q42-gw-1(config)#router ospf 1
msk-q42-gw-1(config-router)#router-id 10.128.254.2
msk-q42-gw-1(config-router)#network 10.0.0.0 0.255.255.255 area 0
msk-q42-gw-1(config-router)#exit
```

The screenshot shows a Cisco IOS Command Line Interface (CLI) window titled "msk-q42-vmshutenko-gw-1". The window has tabs for Physical, Config, CLI (which is selected), and Attributes. The main area displays the following configuration commands:

```
changed state to up

User Access Verification

Password:
msk-q42-vmshutenko-gw-1>en
Password:
msk-q42-vmshutenko-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-q42-vmshutenko-gw-1(config)#router ospf 1
msk-q42-vmshutenko-gw-1(config-router)#router-id 10.128.254.2
msk-q42-vmshutenko-gw-1(config-router)#network 10.0.0.0 0.255.255.255 area 0
msk-q42-vmshutenko-gw-1(config-router)#exit
msk-q42-vmshutenko-gw-1(config)#^Z
msk-q42-vmshutenko-gw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr
00:20:26: %OSPF-5-ADJCHG: Process 1, Nbr 10.128.254.1 on FastEthernet0/1.5
from LOADING to FULL, Loading Done
mem
Translating "wrmem"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find computer address

msk-q42-vmshutenko-gw-1#wr mem
Building configuration...
[OK]
msk-q42-vmshutenko-gw-1#
```

At the bottom of the window, there are buttons for "Command+F6 to exit CLI focus", "Copy", and "Paste". A scroll bar is visible on the right side of the main text area.

Рисунок 4. Настройка маршрутизатора msk-q42-gw-1

msk-q42-vmshutenko-gw-1

Physical Config **CLI** Attributes

IOS Command Line Interface

```
[root] msk-q42-vmshutenko-gw-1#sh ip ospf
Routing Process "ospf 1" with ID 10.128.254.2
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 0. Checksum Sum 0x000000
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
Area BACKBONE(0)
    Number of interfaces in this area is 3
    Area has no authentication
    SPF algorithm executed 3 times
    Area ranges are
    Number of LSA 3. Checksum Sum 0x01c7b8
    Number of opaque link LSA 0. Checksum Sum 0x000000
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0

msk-q42-vmshutenko-gw-1#sh ip ospf neighbor

Neighbor ID      Pri      State            Dead Time     Address
Interface
10.128.254.1      1      FULL/DR        00:00:36     10.128.255.1
FastEthernet0/1.5
msk-q42-vmshutenko-gw-1#
```

Command+F6 to exit CLI focus

Copy

Paste

msk-q42-vmshutenko-gw-1

Physical Config **CLI** Attributes

IOS Command Line Interface

```

FastEthernet0/1.5
msk-q42-vmshutenko-gw-1#sh 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, E - EGP
       i - IS-IS, 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 10.128.255.1 to network 0.0.0.0

      10.0.0.0/8 is variably subnetted, 14 subnets, 4 masks
O        10.128.0.0/24 [110/2] via 10.128.255.1, 00:02:25,
FastEthernet0/1.5
O        10.128.1.0/24 [110/2] via 10.128.255.1, 00:02:25,
FastEthernet0/1.5
O        10.128.3.0/24 [110/2] via 10.128.255.1, 00:02:25,
FastEthernet0/1.5
O        10.128.4.0/24 [110/2] via 10.128.255.1, 00:02:25,
FastEthernet0/1.5
O        10.128.5.0/24 [110/2] via 10.128.255.1, 00:02:25,
FastEthernet0/1.5
O        10.128.6.0/24 [110/2] via 10.128.255.1, 00:02:25,
FastEthernet0/1.5
C        10.128.255.0/30 is directly connected, FastEthernet0/1.5
L        10.128.255.2/32 is directly connected, FastEthernet0/1.5
O        10.128.255.4/30 [110/2] via 10.128.255.1, 00:02:25,
FastEthernet0/1.5
C        10.129.0.0/24 is directly connected, FastEthernet0/0.201
L        10.129.0.1/32 is directly connected, FastEthernet0/0.201

```

Command+F6 to exit CLI focus **Copy** **Paste**

Рисунки 5-6. Проверка состояния протокола OSPF на маршрутизаторе

15.4.1.4. Настроила маршрутизирующий коммутатор

msk-hostel-gw-1

msk-hostel-gw-1>enable

msk-hostel-gw-1#configure terminal

msk-hostel-gw-1(config)#router ospf 1

msk-hostel-gw-1(config-router)#router-id 10.128.254.3

msk-hostel-gw-1(config-router)#network 10.0.0.0 0.255.255.255 area 0

msk-hostel-gw-1(config-router)#exit

The screenshot shows a terminal window titled "msk-hostel-vmshutenko-gw-1". The tab bar includes "Physical", "Config", "CLI" (which is selected), and "Attributes". Below the title is the text "IOS Command Line Interface". The main pane displays the following configuration session:

