

Лаба 2 Eltex

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Тема: Настройка протокола STP (IEEE 802.1D)

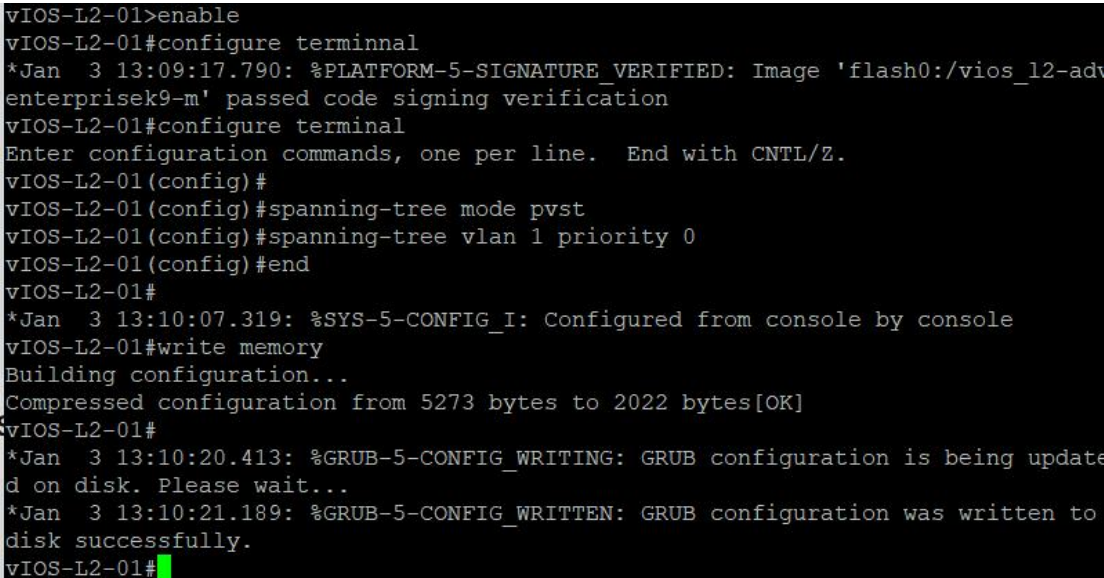
1) Для заданной на схеме schema-lab2 сети, состоящей из управляемых коммутаторов и персональных компьютеров настроить протокол STP, назначив явно один из коммутаторов корневым настройкой приоритета.

На Switch2 (делаем его Root):

```
enable
configure terminal
spanning-tree mode pvst
spanning-tree vlan 1 priority 0
end
write memory
```

На всех остальных коммутаторах (Switch1, Switch3, Switch4, Switch5):

```
enable
configure terminal
spanning-tree mode pvst
end
write memory
```



```
vIOS-L2-01>enable
vIOS-L2-01#configure terminal
*Jan  3 13:09:17.790: %PLATFORM-5-SIGNATURE_VERIFIED: Image 'flash0:/vios_l2-adv
enterprisek9-m' passed code signing verification
vIOS-L2-01#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
vIOS-L2-01(config)#
vIOS-L2-01(config)#spanning-tree mode pvst
vIOS-L2-01(config)#spanning-tree vlan 1 priority 0
vIOS-L2-01(config)#end
vIOS-L2-01#
*Jan  3 13:10:07.319: %SYS-5-CONFIG_I: Configured from console by console
vIOS-L2-01#write memory
Building configuration...
Compressed configuration from 5273 bytes to 2022 bytes[OK]
vIOS-L2-01#
*Jan  3 13:10:20.413: %GRUB-5-CONFIG_WRITING: GRUB configuration is being update
d on disk. Please wait...
*Jan  3 13:10:21.189: %GRUB-5-CONFIG_WRITTEN: GRUB configuration was written to
disk successfully.
vIOS-L2-01#
```

Рисунок 1.1 - Настройка коммутатора Switch2

```
*****
vIOS-L2-01>enable
vIOS-L2-01#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
vIOS-L2-01(config)#spanning-tree mode pvst
vIOS-L2-01(config)#end
vIOS-L2-01#
*Jan  3 13:11:30.971: %SYS-5-CONFIG_I: Configured from console by console
vIOS-L2-01#write memory
Building configuration...
Compressed configuration from 5239 bytes to 1996 bytes[OK]
vIOS-L2-01#
*Jan  3 13:11:39.839: %GRUB-5-CONFIG_WRITING: GRUB configuration is being updated on disk. Please wait...
*Jan  3 13:11:40.635: %GRUB-5-CONFIG_WRITTEN: GRUB configuration was written to disk successfully.
vIOS-L2-01#
```

Рисунок 1.2 - Настройка коммутатора Switch1

2) Проверить доступность каждого с каждым всех персональных компьютеров (VPCS), результаты запротоколировать.

Назначим компьютерам следующие ip-адреса:

PC1: 192.168.1.11/24

PC2: 192.168.1.12/24

PC3: 192.168.1.13/24

PC4: 192.168.1.14/24

PC5: 192.168.1.15/24

PC6: 192.168.1.16/24

Теперь проверим доступность командой ping.

```
PC1> ping 192.168.1.12

84 bytes from 192.168.1.12 icmp_seq=1 ttl=64 time=4.493 ms
84 bytes from 192.168.1.12 icmp_seq=2 ttl=64 time=3.457 ms
84 bytes from 192.168.1.12 icmp_seq=3 ttl=64 time=0.527 ms
84 bytes from 192.168.1.12 icmp_seq=4 ttl=64 time=2.132 ms
84 bytes from 192.168.1.12 icmp_seq=5 ttl=64 time=0.994 ms

PC1> ping 192.168.1.13

84 bytes from 192.168.1.13 icmp_seq=1 ttl=64 time=12.966 ms
84 bytes from 192.168.1.13 icmp_seq=2 ttl=64 time=8.827 ms
84 bytes from 192.168.1.13 icmp_seq=3 ttl=64 time=24.121 ms
84 bytes from 192.168.1.13 icmp_seq=4 ttl=64 time=8.218 ms
84 bytes from 192.168.1.13 icmp_seq=5 ttl=64 time=11.380 ms

PC1> ping 192.168.1.14

84 bytes from 192.168.1.14 icmp_seq=1 ttl=64 time=14.393 ms
84 bytes from 192.168.1.14 icmp_seq=2 ttl=64 time=10.232 ms
84 bytes from 192.168.1.14 icmp_seq=3 ttl=64 time=8.533 ms
84 bytes from 192.168.1.14 icmp_seq=4 ttl=64 time=12.248 ms
84 bytes from 192.168.1.14 icmp_seq=5 ttl=64 time=4.380 ms

PC1> ping 192.168.1.15

84 bytes from 192.168.1.15 icmp_seq=1 ttl=64 time=12.700 ms
84 bytes from 192.168.1.15 icmp_seq=2 ttl=64 time=10.393 ms
84 bytes from 192.168.1.15 icmp_seq=3 ttl=64 time=4.434 ms
84 bytes from 192.168.1.15 icmp_seq=4 ttl=64 time=6.132 ms
84 bytes from 192.168.1.15 icmp_seq=5 ttl=64 time=8.804 ms

PC1> ping 192.168.1.16

84 bytes from 192.168.1.16 icmp_seq=1 ttl=64 time=8.154 ms
84 bytes from 192.168.1.16 icmp_seq=2 ttl=64 time=6.522 ms
84 bytes from 192.168.1.16 icmp_seq=3 ttl=64 time=5.752 ms
84 bytes from 192.168.1.16 icmp_seq=4 ttl=64 time=5.537 ms
84 bytes from 192.168.1.16 icmp_seq=5 ttl=64 time=6.659 ms
```

