
Компьютерные сети. Обучение в записи

Урок 5. Семинар. Технология Ethernet. Протокол IP

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Задача 1. Работа со статическими маршрутами и IP-сетями

Задача 1. Работа со статическими маршрутами и IP сетями.

Собрать сеть по схеме ниже.

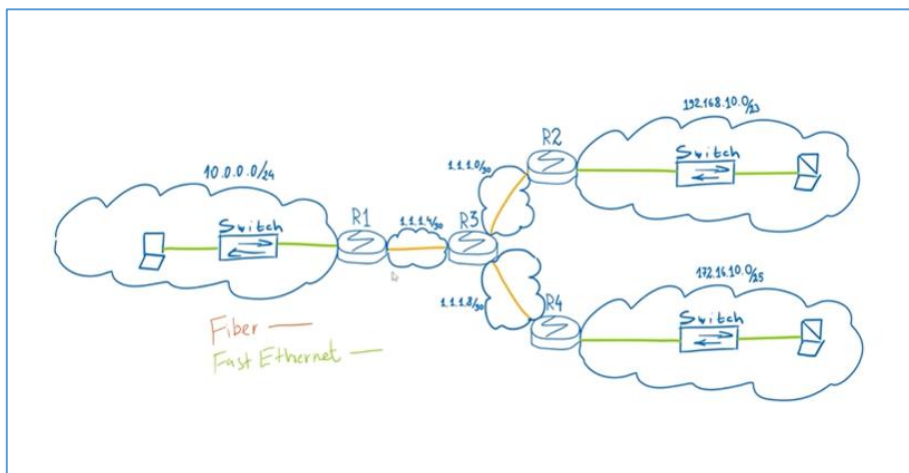
(https://disk.yandex.ru/i/OLDO0-t_pURhVA - рисунок схемы)

Необходимо связать только сети 192.168.10.0/23, 10.0.0.0/24 и 172.16.10.0/25 между собой, чтобы компы пинговали друг друга. Показать успешный пинг.

1. Выберите роутеры, чтобы можно было добавлять SPF модули в R2, R3, R4. Соедините оптикой, как на схеме.
2. Поднимите интерфейсы и настройте IP адреса.
3. Пропингуйте соседние устройства.
4. Пропишите маршруты.

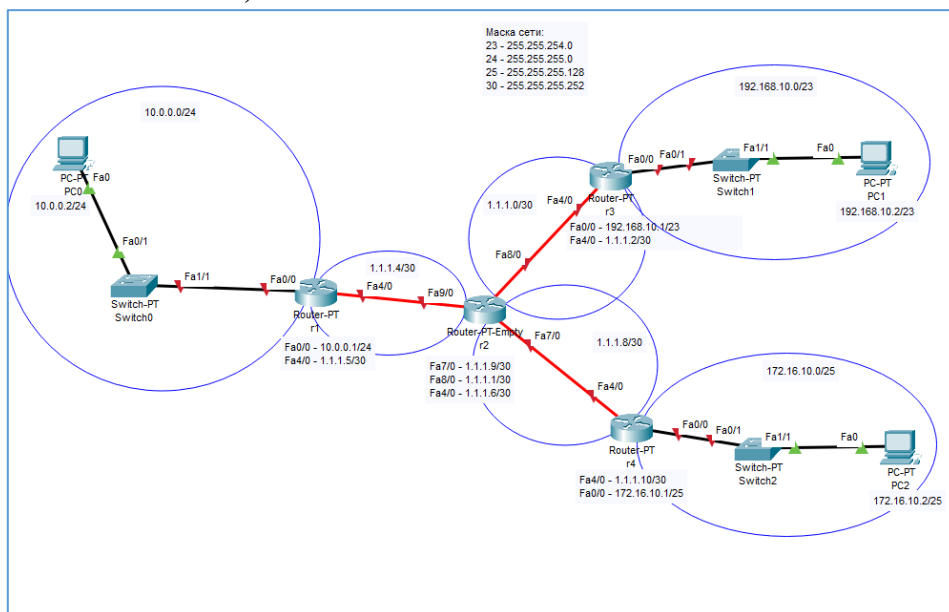


Поставьте видео на паузу и выполните задание



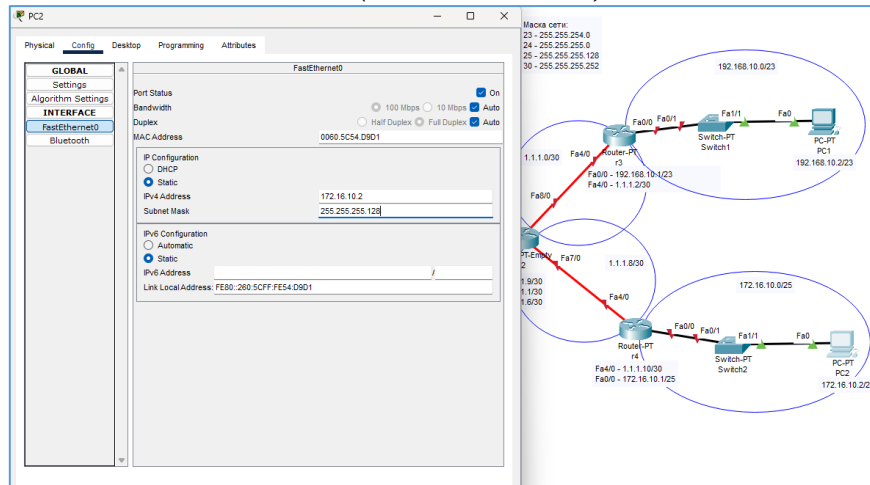
Ход выполнения задания 1:

Задание 1: Выбрать роутеры, чтобы можно было добавлять SFP модули в R2, R3, R4. Соединить оптикой, как на схеме.



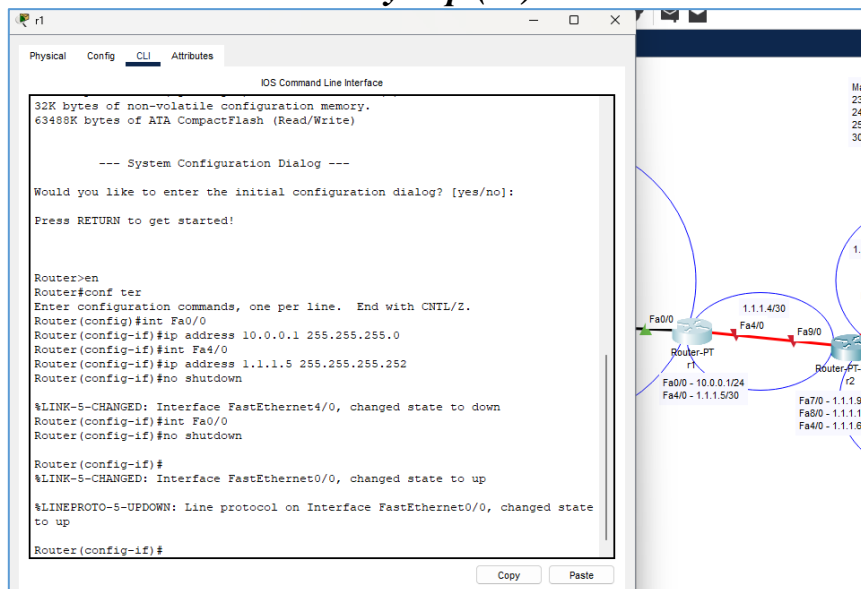
Задание 2: Поднять интерфейсы и настроить IP-адреса.

PC2 (172.16.10.2/25)

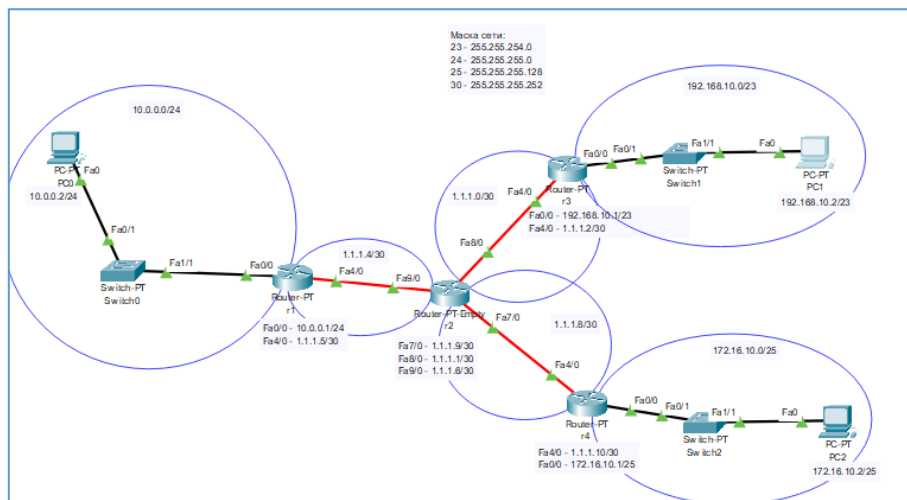


и т.д. ...

Роутер (r1)



и т.д. ...



Задание 3: Пропинговать соседние устройства.

