МИНИСТЕРСТВО ОБРАЗОВАНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ
БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ
ФАКУЛЬТЕТ ПРИКЛАДНОЙ МАТЕМАТИКИ И ИНФОРМАТИКИ

БЛАГОДАРНЫЙ АРТЁМ АНДРЕЕВИЧ

Конфигурация OSPF с множественным доступом и её проверка

Отчет по лабораторной работе № 11,
(“Компьютерные сети”)
студента 3-го курса 3-й группы

Преподаватель

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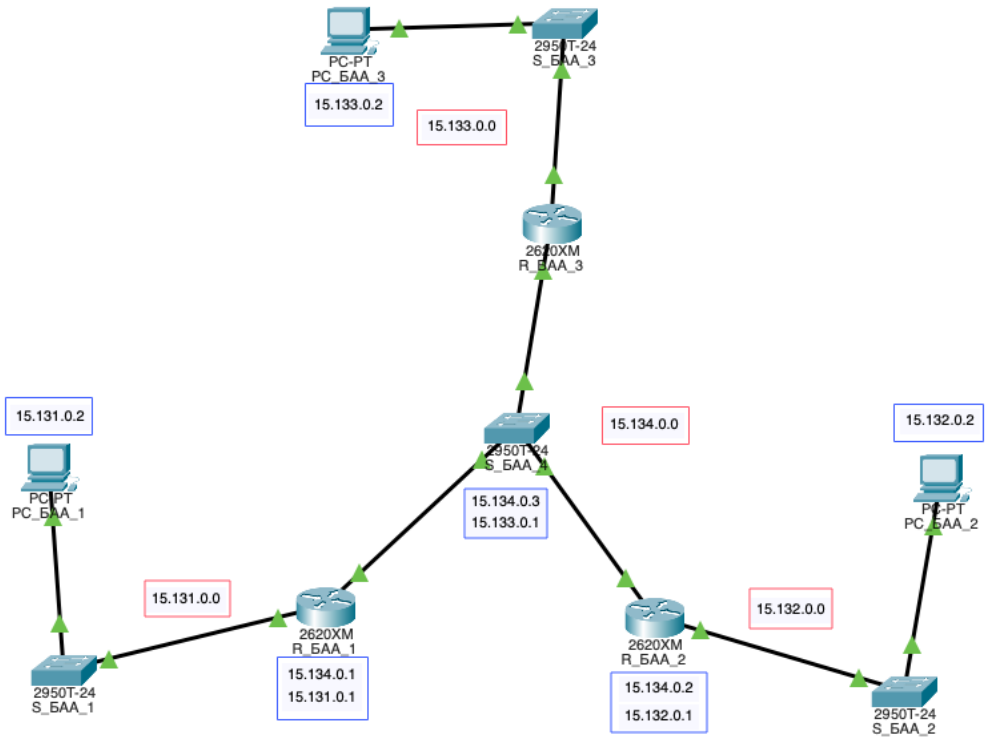
Задание на лабораторную работу №11

1. *Вырезать из таблицы и вставить в отчет исходные данные вашего варианта*

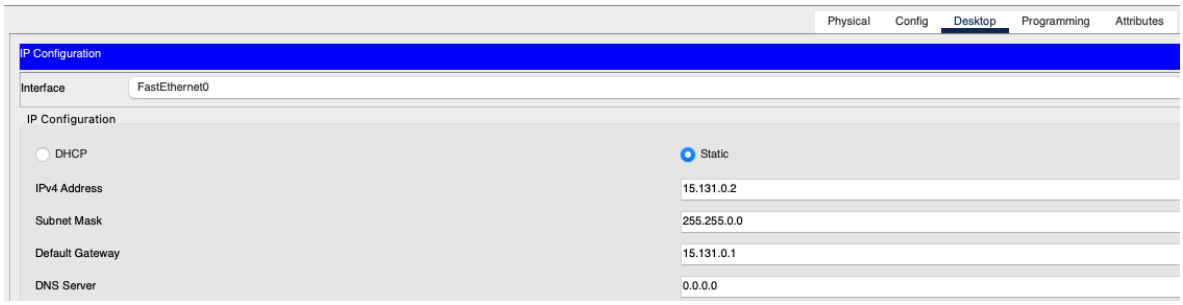
Вариант	Сеть 1 - 4
8	15.131.0.0/16 15.135.0.0/16 15.132.0.0/16 15.133.0.0/16 15.134.0.0/16

задания.

2. *Реализуйте схему, которая изображена на рисунке 1. Имена хостов и маршрутизаторов подписать по уже принятым правилам.*



3. *Настройте интерфейсы маршрутизаторов и узлов.*
Сохраните текущую конфигурацию в качестве начальной в привилегированном режиме
Вставить скриншоты конфигурирования достаточно одного маршрутизатора и хоста на ваш выбор.




```
R_BAA_2>enable
R_BAA_2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R_BAA_2(config)#interface FastEthernet0/0
R_BAA_2(config-if)#ip address 15.132.0.1 255.255.0.0
R_BAA_2(config-if)#exit
R_BAA_2(config)#interface FastEthernet1/0
R_BAA_2(config-if)#ip address 15.134.0.2 255.255.0.0
R_BAA_2(config-if)#exit
R_BAA_2(config)#exit
R_BAA_2#
%SYS-5-CONFIG_I: Configured from console by console

R_BAA_2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R_BAA_2#
```

Сохранить текущую конфигурацию в качестве начальной в привилегированном режиме можно с помощью команды: ***copy running-config startup-config***

Заполните таблицу 1. По аналогии как в лабораторной работе №10. Привести хотя бы один скриншот получения ID – маршрутизатора

```
R_BAA_1>show ip ospf
 Routing Process "ospf 16" with ID 15.134.0.1
 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 16
        Number of interfaces in this area is 2
        Area has no authentication
        SPF algorithm executed 6 times
        Area ranges are
        Number of LSA 4. Checksum Sum 0x033222
        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

R_BAA_1>show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
15.134.0.2        1   FULL/BDR        00:00:37    15.134.0.2      FastEthernet1/0
15.134.0.3        1   FULL/DROTHER    00:00:34    15.134.0.3      FastEthernet1/0
```