```
up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan301, changed state to up

User Access Verification

Password:

msk-hostel-vmshutenko-gw-1>en
Password:
msk-hostel-vmshutenko-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-hostel-vmshutenko-gw-1(config)#rputer pspf 1
          ^
% Invalid input detected at '^' marker.

msk-hostel-vmshutenko-gw-1(config)#router ospf 1
msk-hostel-vmshutenko-gw-1(config-router)#router-id 10.128.254.3
msk-hostel-vmshutenko-gw-1(config-router)#network 10.0.0.0 0.255.255.255
area 0
msk-hostel-vmshutenko-gw-1(config-router)#exit
msk-hostel-vmshutenko-gw-1(config)#^Z
msk-hostel-vmshutenko-gw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr mem
Building configuration...
[OK]
msk-hostel-vmshutenko-gw-1#
```

At the bottom left, it says "Command+F6 to exit CLI focus". On the right, there are "Copy" and "Paste" buttons. A scroll bar is visible on the right side of the main pane.

Рисунок 7. Настройка маршрутизирующего коммутатора

msk-hostel-vmshutenko-gw-1

Physical Config **CLI** Attributes

IOS Command Line Interface

```
msk-hostel-vmshutenko-gw-1#sh ip ospf
Routing Process "ospf 1" with ID 10.128.254.3
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 0. Checksum Sum 0x000000
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
Area BACKBONE(0)
    Number of interfaces in this area is 2
    Area has no authentication
    SPF algorithm executed 1 times
    Area ranges are
        Number of LSA 1. Checksum Sum 0x00444c
        Number of opaque link LSA 0. Checksum Sum 0x000000
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0

msk-hostel-vmshutenko-gw-1#sh ip ospf neighbor

msk-hostel-vmshutenko-gw-1#sh ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter
```

Command+F6 to exit CLI focus

Copy **Paste**

Снимок экрана

```
msk-hostel-vmshutenko-gw-1#sh ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
        i - IS-IS, 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 10.129.1.1 to network 0.0.0.0

    10.0.0.0/24 is subnetted, 2 subnets
C        10.129.1.0 is directly connected, Vlan202
C        10.129.128.0 is directly connected, Vlan301
S*      0.0.0.0/0 [1/0] via 10.129.1.1

msk-hostel-vmshutenko-gw-1#
```

Command+F6 to exit CLI focus

Top

Copy Paste

Рисунки 8-9. Проверка состояния протокола OSPF на маршрутизаторе

15.4.1.5. Настроила маршрутизатор sch-sochi-gw-1

```
sch-sochi-gw-1>enable
```

```
sch-sochi-gw-1#configure terminal
```

```
sch-sochi-gw-1(config)#router ospf 1
```

```
sch-sochi-gw-1(config-router)#router-id 10.128.254.4
```

```
sch-sochi-gw-1(config-router)#network 10.0.0.0 0.255.255.255 area 0
```

```
sch-sochi-gw-1(config-router)#exit
```

The screenshot shows a Cisco IOS Command Line Interface (CLI) window titled "sch-sochi-vmshutenko-gw-1". The window has tabs for Physical, Config, CLI (which is selected), and Attributes. The main area displays the following configuration commands:

```
%LINEPROTO-5-UPDOWN: Line protocol on interface FastEthernet0/0.401, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.402, changed state to up

User Access Verification

Password:
sch-sochi-vmshutenko-gw-1>en
Password:
sch-sochi-vmshutenko-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
sch-sochi-vmshutenko-gw-1(config)#router ospf 1
sch-sochi-vmshutenko-gw-1(config-router)#router-id 10.128.254.4
sch-sochi-vmshutenko-gw-1(config-router)#network 10.0.0.0 0.255.255.255
area 0
sch-sochi-vmshutenko-gw-1(config-router)#exit
sch-sochi-vmshutenko-gw-1(config)#^Z
sch-sochi-vmshutenko-gw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr mem
Building configuration...
[OK]
sch-sochi-vmshutenko-gw-1#
00:44:56: %OSPF-5-ADJCHG: Process 1, Nbr 10.128.254.1 on FastEthernet0/0.6 from LOADING to FULL, Loading Done
```

Below the CLI window, there is a status bar with the text "Command+F6 to exit CLI focus" and buttons for "Copy" and "Paste". A "Top" button is also present.

Рисунок 10. Настройка маршрутизатора sch-sochi-gw-1

sch-sochi-vmshutenko-gw-1

Physical Config **CLI** Attributes

IOS Command Line Interface

