Лабораторная работа №15

Динамическая маршрутизация

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Информация

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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.
2. Настроить связь сети квартала 42 в Москве с сетью филиала в г. Сочи напрямую.
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.

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

Рис. 1: Настройка маршрутизатора msk-donskaya-gw-1

```
msk-donskaya-dmbelicheva-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-dmbelicheva-gw-1#
```

Рис. 2: Проверка состояния протокола OSPF на маршрутизаторе msk-donskaya-gw-1

Настройка OSPF

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

msk-donskaya-dmbelicheva-gw-1#sh ip ospf routr
                                     ^
% Invalid input detected at '^' marker.

msk-donskaya-dmbelicheva-gw-1#sh ip ospf route
                                     ^
% Invalid input detected at '^' marker.

msk-donskaya-dmbelicheva-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
S       10.130.0.0/16 [1/0] via 10.128.255.6
     198.51.100.0/24 is variably subnetted, 2 subnets, 2 masks
C       198.51.100.0/28 is directly connected, FastEthernet0/1.4
L       198.51.100.2/32 is directly connected, FastEthernet0/1.4
S*   0.0.0.0/0 [1/0] via 198.51.100.1
```

```
Password:
msk-q42-dmbelicheva-gw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-q42-dmbelicheva-gw-1(config)#router ospf 1
msk-q42-dmbelicheva-gw-1(config-router)#router-id 10.128.254.2
msk-q42-dmbelicheva-gw-1(config-router)#network 10.0.0.0 0.255.255.255 area 0
msk-q42-dmbelicheva-gw-1(config-router)#exit
msk-q42-dmbelicheva-gw-1(config)#^Z
msk-q42-dmbelicheva-gw-1#
%SYS-5-CONFIG_I: Configured from console by console
```

Рис. 4: Настройка маршрутизатора msk-q42-gw-1

```
msk-hostel-dmbelicheva-gw-1>en
Password:
msk-hostel-dmbelicheva-gw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-hostel-dmbelicheva-gw-1(config)#router ospf 1
msk-hostel-dmbelicheva-gw-1(config-router)#router id 10.128.254.3
                                           ^
% Invalid input detected at '^' marker.

msk-hostel-dmbelicheva-gw-1(config-router)#router-id 10.128.254.3
msk-hostel-dmbelicheva-gw-1(config-router)#network 10.0.0.0 0.255.255.255 area 0
msk-hostel-dmbelicheva-gw-1(config-router)#exit
msk-hostel-dmbelicheva-gw-1(config)#^Z
msk-hostel-dmbelicheva-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

msk-hostel-dmbelicheva-gw-1#wr mem
Building configuration...
```

Рис. 5: Настройка маршрутизирующего коммутатора msk-hostel-gw-1

Настройка OSPF

```
Password:
sch-sochi-dmbelicheva-gw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
sch-sochi-dmbelicheva-gw-1(config)#router ospf 1
sch-sochi-dmbelicheva-gw-1(config-router)#router-id 10.128.254.4
sch-sochi-dmbelicheva-gw-1(config-router)#network 10.0.0.0 0.255.255.255 area 0
sch-sochi-dmbelicheva-gw-1(config-router)#exit
sch-sochi-dmbelicheva-gw-1(config)#^Z
sch-sochi-dmbelicheva-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

sch-sochi-dmbelicheva-gw-1#wr mem
Building configuration...
```

Рис. 6: Настройка маршрутизатора sch-sochi-gw-1

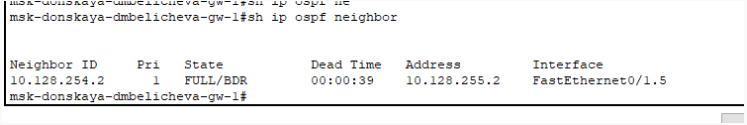
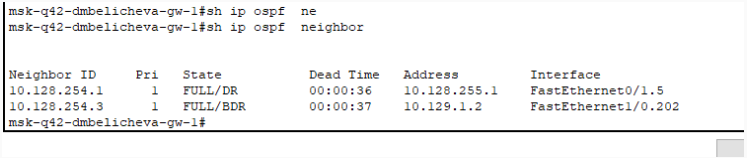


Рис. 7: Проверка состояния протокола OSPF на маршрутизаторе msk-donskaya-gw-1