Таблица 1

n/n	R_BAA_1	R_BAA_2	R_BAA_3
1	FastEthernet0/0 15.131.0.1 FastEthernet1/0 15.134.0.1	FastEthernet0/0 15.132.0.1 FastEthernet1/0 15.134.0.2	FastEthernet0/015.133.0.1 FastEthernet1/015.134.0.3
2	id(R1) = **15.134.0.1**	d(R2) = **15.134.0.2**	id(R3) = **15.134.0.3**

4. ***Настройте OSPF-процесс вначале на маршрутизаторе с наивысшим ID, чтобы он стал DR-маршрутизатором.***
   Укажите имя устройства и его ID.
   Задайте process-id и area-id – ваш номер варианта.
   Вставить скриншот настройки.
   Выделить на скриншоте параметры State и Priority

```
R_BAA_1>enable
R_BAA_1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R_BAA_1(config)#interface FastEthernet1/0
R_BAA_1(config-if)#ip ospf priority 1
R_BAA_1(config-if)#end
R_BAA_1#
R_BAA_1#show ip ospf interface

FastEthernet0/0 is up, line protocol is up
  Internet address is 15.131.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 15.134.0.1, Interface address 15.131.0.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:01
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
FastEthernet1/0 is up, line protocol is up
  Internet address is 15.134.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 15.134.0.1, Interface address 15.134.0.1
  Backup Designated Router (ID) 15.134.0.2, Interface address 15.134.0.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
```

5. ***Настройте OSPF-процесс на маршрутизаторе со вторым наивысшим ID, чтобы он стал BDR-маршрутизатором.***
   Укажите имя устройства и его ID.
   Вставить скриншот настройки.
   Выделить на скриншоте параметры State и Priority

```
R_BAA_2>
R_BAA_2>enable
R_BAA_2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R_BAA_2(config)#router ospf 16
R_BAA_2(config-router)#router-id 15.134.0.2
R_BAA_2(config-router)#network 15.134.0.0 0.0.0.255 area 16
R_BAA_2(config-router)#exit
R_BAA_2(config)#interface FastEthernet1/0
R_BAA_2(config-if)#ip ospf priority 1
R_BAA_2(config-if)#end
```

```
R_BAA_2>show ip ospf interface

FastEthernet1/0 is up, line protocol is up
  Internet address is 15.134.0.2/16, Area 16
  Process ID 16, Router ID 15.134.0.2, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State BDR, Priority 1
  Designated Router (ID) 15.134.0.1, Interface address 15.134.0.1
  Backup Designated Router (ID) 15.134.0.2, Interface address 15.134.0.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:04
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 2, Adjacent neighbor count is 2
    Adjacent with neighbor 15.134.0.1  (Designated Router)
    Adjacent with neighbor 15.134.0.3
  Suppress hello for 0 neighbor(s)
FastEthernet0/0 is up, line protocol is up
  Internet address is 15.132.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.2, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 15.134.0.2, Interface address 15.132.0.1
 --More--
```

6. ***Настройте OSPF-процесс на маршрутизаторе с самым низким ID, чтобы он стал DRother-маршрутизатором.***
   Укажите имя устройства и его ID.
   Вставить скриншот настройки.
   Выделить на скриншоте параметры State и Priority

```
R_BAA_3>enable
R_BAA_3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R_BAA_3(config)#router ospf 16
R_BAA_3(config-router)#router-id 15.134.0.3
R_BAA_3(config-router)#network 15.134.0.0 0.0.0.255 area 16
R_BAA_3(config-router)#
R_BAA_3(config-router)#exit
R_BAA_3(config)#interface FastEthernet1/0
R_BAA_3(config-if)#ip ospf priority 1
R_BAA_3(config-if)#end
R_BAA_3>show ip ospf interface

FastEthernet1/0 is up, line protocol is up
  Internet address is 15.134.0.3/16, Area 16
  Process ID 16, Router ID 15.134.0.3, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DROTHER, Priority 1
  Designated Router (ID) 15.134.0.1, Interface address 15.134.0.1
  Backup Designated Router (ID) 15.134.0.2, Interface address 15.134.0.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:05
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 2, Adjacent neighbor count is 2
    Adjacent with neighbor 15.134.0.1  (Designated Router)
    Adjacent with neighbor 15.134.0.2  (Backup Designated Router)
  Suppress hello for 0 neighbor(s)
FastEthernet0/0 is up, line protocol is up
  Internet address is 15.133.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.3, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 15.134.0.3, Interface address 15.133.0.1
 --More--
```

7. ***Процесс конфигурирования и результаты тестирования с помощью команды show ip ospf neighbor должны быть представлены в отчете и прокомментированы.***

```
R_BAA_3>show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
15.134.0.2        1   FULL/BDR        00:00:30    15.134.0.2      FastEthernet1/0
15.134.0.1        1   FULL/DR         00:00:38    15.134.0.1      FastEthernet1/0

R_BAA_2> show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
15.134.0.1        1   FULL/DR         00:00:38    15.134.0.1      FastEthernet1/0
15.134.0.3        1   FULL/DROTHER    00:00:38    15.134.0.3      FastEthernet1/0

R_BAA_1> show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
15.134.0.2        1   FULL/BDR        00:00:30    15.134.0.2      FastEthernet1/0
15.134.0.3        1   FULL/DROTHER    00:00:38    15.134.0.3      FastEthernet1/0
```

Вывод команд `show ip ospf neighbor` на всех трёх маршрутизаторах подтверждает корректное распределение ролей в OSPF:

Устройство	Router ID	Роль OSPF	Состояние
R_BAA_1	15.134.0.1	**DR**	FULL
R_BAA_2	15.134.0.2	**BDR**	FULL
R_BAA_3	15.134.0.3	**DROTHER**	FULL

- Все маршрутизаторы находятся в состоянии **FULL**, что говорит об успешной установке соседства.
- **R_BAA_1** — DR, подтверждено у соседей.
- **R_BAA_2** — BDR, как видно у всех.
- **R_BAA_3** — DROTHER, не является ни DR, ни BDR, но в полном соседстве.