PC0

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time<1ms TTL=255
Reply from 10.0.0.1: bytes=32 time<1ms TTL=255
Reply from 10.0.0.1: bytes=32 time=11ms TTL=255
Reply from 10.0.0.1: bytes=32 time=1ms TTL=255

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 11ms, Average = 3ms

C:\>
```

Network diagram for PC0: PC0 (10.0.2/24) is connected to Switch0 (Fa0/1) via Fa0. Switch0 (Fa1/1) is connected to Router-PT r1 (Fa0/0) via Fa1. Router-PT r1 (Fa4/0) is connected to PC1 (1.1.5/30) via Fa4. PC1 is in the 10.0.0.0/24 network.

PC1

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

Reply from 192.168.10.1: bytes=32 time<1ms TTL=255
Reply from 192.168.10.1: bytes=32 time<1ms TTL=255
Reply from 192.168.10.1: bytes=32 time<1ms TTL=255
Reply from 192.168.10.1: bytes=32 time=1ms TTL=255

Ping statistics for 192.168.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

Network diagram for PC1: PC1 (192.168.10.2/23) is connected to Switch1 (Fa1/1) via Fa0. Switch1 (Fa0/1) is connected to Router-PT r3 (Fa0/0) via Fa0. Router-PT r3 (Fa4/0) is connected to PC2 (1.1.2/30) via Fa4. PC2 is in the 192.168.10.0/23 network.

PC2

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.16.10.1

Pinging 172.16.10.1 with 32 bytes of data:

Reply from 172.16.10.1: bytes=32 time<1ms TTL=255
Reply from 172.16.10.1: bytes=32 time<1ms TTL=255
Reply from 172.16.10.1: bytes=32 time<1ms TTL=255
Reply from 172.16.10.1: bytes=32 time<1ms TTL=255

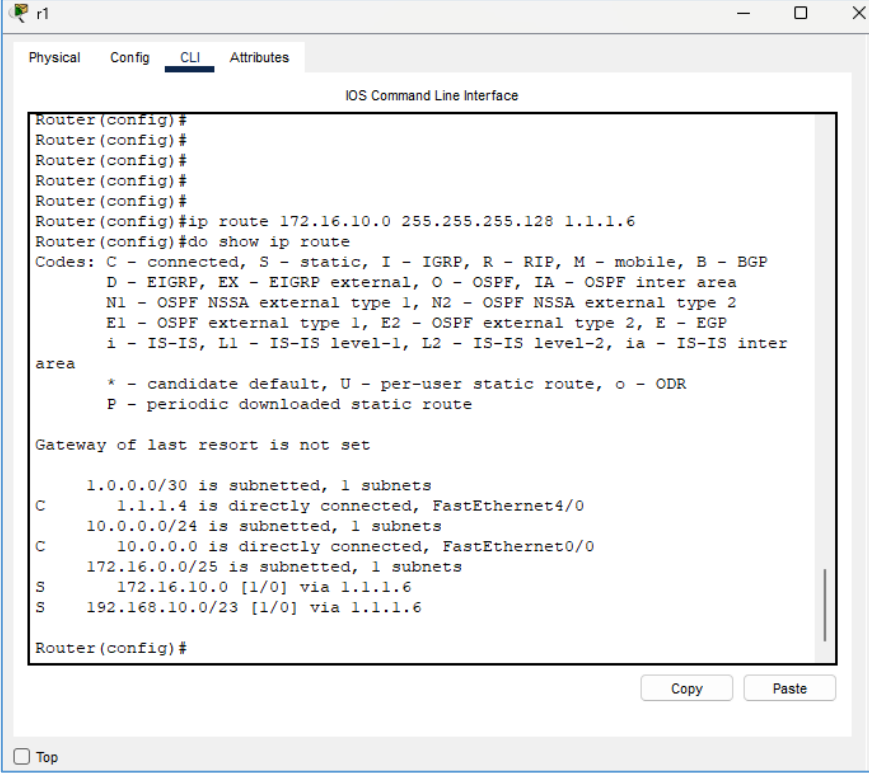
Ping statistics for 172.16.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Network diagram for PC2: PC2 (172.16.10.2/25) is connected to Switch2 (Fa1/1) via Fa0. Switch2 (Fa0/1) is connected to Router-PT r4 (Fa0/0) via Fa0. Router-PT r4 (Fa4/0) is connected to PC3 (1.1.10/30) via Fa4. PC3 is in the 172.16.10.0/25 network.

Задание 4: Прописать маршруты.

Роутер (r1)



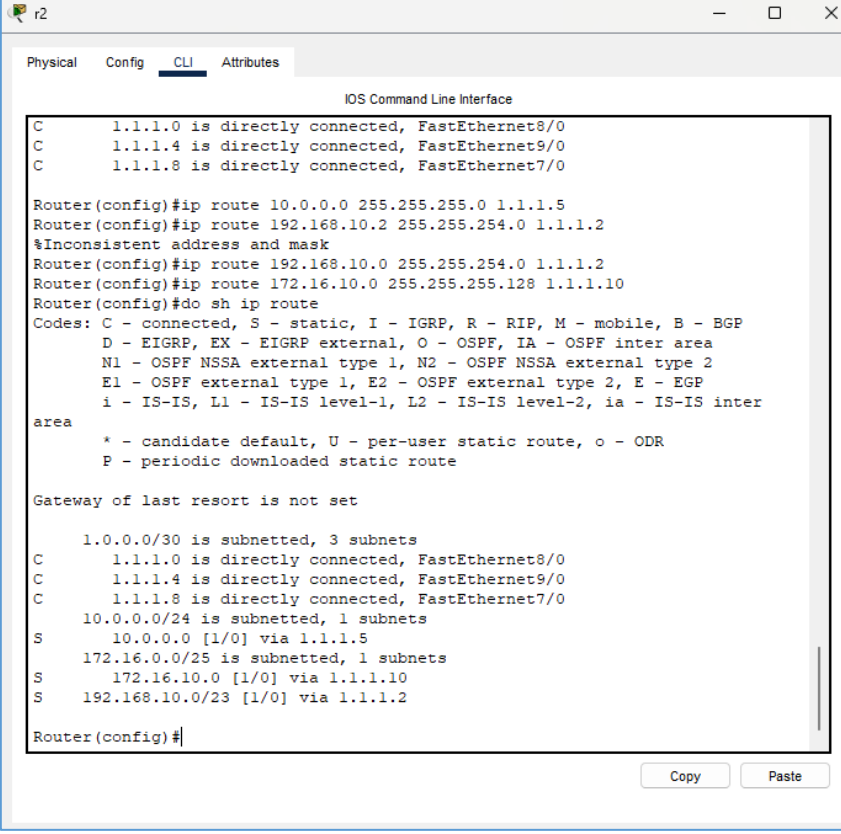
```
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#ip route 172.16.10.0 255.255.255.128 1.1.1.6
Router(config)#do show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       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 not set

      1.0.0.0/30 is subnetted, 1 subnets
C       1.1.1.4 is directly connected, FastEthernet4/0
      10.0.0.0/24 is subnetted, 1 subnets
C       10.0.0.0 is directly connected, FastEthernet0/0
      172.16.0.0/25 is subnetted, 1 subnets
S       172.16.10.0 [1/0] via 1.1.1.6
S      192.168.10.0/23 [1/0] via 1.1.1.6

Router(config)#
```

Роутер (r2)



```
C       1.1.1.0 is directly connected, FastEthernet8/0
C       1.1.1.4 is directly connected, FastEthernet9/0
C       1.1.1.8 is directly connected, FastEthernet7/0

Router(config)#ip route 10.0.0.0 255.255.255.0 1.1.1.5
Router(config)#ip route 192.168.10.2 255.255.254.0 1.1.1.2
%Inconsistent address and mask
Router(config)#ip route 192.168.10.0 255.255.254.0 1.1.1.2
Router(config)#ip route 172.16.10.0 255.255.255.128 1.1.1.10
Router(config)#do 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

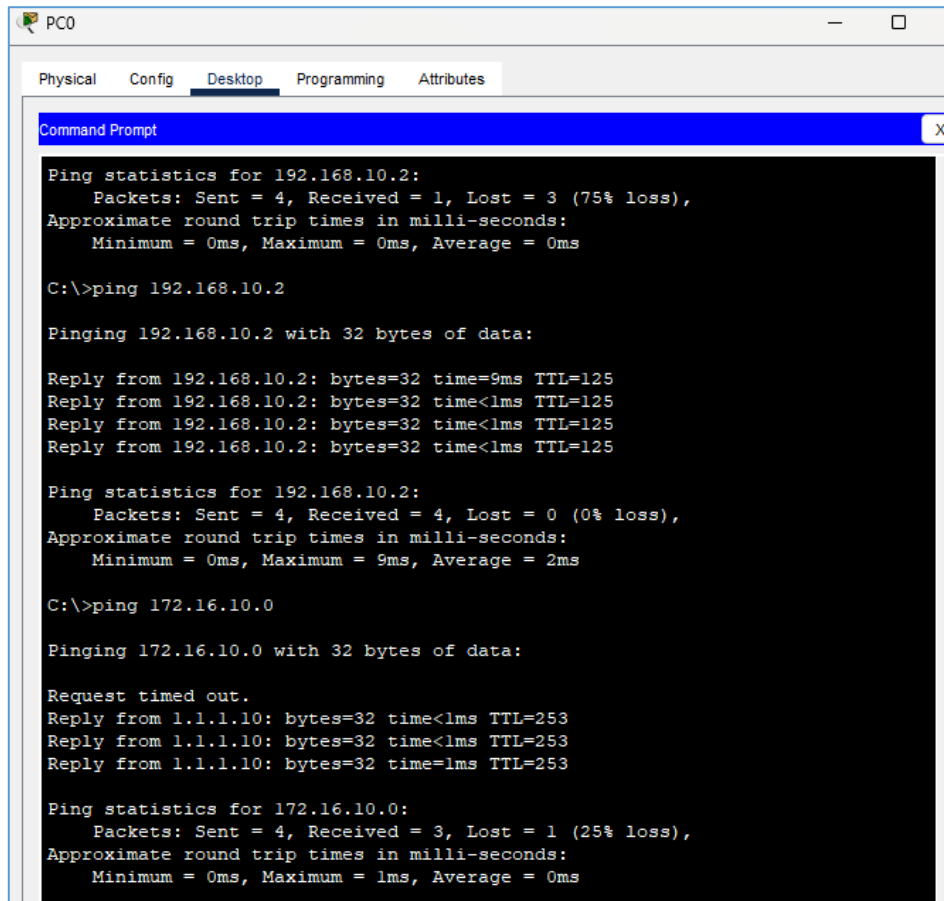
Gateway of last resort is not set

      1.0.0.0/30 is subnetted, 3 subnets
C       1.1.1.0 is directly connected, FastEthernet8/0
C       1.1.1.4 is directly connected, FastEthernet9/0
C       1.1.1.8 is directly connected, FastEthernet7/0
      10.0.0.0/24 is subnetted, 1 subnets
S       10.0.0.0 [1/0] via 1.1.1.5
      172.16.0.0/25 is subnetted, 1 subnets
S       172.16.10.0 [1/0] via 1.1.1.10
S      192.168.10.0/23 [1/0] via 1.1.1.2