```
sch-sochi-vmshutenko-gw-1#sh ip ospf
Routing Process "ospf 1" with ID 10.128.254.4
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 0. Checksum Sum 0x000000
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
Area BACKBONE(0)
    Number of interfaces in this area is 3
    Area has no authentication
    SPF algorithm executed 2 times
    Area ranges are
        Number of LSA 5. Checksum Sum 0x03612a
        Number of opaque link LSA 0. Checksum Sum 0x000000
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
    Flood list length 0

sch-sochi-vmshutenko-gw-1#sh ip ospf neighbor

Neighbor ID      Pri      State            Dead Time      Address
Interface
10.128.254.1      1      FULL/DR          00:00:39      10.128.255.5
FastEthernet0/0.6

sch-sochi-vmshutenko-gw-1#sh ip route
```

Command+F6 to exit CLI focus

Copy

Paste

sch-sochi-vmshutenko-gw-1

Physical Config **CLI** Attributes

IOS Command Line Interface

```

sch-sochi-vmshutenko-gw-1#sh 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, E - EGP
        i - IS-IS, 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 10.128.255.5 to network 0.0.0.0

    10.0.0.0/8 is variably subnetted, 15 subnets, 3 masks
O      10.128.0.0/24 [110/2] via 10.128.255.5, 00:02:27,
FastEthernet0/0.6
O      10.128.1.0/24 [110/2] via 10.128.255.5, 00:02:27,
FastEthernet0/0.6
O      10.128.3.0/24 [110/2] via 10.128.255.5, 00:02:27,
FastEthernet0/0.6
O      10.128.4.0/24 [110/2] via 10.128.255.5, 00:02:27,
FastEthernet0/0.6
O      10.128.5.0/24 [110/2] via 10.128.255.5, 00:02:27,
FastEthernet0/0.6
O      10.128.6.0/24 [110/2] via 10.128.255.5, 00:02:27,
FastEthernet0/0.6
O      10.128.255.0/30 [110/2] via 10.128.255.5, 00:02:27,
FastEthernet0/0.6
C      10.128.255.4/30 is directly connected, FastEthernet0/0.6
L      10.128.255.6/32 is directly connected, FastEthernet0/0.6
O      10.129.0.0/24 [110/3] via 10.128.255.5, 00:02:27,
FastEthernet0/0.6
O      10.129.1.0/24 [110/3] via 10.128.255.5, 00:02:27,
FastEthernet0/0.6

```

Command+F6 to exit CLI focus [Copy](#) [Paste](#)

Рисунки 11-12. Проверка состояния протокола OSPF на маршрутизаторе

15.4.2. Настройка линка 42-й квартал–Сочи

15.4.2.1. Настроила интерфейсы коммутатора provider-sw-1

provider-sw-1>enable

provider-sw-1#configure terminal

provider-sw-1(config)#vlan 7

provider-sw-1(config-vlan)#name q42-sochi

provider-sw-1(config-vlan)#exit

provider-sw-1(config)#interface vlan7

provider-sw-1(config-if)#no shutdown

```
provider-sw-1(config-if)#exit
```

```
%LINEPROTO-5-UPDOWN: Line protocol on interface FastEthernet0/4, changed state to up

User Access Verification

Password:

provider-vmshutenko-sw-1>en
Password:
provider-vmshutenko-sw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
provider-vmshutenko-sw-1(config)#vlan 7
provider-vmshutenko-sw-1(config-vlan)#name q42-sochi
provider-vmshutenko-sw-1(config-vlan)#exit
provider-vmshutenko-sw-1(config)#int vlan7
provider-vmshutenko-sw-1(config-if)#
%LINK-5-CHANGED: Interface Vlan7, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan7, changed state to up

provider-vmshutenko-sw-1(config-if)#no shutdown
provider-vmshutenko-sw-1(config-if)#exit
provider-vmshutenko-sw-1(config)#^Z
provider-vmshutenko-sw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr mem
Building configuration...
[OK]
provider-vmshutenko-sw-1#
```

Command+F6 to exit CLI focus Copy Paste

Top

Рисунок 13. Настройка линка 42-й квартал–Сочи

15.4.2.2. Настроила маршрутизатор msk-q42-gw-1

```
msk-q42-gw-1>enable
msk-q42-gw-1#configure terminal
msk-q42-gw-1(config)#interface f0/1.7
msk-q42-gw-1(config-subif)#encapsulation dot1Q 7
msk-q42-gw-1(config-subif)#ip address 10.128.255.9 255.255.255.252
msk-q42-gw-1(config-subif)#description sochi
msk-q42-gw-1(config-subif)#exit
```

User Access Verification

Password:

```
msk-q42-vmshutenko-gw-1>en
Password:
msk-q42-vmshutenko-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
msk-q42-vmshutenko-gw-1(config)#interface f0/1.7
msk-q42-vmshutenko-gw-1(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/1.7, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1.7, changed
state to up

msk-q42-vmshutenko-gw-1(config-subif)#encapsulation dot1Q 7
msk-q42-vmshutenko-gw-1(config-subif)#ip address 10.128.255.9
255.255.255.252
msk-q42-vmshutenko-gw-1(config-subif)#description sochi
msk-q42-vmshutenko-gw-1(config-subif)#exit
msk-q42-vmshutenko-gw-1(config)#^Z
msk-q42-vmshutenko-gw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr mem
Building configuration...
[OK]
msk-q42-vmshutenko-gw-1#
```

Command+F6 to exit CLI focus

Copy Paste

Рисунок 14. Настройка маршрутизатора msk-q42-gw-1

15.4.2.3. Настроила коммутатор sch-sochi-sw-1