8. ***Проверить взаимодостижимость всех узлов пользователей.***
Результат проверки представить в отчете (использовать инструменты пакета).
Вставить скриншоты таблиц маршрутизации всех трех маршрутизаторов (использовать инструмент лупа, и все три таблицы маршрутизации желательно поместить на одном рисунке вместе со схемой сети).

PC_BAA_1:

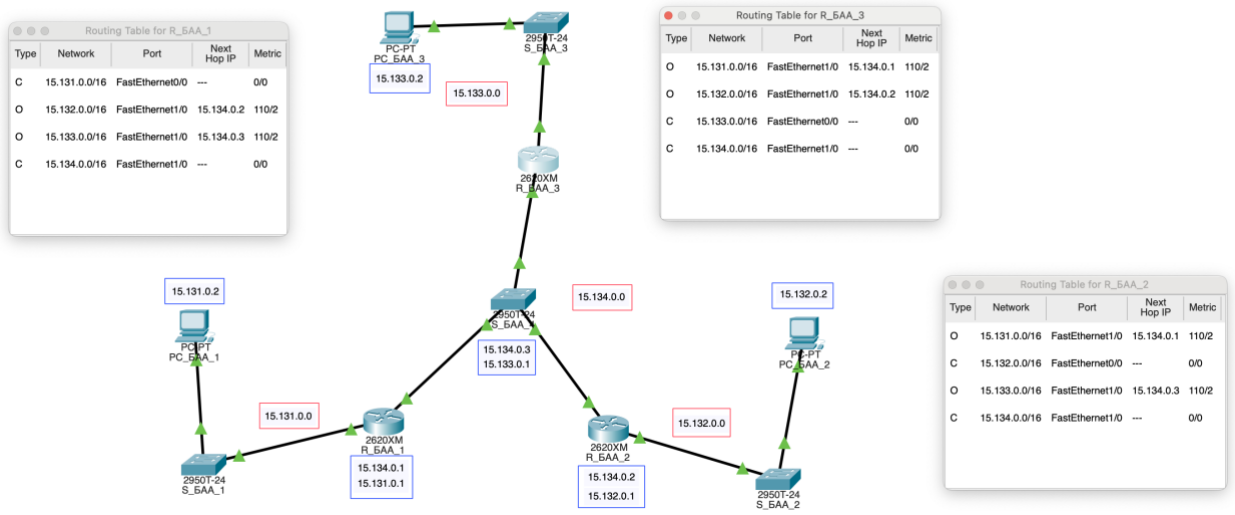
```
C:\> ping 15.133.0.2

Pinging 15.133.0.2 with 32 bytes of data:

Reply from 15.133.0.2: bytes=32 time=1ms TTL=126
Reply from 15.133.0.2: bytes=32 time<1ms TTL=126
Reply from 15.133.0.2: bytes=32 time<1ms TTL=126
Reply from 15.133.0.2: bytes=32 time<1ms TTL=126

Ping statistics for 15.133.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\> ping 15.132.0.2

Pinging 15.132.0.2 with 32 bytes of data:

Request timed out.
Reply from 15.132.0.2: bytes=32 time<1ms TTL=126
Reply from 15.132.0.2: bytes=32 time<1ms TTL=126
Reply from 15.132.0.2: bytes=32 time<1ms TTL=126

Ping statistics for 15.132.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss)
Approximate round trip times in milli-seconds:
```

PC_BAA_2:

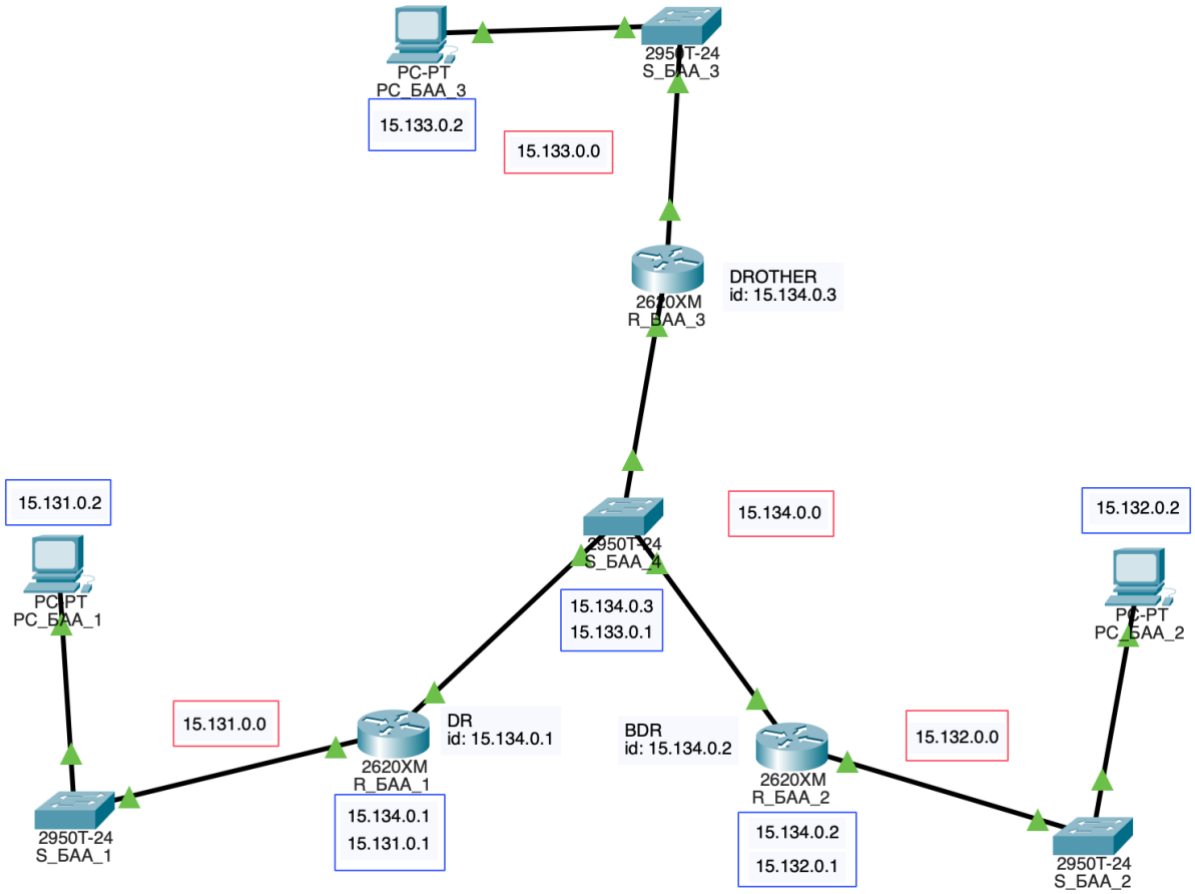
```
C:\>ping 15.131.0.2

Pinging 15.131.0.2 with 32 bytes of data:

Reply from 15.131.0.2: bytes=32 time<1ms TTL=126
Reply from 15.131.0.2: bytes=32 time<1ms TTL=126
Reply from 15.131.0.2: bytes=32 time<1ms TTL=126
Reply from 15.131.0.2: bytes=32 time<1ms TTL=126

Ping statistics for 15.131.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 15.133.0.2

Pinging 15.133.0.2 with 32 bytes of data:

Reply from 15.133.0.2: bytes=32 time<1ms TTL=126
Reply from 15.133.0.2: bytes=32 time<1ms TTL=126
Reply from 15.133.0.2: bytes=32 time<1ms TTL=126
Reply from 15.133.0.2: bytes=32 time<1ms TTL=126

Ping statistics for 15.133.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

PC_BAA_3:

```
C:\>ping 15.131.0.2

Pinging 15.131.0.2 with 32 bytes of data:

Reply from 15.131.0.2: bytes=32 time<1ms TTL=126
Reply from 15.131.0.2: bytes=32 time<1ms TTL=126
Reply from 15.131.0.2: bytes=32 time<1ms TTL=126
Reply from 15.131.0.2: bytes=32 time<1ms TTL=126

Ping statistics for 15.131.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 15.132.0.2

Pinging 15.132.0.2 with 32 bytes of data:

Reply from 15.132.0.2: bytes=32 time=12ms TTL=126
Reply from 15.132.0.2: bytes=32 time<1ms TTL=126
Reply from 15.132.0.2: bytes=32 time<1ms TTL=126
Reply from 15.132.0.2: bytes=32 time<1ms TTL=126