```
msk-hostel-dmbelicheva-gw-1#sh ip ospf ne
msk-hostel-dmbelicheva-gw-1#sh ip ospf neighbor


Neighbor ID     Pri   State           Dead Time   Address         Interface
10.128.254.2      1   FULL/DR         00:00:39    10.129.1.1      Vlan202
msk-hostel-dmbelicheva-gw-1#
```

Рис. 8: Проверка состояния протокола OSPF на маршрутизаторе msk-hostel-gw-1



```
msk-q42-dmbelicheva-gw-1#sh ip ospf  ne
msk-q42-dmbelicheva-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
10.128.254.3      1   FULL/BDR        00:00:37    10.129.1.2      FastEthernet1/0.202
msk-q42-dmbelicheva-gw-1#
```

Рис. 9: Проверка состояния протокола OSPF на маршрутизаторе msk-q42-gw-1

Настройка OSPF

```
msk-q42-dmbelicheva-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, 15 subnets, 4 masks
O       10.128.0.0/24 [110/2] via 10.128.255.1, 00:04:35, FastEthernet0/1.5
O       10.128.1.0/24 [110/2] via 10.128.255.1, 00:04:35, FastEthernet0/1.5
O       10.128.3.0/24 [110/2] via 10.128.255.1, 00:04:35, FastEthernet0/1.5
O       10.128.4.0/24 [110/2] via 10.128.255.1, 00:04:35, FastEthernet0/1.5
O       10.128.5.0/24 [110/2] via 10.128.255.1, 00:04:35, FastEthernet0/1.5
O       10.128.6.0/24 [110/2] via 10.128.255.1, 00:04:35, 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, 00:04:35, 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
C       10.129.1.0/24 is directly connected, FastEthernet1/0.202
L       10.129.1.1/32 is directly connected, FastEthernet1/0.202
S       10.129.128.0/17 [1/0] via 10.129.1.2
O       10.129.128.0/24 [110/2] via 10.129.1.2, 00:03:40, FastEthernet1/0.202
S*   0.0.0.0/0 [1/0] via 10.128.255.1
```

Рис. 10: Проверка состояния протокола OSPF на маршрутизаторе msk-q42-gw-1

Настройка линка 42-й квартал–Сочи

```
provider-dmbelicheva-sw-1>en
Password:
provider-dmbelicheva-sw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
provider-dmbelicheva-sw-1(config)#vlan 7
provider-dmbelicheva-sw-1(config-vlan)#name q42-sochi
provider-dmbelicheva-sw-1(config-vlan)#int vlan7
provider-dmbelicheva-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-dmbelicheva-sw-1(config-if)#no shutdown
provider-dmbelicheva-sw-1(config-if)#exit
provider-dmbelicheva-sw-1(config)#^Z
provider-dmbelicheva-sw-1#
%SYS-5-CONFIG_I: Configured from console by console

provider-dmbelicheva-sw-1#wr mem
```

Рис. 11: Настройка интерфейсов коммутатора provider-sw-1

Настройка линка 42-й квартал–Сочи

```
msk-q42-dmbelicheva-gw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
msk-q42-dmbelicheva-gw-1(config)#int f0/1.7
msk-q42-dmbelicheva-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-dmbelicheva-gw-1(config-subif)#encapsulation dot1Q 7
msk-q42-dmbelicheva-gw-1(config-subif)#ip address 10.128.255.9 255.255.255.252
msk-q42-dmbelicheva-gw-1(config-subif)#description sochi
msk-q42-dmbelicheva-gw-1(config-subif)#exit
msk-q42-dmbelicheva-gw-1(config)#^Z
msk-q42-dmbelicheva-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

msk-q42-dmbelicheva-gw-1#wr mem
Building configuration...
```

Рис. 12: Настройка маршрутизатора msk-q42-gw-1

Настройка линка 42-й квартал–Сочи