Рисунок 2.1 - Пинг на PC1

```
PC2> ping 192.168.1.11

84 bytes from 192.168.1.11 icmp_seq=1 ttl=64 time=6.547 ms
84 bytes from 192.168.1.11 icmp_seq=2 ttl=64 time=3.953 ms
84 bytes from 192.168.1.11 icmp_seq=3 ttl=64 time=7.202 ms
84 bytes from 192.168.1.11 icmp_seq=4 ttl=64 time=9.688 ms
84 bytes from 192.168.1.11 icmp_seq=5 ttl=64 time=7.019 ms

PC2> ping 192.168.1.13

84 bytes from 192.168.1.13 icmp_seq=1 ttl=64 time=12.456 ms
84 bytes from 192.168.1.13 icmp_seq=2 ttl=64 time=6.192 ms
84 bytes from 192.168.1.13 icmp_seq=3 ttl=64 time=10.412 ms
84 bytes from 192.168.1.13 icmp_seq=4 ttl=64 time=8.517 ms
84 bytes from 192.168.1.13 icmp_seq=5 ttl=64 time=18.767 ms

PC2> ping 192.168.1.14

84 bytes from 192.168.1.14 icmp_seq=1 ttl=64 time=4.144 ms
84 bytes from 192.168.1.14 icmp_seq=2 ttl=64 time=8.233 ms
84 bytes from 192.168.1.14 icmp_seq=3 ttl=64 time=21.659 ms
84 bytes from 192.168.1.14 icmp_seq=4 ttl=64 time=14.949 ms
84 bytes from 192.168.1.14 icmp_seq=5 ttl=64 time=3.617 ms

PC2> ping 192.168.1.15

84 bytes from 192.168.1.15 icmp_seq=1 ttl=64 time=9.934 ms
84 bytes from 192.168.1.15 icmp_seq=2 ttl=64 time=7.494 ms
84 bytes from 192.168.1.15 icmp_seq=3 ttl=64 time=24.173 ms
84 bytes from 192.168.1.15 icmp_seq=4 ttl=64 time=4.020 ms
84 bytes from 192.168.1.15 icmp_seq=5 ttl=64 time=5.109 ms

PC2> ping 192.168.1.16

84 bytes from 192.168.1.16 icmp_seq=1 ttl=64 time=12.336 ms
84 bytes from 192.168.1.16 icmp_seq=2 ttl=64 time=5.920 ms
84 bytes from 192.168.1.16 icmp_seq=3 ttl=64 time=2.153 ms
84 bytes from 192.168.1.16 icmp_seq=4 ttl=64 time=7.387 ms
84 bytes from 192.168.1.16 icmp_seq=5 ttl=64 time=4.124 ms
```

Рисунок 2.2 - Пинг на PC2


```
PC3> ping 192.168.1.11

84 bytes from 192.168.1.11 icmp_seq=1 ttl=64 time=5.722 ms
84 bytes from 192.168.1.11 icmp_seq=2 ttl=64 time=15.405 ms
84 bytes from 192.168.1.11 icmp_seq=3 ttl=64 time=3.760 ms
84 bytes from 192.168.1.11 icmp_seq=4 ttl=64 time=13.582 ms
84 bytes from 192.168.1.11 icmp_seq=5 ttl=64 time=4.692 ms

PC3> ping 192.168.1.12

84 bytes from 192.168.1.12 icmp_seq=1 ttl=64 time=8.259 ms
84 bytes from 192.168.1.12 icmp_seq=2 ttl=64 time=9.828 ms
84 bytes from 192.168.1.12 icmp_seq=3 ttl=64 time=6.372 ms
84 bytes from 192.168.1.12 icmp_seq=4 ttl=64 time=3.447 ms
84 bytes from 192.168.1.12 icmp_seq=5 ttl=64 time=6.755 ms

PC3> ping 192.168.1.14

84 bytes from 192.168.1.14 icmp_seq=1 ttl=64 time=0.514 ms
84 bytes from 192.168.1.14 icmp_seq=2 ttl=64 time=0.900 ms
84 bytes from 192.168.1.14 icmp_seq=3 ttl=64 time=0.909 ms
84 bytes from 192.168.1.14 icmp_seq=4 ttl=64 time=1.024 ms
84 bytes from 192.168.1.14 icmp_seq=5 ttl=64 time=0.919 ms

PC3> ping 192.168.1.15

84 bytes from 192.168.1.15 icmp_seq=1 ttl=64 time=6.606 ms
84 bytes from 192.168.1.15 icmp_seq=2 ttl=64 time=2.457 ms
84 bytes from 192.168.1.15 icmp_seq=3 ttl=64 time=6.940 ms
84 bytes from 192.168.1.15 icmp_seq=4 ttl=64 time=7.777 ms
84 bytes from 192.168.1.15 icmp_seq=5 ttl=64 time=1.994 ms

PC3> ping 192.168.1.16

84 bytes from 192.168.1.16 icmp_seq=1 ttl=64 time=8.884 ms
84 bytes from 192.168.1.16 icmp_seq=2 ttl=64 time=2.194 ms
84 bytes from 192.168.1.16 icmp_seq=3 ttl=64 time=12.829 ms
84 bytes from 192.168.1.16 icmp_seq=4 ttl=64 time=8.486 ms
84 bytes from 192.168.1.16 icmp_seq=5 ttl=64 time=10.015 ms

PC3> █
```

Рисунок 2.3 - Пинг на PC3

```
PC4> ping 192.168.1.11

84 bytes from 192.168.1.11 icmp_seq=1 ttl=64 time=2.815 ms
84 bytes from 192.168.1.11 icmp_seq=2 ttl=64 time=8.595 ms
84 bytes from 192.168.1.11 icmp_seq=3 ttl=64 time=10.820 ms
84 bytes from 192.168.1.11 icmp_seq=4 ttl=64 time=12.107 ms
84 bytes from 192.168.1.11 icmp_seq=5 ttl=64 time=14.775 ms

PC4> ping 192.168.1.12

84 bytes from 192.168.1.12 icmp_seq=1 ttl=64 time=6.021 ms
84 bytes from 192.168.1.12 icmp_seq=2 ttl=64 time=9.145 ms
84 bytes from 192.168.1.12 icmp_seq=3 ttl=64 time=17.108 ms
84 bytes from 192.168.1.12 icmp_seq=4 ttl=64 time=9.391 ms
84 bytes from 192.168.1.12 icmp_seq=5 ttl=64 time=11.224 ms

PC4> ping 192.168.1.13

84 bytes from 192.168.1.13 icmp_seq=1 ttl=64 time=1.564 ms
84 bytes from 192.168.1.13 icmp_seq=2 ttl=64 time=6.171 ms
84 bytes from 192.168.1.13 icmp_seq=3 ttl=64 time=2.533 ms
84 bytes from 192.168.1.13 icmp_seq=4 ttl=64 time=0.651 ms
84 bytes from 192.168.1.13 icmp_seq=5 ttl=64 time=0.982 ms

PC4> ping 192.168.1.15

84 bytes from 192.168.1.15 icmp_seq=1 ttl=64 time=15.186 ms
84 bytes from 192.168.1.15 icmp_seq=2 ttl=64 time=8.866 ms
84 bytes from 192.168.1.15 icmp_seq=3 ttl=64 time=2.575 ms
84 bytes from 192.168.1.15 icmp_seq=4 ttl=64 time=15.369 ms
84 bytes from 192.168.1.15 icmp_seq=5 ttl=64 time=12.747 ms

PC4> ping 192.168.1.16

84 bytes from 192.168.1.16 icmp_seq=1 ttl=64 time=12.513 ms
84 bytes from 192.168.1.16 icmp_seq=2 ttl=64 time=2.050 ms
84 bytes from 192.168.1.16 icmp_seq=3 ttl=64 time=9.894 ms
84 bytes from 192.168.1.16 icmp_seq=4 ttl=64 time=7.883 ms
84 bytes from 192.168.1.16 icmp_seq=5 ttl=64 time=11.295 ms
```