Ping statistics for 15.132.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 12ms, Average = 3ms
```



9. ***Используя рисунок 1, создайте новый рисунок 2, на котором подпишите статус порта каждого маршрутизатора: DR, BDR и Drother и их ID.***
Вставить рисунок 2 в отчет.
Сохраните модель№1



10. ***Заполните таблицу 2 с вашими данными. Первые строки можем перенести из таблицы 1.***

Таблица 2

R1	R2	R3
Занести в	Занести в	Занести в
FastEthernet0/0 15.131.0.1 FastEthernet1/0 15.134.0.1	FastEthernet0/0 15.132.0.1 FastEthernet1/0 15.134.0.2	FastEthernet0/0 15.133.0.1 FastEthernet1/0 15.134.0.3
ID-15.134.0.1	***ID-15.134.0.2***	***ID-15.134.0.3***
Priority=1	**Priority=1**	**Priority=1**
DR	**BDR**	**DROTHER**

11. ***Исследуем, как проходят OSPF-процессы после изменения приоритетов. Используйте команду ip ospf priority interface, чтобы изменить приоритет OSPF маршрутизаторов на следующие значения:***

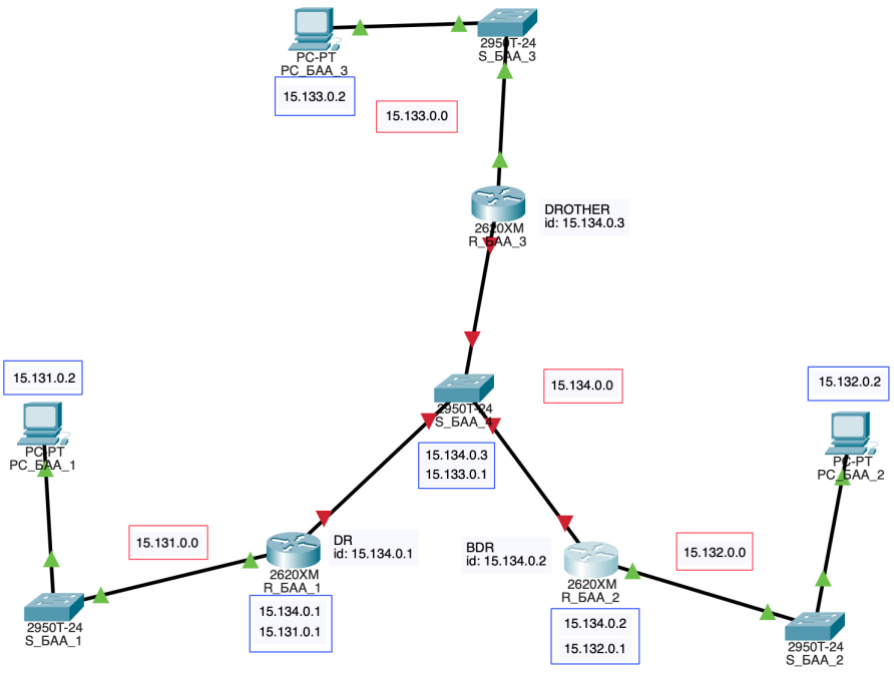
    a) ***255 для DRother-маршрутизатора.***
    b) ***100 для DR-маршрутизатора.***
    c) ***0 для BDR-маршрутизатора.***

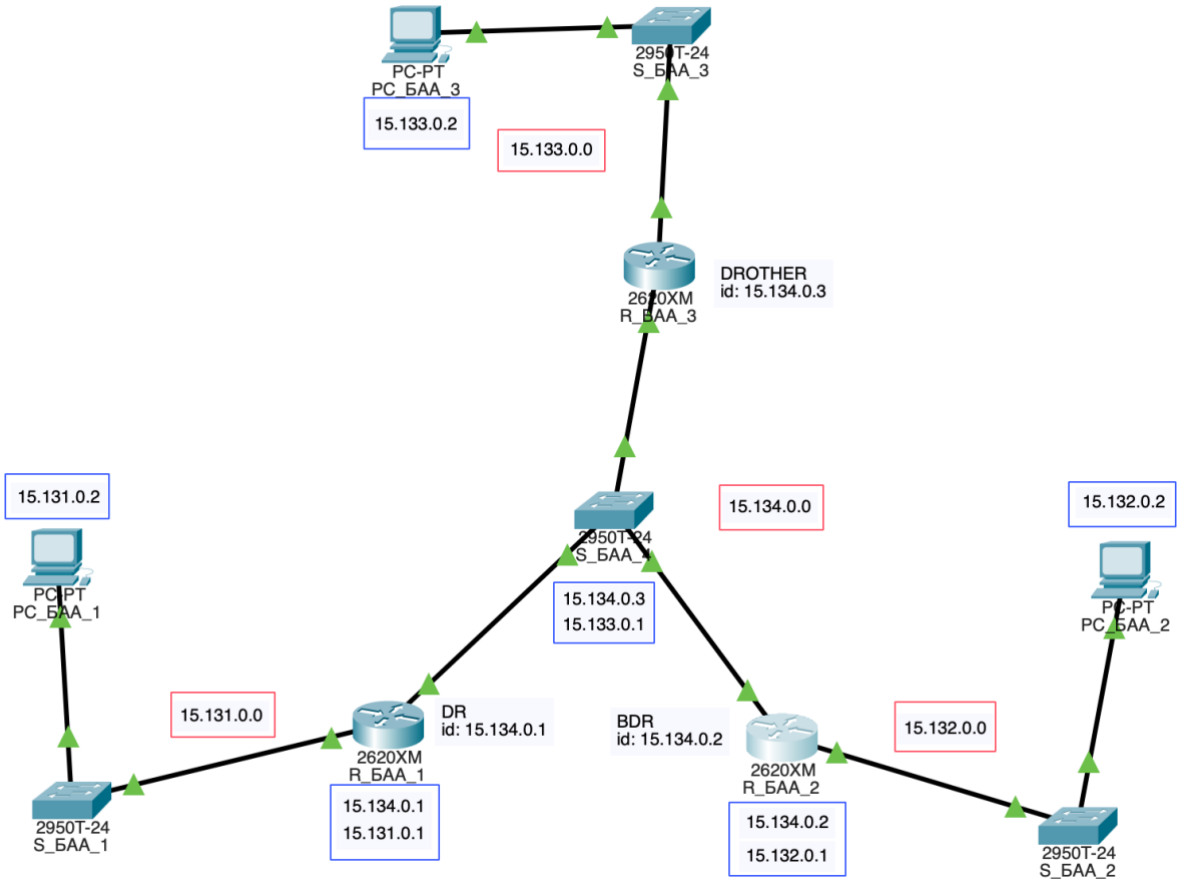
Скриншоты команд изменения приоритета вставить в отчет.

```
R_BAA_3(config-if)#ip ospf priority 255
R_BAA_2>enable
R_BAA_2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R_BAA_2(config)#interface FastEthernet1/0
R_BAA_2(config-if)#ip ospf priority 0
```

```
R_BAA_1>enable
R_BAA_1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R_BAA_1(config)#interface FastEthernet1/0
R_BAA_1(config-if)#ip ospf priority 100
```

12. ***Закройте и опять активируйте интерфейсы FastEthernet0/0, чтобы запустить OSPF-процессы.***





13. ***Используя команды show ip ospf neighbor для проверки отношений соседства, show ip ospf interface, поясните, что получилось в результате изменения приоритета OSPF маршрутизаторов.***

Выдать старые отношения соседства (до изменения приоритета).

```
R_BAA_1#show ip ospf interface

FastEthernet0/0 is up, line protocol is up
  Internet address is 15.131.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 15.134.0.1, Interface address 15.131.0.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:01
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
FastEthernet1/0 is up, line protocol is up
  Internet address is 15.134.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 15.134.0.1, Interface address 15.134.0.1
  Backup Designated Router (ID) 15.134.0.2, Interface address 15.134.0.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
```

```
R_BAA_2>show ip ospf interface

FastEthernet1/0 is up, line protocol is up
  Internet address is 15.134.0.2/16, Area 16
  Process ID 16, Router ID 15.134.0.2, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State BDR, Priority 1
  Designated Router (ID) 15.134.0.1, Interface address 15.134.0.1
  Backup Designated Router (ID) 15.134.0.2, Interface address 15.134.0.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:04
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 2, Adjacent neighbor count is 2
    Adjacent with neighbor 15.134.0.1  (Designated Router)
    Adjacent with neighbor 15.134.0.3
  Suppress hello for 0 neighbor(s)
FastEthernet0/0 is up, line protocol is up
  Internet address is 15.132.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.2, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 15.134.0.2, Interface address 15.132.0.1
 --More--

R_BAA_3>show ip ospf interface

FastEthernet1/0 is up, line protocol is up
  Internet address is 15.134.0.3/16, Area 16
  Process ID 16, Router ID 15.134.0.3, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DROTHER, Priority 1
  Designated Router (ID) 15.134.0.1, Interface address 15.134.0.1
  Backup Designated Router (ID) 15.134.0.2, Interface address 15.134.0.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:05
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 2, Adjacent neighbor count is 2
    Adjacent with neighbor 15.134.0.1  (Designated Router)
    Adjacent with neighbor 15.134.0.2  (Backup Designated Router)
  Suppress hello for 0 neighbor(s)
FastEthernet0/0 is up, line protocol is up
  Internet address is 15.133.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.3, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 15.134.0.3, Interface address 15.133.0.1
 --More--
```

Выдать новые отношения соседства (после изменения приоритета).