Router(config)#
```

и т.д. ...

PING



PC0

Physical Config Desktop Programming Attributes

Command Prompt

```
Ping statistics for 192.168.10.2:
    Packets: Sent = 4, Received = 1, Lost = 3 (75% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.10.2

Pinging 192.168.10.2 with 32 bytes of data:

Reply from 192.168.10.2: bytes=32 time=9ms TTL=125
Reply from 192.168.10.2: bytes=32 time<1ms TTL=125
Reply from 192.168.10.2: bytes=32 time<1ms TTL=125
Reply from 192.168.10.2: bytes=32 time<1ms TTL=125

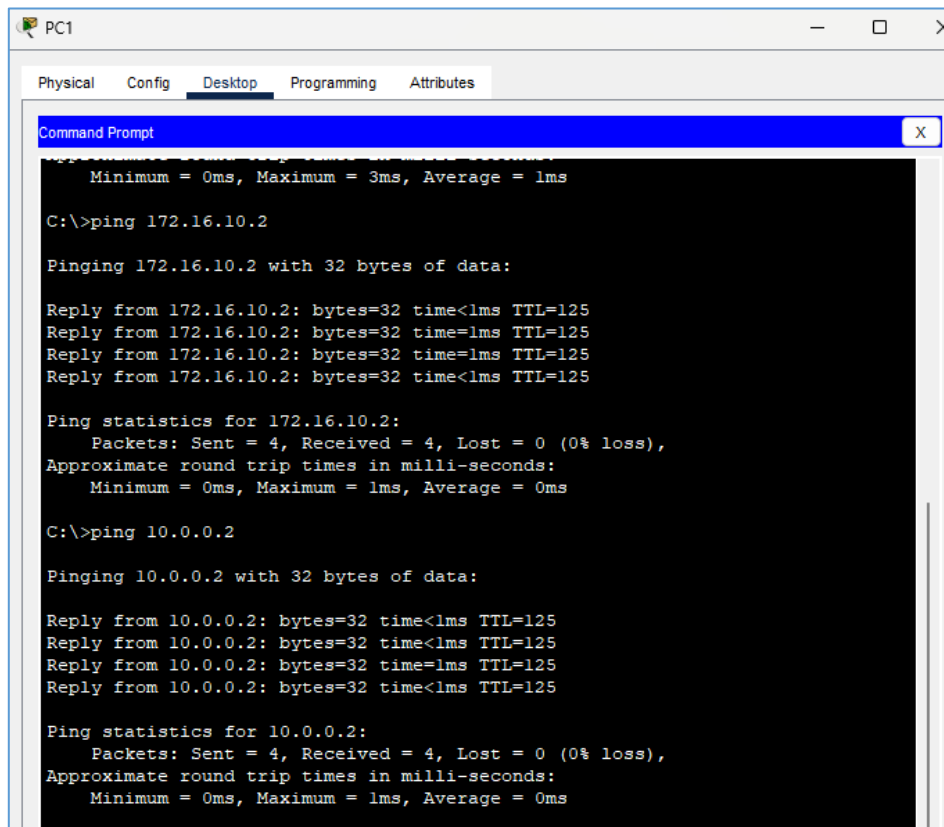
Ping statistics for 192.168.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 9ms, Average = 2ms

C:\>ping 172.16.10.0

Pinging 172.16.10.0 with 32 bytes of data:

Request timed out.
Reply from 1.1.1.10: bytes=32 time<1ms TTL=253
Reply from 1.1.1.10: bytes=32 time<1ms TTL=253
Reply from 1.1.1.10: bytes=32 time=1ms TTL=253

Ping statistics for 172.16.10.0:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```



PC1

Physical Config Desktop Programming Attributes

Command Prompt

```
Minimum = 0ms, Maximum = 3ms, Average = 1ms

C:\>ping 172.16.10.2

Pinging 172.16.10.2 with 32 bytes of data:

Reply from 172.16.10.2: bytes=32 time<1ms TTL=125
Reply from 172.16.10.2: bytes=32 time=1ms TTL=125
Reply from 172.16.10.2: bytes=32 time=1ms TTL=125
Reply from 172.16.10.2: bytes=32 time<1ms TTL=125

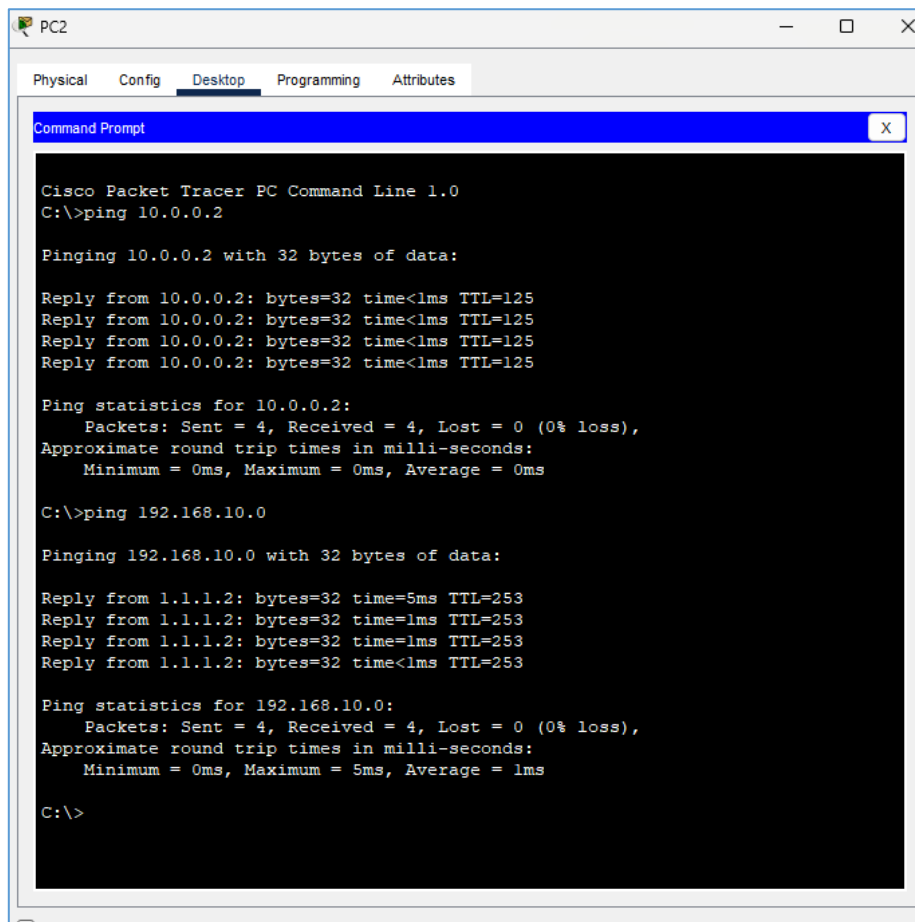
Ping statistics for 172.16.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time<1ms TTL=125
Reply from 10.0.0.2: bytes=32 time<1ms TTL=125
Reply from 10.0.0.2: bytes=32 time=1ms TTL=125
Reply from 10.0.0.2: bytes=32 time<1ms TTL=125

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

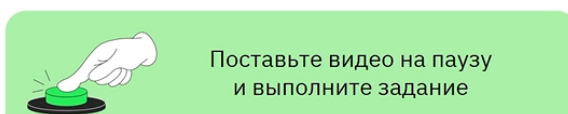


Задача 2. Работа со статическими маршрутами и IP-сетями (продолжение)

Задача 2. Работа со статическими маршрутами и IP сетями. Продолжение

Убедитесь, что из сетей 192.168.10.0/23, 10.0.0.0/24 и 172.16.10.0/25 нет пинга до сетей 1.1.1.X (только к тем, которые не являются Connected к ближайшим роутерам).

Усложните схему связности, сделав так, чтобы эти сети были доступны.



Ход выполнения задания 2:

Задание 1: Проверка отсутствия ping до сетей 1.1.1.X.

```
PC0
Physical Config Desktop Programming Attributes
Command Prompt
Reply from 1.1.1.10: bytes=32 time<1ms TTL=253
Reply from 1.1.1.10: bytes=32 time<1ms TTL=253
Reply from 1.1.1.10: bytes=32 time=1ms TTL=253

Ping statistics for 172.16.10.0:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 1.1.1.2

Pinging 1.1.1.2 with 32 bytes of data:

Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.

Ping statistics for 1.1.1.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 1.1.1.10

Pinging 1.1.1.10 with 32 bytes of data:

Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Request timed out.
Reply from 10.0.0.1: Destination host unreachable.

Ping statistics for 1.1.1.10:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```


PC1

Physical Config Desktop Programming Attributes

Command Prompt

```
C:\>ping 1.1.1.5

Pinging 1.1.1.5 with 32 bytes of data:

Reply from 192.168.10.1: Destination host unreachable.
Request timed out.
Reply from 192.168.10.1: Destination host unreachable.
Reply from 192.168.10.1: Destination host unreachable.

Ping statistics for 1.1.1.5:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 1.1.1.10

Pinging 1.1.1.10 with 32 bytes of data:

Reply from 192.168.10.1: Destination host unreachable.
Reply from 192.168.10.1: Destination host unreachable.
Reply from 192.168.10.1: Destination host unreachable.
Reply from 192.168.10.1: Destination host unreachable.

Ping statistics for 1.1.1.10:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

PC2

Physical Config Desktop Programming Attributes

Command Prompt

```
C:\>ping 1.1.1.5

Pinging 1.1.1.5 with 32 bytes of data:

Reply from 172.16.10.1: Destination host unreachable.
Reply from 172.16.10.1: Destination host unreachable.
Request timed out.
Reply from 172.16.10.1: Destination host unreachable.

