

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ
Федеральное государственное автономное образовательное учреждение
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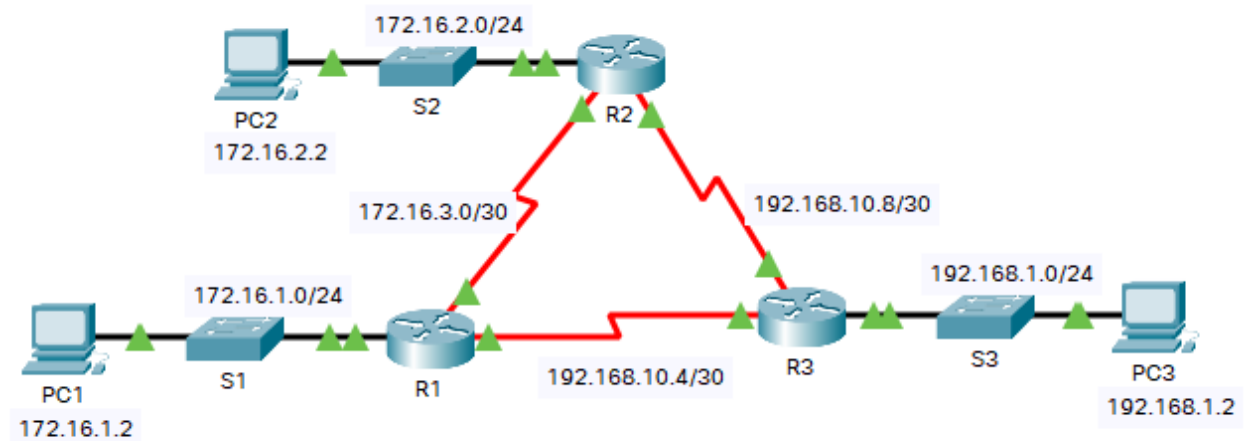
Configuring OSPFv2 in a Single Area

Отчет по лабораторной работе № 5
по дисциплине «Компьютерные сети»
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Симферополь, 2022

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	G0/0	172.16.1.1	255.255.255.0	N/A
	S0/0/0	172.16.3.1	255.255.255.252	N/A
	S0/0/1	192.168.10.5	255.255.255.252	N/A
R2	G0/0	172.16.2.1	255.255.255.0	N/A
	S0/0/0	172.16.3.2	255.255.255.252	N/A
	S0/0/1	192.168.10.9	255.255.255.252	N/A
R3	G0/0	192.168.1.1	255.255.255.0	N/A
	S0/0/0	192.168.10.6	255.255.255.252	N/A
	S0/0/1	192.168.10.10	255.255.255.252	N/A
PC1	NIC	172.16.1.2	255.255.255.0	172.16.1.1
PC2	NIC	172.16.2.2	255.255.255.0	172.16.2.1
PC3	NIC	192.168.1.2	255.255.255.0	192.168.1.1



Part 1: Configure OSPFv2 Routing

Step 1: Configure OSPF on the R1, R2 and R3.

Use the following requirements to configure OSPF routing on all three routers:

- Process ID 10
- Router ID for each router: R1 = 1.1.1.1; R2 = 2.2.2.2; R3 = 3.3.3.3
- Network address for each interface
- LAN interface set to passive (do not use the **default** keyword)

R1

```
R1>ena
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 10
R1(config-router)#router-id 1.1.1.1
R1(config-router)#network 172.16.1.0 0.0.0.255 area 0
R1(config-router)#network 172.16.3.0 0.0.0.3 area 0
R1(config-router)#network 192.168.10.4 0.0.0.3 area 0
R1(config-router)#pa
R1(config-router)#passive-interface gig
R1(config-router)#passive-interface gigabitEthernet 0/0
R1(config-router)#
```

R2

```
R2>ena
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#router ospf 10
R2(config-router)#router-id 10
      ^
% Invalid input detected at '^' marker.

R2(config-router)#router-id 2.2.2.2
R2(config-router)#network 172.16.2.0 0.0.0.255 area 0
R2(config-router)#network 192.168.10.8 0.0.0.3 area 0
R2(config-router)#network 172.16.3.0 0.0.0.3 area 0
R2(config-router)#
00:27:59: %OSPF-5-ADJCHG: Process 10, Nbr 1.1.1.1 on Serial0/0/0 from LOADING to FULL,
Loading Done

R2(config-router)#pas
R2(config-router)#passive-interface gig
R2(config-router)#passive-interface gigabitEthernet 0/0
R2(config-router)#
```