Рисунок 2.4 - Пинг на PC4

```
PC5> ping 192.168.1.11

84 bytes from 192.168.1.11 icmp_seq=1 ttl=64 time=7.762 ms
84 bytes from 192.168.1.11 icmp_seq=2 ttl=64 time=12.018 ms
84 bytes from 192.168.1.11 icmp_seq=3 ttl=64 time=9.106 ms
84 bytes from 192.168.1.11 icmp_seq=4 ttl=64 time=10.955 ms
84 bytes from 192.168.1.11 icmp_seq=5 ttl=64 time=10.739 ms

PC5> ping 192.168.1.12

84 bytes from 192.168.1.12 icmp_seq=1 ttl=64 time=6.506 ms
84 bytes from 192.168.1.12 icmp_seq=2 ttl=64 time=8.406 ms
84 bytes from 192.168.1.12 icmp_seq=3 ttl=64 time=14.679 ms
84 bytes from 192.168.1.12 icmp_seq=4 ttl=64 time=5.853 ms
84 bytes from 192.168.1.12 icmp_seq=5 ttl=64 time=9.016 ms

PC5> ping 192.168.1.13

84 bytes from 192.168.1.13 icmp_seq=1 ttl=64 time=13.161 ms
84 bytes from 192.168.1.13 icmp_seq=2 ttl=64 time=6.211 ms
84 bytes from 192.168.1.13 icmp_seq=3 ttl=64 time=8.512 ms
84 bytes from 192.168.1.13 icmp_seq=4 ttl=64 time=8.350 ms
84 bytes from 192.168.1.13 icmp_seq=5 ttl=64 time=3.538 ms

PC5> ping 192.168.1.14

84 bytes from 192.168.1.14 icmp_seq=1 ttl=64 time=3.527 ms
84 bytes from 192.168.1.14 icmp_seq=2 ttl=64 time=12.048 ms
84 bytes from 192.168.1.14 icmp_seq=3 ttl=64 time=16.464 ms
84 bytes from 192.168.1.14 icmp_seq=4 ttl=64 time=4.893 ms
84 bytes from 192.168.1.14 icmp_seq=5 ttl=64 time=5.582 ms

PC5> ping 192.168.1.16

84 bytes from 192.168.1.16 icmp_seq=1 ttl=64 time=7.844 ms
84 bytes from 192.168.1.16 icmp_seq=2 ttl=64 time=3.720 ms
84 bytes from 192.168.1.16 icmp_seq=3 ttl=64 time=6.686 ms
84 bytes from 192.168.1.16 icmp_seq=4 ttl=64 time=8.369 ms
84 bytes from 192.168.1.16 icmp_seq=5 ttl=64 time=0.911 ms
```

Рисунок 2.5 - Пинг на PC5


```
PC6> ping 192.168.1.11

84 bytes from 192.168.1.11 icmp_seq=1 ttl=64 time=3.885 ms
84 bytes from 192.168.1.11 icmp_seq=2 ttl=64 time=8.539 ms
84 bytes from 192.168.1.11 icmp_seq=3 ttl=64 time=8.235 ms
84 bytes from 192.168.1.11 icmp_seq=4 ttl=64 time=10.025 ms
84 bytes from 192.168.1.11 icmp_seq=5 ttl=64 time=6.490 ms

PC6> ping 192.168.1.12

84 bytes from 192.168.1.12 icmp_seq=1 ttl=64 time=23.850 ms
84 bytes from 192.168.1.12 icmp_seq=2 ttl=64 time=16.752 ms
84 bytes from 192.168.1.12 icmp_seq=3 ttl=64 time=3.739 ms
84 bytes from 192.168.1.12 icmp_seq=4 ttl=64 time=10.657 ms
84 bytes from 192.168.1.12 icmp_seq=5 ttl=64 time=3.635 ms

PC6> ping 192.168.1.13

84 bytes from 192.168.1.13 icmp_seq=1 ttl=64 time=6.356 ms
84 bytes from 192.168.1.13 icmp_seq=2 ttl=64 time=8.930 ms
84 bytes from 192.168.1.13 icmp_seq=3 ttl=64 time=9.770 ms
84 bytes from 192.168.1.13 icmp_seq=4 ttl=64 time=8.674 ms
84 bytes from 192.168.1.13 icmp_seq=5 ttl=64 time=18.066 ms

PC6> ping 192.168.1.14

84 bytes from 192.168.1.14 icmp_seq=1 ttl=64 time=11.973 ms
84 bytes from 192.168.1.14 icmp_seq=2 ttl=64 time=11.894 ms
84 bytes from 192.168.1.14 icmp_seq=3 ttl=64 time=10.495 ms
84 bytes from 192.168.1.14 icmp_seq=4 ttl=64 time=11.611 ms
84 bytes from 192.168.1.14 icmp_seq=5 ttl=64 time=8.411 ms

PC6> ping 192.168.1.15

84 bytes from 192.168.1.15 icmp_seq=1 ttl=64 time=4.576 ms
84 bytes from 192.168.1.15 icmp_seq=2 ttl=64 time=2.971 ms
84 bytes from 192.168.1.15 icmp_seq=3 ttl=64 time=1.397 ms
84 bytes from 192.168.1.15 icmp_seq=4 ttl=64 time=6.333 ms
84 bytes from 192.168.1.15 icmp_seq=5 ttl=64 time=1.679 ms
```

Рисунок 2.6 - Пинг на PC6

3) На изображении схемы отметить VID каждого коммутатора и режимы работы портов (RP/DP/blocked) и стоимости маршрутов, результат сохранить в файл.

Командой **show spanning-tree** выведем необходимую информацию.


```
vIOS-L2-01>show spanning-tree
```

VLAN0001

Spanning tree enabled protocol ieee

Root ID Priority 1
 Address 0cd5.e6cd.0000
 Cost 4
 Port 1 (GigabitEthernet0/0)
 Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
 Address 0cb3.1337.0000
 Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
 Aging Time 300 sec

Interface	Role	Sts	Cost	Prio.Nbr	Type
Gi0/0	Root	FWD	4	128.1	Shr
Gi0/1	Altn	BLK	4	128.2	Shr
Gi0/2	Altn	BLK	4	128.3	Shr
Gi0/3	Altn	BLK	4	128.4	Shr
Gi1/0	Altn	BLK	4	128.5	Shr
Gi1/1	Altn	BLK	4	128.6	Shr
Gi1/2	Altn	BLK	4	128.7	Shr
Gi1/3	Altn	BLK	4	128.8	Shr
Gi2/0	Desg	FWD	4	128.9	Shr

Рисунок 3.1 - Switch1

```
vIOS-L2-01>show spanning-tree
```

VLAN0001

Spanning tree enabled protocol ieee

Root ID Priority 1
 Address 0cd5.e6cd.0000
 Cost 4
 Port 3 (GigabitEthernet0/2)
 Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
 Address 0c75.7ad0.0000
 Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
 Aging Time 300 sec