Ping statistics for 1.1.1.5:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 1.1.1.2

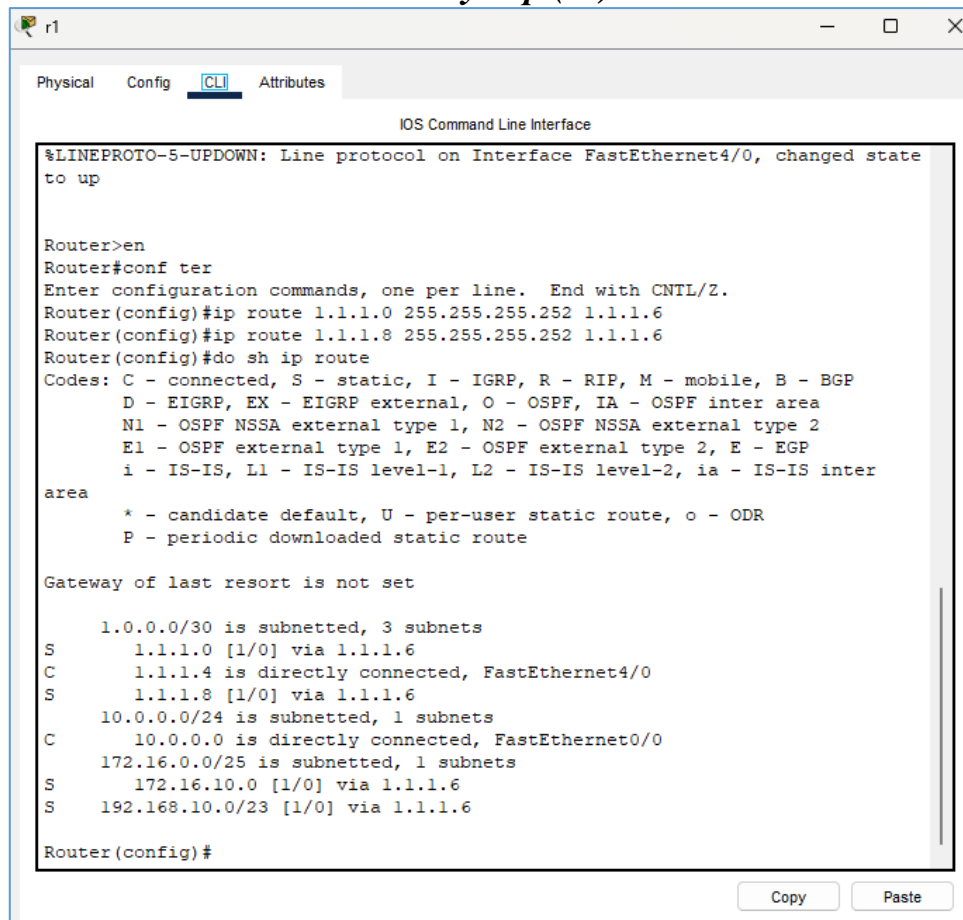
Pinging 1.1.1.2 with 32 bytes of data:

Reply from 172.16.10.1: Destination host unreachable.
Reply from 172.16.10.1: Destination host unreachable.
Reply from 172.16.10.1: Destination host unreachable.
Request timed out.

Ping statistics for 1.1.1.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Задание 2: Прописать маршруты.

Роутер (r1)



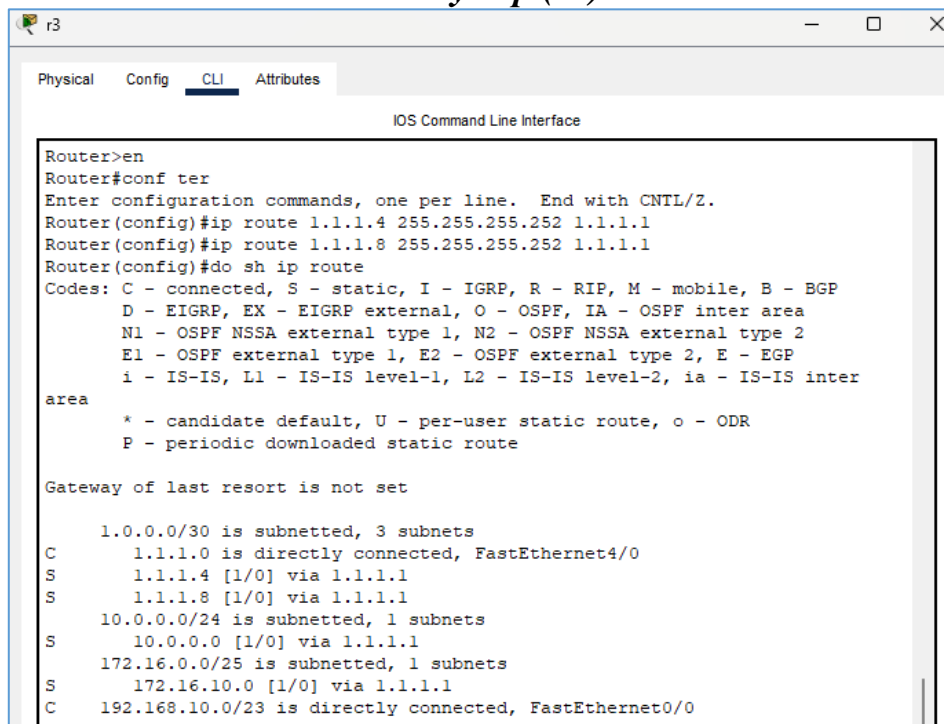
```
Router>en
Router#conf ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 1.1.1.0 255.255.255.252 1.1.1.6
Router(config)#ip route 1.1.1.8 255.255.255.252 1.1.1.6
Router(config)#do sh ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - 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 not set

      1.0.0.0/30 is subnetted, 3 subnets
S       1.1.1.0 [1/0] via 1.1.1.6
C       1.1.1.4 is directly connected, FastEthernet4/0
S       1.1.1.8 [1/0] via 1.1.1.6
      10.0.0.0/24 is subnetted, 1 subnets
C       10.0.0.0 is directly connected, FastEthernet0/0
      172.16.0.0/25 is subnetted, 1 subnets
S       172.16.10.0 [1/0] via 1.1.1.6
S       192.168.10.0/23 [1/0] via 1.1.1.6

Router(config)#
```

Роутер (r3)

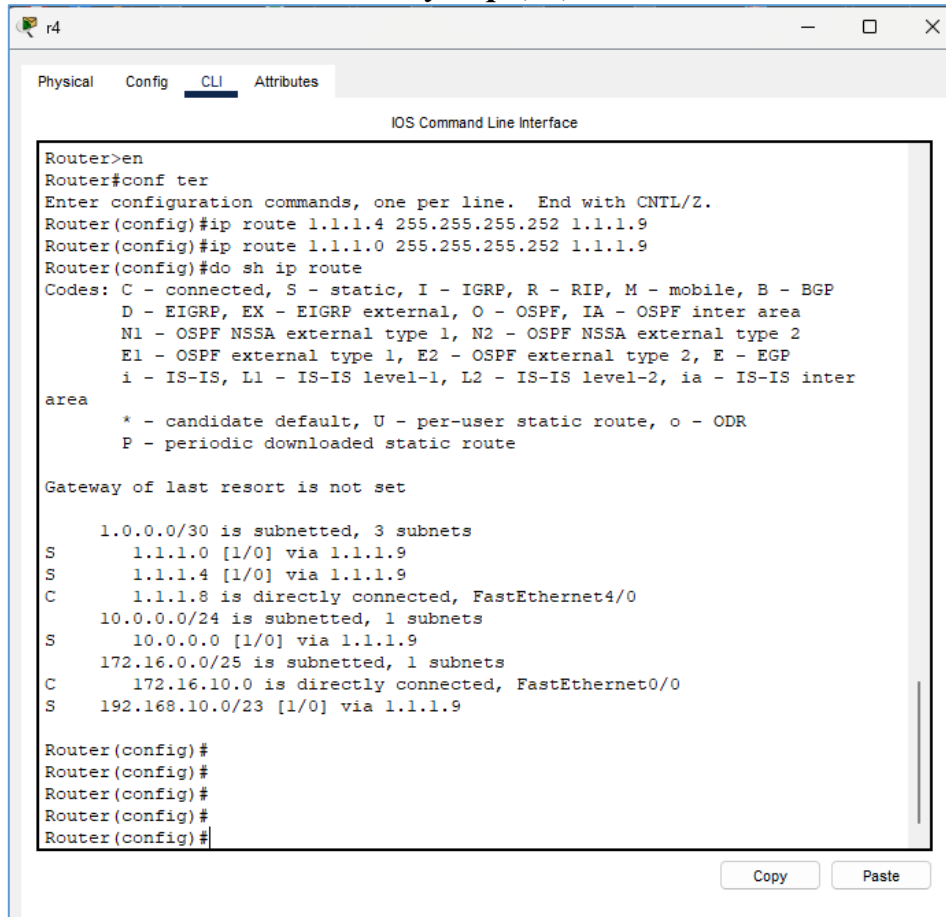


```
Router>en
Router#conf ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 1.1.1.4 255.255.255.252 1.1.1.1
Router(config)#ip route 1.1.1.8 255.255.255.252 1.1.1.1
Router(config)#do sh ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - 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 not set

      1.0.0.0/30 is subnetted, 3 subnets
C       1.1.1.0 is directly connected, FastEthernet4/0
S       1.1.1.4 [1/0] via 1.1.1.1
S       1.1.1.8 [1/0] via 1.1.1.1
      10.0.0.0/24 is subnetted, 1 subnets
S       10.0.0.0 [1/0] via 1.1.1.1
      172.16.0.0/25 is subnetted, 1 subnets
S       172.16.10.0 [1/0] via 1.1.1.1
C       192.168.10.0/23 is directly connected, FastEthernet0/0
```