```
sch-sochi-sw-1>enable
sch-sochi-sw-1#configure terminal
sch-sochi-sw-1(config)#vlan 7
sch-sochi-sw-1(config-vlan)#name q42-sochi
sch-sochi-sw-1(config-vlan)#exit
sch-sochi-sw-1(config)#interface vlan7
sch-sochi-sw-1(config-if)#no shutdown
sch-sochi-sw-1(config-if)#exit
```

The screenshot shows a terminal window titled "sch-sochi-vmshutenko-sw-1". The tab bar includes "Physical", "Config", "CLI" (which is selected), and "Attributes". The main area is labeled "IOS Command Line Interface". The terminal output is as follows:

```
state to up

User Access Verification

Password:
Password:

sch-sochi-vmshutenko-sw-1>en
Password:
sch-sochi-vmshutenko-sw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
sch-sochi-vmshutenko-sw-1(config)#vlan 7
sch-sochi-vmshutenko-sw-1(config-vlan)#name q42-sochi
sch-sochi-vmshutenko-sw-1(config-vlan)#exit
sch-sochi-vmshutenko-sw-1(config)#int vlan7
sch-sochi-vmshutenko-sw-1(config-if)#
%LINK-5-CHANGED: Interface Vlan7, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan7, changed state to up

sch-sochi-vmshutenko-sw-1(config-if)#no shutdown
sch-sochi-vmshutenko-sw-1(config-if)#exit
sch-sochi-vmshutenko-sw-1(config)#^Z
sch-sochi-vmshutenko-sw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr mem
Building configuration...
[OK]
sch-sochi-vmshutenko-sw-1#
```

At the bottom, there are "Copy" and "Paste" buttons. A "Top" button is also visible.

Рисунок 15. Настройка коммутатора sch-sochi-sw-1

15.4.2.4. Настроила маршрутизатор sch-sochi-gw-1

```
sch-sochi-gw-1>enable
sch-sochi-gw-1#configure terminal
sch-sochi-gw-1(config)#interface f0/0.7
sch-sochi-gw-1(config-subif)#encapsulation dot1Q 7
sch-sochi-gw-1(config-subif)#ip address 10.128.255.10 255.255.255.252
sch-sochi-gw-1(config-subif)#description q42
sch-sochi-gw-1(config-subif)#exit
```

sch-sochi-vmshutenko-gw-1>en
Password:
sch-sochi-vmshutenko-gw-1#int f0/0.7
^
% Invalid input detected at '^' marker.

sch-sochi-vmshutenko-gw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
sch-sochi-vmshutenko-gw-1(config)#int f0/0.7
sch-sochi-vmshutenko-gw-1(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.7, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.7, changed state to up

sch-sochi-vmshutenko-gw-1(config-subif)#encapsulation dot1Q 7
sch-sochi-vmshutenko-gw-1(config-subif)#ip address 10.128.255.10
255.255.255.252
sch-sochi-vmshutenko-gw-1(config-subif)#description q42
sch-sochi-vmshutenko-gw-1(config-subif)#e
00:47:07: %OSPF-5-ADJCHG: Process 1, Nbr 10.128.254.2 on FastEthernet0/0.7
from LOADING to FULL, Loading Done
sch-sochi-vmshutenko-gw-1(config-subif)#exit
sch-sochi-vmshutenko-gw-1(config)#^Z
sch-sochi-vmshutenko-gw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr mem
Building configuration...
[OK]
sch-sochi-vmshutenko-gw-1#

Command+F6 to exit CLI focus [Copy](#) [Paste](#)

Снимок экрана

Рисунок 16. Настройка маршрутизатора sch-sochi-gw-1

В режиме симуляции отследила движение пакета ICMP с ноутбука администратора сети на Донской в Москве (Laptop-PT admin) до компьютера пользователя в филиале в г. Сочи pc-sochi-1. Пакет прошел запланированный путь.

admin

Physical Config Desktop Programming Attributes

Command Prompt X

```
C:\>tracert 10.130.0.200

Tracing route to 10.130.0.200 over a maximum of 30 hops:

 1  14 ms      0 ms      0 ms      10.128.6.1
 2  1 ms       0 ms      0 ms      10.128.255.6
 3  1 ms       0 ms      0 ms      10.130.0.200

Trace complete.