Interface	Role	Sts	Cost	Prio.Nbr	Type
Gi0/0	Desg	FWD	4	128.1	Shr
Gi0/1	Desg	FWD	4	128.2	Shr
Gi0/2	Root	FWD	4	128.3	Shr
Gi0/3	Altn	BLK	4	128.4	Shr
Gi1/0	Desg	FWD	4	128.5	Shr
Gi1/1	Desg	FWD	4	128.6	Shr

Рисунок 3.2 - Switch3

```

vIOS-L2-01>show spanning-tree

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    1
             Address     0cd5.e6cd.0000
             Cost        4
             Port        3 (GigabitEthernet0/2)
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
             Address     0c37.c2dd.0000
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time   300 sec

Interface                Role Sts Cost        Prio.Nbr Type
-----
Gi0/0                    Desg FWD 4          128.1 Shr
Gi0/1                    Desg FWD 4          128.2 Shr
Gi0/2                    Root FWD 4          128.3 Shr
Gi0/3                    Altn BLK 4          128.4 Shr
Gi1/0                    Desg FWD 4          128.5 Shr
Gi1/1                    Desg FWD 4          128.6 Shr

```

Рисунок 3.3 - Switch4

```

vIOS-L2-01>show spanning-tree

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    1
             Address     0cd5.e6cd.0000
             Cost        4
             Port        3 (GigabitEthernet0/2)
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
             Address     0c71.e13e.0000
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time   300 sec

Interface                Role Sts Cost        Prio.Nbr Type
-----
Gi0/0                    Desg FWD 4          128.1 Shr
Gi0/1                    Desg FWD 4          128.2 Shr
Gi0/2                    Root FWD 4          128.3 Shr
Gi0/3                    Altn BLK 4          128.4 Shr
Gi1/0                    Desg FWD 4          128.5 Shr
Gi1/1                    Desg FWD 4          128.6 Shr

```

Рисунок 3.4 - Switch5

```

vIOS-L2-01>show spanning-tree

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    1
            Address     0cd5.e6cd.0000
            This bridge is the root
            Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    1      (priority 0 sys-id-ext 1)
            Address     0cd5.e6cd.0000
            Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time  300 sec

Interface                Role  Sts Cost      Prio.Nbr Type
-----
Gi0/0                    Desg FWD  4         128.1  Shr
Gi0/1                    Desg FWD  4         128.2  Shr
Gi0/2                    Desg FWD  4         128.3  Shr
Gi0/3                    Desg FWD  4         128.4  Shr
Gi1/0                    Desg FWD  4         128.5  Shr
Gi1/1                    Desg FWD  4         128.6  Shr
Gi1/2                    Desg FWD  4         128.7  Shr
Gi1/3                    Desg FWD  4         128.8  Shr
Gi2/0                    Desg FWD  4         128.9  Shr

```

Рисунок 3.5 - Switch2

Получаем следующую схему (сохранена в файл `schema.png`):

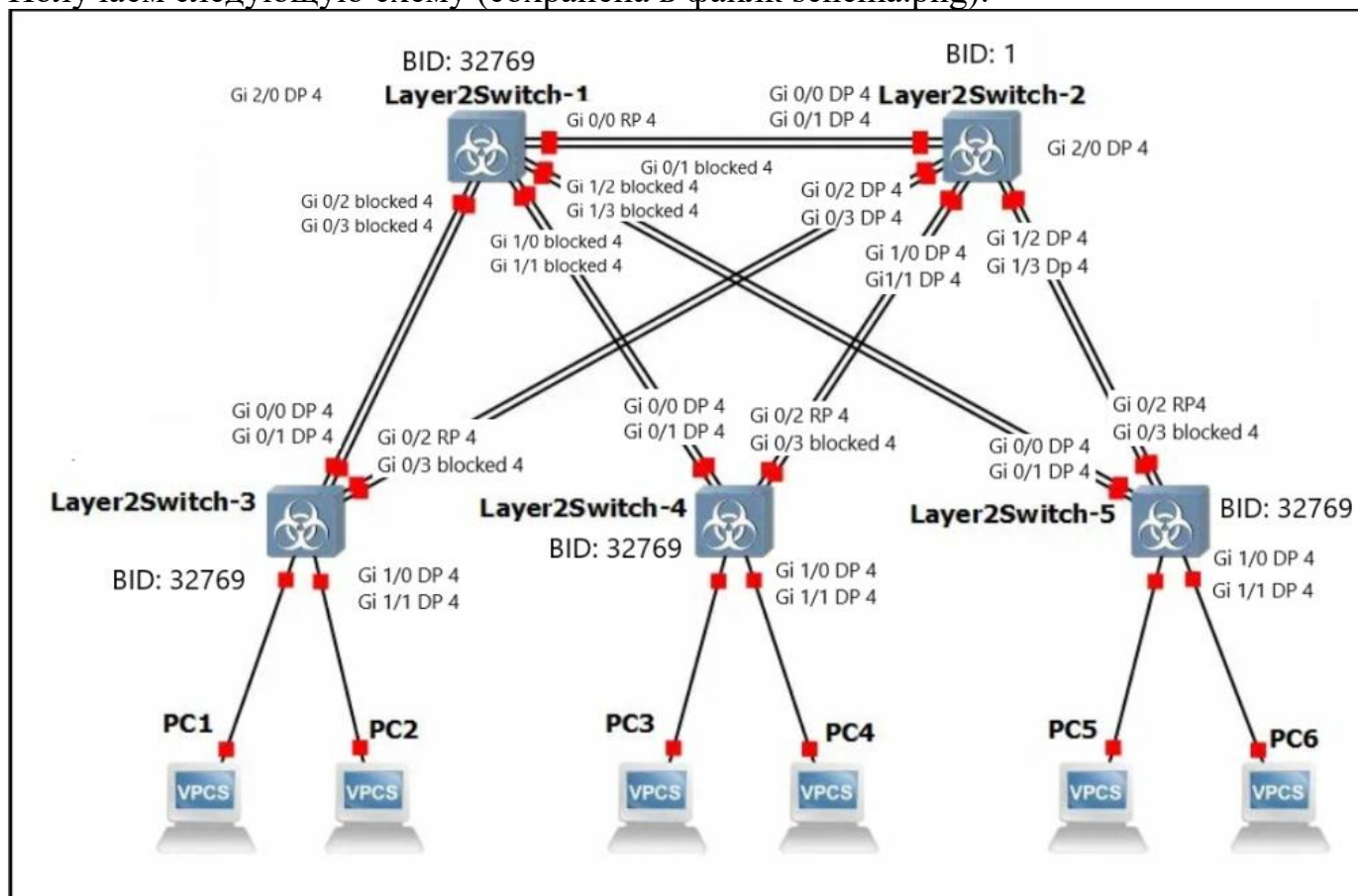


Рисунок 3.6 - Схема

4) При помощи Wireshark отследить передачу пакетов hello от корневого коммутатора на всех линках (nb!).