Роутер (r4)



The screenshot shows a window titled 'r4' with tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, displaying the 'IOS Command Line Interface'. The user has entered the following commands:

```
Router>en
Router#conf ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 1.1.1.4 255.255.255.252 1.1.1.9
Router(config)#ip route 1.1.1.0 255.255.255.252 1.1.1.9
Router(config)#do sh ip route
```

The output shows the routing table with various codes and a summary of the gateway of last resort. The codes are: 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. The gateway of last resort is not set. The routing table shows the following entries:

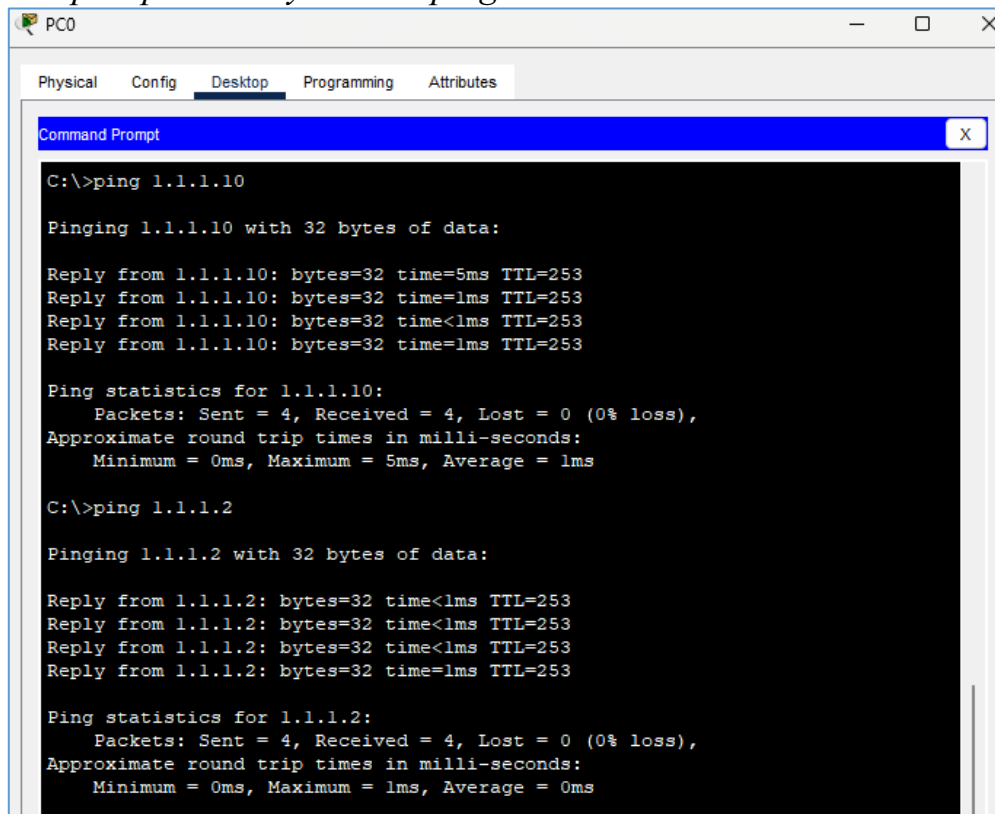
```
1.0.0.0/30 is subnetted, 3 subnets
S    1.1.1.0 [1/0] via 1.1.1.9
S    1.1.1.4 [1/0] via 1.1.1.9
C    1.1.1.8 is directly connected, FastEthernet4/0
10.0.0.0/24 is subnetted, 1 subnets
S    10.0.0.0 [1/0] via 1.1.1.9
172.16.0.0/25 is subnetted, 1 subnets
C    172.16.10.0 is directly connected, FastEthernet0/0
S    192.168.10.0/23 [1/0] via 1.1.1.9
```

The user has then entered the following commands:

```
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
```

Buttons for 'Copy' and 'Paste' are visible at the bottom right of the CLI window.

Задание 3: Проверка доступности ring до сетей 1.1.1.X.



The screenshot shows a window titled 'PC0' with tabs for Physical, Config, Desktop, Programming, and Attributes. The Desktop tab is active, displaying a 'Command Prompt' window. The user has entered the following commands:

```
C:\>ping 1.1.1.10

Pinging 1.1.1.10 with 32 bytes of data:

Reply from 1.1.1.10: bytes=32 time=5ms TTL=253
Reply from 1.1.1.10: bytes=32 time=1ms TTL=253
Reply from 1.1.1.10: bytes=32 time<1ms TTL=253
Reply from 1.1.1.10: bytes=32 time=1ms TTL=253

Ping statistics for 1.1.1.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 5ms, Average = 1ms

C:\>ping 1.1.1.2

Pinging 1.1.1.2 with 32 bytes of data:

Reply from 1.1.1.2: bytes=32 time<1ms TTL=253
Reply from 1.1.1.2: bytes=32 time<1ms TTL=253
Reply from 1.1.1.2: bytes=32 time<1ms TTL=253
Reply from 1.1.1.2: bytes=32 time=1ms TTL=253

Ping statistics for 1.1.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

PC1

Physical Config Desktop Programming Attributes

Command Prompt

```
C:\>
C:\>ping 1.1.1.10

Pinging 1.1.1.10 with 32 bytes of data:

Reply from 1.1.1.10: bytes=32 time=6ms TTL=253
Reply from 1.1.1.10: bytes=32 time<1ms TTL=253
Reply from 1.1.1.10: bytes=32 time<1ms TTL=253
Reply from 1.1.1.10: bytes=32 time<1ms TTL=253

Ping statistics for 1.1.1.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 6ms, Average = 1ms

C:\>ping 1.1.1.5

Pinging 1.1.1.5 with 32 bytes of data:

Reply from 1.1.1.5: bytes=32 time<1ms TTL=253
Reply from 1.1.1.5: bytes=32 time<1ms TTL=253
Reply from 1.1.1.5: bytes=32 time=2ms TTL=253
Reply from 1.1.1.5: bytes=32 time=2ms TTL=253

Ping statistics for 1.1.1.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 1ms
```

PC2

Physical Config Desktop Programming Attributes

Command Prompt

```
C:\>
C:\>ping 1.1.1.2

Pinging 1.1.1.2 with 32 bytes of data:

Reply from 1.1.1.2: bytes=32 time<1ms TTL=253
Reply from 1.1.1.2: bytes=32 time=2ms TTL=253
Reply from 1.1.1.2: bytes=32 time<1ms TTL=253
Reply from 1.1.1.2: bytes=32 time<1ms TTL=253

Ping statistics for 1.1.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\>ping 1.1.1.5

Pinging 1.1.1.5 with 32 bytes of data:

Reply from 1.1.1.5: bytes=32 time<1ms TTL=253
Reply from 1.1.1.5: bytes=32 time<1ms TTL=253
Reply from 1.1.1.5: bytes=32 time<1ms TTL=253
Reply from 1.1.1.5: bytes=32 time=1ms TTL=253

Ping statistics for 1.1.1.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
```

Домашнее задание

Домашнее задание

Условие:

1. Усложняем сеть из предыдущего домашнего задания
Используя только статическую маршрутизацию связать сеть компов и сервера

2. Проверить работоспособность сети командой ping с компов до сервера и обратно

3. Изучить получившиеся таблицы маршрутизации

4. Попрактиковаться в использовании команды tracer

Скинуть скриншоты с успешным трейсом между сетями - от компа до сервера.



Урок 5. Семинар. Технология Ethernet. Протокол IP

1. Усложняем сеть из предыдущего домашнего задания. Используя только статическую маршрутизацию, **связать сеть компов и сервера**.

2. Проверить работоспособность сети командой ping **с компов до сервера и обратно**.

2.1* Попробовать настроить статику так, чтобы пинговались все интерфейсы отовсюду.

3. Изучить получившиеся таблицы маршрутизации.

4. Попрактиковаться в использовании команды tracer.

5**. Настроить loop back интерфейсы, статику до них и они тоже должны пинговаться
(Задание со * и ** являются заданиями с повышенной сложностью. Если они не выполнены, это не влияет на оценку).

Скинуть скриншоты с успешным трейсом между сетями (если сделан только п.2 то скрин трейса от компа до сервера, если сделан п.2.1 то добавьте скрин трейса от компа до промежуточных сетей, которые лежат между компом и сервером).

Ход выполнения домашнего задания:

Задание 1: Используя только статическую маршрутизацию, связать сеть компов и сервера.

Проверка отсутствия ping

```
10.0.0.10/8
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.17.255.132

Pinging 172.17.255.132 with 32 bytes of data:

Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Request timed out.
Reply from 10.0.0.1: Destination host unreachable.