```
R_BAA_1>show ip ospf neighbor


Neighbor ID     Pri   State           Dead Time   Address         Interface
15.134.0.3      255   FULL/BDR        00:00:37    15.134.0.3      FastEthernet1/0
15.134.0.2        0   FULL/DROTHER    00:00:32    15.134.0.2      FastEthernet1/0
R_BAA_1>show ip ospf interface

FastEthernet0/0 is up, line protocol is up
  Internet address is 15.131.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 15.134.0.1, Interface address 15.131.0.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:09
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
FastEthernet1/0 is up, line protocol is up
  Internet address is 15.134.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 100
  Designated Router (ID) 15.134.0.1, Interface address 15.134.0.1
  Backup Designated Router (ID) 15.134.0.3, Interface address 15.134.0.3
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5


R_BAA_2>show ip ospf neighbor


Neighbor ID     Pri   State           Dead Time   Address         Interface
15.134.0.3      255   FULL/BDR        00:00:33    15.134.0.3      FastEthernet1/0
15.134.0.1      100   FULL/DR         00:00:38    15.134.0.1      FastEthernet1/0
R_BAA_2>show ip ospf interface

FastEthernet0/0 is up, line protocol is up
  Internet address is 15.132.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.2, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 15.134.0.2, Interface address 15.132.0.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:00
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
FastEthernet1/0 is up, line protocol is up
  Internet address is 15.134.0.2/16, Area 16
  Process ID 16, Router ID 15.134.0.2, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DROTHER, Priority 0
  Designated Router (ID) 15.134.0.1, Interface address 15.134.0.1
  Backup Designated Router (ID) 15.134.0.3, Interface address 15.134.0.3
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
```

```
R_BAA_3>show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
15.134.0.1      100   FULL/DR         00:00:36    15.134.0.1      FastEthernet1/0
15.134.0.2        0   FULL/DROTHER    00:00:36    15.134.0.2      FastEthernet1/0
R_BAA_3>show ip ospf interface