C:\>ping -n 1000 10.130.0.200

Pinging 10.130.0.200 with 32 bytes of data:

Reply from 10.130.0.200: bytes=32 time<1ms TTL=126
Reply from 10.130.0.200: bytes=32 time=2ms TTL=126
Reply from 10.130.0.200: bytes=32 time<1ms TTL=126
Reply from 10.130.0.200: bytes=32 time<1ms TTL=126
Reply from 10.130.0.200: bytes=32 time<1ms TTL=126
Reply from 10.130.0.200: bytes=32 time=1ms TTL=126
Reply from 10.130.0.200: bytes=32 time<1ms TTL=126
Reply from 10.130.0.200: bytes=32 time=2ms TTL=126
Reply from 10.130.0.200: bytes=32 time<1ms TTL=126
Reply from 10.130.0.200: bytes=32 time=1ms TTL=126
Reply from 10.130.0.200: bytes=32 time<1ms TTL=126
Reply from 10.130.0.200: bytes=32 time<1ms TTL=126
Reply from 10.130.0.200: bytes=32 time<1ms TTL=126
Reply from 10.130.0.200: bytes=32 time=1ms TTL=126
Reply from 10.130.0.200: bytes=32 time<1ms TTL=126
Reply from 10.130.0.200: bytes=32 time<1ms TTL=126
Reply from 10.130.0.200: bytes=32 time<1ms TTL=126
Reply from 10.130.0.200: bytes=32 time=1ms TTL=126
```

Top

13.4. Последовательность выполнения работы

Рисунок 17. Проверка пути и запуск пинга на компьютере администратора.

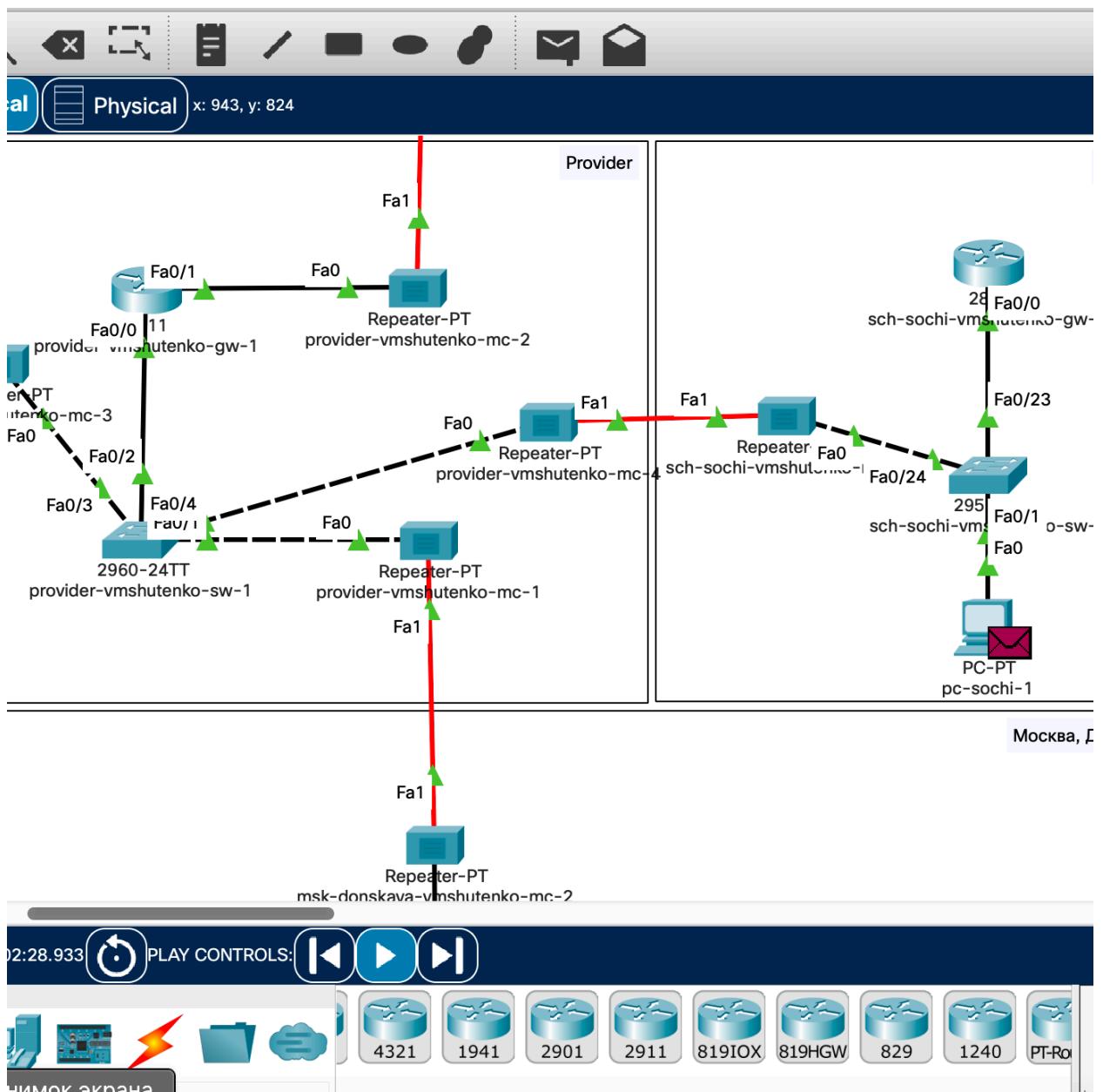


Рисунок 18. Запуск симуляции.

4. На коммутаторе провайдера отключила временно vlan 6 и в режиме симуляции убедилась в изменении маршрута прохождения пакета ICMP с ноутбука администратора сети на Донской в Москве (Laptop-PT admin) до компьютера пользователя в филиале в г. Сочи pc-sochi-1.

Physical Config **Desktop** Programming Attributes

Command Prompt X