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0c:75:7a:d0:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8005
2	1.014125	0c:75:7a:d0:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8005
3	2.037077	0c:75:7a:d0:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8005

> Logical-Link Control
 > Spanning Tree Protocol

Protocol Identifier: Spanning Tree Protocol (0x0000)
 Protocol Version Identifier: Spanning Tree (0)
 BPDU Type: Configuration (0x00)
 > BPDU flags: 0x00
 > Root Identifier: 0 / 1 / 0c:d5:e6:cd:00:00
 Root Bridge Priority: 0
 Root Bridge System ID Extension: 1
 Root Bridge System ID: 0c:d5:e6:cd:00:00 (0c:d5:e6:cd:00:00)
 Root Path Cost: 4
 > Bridge Identifier: 32768 / 1 / 0c:75:7a:d0:00:00
 Bridge Priority: 32768
 Bridge System ID Extension: 1
 Bridge System ID: 0c:75:7a:d0:00:00 (0c:75:7a:d0:00:00)
 Port identifier: 0x8005
 Message Age: 1
 Max Age: 20
 Hello Time: 2
 Forward Delay: 15

0000 01 80 c2 00 00 00 0c 75 7a d0 00 04 00 26 42 42u z....&BB
 0010 03 00 00 00 00 00 01 0c d5 e6 cd 00 00 00 00
 0020 00 04 80 01 0c 75 7a d0 00 00 80 05 01 00 14 00uz-
 0030 02 00 0f 00 00 00 00 00 00 00 00 00

Рисунок 4.1 - Пакеты между Switch3 и PC1

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0c:75:7a:d0:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8006
2	1.021303	0c:75:7a:d0:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8006
3	2.037077	0c:75:7a:d0:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8006

> Frame 1: Packet, 60 bytes on wire (480 bits), 60 bytes captured (480 bit
 > IEEE 802.3 Ethernet
 > Logical-Link Control
 > Spanning Tree Protocol

Protocol Identifier: Spanning Tree Protocol (0x0000)
 Protocol Version Identifier: Spanning Tree (0)
 BPDU Type: Configuration (0x00)
 > BPDU flags: 0x00
 > Root Identifier: 0 / 1 / 0c:d5:e6:cd:00:00
 Root Bridge Priority: 0
 Root Bridge System ID Extension: 1
 Root Bridge System ID: 0c:d5:e6:cd:00:00 (0c:d5:e6:cd:00:00)
 Root Path Cost: 4
 > Bridge Identifier: 32768 / 1 / 0c:75:7a:d0:00:00
 Bridge Priority: 32768
 Bridge System ID Extension: 1
 Bridge System ID: 0c:75:7a:d0:00:00 (0c:75:7a:d0:00:00)
 Port identifier: 0x8006
 Message Age: 1
 Max Age: 20
 Hello Time: 2
 Forward Delay: 15

0000 01 80 c2 00 00 00 0c 75 7a d0 00 05 00 26 42 42u z....&BB
 0010 03 00 00 00 00 00 01 0c d5 e6 cd 00 00 00 00
 0020 00 04 80 01 0c 75 7a d0 00 00 80 06 01 00 14 00uz-
 0030 02 00 0f 00 00 00 00 00 00 00 00 00

Рисунок 4.2 - Пакеты между Switch3 и PC2

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0c:37:c2:dd:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8005
2	1.023224	0c:37:c2:dd:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8005
3	2.043548	0c:37:c2:dd:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8005
4	3.067198	0c:37:c2:dd:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8005
5	4.087223	0c:37:c2:dd:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8005
6	5.096933	0c:37:c2:dd:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8005
7	6.114850	0c:37:c2:dd:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8005

> Frame 1: Packet, 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0	0000	01 80 c2 00 00 00 0c 37 c2 dd 00 04 00 26 42 42	.....7.....&B
> IEEE 802.3 Ethernet	0010	03 00 00 00 00 00 00 01 0c d5 e6 cd 00 00 00 00	.....
> Logical-Link Control	0020	00 04 80 01 0c 37 c2 dd 00 00 80 05 01 00 14 00	.....7.....
> Spanning Tree Protocol	0030	02 00 0f 00 00 00 00 00 00 00 00 00	.....

Protocol Identifier: Spanning Tree Protocol (0x0000)
 Protocol Version Identifier: Spanning Tree (0)
 BPDU Type: Configuration (0x00)
 > BPDU flags: 0x00
 > Root Identifier: 0 / 1 / 0c:d5:e6:cd:00:00
 Root Bridge Priority: 0
 Root Bridge System ID Extension: 1
 Root Bridge System ID: 0c:d5:e6:cd:00:00 (0c:d5:e6:cd:00:00)
 Root Path Cost: 4
 > Bridge Identifier: 32768 / 1 / 0c:37:c2:dd:00:00
 Bridge Priority: 32768
 Bridge System ID Extension: 1
 Bridge System ID: 0c:37:c2:dd:00:00 (0c:37:c2:dd:00:00)
 Port identifier: 0x8005
 Message Age: 1
 Max Age: 20
 Hello Time: 2
 Forward Delay: 15

Рисунок 4.3 - Пакеты между Switch4 и PC3

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0c:37:c2:dd:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8006
2	1.017814	0c:37:c2:dd:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8006
3	2.035405	0c:37:c2:dd:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8006
4	3.055606	0c:37:c2:dd:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8006
5	4.078036	0c:37:c2:dd:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8006
6	5.096892	0c:37:c2:dd:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8006
7	6.112199	0c:37:c2:dd:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8006

> Frame 1: Packet, 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0	0000	01 80 c2 00 00 00 0c 37 c2 dd 00 05 00 26 42 42	.....7.....&B
> IEEE 802.3 Ethernet	0010	03 00 00 00 00 00 00 01 0c d5 e6 cd 00 00 00 00	.....
> Logical-Link Control	0020	00 04 80 01 0c 37 c2 dd 00 00 80 06 01 00 14 00	.....7.....
> Spanning Tree Protocol	0030	02 00 0f 00 00 00 00 00 00 00 00 00	.....

Protocol Identifier: Spanning Tree Protocol (0x0000)
 Protocol Version Identifier: Spanning Tree (0)
 BPDU Type: Configuration (0x00)
 > BPDU flags: 0x00
 > Root Identifier: 0 / 1 / 0c:d5:e6:cd:00:00
 Root Bridge Priority: 0
 Root Bridge System ID Extension: 1
 Root Bridge System ID: 0c:d5:e6:cd:00:00 (0c:d5:e6:cd:00:00)
 Root Path Cost: 4
 > Bridge Identifier: 32768 / 1 / 0c:37:c2:dd:00:00
 Bridge Priority: 32768
 Bridge System ID Extension: 1
 Bridge System ID: 0c:37:c2:dd:00:00 (0c:37:c2:dd:00:00)
 Port identifier: 0x8006
 Message Age: 1
 Max Age: 20
 Hello Time: 2
 Forward Delay: 15

Рисунок 4.4 - Пакеты между Switch4 и PC4

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0c:71:e1:3e:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8005
2	1.013958	0c:71:e1:3e:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8005
3	2.026716	0c:71:e1:3e:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8005

> Frame 1: Packet, 60 bytes on wire (480 bits), 60 bytes captured (480 bit	0000	01 80 c2 00 00 00 0c 71 e1 3e 00 04 00 26 42 42	.....q ->...&BB
> IEEE 802.3 Ethernet	0010	03 00 00 00 00 00 00 01 0c d5 e6 cd 00 00 00 00	.....
> Logical-Link Control	0020	00 04 80 01 0c 71 e1 3e 00 00 80 05 01 00 14 00	.....q->
> Spanning Tree Protocol	0030	02 00 0f 00 00 00 00 00 00 00 00 00	.....