FastEthernet0/0 is up, line protocol is up
  Internet address is 15.133.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.3, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 15.134.0.3, Interface address 15.133.0.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:04
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
FastEthernet1/0 is up, line protocol is up
  Internet address is 15.134.0.3/16, Area 16
  Process ID 16, Router ID 15.134.0.3, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State BDR, Priority 255
  Designated Router (ID) 15.134.0.1, Interface address 15.134.0.1
  Backup Designated Router (ID) 15.134.0.3, Interface address 15.134.0.3
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
```

Произошли изменения приоритетов OSPF интерфейсов на маршрутизаторах, что привело к изменению ролей **Designated Router (DR)** и **Backup Designated Router (BDR)**.

1. Роль DR и BDR

- **Designated Router (DR)** — это маршрутизатор, который отвечает за обмен маршрутами с другими маршрутизаторами в сети OSPF в мульти-точечном (broadcast) окружении.
- **Backup Designated Router (BDR)** — это резервный маршрутизатор, который становится DR, если основной DR выходит из строя.
- **DROTHER** — это маршрутизаторы, которые не стали ни DR, ни BDR.

2. Изменение ролей после изменения приоритета

Маршрутизатор R_BAA_1:

- **FastEthernet1/0:** Роль **DR** на этом интерфейсе, так как приоритет равен **100**, и он стал **Designated Router** на интерфейсе с адресом 15.134.0.1.
- **FastEthernet0/0:** Роль **DR** с приоритетом **1**. Этот интерфейс не имеет **Backup DR**, поскольку на нем нет соседей с более высоким приоритетом.

Маршрутизатор R_BAA_2:

- **FastEthernet1/0:** Этот интерфейс стал **DROTHER** с приоритетом **0** на интерфейсе с адресом 15.134.0.2, потому что приоритет на нем был изменен на **0**, что не позволяет ему стать ни **DR**, ни **BDR**.
- **FastEthernet0/0:** Роль **DR** с приоритетом **1**, и на нем нет **Backup DR**.

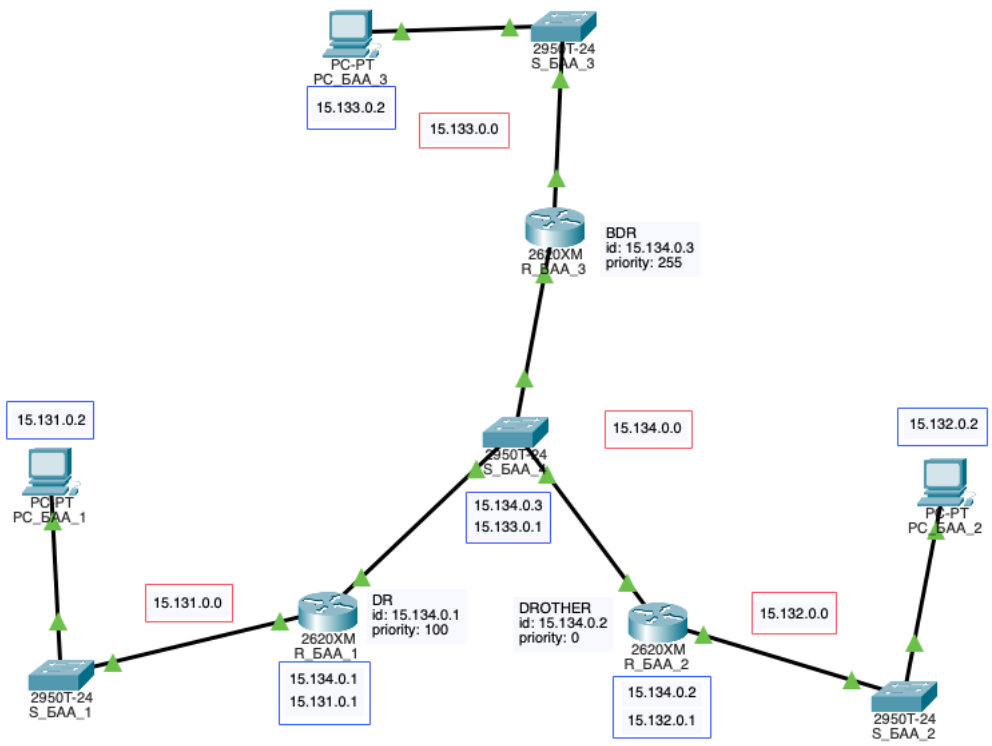
Маршрутизатор R_BAA_3:

- **FastEthernet1/0:** Роль **BDR** с приоритетом **255** на интерфейсе с адресом 15.134.0.3. Это означает, что данный маршрутизатор стал **Backup Designated Router**, поскольку его приоритет выше, чем у других маршрутизаторов.
- **FastEthernet0/0:** Роль **DR** с приоритетом **1**, но на этом интерфейсе нет **Backup DR**.

3. Влияние изменения приоритета:

- На интерфейсе **FastEthernet1/0** маршрутизатора R_BAA_1 был установлен высокий приоритет **100**, что позволило ему стать **Designated Router (DR)** на этом интерфейсе.
- В то же время, маршрутизатор **R_BAA_2** с приоритетом **0** на интерфейсе **FastEthernet1/0** не смог стать **DR** или **BDR** и остался в роли **DROTHER**.
- **R_BAA_3** с высоким приоритетом **255** стал **BDR** на интерфейсе **FastEthernet1/0**, а с более низким приоритетом **1** — **DR** на другом интерфейсе.

14. ***По аналоги как в пункте 9 создайте рисунок 3.***
На рисунке 3 подпишите приоритеты и статус.
Сравните рисунки 2 и 3 и сделайте вывод.



Изменение приоритета **OSPF** маршрутизаторов привело к перераспределению ролей **DR**, **BDR** и **DROTHER**:

- Роль **DR** и **BDR** зависит от **приоритета интерфейса** и **Router ID**.
- На маршрутизаторе **R_BAA_1** установлено высокое значение приоритета, что сделало его **DR**.
- На маршрутизаторе **R_BAA_2** приоритет был снижен до **0**, из-за чего он стал **DROTHER**.
- На маршрутизаторе **R_BAA_3** высокий приоритет **255** сделал его **BDR**.

Так как первый роутер, который включился **R_BAA_1** с приоритетом 100 стал DR, а роутер с приоритетом 255 появился позже, **он не сможет сместить текущего DR**.

15. ***Заполнить таблицу 3 (первые строки — это копия таблицы 2 пункта 10). Проанализировать содержимое таблицы 3.***

Таблица 3

R1	R2	R3
FastEthernet0/0 15.131.0.1 FastEthernet1/0 15.134.0.1	FastEthernet0/0 15.132.0.1 FastEthernet1/0 15.134.0.2	FastEthernet0/0 15.133.0.1 FastEthernet1/0 15.134.0.3
До изменения приоритета		
***ID*-**15.134.0.1	***ID*-**15.134.0.2	***ID*-**15.134.0.3
Priority=1	**Priority=1**	**Priority=1**
State DR	**State BDR**	**State DROTHER**
После изменения приоритета		
***ID*-**15.134.0.1	***ID*-**15.134.0.2	***ID*-**15.134.0.3
Priority=100	**Priority=255**	**Priority=0**
State DR	**State DROTHER**	**State BDR**

Исходно все роутеры имели priority=1, и выбор DR/BDR происходил по Router ID: **R1 (15.134.0.1)** стал DR (наибольший RID), **R2 (15.134.0.2)** — BDR, а **R3 (15.134.0.3)** — DROTHER. После изменения приоритетов (R1=100, R2=255, R3=0) ожидалось, что R2 станет DR (максимальный приоритет), R1 — BDR, а R3 (с priority=0) — DROTHER, но из-за того, что роутер был включен первее, R1 стал DR.

16. ***Проверить взаимодостижимость всех хостов пользователей.***

PC_BAA_1:

```
C:\>ping 15.133.0.2

Pinging 15.133.0.2 with 32 bytes of data:

Reply from 15.133.0.2: bytes=32 time<1ms TTL=126
Reply from 15.133.0.2: bytes=32 time<1ms TTL=126
Reply from 15.133.0.2: bytes=32 time<1ms TTL=126
Reply from 15.133.0.2: bytes=32 time=7ms TTL=126

Ping statistics for 15.133.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 7ms, Average = 1ms

C:\>ping 15.132.0.2

Pinging 15.132.0.2 with 32 bytes of data:

Request timed out.
Reply from 15.132.0.2: bytes=32 time<1ms TTL=126
Reply from 15.132.0.2: bytes=32 time<1ms TTL=126
Reply from 15.132.0.2: bytes=32 time=1ms TTL=126