```
Password:
sch-sochi-dmbelicheva-sw-1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
sch-sochi-dmbelicheva-sw-1(config)#vlan 7
sch-sochi-dmbelicheva-sw-1(config-vlan)#name q42-sochi
sch-sochi-dmbelicheva-sw-1(config-vlan)#exit
sch-sochi-dmbelicheva-sw-1(config)#int vlan7
sch-sochi-dmbelicheva-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
no shutdown
sch-sochi-dmbelicheva-sw-1(config-if)#no shutdown
sch-sochi-dmbelicheva-sw-1(config-if)#exit
sch-sochi-dmbelicheva-sw-1(config)#^Z
sch-sochi-dmbelicheva-sw-1#
%SYS-5-CONFIG_I: Configured from console by console

sch-sochi-dmbelicheva-sw-1#wr mem
Building configuration...
[OK]
sch-sochi-dmbelicheva-sw-1#
```

Рис. 13: Настройка коммутатора sch-sochi-sw-1

Настройка линка 42-й квартал–Сочи

```
sch-sochi-dmbelicheva-gw-1#sh ip ospf nei
sch-sochi-dmbelicheva-gw-1#sh ip ospf neighbor

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

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

sch-sochi-dmbelicheva-gw-1(config-subif)#encapsulation dot1Q 7
sch-sochi-dmbelicheva-gw-1(config-subif)#ip address 10.128.255.10 255.255.255.252
sch-sochi-dmbelicheva-gw-1(config-subif)#description q42
sch-sochi-dmbelicheva-gw-1(config-subif)#exit
sch-sochi-dmbelicheva-gw-1(config)#^Z
sch-sochi-dmbelicheva-gw-1#
%SYS-5-CONFIG_I: Configured from console by console

sch-sochi-dmbelicheva-gw-1#wr mem
Building configuration...
[OK]
```

Рис. 14: Настройка маршрутизатора sch-sochi-gw-1

Проверка настроек

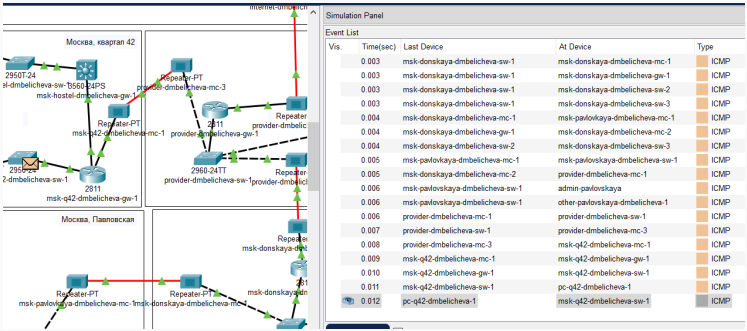


Рис. 15: Движение пакета ICMP при пересылке с администратора на ПК в 42 квартал в режиме симуляции

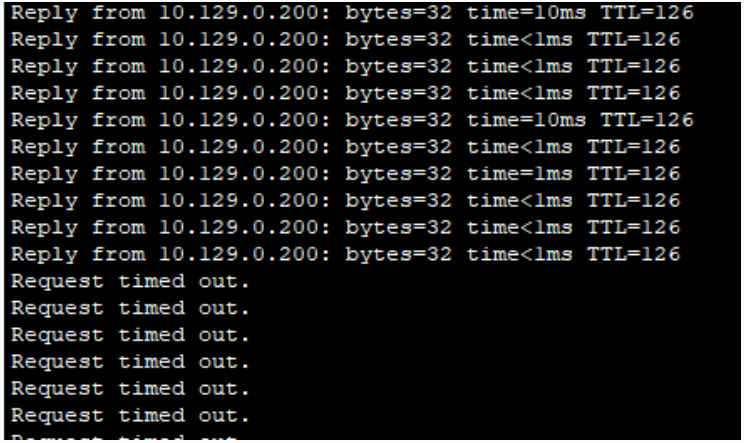


Рис. 16: Пинг не проходит

Выводы

В результате выполнения данной лабораторной я приобрела практические навыки по настройке динамической маршрутизации между территориями организации.