Protocol Identifier: Spanning Tree Protocol (0x0000)
 Protocol Version Identifier: Spanning Tree (0)
 BPDU Type: Configuration (0x00)
 > BPDU flags: 0x00
 ✓ Root Identifier: 0 / 1 / 0c:d5:e6:cd:00:00
 Root Bridge Priority: 0
 Root Bridge System ID Extension: 1
 Root Bridge System ID: 0c:d5:e6:cd:00:00 (0c:d5:e6:cd:00:00)
 Root Path Cost: 4
 ✓ Bridge Identifier: 32768 / 1 / 0c:71:e1:3e:00:00
 Bridge Priority: 32768
 Bridge System ID Extension: 1
 Bridge System ID: 0c:71:e1:3e:00:00 (0c:71:e1:3e:00:00)
 Port identifier: 0x8005
 Message Age: 1
 Max Age: 20
 Hello Time: 2
 Forward Delay: 15

Рисунок 4.5 - Пакеты между Switch5 и PC5

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0c:71:e1:3e:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8006
2	1.018450	0c:71:e1:3e:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8006
4	2.041788	0c:71:e1:3e:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8006

> Frame 1: Packet, 60 bytes on wire (480 bits), 60 bytes captured (480 bit	0000	01 80 c2 00 00 00 0c 71 e1 3e 00 05 00 26 42 42	.....q ->...&BB
> IEEE 802.3 Ethernet	0010	03 00 00 00 00 00 00 01 0c d5 e6 cd 00 00 00 00	.....
> Logical-Link Control	0020	00 04 80 01 0c 71 e1 3e 00 00 80 06 01 00 14 00	.....q->
> Spanning Tree Protocol	0030	02 00 0f 00 00 00 00 00 00 00 00 00	.....

Protocol Identifier: Spanning Tree Protocol (0x0000)
 Protocol Version Identifier: Spanning Tree (0)
 BPDU Type: Configuration (0x00)
 > BPDU flags: 0x00
 ✓ Root Identifier: 0 / 1 / 0c:d5:e6:cd:00:00
 Root Bridge Priority: 0
 Root Bridge System ID Extension: 1
 Root Bridge System ID: 0c:d5:e6:cd:00:00 (0c:d5:e6:cd:00:00)
 Root Path Cost: 4
 ✓ Bridge Identifier: 32768 / 1 / 0c:71:e1:3e:00:00
 Bridge Priority: 32768
 Bridge System ID Extension: 1
 Bridge System ID: 0c:71:e1:3e:00:00 (0c:71:e1:3e:00:00)
 Port identifier: 0x8006
 Message Age: 1
 Max Age: 20
 Hello Time: 2
 Forward Delay: 15

Рисунок 4.6 - Пакеты между Switch6 и PC6

No.	Time	Source	Destination	Protocol	Length	Info
83	18.321406	0c:d5:e6:cd:00:03	Nearest-Customer-Br...	STP	60	Conf. Root = 32768/300/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8004
84	19.291927	0c:d5:e6:cd:00:03	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8004
85	20.162021	0c:75:7a:d0:00:03	Nearest-Customer-Br...	STP	60	Conf. Root = 32768/100/0c:75:7a:d0:00:00 Cost = 0 Port = 0x8004
86	20.166711	0c:75:7a:d0:00:03	Nearest-Customer-Br...	STP	60	Conf. Root = 32768/200/0c:75:7a:d0:00:00 Cost = 0 Port = 0x8004
87	20.171872	0c:75:7a:d0:00:03	Nearest-Customer-Br...	STP	60	Conf. Root = 32768/300/0c:75:7a:d0:00:00 Cost = 0 Port = 0x8004
88	20.301074	0c:d5:e6:cd:00:03	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8004
89	20.329833	0c:d5:e6:cd:00:03	Nearest-Customer-Br...	STP	60	Conf. Root = 32768/100/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8004
90	20.333812	0c:d5:e6:cd:00:03	Nearest-Customer-Br...	STP	60	Conf. Root = 32768/200/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8004
91	20.350139	0c:d5:e6:cd:00:03	Nearest-Customer-Br...	STP	60	Conf. Root = 32768/300/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8004

Protocol Version Identifier: Spanning Tree (0)	0000 01 80 c2 00 00 00 0c d5 e6 cd 00 03 81 00 00 64	.....d
BPDU Type: Configuration (0x00)	0010 00 26 42 42 03 00 00 00 00 00 80 64 0c d5 e6 cd	..&BB...d...
> BPDU flags: 0x00	0020 00 00 00 00 00 00 80 64 0c d5 e6 cd 00 00 80 04	.....d.....
> Root Identifier: 32768 / 100 / 0c:d5:e6:cd:00:00	0030 00 00 14 00 02 00 0f 00 00 00 00 00	.....
Root Bridge Priority: 32768		
Root Bridge System ID Extension: 100		
Root Bridge System ID: 0c:d5:e6:cd:00:00 (0c:d5:e6:cd:00:00)		
Root Path Cost: 0		
> Bridge Identifier: 32768 / 100 / 0c:d5:e6:cd:00:00		
Bridge Priority: 32768		
Bridge System ID Extension: 100		
Bridge System ID: 0c:d5:e6:cd:00:00 (0c:d5:e6:cd:00:00)		
Port identifier: 0x8004		
Message Age: 0		
Max Age: 20		
Hello Time: 2		
Forward Delay: 15		

Рисунок 4.7 - Пакеты между Switch2 Switch3

No.	Time	Source	Destination	Protocol	Length	Info
178	40.740627	0c:37:c2:dd:00:02	Nearest-Customer-Br...	STP	60	Conf. Root = 32768/200/0c:37:c2:dd:00:00 Cost = 0 Port = 0x8003
179	40.755955	0c:37:c2:dd:00:02	Nearest-Customer-Br...	STP	60	Conf. Root = 32768/300/0c:37:c2:dd:00:00 Cost = 0 Port = 0x8003
180	41.752440	0c:d5:e6:cd:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8005

> Frame 1: Packet, 60 bytes on wire (480 bits), 60 bytes captured (480 bit	0000 01 80 c2 00 00 00 0c d5 e6 cd 00 04 81 00 00 64	.....d
> Ethernet II, Src: 0c:d5:e6:cd:00:04 (0c:d5:e6:cd:00:04), Dst: Nearest-Cu	0010 00 26 42 42 03 00 00 00 00 00 80 64 0c d5 e6 cd	..&BB...d...
> 802.1Q Virtual LAN, PRI: 0, DEI: 0, ID: 100	0020 00 00 00 00 00 00 80 64 0c d5 e6 cd 00 00 80 05	.....d.....
> Logical-Link Control	0030 00 00 14 00 02 00 0f 00 00 00 00 00	.....
> Spanning Tree Protocol		
Protocol Identifier: Spanning Tree Protocol (0x0000)		
Protocol Version Identifier: Spanning Tree (0)		
BPDU Type: Configuration (0x00)		
> BPDU flags: 0x00		
> Root Identifier: 32768 / 100 / 0c:d5:e6:cd:00:00		
Root Bridge Priority: 32768		
Root Bridge System ID Extension: 100		
Root Bridge System ID: 0c:d5:e6:cd:00:00 (0c:d5:e6:cd:00:00)		
Root Path Cost: 0		
> Bridge Identifier: 32768 / 100 / 0c:d5:e6:cd:00:00		
Bridge Priority: 32768		
Bridge System ID Extension: 100		
Bridge System ID: 0c:d5:e6:cd:00:00 (0c:d5:e6:cd:00:00)		
Port identifier: 0x8005		
Message Age: 0		
Max Age: 20		
Hello Time: 2		
Forward Delay: 15		