Ping statistics for 15.132.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

PC_BAA_2:

```
C:\>ping 15.131.0.2

Pinging 15.131.0.2 with 32 bytes of data:

Reply from 15.131.0.2: bytes=32 time<1ms TTL=126
Reply from 15.131.0.2: bytes=32 time<1ms TTL=126
Reply from 15.131.0.2: bytes=32 time<1ms TTL=126
Reply from 15.131.0.2: bytes=32 time=1ms TTL=126

Ping statistics for 15.131.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 15.133.0.2

Pinging 15.133.0.2 with 32 bytes of data:

Reply from 15.133.0.2: bytes=32 time<1ms TTL=126
Reply from 15.133.0.2: bytes=32 time<1ms TTL=126
Reply from 15.133.0.2: bytes=32 time=1ms TTL=126
Reply from 15.133.0.2: bytes=32 time<1ms TTL=126

Ping statistics for 15.133.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

PC_BAA_3:

```
C:\>ping 15.131.0.2

Pinging 15.131.0.2 with 32 bytes of data:

Reply from 15.131.0.2: bytes=32 time<1ms TTL=126
Reply from 15.131.0.2: bytes=32 time<1ms TTL=126
Reply from 15.131.0.2: bytes=32 time<1ms TTL=126
Reply from 15.131.0.2: bytes=32 time<1ms TTL=126

Ping statistics for 15.131.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 15.132.0.2

Pinging 15.132.0.2 with 32 bytes of data:

Reply from 15.132.0.2: bytes=32 time<1ms TTL=126
Reply from 15.132.0.2: bytes=32 time=1ms TTL=126
Reply from 15.132.0.2: bytes=32 time=1ms TTL=126
Reply from 15.132.0.2: bytes=32 time<1ms TTL=126

Ping statistics for 15.132.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

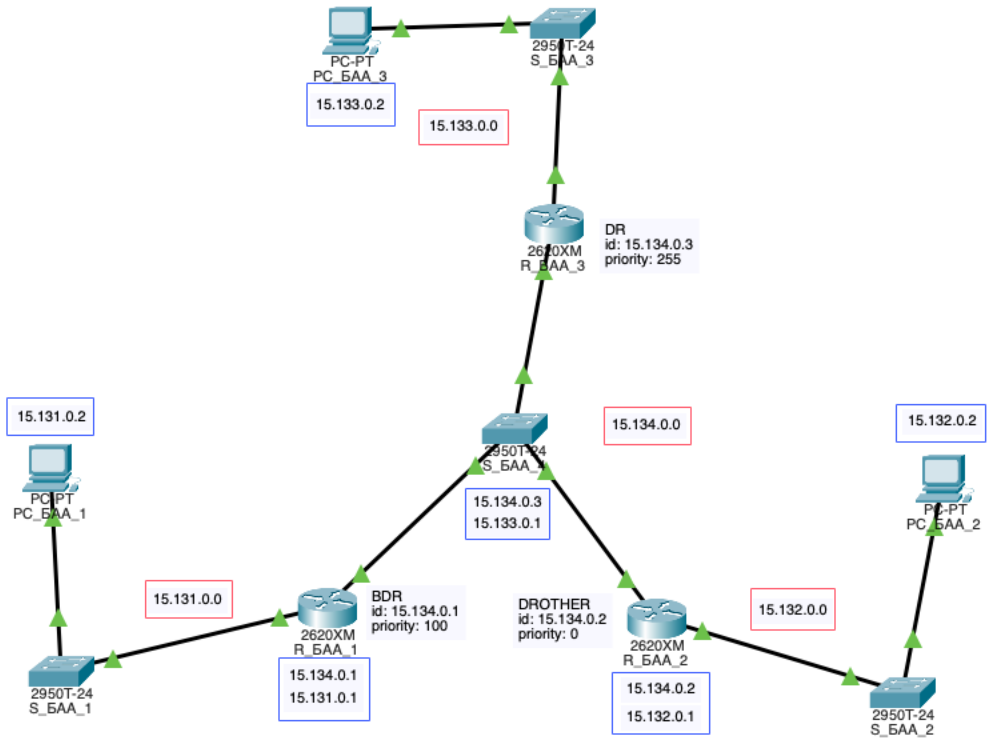
Все хосты достижимы.

Замечание

Я перезапустил ospf с помощью команды *clear ip ospf process* и вот что вышло:

```
R_BAA_1>show ip ospf interface

FastEthernet0/0 is up, line protocol is up
  Internet address is 15.131.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 15.134.0.1, Interface address 15.131.0.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:07
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
FastEthernet1/0 is up, line protocol is up
  Internet address is 15.134.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State BDR, Priority 100
  Designated Router (ID) 15.134.0.3, Interface address 15.134.0.3
  Backup Designated Router (ID) 15.134.0.1, Interface address 15.134.0.1
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
R_BAA_2>show ip ospf interface

FastEthernet0/0 is up, line protocol is up
  Internet address is 15.132.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.2, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 15.134.0.2, Interface address 15.132.0.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:05
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
FastEthernet1/0 is up, line protocol is up
  Internet address is 15.134.0.2/16, Area 16
  Process ID 16, Router ID 15.134.0.2, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DROTHER, Priority 0
  Designated Router (ID) 15.134.0.3, Interface address 15.134.0.3
  Backup Designated Router (ID) 15.134.0.1, Interface address 15.134.0.1
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
```

```
R_БАА_3>show ip ospf interface

FastEthernet0/0 is up, line protocol is up
  Internet address is 15.133.0.1/16, Area 16
  Process ID 16, Router ID 15.134.0.3, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 15.134.0.3, Interface address 15.133.0.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:03
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
FastEthernet1/0 is up, line protocol is up
  Internet address is 15.134.0.3/16, Area 16
  Process ID 16, Router ID 15.134.0.3, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 255
  Designated Router (ID) 15.134.0.3, Interface address 15.134.0.3
  Backup Designated Router (ID) 15.134.0.1, Interface address 15.134.0.1
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
 --More--
```



17. ***Перед сохранением файла с отчетом в колонтитуле обновить поле “FileName”.***
То есть должно стоять имя файла вашего отчета.
Убрать имя user-а и вставить свое ФИО.
Не забываем вставить титульный лист.