```
Reply from 10.130.0.200: bytes=32 time=24ms TTL=126
Request timed out.

Ping statistics for 10.130.0.200:
  Packets: Sent = 39, Received = 31, Lost = 8 (21% loss),
  Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 24ms, Average = 5ms

Control-C
^C
C:\>tracert 10.130.0.200

Tracing route to 10.130.0.200 over a maximum of 30 hops:
  1  7 ms      6 ms      6 ms      10.128.6.1
  2  18 ms     18 ms     18 ms      10.128.255.2
  3  32 ms     32 ms     32 ms      10.128.255.10
  4  36 ms     36 ms     36 ms      10.130.0.200

Trace complete.

C:\>
```

Top

Рисунок 19. Проверка маршрута после отключения vlan 6 с компьютера администратора (идёт через квартал 42).

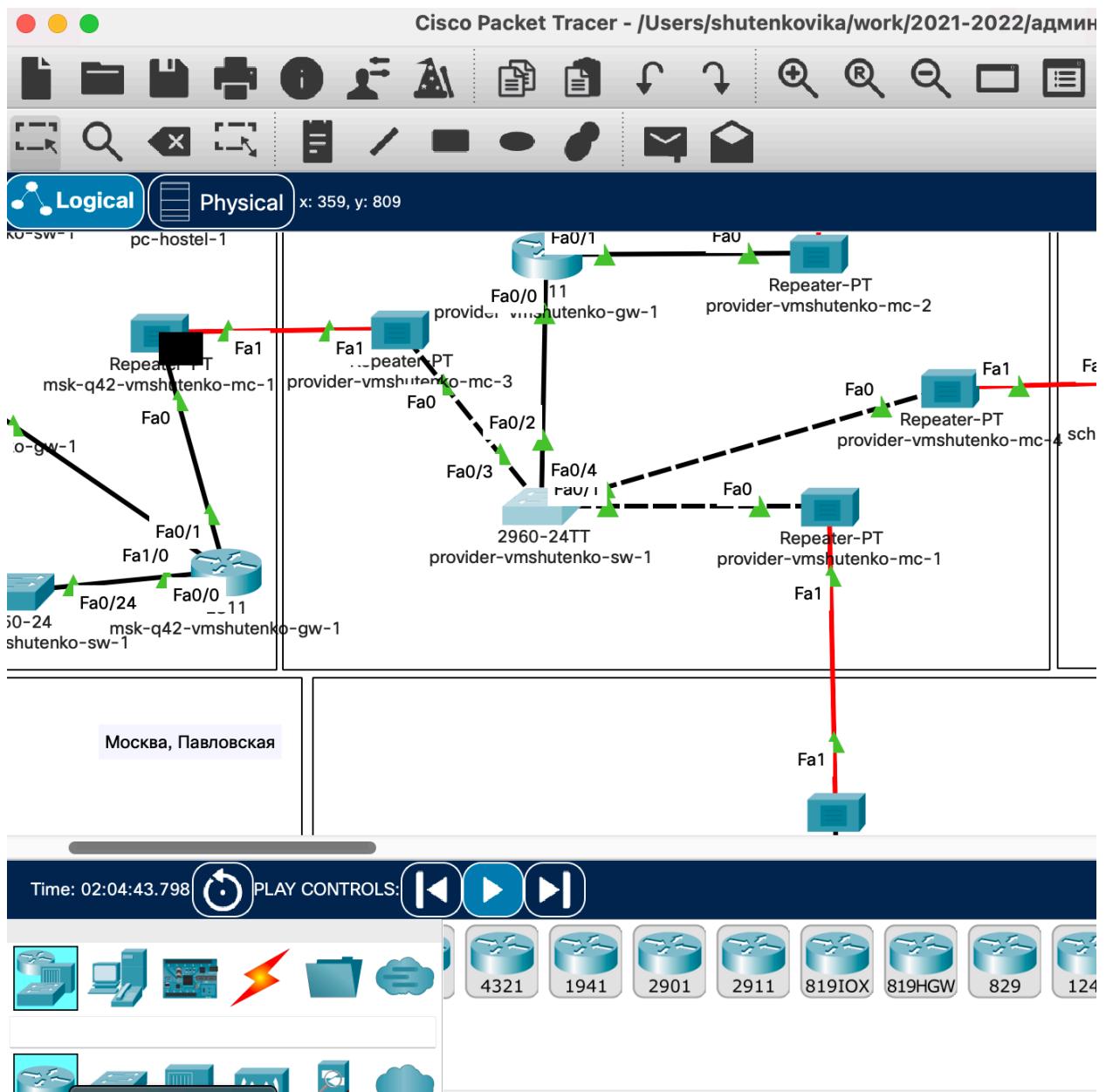


Рисунок 20. Измененный маршрут пакета через 42-й квартал в режиме симуляции.

5. На коммутаторе провайдера восстановить vlan 6 и в режиме симуляции убедиться в изменении маршрута прохождения пакета ICMP с ноутбука администратора сети на Донской в Москве (Laptop-PT admin) до компьютера пользователя в филиале в г. Сочи pc-sochi-1.

provider-vmshutenko-sw-1

Physical Config **CLI** Attributes

IOS Command Line Interface