Рисунок 4.8 - Пакеты между Switch2 Switch4

No.	Time	Source	Destination	Protocol	Length	Info
86	19.990455	0c:d5:e6:cd:00:07	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8008
87	20.181672	0c:71:e1:3e:00:03	Nearest-Customer-Br...	STP	60	Conf. Root = 32768/100/0c:71:e1:3e:00:00 Cost = 0 Port = 0x8004
88	20.184892	0c:71:e1:3e:00:03	Nearest-Customer-Br...	STP	60	Conf. Root = 32768/200/0c:71:e1:3e:00:00 Cost = 0 Port = 0x8004
89	20.203031	0c:71:e1:3e:00:03	Nearest-Customer-Br...	STP	60	Conf. Root = 32768/300/0c:71:e1:3e:00:00 Cost = 0 Port = 0x8004
90	21.010966	0c:d5:e6:cd:00:07	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8008

> Frame 1: Packet, 60 bytes on wire (480 bits), 60 bytes captured (480 bit	0000	01 80 c2 00 00 00 0c 71 e1 3e 00 03 81 00 00 64	.....q->.....d
> Ethernet II, Src: 0c:71:e1:3e:00:03 (0c:71:e1:3e:00:03), Dst: Nearest-Cu	0010	00 26 42 42 03 00 00 00 00 00 80 64 0c 71 e1 3e	-&BB....-d-q->
> 802.1Q Virtual LAN, PRI: 0, DEI: 0, ID: 100	0020	00 00 00 00 00 00 80 64 0c 71 e1 3e 00 00 80 04	.....d-q->....
> Logical-Link Control	0030	00 00 14 00 02 00 0f 00 00 00 00 00	.....

Spanning Tree Protocol

Protocol Identifier: Spanning Tree Protocol (0x0000)

Protocol Version Identifier: Spanning Tree (0)

BPDU Type: Configuration (0x00)

> BPDU flags: 0x00

Root Identifier: 32768 / 100 / 0c:71:e1:3e:00:00

Root Bridge Priority: 32768

Root Bridge System ID Extension: 100

Root Bridge System ID: 0c:71:e1:3e:00:00 (0c:71:e1:3e:00:00)

Root Path Cost: 0

Bridge Identifier: 32768 / 100 / 0c:71:e1:3e:00:00

Bridge Priority: 32768

Bridge System ID Extension: 100

Bridge System ID: 0c:71:e1:3e:00:00 (0c:71:e1:3e:00:00)

Port identifier: 0x8004

Message Age: 0

Max Age: 20

Hello Time: 2

Forward Delay: 15

Рисунок 4.9 - Пакеты между Switch2 Switch5

5) Изменить стоимость маршрута для порта RP произвольного назначенного (designated) коммутатора, повторить действия из п.3, результат сохранить в отдельный файл.

На Switch4:

```
enable
configure terminal
interface GigabitEthernet0/0
spanning-tree cost 999
end
```

```
vIOS-L2-01>enable
vIOS-L2-01#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
vIOS-L2-01(config)#interfase GigabitEthernet0/0
      ^
% Invalid input detected at '^' marker.

vIOS-L2-01(config)#interface GigabitEthernet0/0
vIOS-L2-01(config-if)#spanning-tree cost 999
vIOS-L2-01(config-if)#end
vIOS-L2-01#
```

Рисунок 5.1 - Изменение стоимости маршрута на коммутаторе Switch4

Сделаем схему как в пункте 3 (изображение сохранено как schema_5.png).

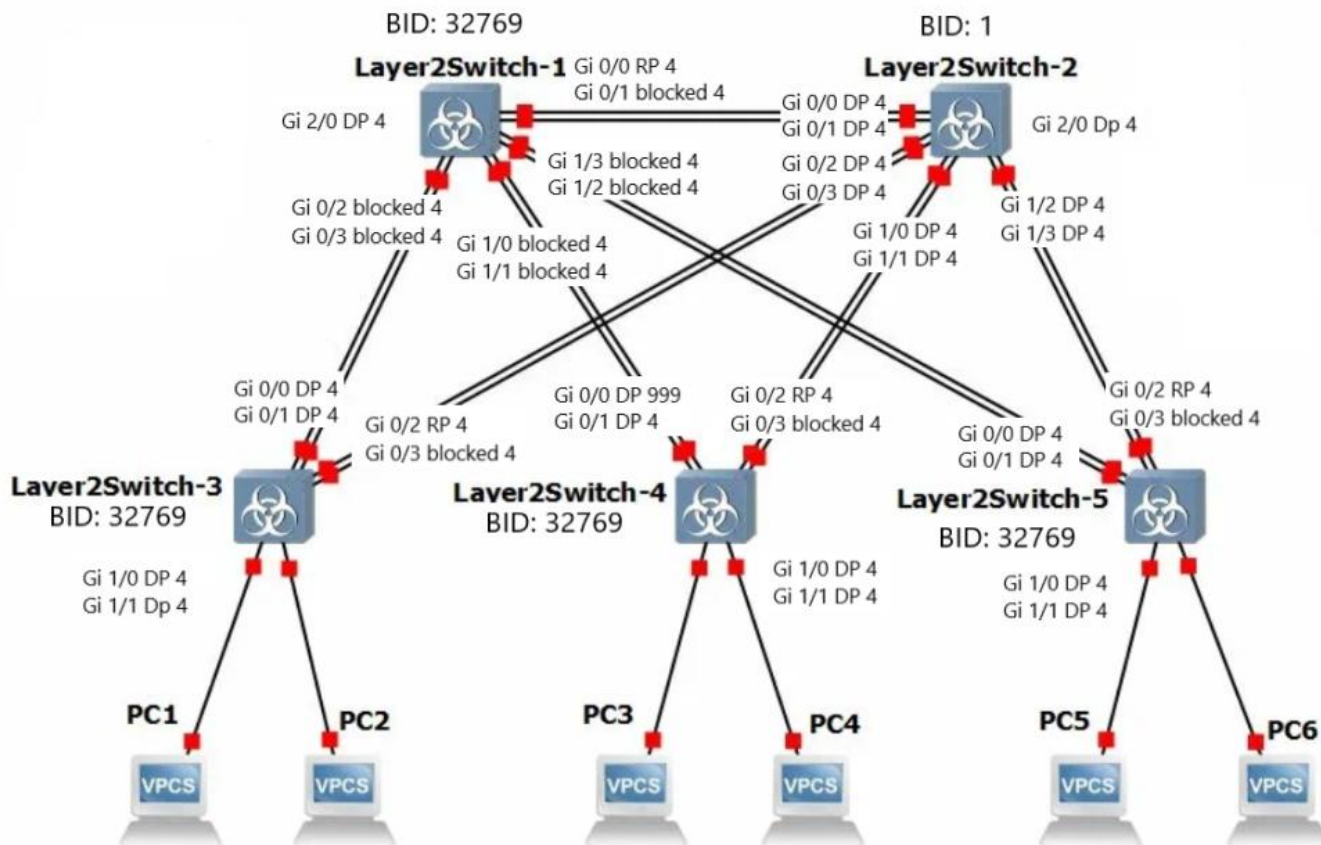


Рисунок 5.2 - Схема

6) Сохранить файлы конфигураций устройств в виде набора файлов с именами, соответствующими именам устройств.

Сохраненные файлы находятся в папке configs.