R3

```
R3>ena
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#router ospf 10
R3(config-router)#router-id 3.3.3.3
R3(config-router)#network 192.168.1.0 0.0.255 area 0
      ^
% Invalid input detected at '^' marker.

R3(config-router)#network 192.168.1.0 0.0.0.255 area 0
R3(config-router)#network 192.168.10.4 0.0.0.3 area 0
R3(config-router)#network 192.168.10.4 0.0.0.3 area 0
00:31:13: %OSPF-5-ADJCHG: Process 10, Nbr 1.1.1.1 on Serial0/0/0 from LOADING to FULL,
Loading Done

R3(config-router)#network 192.168.10.8 0.0.0.3 area 0
R3(config-router)#
00:31:38: %OSPF-5-ADJCHG: Process 10, Nbr 2.2.2.2 on Serial0/0/1 from LOADING to FULL,
Loading Done

R3(config-router)#pas
R3(config-router)#passive-interface gig
R3(config-router)#passive-interface gigabitEthernet 0/0
R3(config-router)#
```

Step 2: Verify OSPF routing is operational.

On each router, the routing table should now have a route to every network in the topology.

R1

```
R1#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 not set

    172.16.0.0/16 is variably subnetted, 5 subnets, 3 masks
C       172.16.1.0/24 is directly connected, GigabitEthernet0/0
L       172.16.1.1/32 is directly connected, GigabitEthernet0/0
O       172.16.2.0/24 [110/65] via 172.16.3.2, 00:05:28, Serial0/0/0
C       172.16.3.0/30 is directly connected, Serial0/0/0
L       172.16.3.1/32 is directly connected, Serial0/0/0
O       192.168.1.0/24 [110/65] via 192.168.10.6, 00:02:14, Serial0/0/1
    192.168.10.0/24 is variably subnetted, 3 subnets, 2 masks
C       192.168.10.4/30 is directly connected, Serial0/0/1
L       192.168.10.5/32 is directly connected, Serial0/0/1
O       192.168.10.8/30 [110/128] via 172.16.3.2, 00:01:54, Serial0/0/0
           [110/128] via 192.168.10.6, 00:01:54, Serial0/0/1
```

R2

```
R2#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 not set

    172.16.0.0/16 is variably subnetted, 5 subnets, 3 masks
O       172.16.1.0/24 [110/65] via 172.16.3.1, 00:06:29, Serial0/0/0
C       172.16.2.0/24 is directly connected, GigabitEthernet0/0
L       172.16.2.1/32 is directly connected, GigabitEthernet0/0
C       172.16.3.0/30 is directly connected, Serial0/0/0
L       172.16.3.2/32 is directly connected, Serial0/0/0
O       192.168.1.0/24 [110/65] via 192.168.10.10, 00:02:55, Serial0/0/1
    192.168.10.0/24 is variably subnetted, 3 subnets, 2 masks
O       192.168.10.4/30 [110/128] via 192.168.10.10, 00:02:55, Serial0/0/1
           [110/128] via 172.16.3.1, 00:02:55, Serial0/0/0
C       192.168.10.8/30 is directly connected, Serial0/0/1
L       192.168.10.9/32 is directly connected, Serial0/0/1
```