Ping statistics for 172.17.255.132:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Настройка роутера (r1)

```
r1
Physical Config CLI Attributes
IOS Command Line Interface

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

Router>en
Router#conf ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip address 172.17.0.0 255.255.0.0 192.168.0.1
Router(config)#ip route 172.17.0.0 255.255.0.0 192.168.0.1
Router(config)#do 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 not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
S    172.17.0.0/16 [1/0] via 192.168.0.1
C    192.168.0.0/24 is directly connected, FastEthernet0/1
```

Настройка роутера (r2)

```
r2
Physical Config CLI Attributes
IOS Command Line Interface

Router>en
Router#conf ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 172.17.0.0 255.255.0.0 172.18.0.2
Router(config)#ip route 10.0.0.0 255.0.0.0 192.168.0.2

r2
Physical Config CLI Attributes
IOS Command Line Interface

Router(config)#do 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 not set

S    10.0.0.0/8 [1/0] via 192.168.0.2
S    172.17.0.0/16 [1/0] via 172.18.0.2
C    172.18.0.0/16 is directly connected, FastEthernet0/1
C    192.168.0.0/24 is directly connected, FastEthernet0/0
C    192.168.4.0/24 is directly connected, FastEthernet1/0
C    192.168.20.0/24 is directly connected, FastEthernet1/1
```

Настройка роутера (r3)

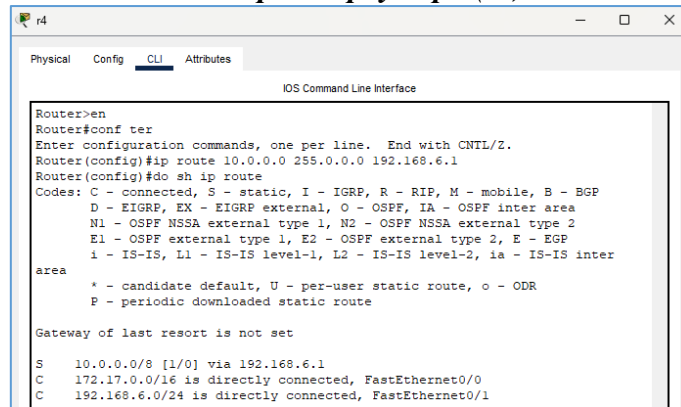
```
r3
Physical Config CLI Attributes
IOS Command Line Interface

Router>en
Router#conf ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 172.17.0.0 255.255.0.0 192.168.6.2
Router(config)#ip route 10.0.0.0 255.0.0.0 172.18.0.1
Router(config)#do 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 not set

S    10.0.0.0/8 [1/0] via 172.18.0.1
S    172.17.0.0/16 [1/0] via 192.168.6.2
C    172.18.0.0/16 is directly connected, FastEthernet0/1
C    192.168.6.0/24 is directly connected, FastEthernet0/0
```

Настройка роутера (r4)



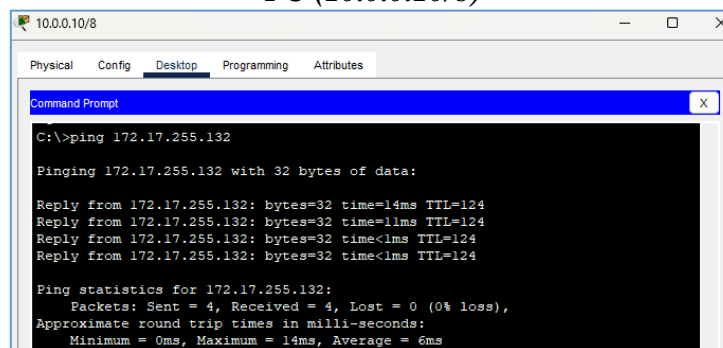
```
Router>en
Router#conf ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 10.0.0.0 255.0.0.0 192.168.6.1
Router(config)#do sh ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - 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 not set

S    10.0.0.0/8 [1/0] via 192.168.6.1
C    172.17.0.0/16 is directly connected, FastEthernet0/0
C    192.168.6.0/24 is directly connected, FastEthernet0/1
```

Задание 2: Проверить работоспособность сети командой `ping` с компов до сервера и обратно.

PC (10.0.0.10/8)



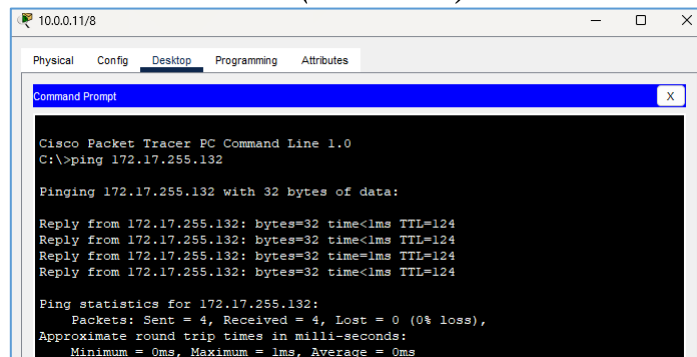
```
C:\>ping 172.17.255.132

Pinging 172.17.255.132 with 32 bytes of data:

Reply from 172.17.255.132: bytes=32 time=14ms TTL=124
Reply from 172.17.255.132: bytes=32 time=11ms TTL=124
Reply from 172.17.255.132: bytes=32 time<1ms TTL=124
Reply from 172.17.255.132: bytes=32 time<1ms TTL=124

Ping statistics for 172.17.255.132:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 14ms, Average = 6ms
```

PC (10.0.0.11/8)



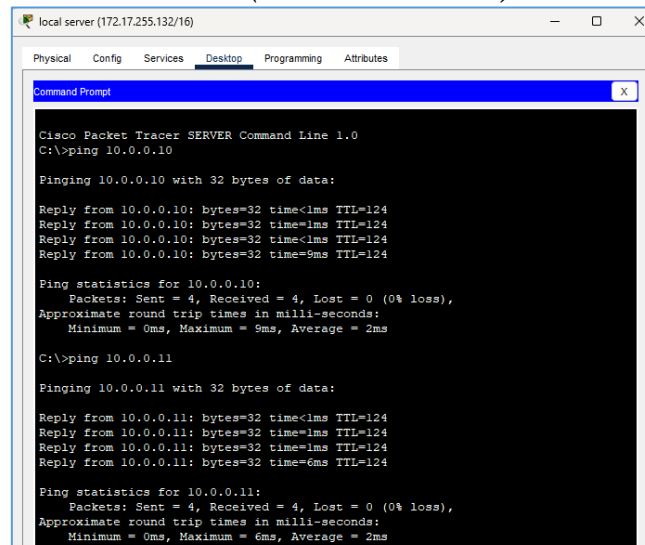
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.17.255.132

Pinging 172.17.255.132 with 32 bytes of data:

Reply from 172.17.255.132: bytes=32 time<1ms TTL=124
Reply from 172.17.255.132: bytes=32 time<1ms TTL=124
Reply from 172.17.255.132: bytes=32 time=1ms TTL=124
Reply from 172.17.255.132: bytes=32 time<1ms TTL=124

Ping statistics for 172.17.255.132:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Server (172.17.255.132/16)



```
local server (172.17.255.132/16)

Cisco Packet Tracer SERVER Command Line 1.0
C:\>ping 10.0.0.10

Pinging 10.0.0.10 with 32 bytes of data:

Reply from 10.0.0.10: bytes=32 time<1ms TTL=124
Reply from 10.0.0.10: bytes=32 time=1ms TTL=124
Reply from 10.0.0.10: bytes=32 time<1ms TTL=124
Reply from 10.0.0.10: bytes=32 time=9ms TTL=124

Ping statistics for 10.0.0.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 9ms, Average = 2ms

C:\>ping 10.0.0.11

Pinging 10.0.0.11 with 32 bytes of data:

Reply from 10.0.0.11: bytes=32 time<1ms TTL=124
Reply from 10.0.0.11: bytes=32 time=1ms TTL=124
Reply from 10.0.0.11: bytes=32 time=1ms TTL=124
Reply from 10.0.0.11: bytes=32 time=6ms TTL=124

Ping statistics for 10.0.0.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 6ms, Average = 2ms
```

Задание 2.1*: Попробовать настроить статику так, чтобы пинговались все интерфейсы отовсюду.

Задание 3: Изучить получившиеся таблицы маршрутизации.

Настройка роутера (r1)

```
r1
Physical Config CLI Attributes
IOS Command Line Interface

Router(config)#ip route 172.18.0.0 255.255.0.0 192.168.0.1
Router(config)#ip route 192.168.6.0 255.255.255.0 192.168.0.1
Router(config)#ip route 192.168.20.0 255.255.255.0 192.168.0.1
Router(config)#ip route 192.168.4.0 255.255.255.0 192.168.0.1
Router(config)#do 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 not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
S    172.17.0.0/16 [1/0] via 192.168.0.1
S    172.18.0.0/16 [1/0] via 192.168.0.1
C    192.168.0.0/24 is directly connected, FastEthernet0/1
S    192.168.4.0/24 [1/0] via 192.168.0.1
S    192.168.6.0/24 [1/0] via 192.168.0.1
S    192.168.20.0/24 [1/0] via 192.168.0.1
```

Настройка роутера (r2)

```
r2
Physical Config CLI Attributes
IOS Command Line Interface

Router(config)#ip route 192.168.6.0 255.255.255.0 172.18.0.2
Router(config)#do 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 not set

S    10.0.0.0/8 [1/0] via 192.168.0.2
S    172.17.0.0/16 [1/0] via 172.18.0.2
C    172.18.0.0/16 is directly connected, FastEthernet0/1
C    192.168.0.0/24 is directly connected, FastEthernet0/0
C    192.168.4.0/24 is directly connected, FastEthernet1/0
S    192.168.6.0/24 [1/0] via 172.18.0.2
C    192.168.20.0/24 is directly connected, FastEthernet1/1
```

Настройка роутера (r3)

```
r3
Physical Config CLI Attributes
IOS Command Line Interface

Router(config)#ip route 192.168.0.0 255.255.255.0 172.18.0.1
Router(config)#ip route 192.168.4.0 255.255.255.0 172.18.0.1
Router(config)#ip route 192.168.20.0 255.255.255.0 172.18.0.1
Router(config)#do 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 not set

S    10.0.0.0/8 [1/0] via 172.18.0.1
S    172.17.0.0/16 [1/0] via 192.168.6.2
C    172.18.0.0/16 is directly connected, FastEthernet0/1
S    192.168.0.0/24 [1/0] via 172.18.0.1
S    192.168.4.0/24 [1/0] via 172.18.0.1
C    192.168.6.0/24 is directly connected, FastEthernet0/0
S    192.168.20.0/24 [1/0] via 172.18.0.1
```


Настройка роутера (r4)

```
r4
Physical Config CLI Attributes
IOS Command Line Interface
Router(config)#ip route 172.18.0.0 255.255.0.0 192.168.6.1
Router(config)#ip route 192.168.0.0 255.255.255.0 192.168.6.1
Router(config)#ip route 192.168.4.0 255.255.255.0 192.168.6.1
Router(config)#ip route 192.168.20.0 255.255.255.0 192.168.6.1
Router(config)#do 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 not set

S    10.0.0.0/8 [1/0] via 192.168.6.1
C    172.17.0.0/16 is directly connected, FastEthernet0/0
S    172.18.0.0/16 [1/0] via 192.168.6.1
S    192.168.0.0/24 [1/0] via 192.168.6.1
S    192.168.4.0/24 [1/0] via 192.168.6.1
C    192.168.6.0/24 is directly connected, FastEthernet0/1
S    192.168.20.0/24 [1/0] via 192.168.6.1
```