```
provider-vmshutenko-sw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
provider-vmshutenko-sw-1(config)#no vlan 6
provider-vmshutenko-sw-1(config)#
%LINK-3-UPDOWN: Interface Vlan6, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan6, changed state to
down

provider-vmshutenko-sw-1#^Z
provider-vmshutenko-sw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr mem
Building configuration...
[OK]
provider-vmshutenko-sw-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
provider-vmshutenko-sw-1(config)#vlan 6
provider-vmshutenko-sw-1(config-vlan)#
%LINK-5-CHANGED: Interface Vlan6, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan6, changed state to up

provider-vmshutenko-sw-1(config-vlan)#name sochi
provider-vmshutenko-sw-1(config-vlan)#exit
provider-vmshutenko-sw-1(config)#+Z
provider-vmshutenko-sw-1#
%SYS-5-CONFIG_I: Configured from console by console
wr mem
Building configuration...
[OK]
provider-vmshutenko-sw-1#
```

Command+F6 to exit CLI focus

Top

[Copy](#) [Paste](#)

Рисунок 21. Включение vlan 6.

The screenshot shows a terminal window titled "admin". The tabs at the top are "Physical", "Config", "Desktop" (which is selected), "Programming", and "Attributes". The main area is a "Command Prompt" window with a blue header bar containing the title "Command Prompt" and a close button "X".

```
Request timed out.  
  
Ping statistics for 10.130.0.200:  
    Packets: Sent = 39, Received = 31, Lost = 8 (21% loss),  
    Approximate round trip times in milli-seconds:  
        Minimum = 0ms, Maximum = 24ms, Average = 5ms  
  
Control-C  
^C  
C:\>tracert 10.130.0.200  
  
Tracing route to 10.130.0.200 over a maximum of 30 hops:  
  
    1    7 ms      6 ms      6 ms      10.128.6.1  
    2   18 ms      18 ms     18 ms      10.128.255.2  
    3   32 ms      32 ms     32 ms      10.128.255.10  
    4   36 ms      36 ms     36 ms      10.130.0.200  
  
Trace complete.  
  
C:\>tracert 10.130.0.200  
  
Tracing route to 10.130.0.200 over a maximum of 30 hops:  
  
    1   11 ms      0 ms      0 ms      10.128.6.1  
    2   0 ms       0 ms      0 ms      10.128.255.6  
    3   0 ms       0 ms      1 ms      10.130.0.200  
  
Trace complete.  
  