R3

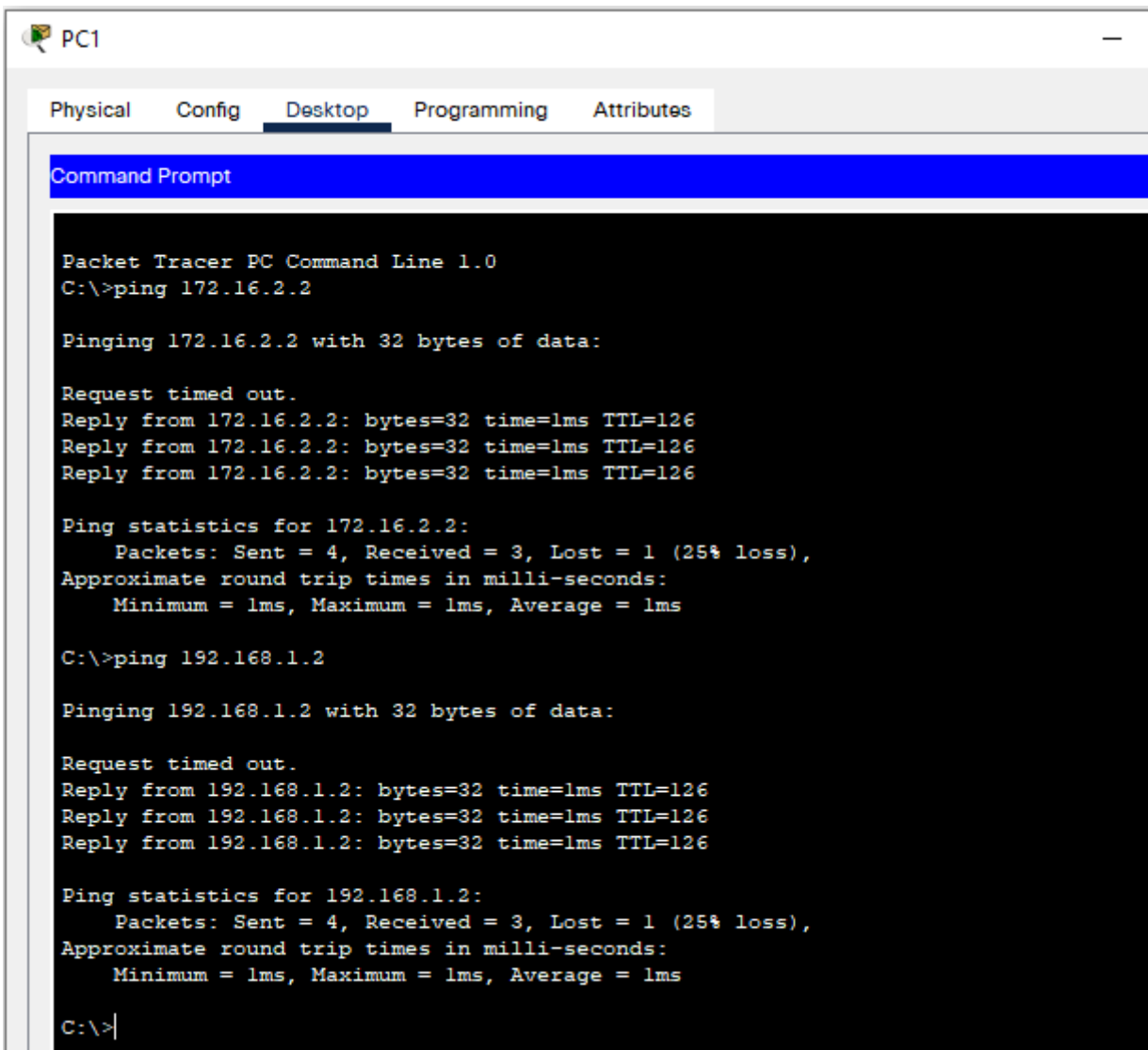
```
R3#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       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 not set

    172.16.0.0/16 is variably subnetted, 3 subnets, 2 masks
O       172.16.1.0/24 [110/65] via 192.168.10.5, 00:03:36, Serial0/0/0
O       172.16.2.0/24 [110/65] via 192.168.10.9, 00:03:11, Serial0/0/1
O       172.16.3.0/30 [110/128] via 192.168.10.5, 00:03:11, Serial0/0/0
           [110/128] via 192.168.10.9, 00:03:11, Serial0/0/1
    192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, GigabitEthernet0/0
L       192.168.1.1/32 is directly connected, GigabitEthernet0/0
    192.168.10.0/24 is variably subnetted, 4 subnets, 2 masks
C       192.168.10.4/30 is directly connected, Serial0/0/0
L       192.168.10.6/32 is directly connected, Serial0/0/0
C       192.168.10.8/30 is directly connected, Serial0/0/1
L       192.168.10.10/32 is directly connected, Serial0/0/1
```

Part 2: Verify the Configurations

Each PC should be able to ping the other two PCs. If not, check your configurations.