Настройка роутера (r5)

```
r5
Physical Config CLI Attributes
IOS Command Line Interface
C    192.168.236.0/24 is directly connected, Loopback1
Router(config)#ip route 10.0.0.0 255.0.0.0 192.168.4.1
Router(config)#ip route 172.17.0.0 255.255.0.0 192.168.4.1
Router(config)#ip route 172.18.0.0 255.255.0.0 192.168.4.1
Router(config)#ip route 192.168.0.0 255.255.255.0 192.168.4.1
Router(config)#ip route 192.168.6.0 255.255.255.0 192.168.4.1
Router(config)#ip route 192.168.20.0 255.255.255.0 192.168.4.1
Router(config)#do 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 not set

S    10.0.0.0/8 [1/0] via 192.168.4.1
C    172.16.0.0/16 is directly connected, Loopback0
S    172.17.0.0/16 [1/0] via 192.168.4.1
S    172.18.0.0/16 [1/0] via 192.168.4.1
S    192.168.0.0/24 [1/0] via 192.168.4.1
C    192.168.4.0/24 is directly connected, FastEthernet0/0
S    192.168.6.0/24 [1/0] via 192.168.4.1
S    192.168.20.0/24 [1/0] via 192.168.4.1
C    192.168.236.0/24 is directly connected, Loopback1
```

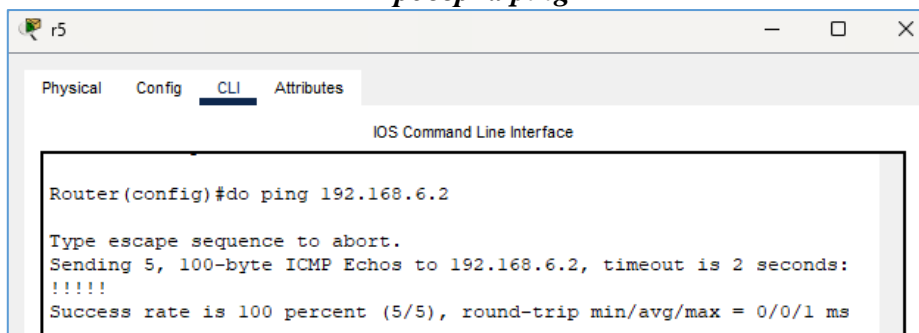
Настройка роутера (r6)

```
r6
Physical Config CLI Attributes
IOS Command Line Interface
Router(config)#ip route 10.0.0.0 255.0.0.0 192.168.20.1
Router(config)#ip route 172.17.0.0 255.255.0.0 192.168.20.1
Router(config)#ip route 172.18.0.0 255.255.0.0 192.168.20.1
Router(config)#ip route 192.168.0.0 255.255.255.0 192.168.20.1
Router(config)#ip route 192.168.4.0 255.255.255.0 192.168.20.1
Router(config)#ip route 192.168.6.0 255.255.255.0 192.168.20.1
Router(config)#do 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 not set

S    10.0.0.0/8 [1/0] via 192.168.20.1
S    172.17.0.0/16 [1/0] via 192.168.20.1
S    172.18.0.0/16 [1/0] via 192.168.20.1
C    172.20.0.0/16 is directly connected, Loopback0
C    172.31.0.0/16 is directly connected, Loopback3
S    192.168.0.0/24 [1/0] via 192.168.20.1
S    192.168.4.0/24 [1/0] via 192.168.20.1
S    192.168.6.0/24 [1/0] via 192.168.20.1
C    192.168.20.0/24 is directly connected, FastEthernet0/0
C    192.168.46.0/24 is directly connected, Loopback1
```

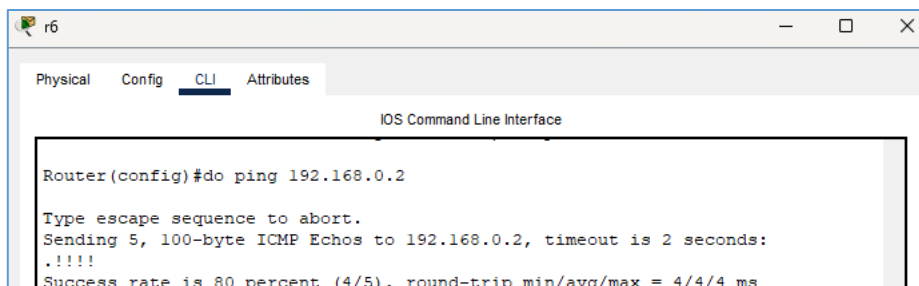
Проверка ping



```
r5
Physical Config CLI Attributes
IOS Command Line Interface

Router(config)#do ping 192.168.6.2

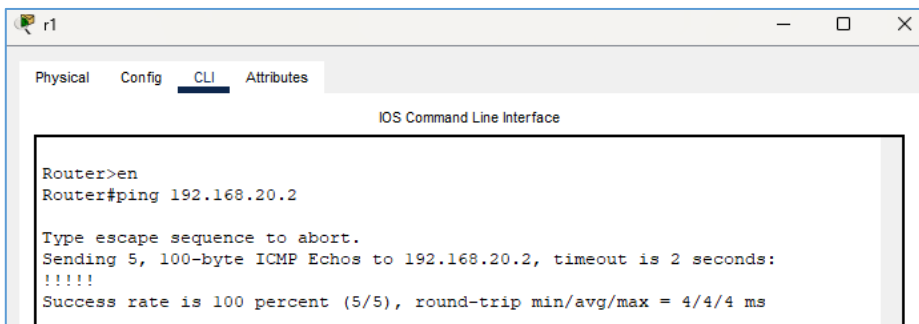
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.6.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms
```



```
r6
Physical Config CLI Attributes
IOS Command Line Interface

Router(config)#do ping 192.168.0.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.2, timeout is 2 seconds:
!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 4/4/4 ms
```



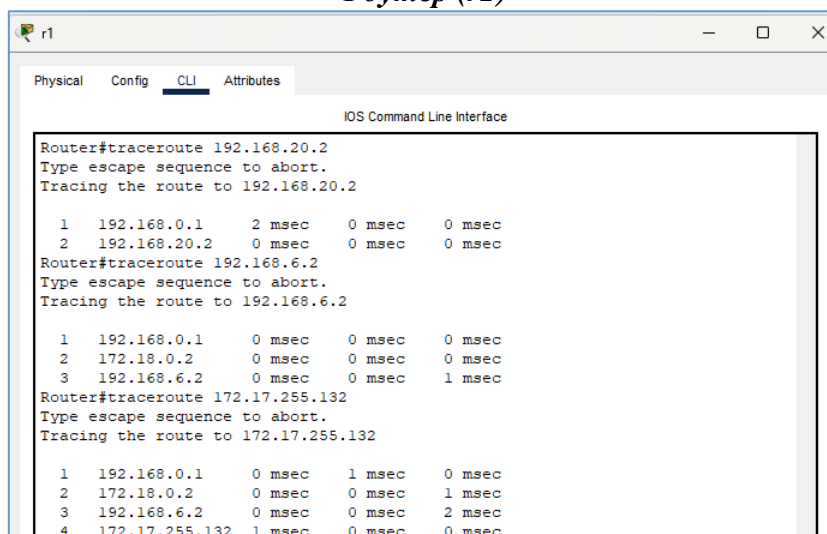
```
r1
Physical Config CLI Attributes
IOS Command Line Interface

Router>en
Router#ping 192.168.20.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.20.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms
```

Задание 4: Попрактиковаться в использовании команды *tracert*.

Роутер (r1)



```
r1
Physical Config CLI Attributes
IOS Command Line Interface

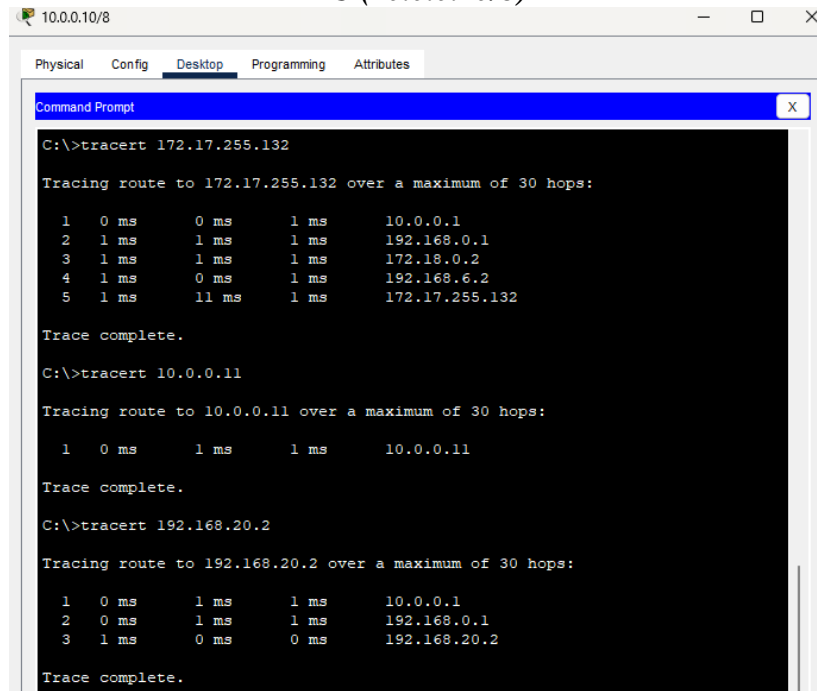
Router#tracert 192.168.20.2
Type escape sequence to abort.
Tracing the route to 192.168.20.2

  1  192.168.0.1      2 msec    0 msec    0 msec
  2  192.168.20.2     0 msec    0 msec    0 msec
Router#tracert 192.168.6.2
Type escape sequence to abort.
Tracing the route to 192.168.6.2

  1  192.168.0.1      0 msec    0 msec    0 msec
  2  172.18.0.2       0 msec    0 msec    0 msec
  3  192.168.6.2      0 msec    0 msec    1 msec
Router#tracert 172.17.255.132
Type escape sequence to abort.
Tracing the route to 172.17.255.132

  1  192.168.0.1      0 msec    1 msec    0 msec
  2  172.18.0.2       0 msec    0 msec    1 msec
  3  192.168.6.2      0 msec    0 msec    2 msec
  4  172.17.255.132   1 msec    0 msec    0 msec
```