C:\>
```

Top

Рисунок 22. Проверка маршрута после включения vlan 6 (маршрут восстановлен и работает, как было прежде).

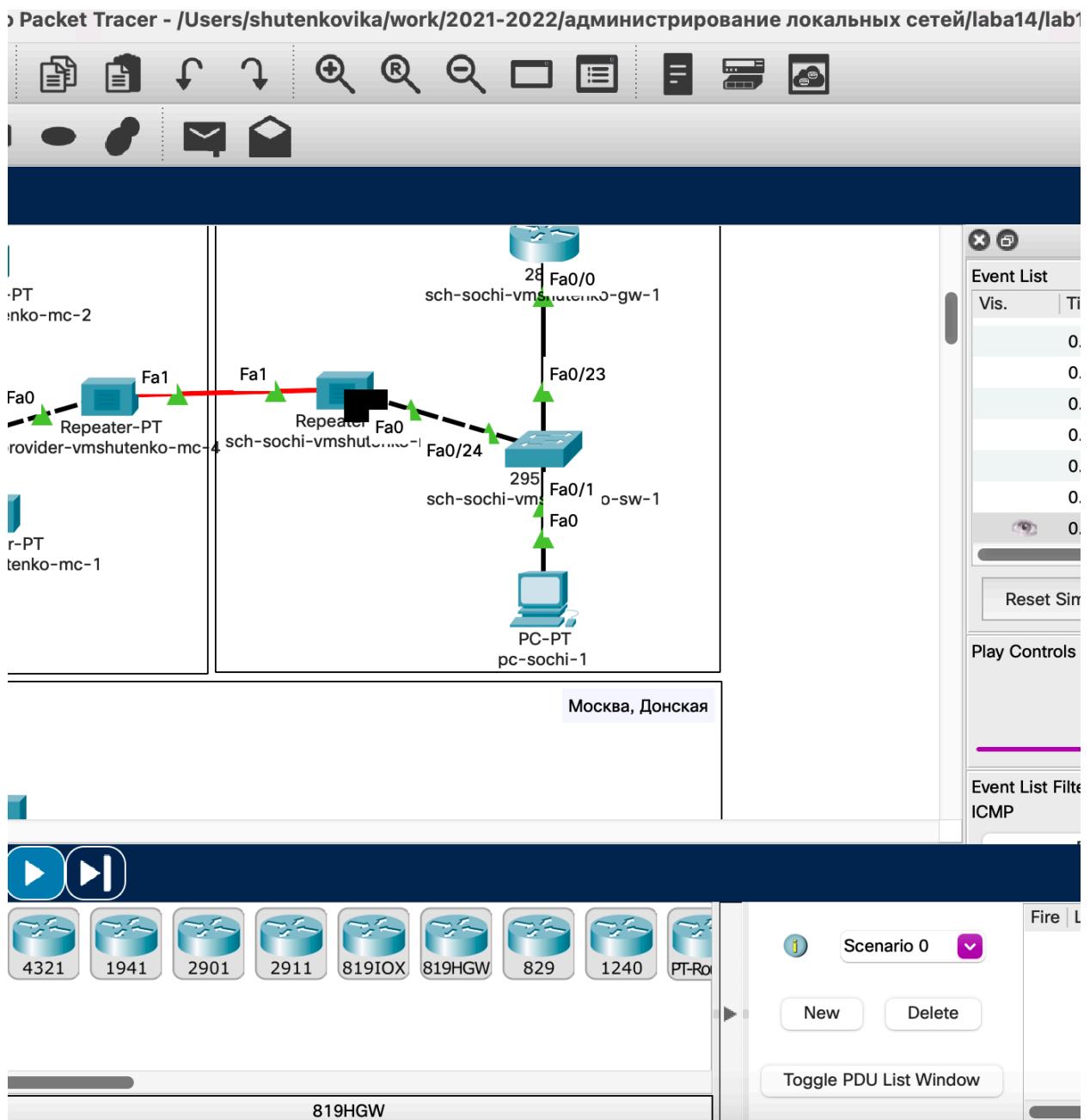


Рисунок 23. Запуск симуляции.

Контрольные вопросы

1. Какие протоколы относятся к протоколам динамической маршрутизации?

Динамическая маршрутизация — вид маршрутизации, при котором таблица маршрутизации редактируется программно.

Протоколы динамической маршрутизации:

- RIP
- OSPF
- EIGRP
- BGP

- IS-IS
2. Охарактеризуйте принципы работы протоколов динамической маршрутизации.

Протоколы динамической маршрутизации предназначены для автоматизации процесса построения маршрутных таблиц маршрутизаторов. Принцип их использования достаточно прост: маршрутизаторы с помощью устанавливаемого протоколом порядка рассылают определенную информацию из своей таблицы маршрутизации другим и корректируют свою таблицу на основе полученных от других данных.

Такой метод построения и поддержки маршрутных таблиц существенно упрощает задачу администрирования сетей, в которых могут происходить изменения (например, расширение) или в ситуациях, когда какие-либо маршрутизаторы и/или подсети выходят из строя.

 3. Опишите процесс обращения устройства из одной подсети к устройству из другой подсети по протоколу динамической маршрутизации.

Например, узел 10.1.1.1 имеет пакет, который нужно отправить узлу 172.16.0.1.

 1. Узел назначения находится не на одной с передающим узлом сети. Узел 10.1.1.1 сконфигурирован так, что любые пакеты, требующие косвенной маршрутизации, передаются его шлюзу по умолчанию – маршрутизатору 1.
 2. Чтобы доставить пакет маршрутизатору 1, узлу 10.1.1.1 необходим MAC-адрес маршрутизатора 10.3.3.3. Если MAC-адрес узлу 10.1.1.1 неизвестен, он отправляет ARP-запрос, чтобы его получить. Затем пакет, предназначенный для 172.16.0.1 отправляется маршрутизатору 1.
 3. Маршрутизатор 1 осознает, что он подсоединен к сети 172.16. и полагает, что узел 172.16.0.1 должен быть частью этой сети. Маршрутизатор 1 реализует свою собственную процедуру прямой маршрутизации и посыпает ARP-запрос, ища узел назначения.
 4. Опишите выводимую информацию при просмотре таблицы маршрутизации.

Каждая строчка определяет, куда отправлять какие пакеты. То есть для диапазона, задаваемого значениями в колонках "сетевой адрес" и "маска сети" создается сетевой маршрут.