The screenshot shows the Packet Tracer interface for PC1. The 'Desktop' tab is selected, displaying a 'Command Prompt' window. The window title is 'Packet Tracer PC Command Line 1.0'. The command prompt shows the execution of two ping commands. The first command is 'C:\>ping 172.16.2.2', which results in a 25% loss (1 out of 4 packets). The second command is 'C:\>ping 192.168.1.2', which also results in a 25% loss (1 out of 4 packets). Both ping operations show a 'Request timed out' message followed by three successful replies with 32 bytes of data, 1ms time, and a TTL of 126. The statistics for both ping operations show 'Packets: Sent = 4, Received = 3, Lost = 1 (25% loss)' and 'Approximate round trip times in milli-seconds: Minimum = 1ms, Maximum = 1ms, Average = 1ms'. The command prompt ends with 'C:\>|'.

```
Packet Tracer PC Command Line 1.0
C:\>ping 172.16.2.2

Pinging 172.16.2.2 with 32 bytes of data:

Request timed out.
Reply from 172.16.2.2: bytes=32 time=1ms TTL=126
Reply from 172.16.2.2: bytes=32 time=1ms TTL=126
Reply from 172.16.2.2: bytes=32 time=1ms TTL=126

Ping statistics for 172.16.2.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

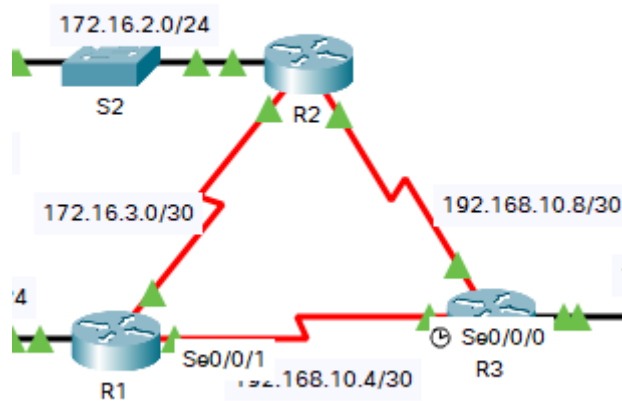
C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

Request timed out.
Reply from 192.168.1.2: bytes=32 time=1ms TTL=126
Reply from 192.168.1.2: bytes=32 time=1ms TTL=126
Reply from 192.168.1.2: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

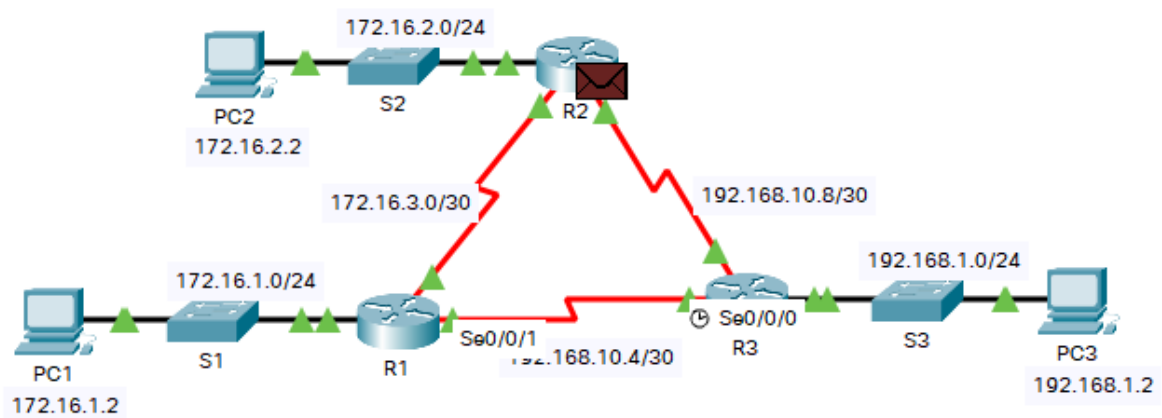
C:\>|
```



Чтобы пакеты проходили от R1 в сеть 192.168.1.0 через R2, а не через R3 нужно увеличить метрику на Se0/0/1

```
R1(config-if)#ip ospf cost 1000
R1(config-if)#
```

Пустив пакет в симуляторе, видим, что он пошел через R2



Нужно отметить, что обратно он возвращается через S0/0/0 так как на маршрутизаторе R3 метрика на это шлюзе осталась та же (64)