PC (10.0.0.10/8)



```
10.0.0.10/8
Physical Config Desktop Programming Attributes
Command Prompt
C:\>tracert 172.17.255.132

Tracing route to 172.17.255.132 over a maximum of 30 hops:

  0  0 ms    0 ms    1 ms     10.0.0.1
  1  1 ms    1 ms    1 ms     192.168.0.1
  2  1 ms    1 ms    1 ms     172.18.0.2
  3  1 ms    0 ms    1 ms     192.168.6.2
  4  1 ms    11 ms   1 ms     172.17.255.132

Trace complete.

C:\>tracert 10.0.0.11

Tracing route to 10.0.0.11 over a maximum of 30 hops:

  0  0 ms    1 ms    1 ms     10.0.0.11

Trace complete.

C:\>tracert 192.168.20.2

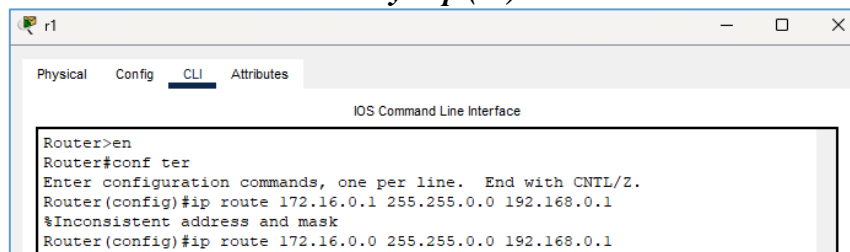
Tracing route to 192.168.20.2 over a maximum of 30 hops:

  0  0 ms    1 ms    1 ms     10.0.0.1
  1  0 ms    1 ms    1 ms     192.168.0.1
  2  1 ms    0 ms    0 ms     192.168.20.2

Trace complete.
```

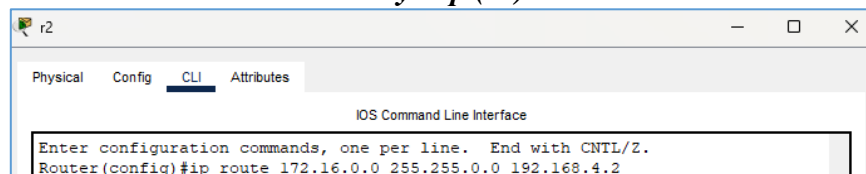
Задание 5*: Настроить loopback-интерфейсы, статику до них, и они тоже должны пинговаться.

Настройка loopback-интерфейса 172.16.0.1/16 Роутер (r1)



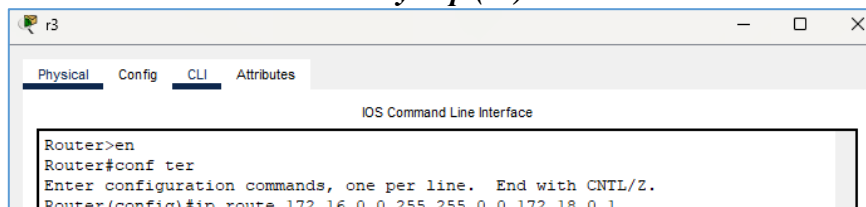
```
r1
Physical Config CLI Attributes
IOS Command Line Interface
Router>en
Router#conf ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 172.16.0.1 255.255.0.0 192.168.0.1
%Inconsistent address and mask
Router(config)#ip route 172.16.0.0 255.255.0.0 192.168.0.1
```

Роутер (r2)



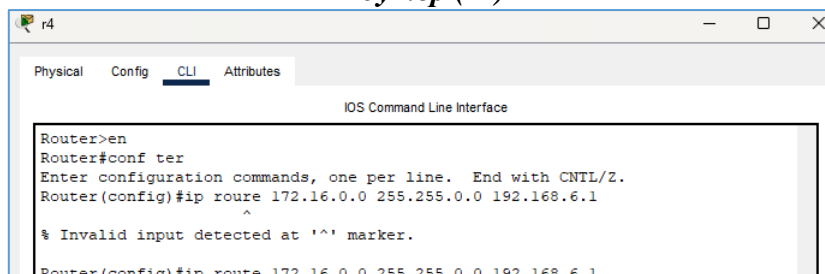
```
r2
Physical Config CLI Attributes
IOS Command Line Interface
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 172.16.0.0 255.255.0.0 192.168.4.2
```

Роутер (r3)



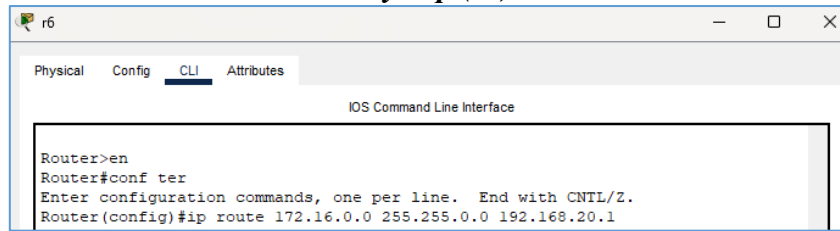
```
r3
Physical Config CLI Attributes
IOS Command Line Interface
Router>en
Router#conf ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 172.16.0.0 255.255.0.0 172.18.0.1
```

Роутер (r4)

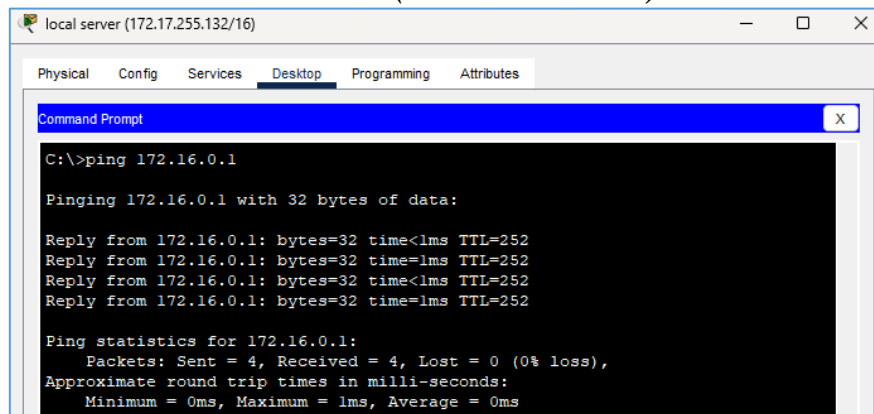


```
r4
Physical Config CLI Attributes
IOS Command Line Interface
Router>en
Router#conf ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 172.16.0.0 255.255.0.0 192.168.6.1
^
% Invalid input detected at '^' marker.
Router(config)#ip route 172.16.0.0 255.255.0.0 192.168.6.1
```

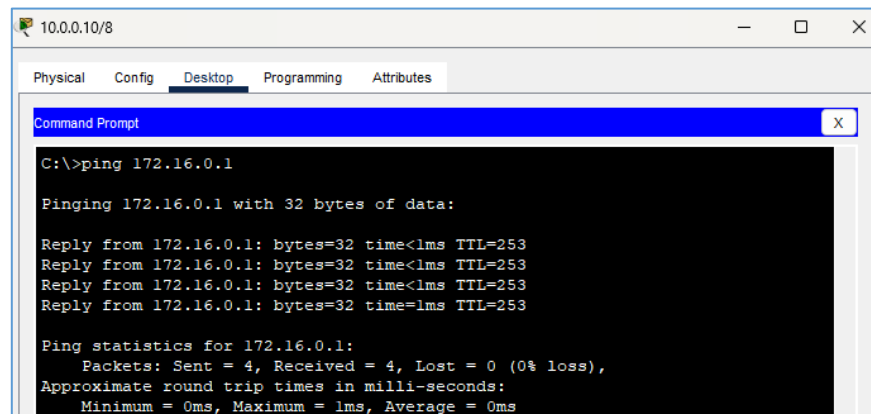
Роутер (r6)



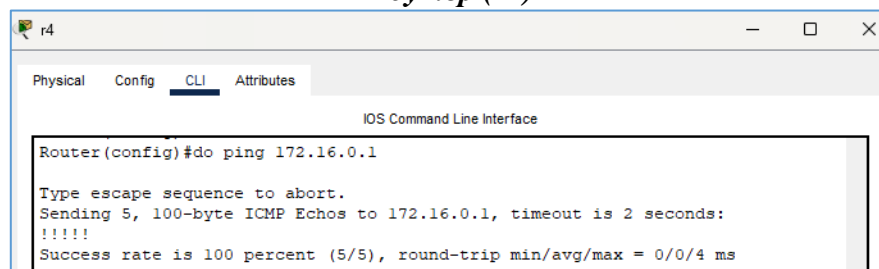
ПРОВЕРКА PING local server (172.17.255.132/16)



PC 10.0.0.10/8



Роутер (r4)



И т.д.

Оставшиеся интерфейсы (R5 - *lo1 - 192.168.236.1/24; R6 - *lo0 - 172.20.243.164/16, *lo1 - 192.168.46.1/24, *lo3 - 172.31.0.1/16) настраиваются аналогичным образом.

Ссылка на репозиторий:

<https://github.com/olgashenkel/GeekBrains-specialization-ELECTIVES/tree/main/08.%20Computer%20networks>