7*) Опциональное задание: заменить STP на RSTP (IEEE 802.1w), повторить 1-6, отметить резервные порты в п.3 и п.5, отличие работы протокола RSTP от протокола STP в п.4.

```
configure terminal
spanning-tree mode rapid-pvst
end
write memory
```

Пункт 3

Схема сохранена под названием schema7.png

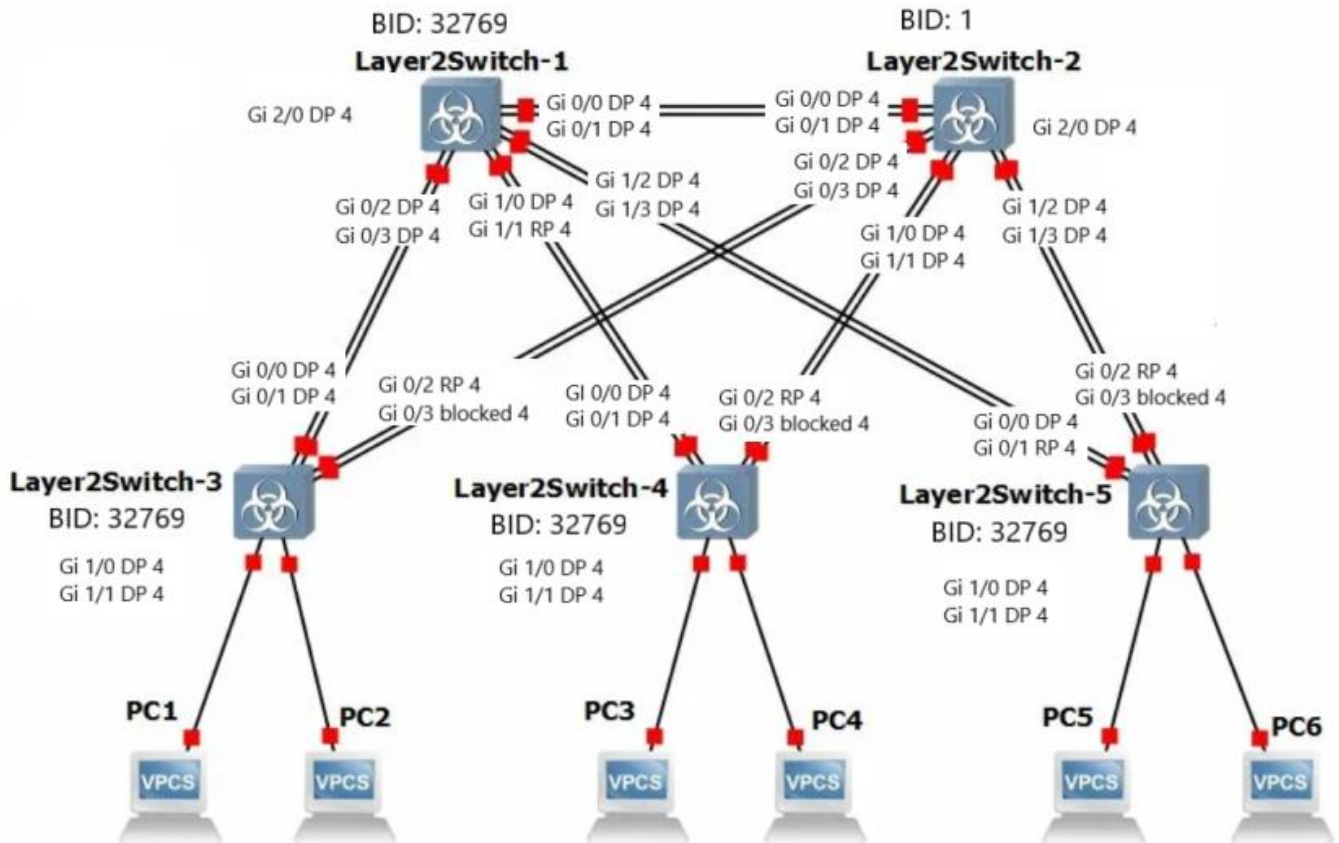


Рисунок 7.1 - Схема для пункта 3

Пункт 4

No.	Time	Source	Destination	Protocol	Length	Info
1473	239.745556	0c:71:e1:3e:00:03	Nearest-Customer-Br...	STP	60	RST. TC + Root = 32768/1/0c:71:e1:3e:00:00 Cost = 0 Port = 0x8004
1474	239.748604	0c:d5:e6:cd:00:07	Nearest-Customer-Br...	STP	60	RST. Root = 32768/200/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8008[Mal...
1475	239.749306	0c:71:e1:3e:00:03	Nearest-Customer-Br...	STP	60	RST. TC + Root = 32768/1/0c:37:c2:dd:00:00 Cost = 8 Port = 0x8004
1476	239.752022	0c:d5:e6:cd:00:07	Nearest-Customer-Br...	STP	60	RST. Root = 32768/300/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8008[Mal...
1477	239.888172	0c:71:e1:3e:00:03	Nearest-Customer-Br...	STP	60	RST. TC + Root = 32768/1/0c:37:c2:dd:00:00 Cost = 8 Port = 0x8004
1478	239.891715	0c:71:e1:3e:00:03	Nearest-Customer-Br...	STP	60	RST. TC + Root = 32768/1/0c:71:e1:3e:00:00 Cost = 0 Port = 0x8004

> Frame 1347: Packet, 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0 > Ethernet II, Src: 0c:d5:e6:cd:00:07 (0c:d5:e6:cd:00:07), Dst: Nearest-Customer-Br... > 802.1Q Virtual LAN, PRI: 0, DEI: 0, ID: 100 > Logical-Link Control > DSAP: Spanning Tree BPDU (0x42) > SSAP: Spanning Tree BPDU (0x42) > Control field: U, func=UI (0x03) > Spanning Tree Protocol > Protocol Identifier: Spanning Tree Protocol (0x0000) > Protocol Version Identifier: Rapid Spanning Tree (2) > BPDU Type: Rapid/Multiple Spanning Tree (0x02) > BPDU flags: 0x3c, Forwarding, Learning, Port Role: Designated > Root Identifier: 32768 / 100 / 0c:d5:e6:cd:00:00 > Root Path Cost: 0 > Bridge Identifier: 32768 / 100 / 0c:d5:e6:cd:00:00 > Port identifier: 0x8008 > Message Age: 0 > Max Age: 20 > Hello Time: 2 > Forward Delay: 15		0000 01 80 c2 00 00 00 0c d5 e6 cd 00 07 81 00 00 64 .....d 0010 00 27 42 42 03 00 00 02 02 3c 80 64 0c d5 e6 cd ..'BB...<-d... 0020 00 00 00 00 00 00 80 64 0c d5 e6 cd 00 00 80 08 .....d 0030 00 00 14 00 02 00 0f 00 00 00 00 00
---	--	---

Рисунок 7.2 - Пакеты для Switch2 и Switch5

No.	Time	Source	Destination	Protocol	Length	Info
1502	241.158656	0c:d5:e6:cd:00:01	Nearest-Customer-Br...	STP	60	RST. Root = 32768/200/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8002[Mal...
1503	241.164671	0c:d5:e6:cd:00:01	Nearest-Customer-Br...	STP	60	RST. Root = 32768/300/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8002[Mal...
1504	241.264240	0c:b3:13:37:00:01	Nearest-Customer-Br...	STP	60	RST. Root = 32768/100/0c:b3:13:37:00:00 Cost = 0 Port = 0x8002[Mal...
1505	241.280490	0c:b3:13:37:00:01	Nearest-Customer-Br...	STP	60	RST. Root = 32768/200/0c:b3:13:37:00:00 Cost = 0 Port = 0x8002[Mal...
1506	241.282474	0c:b3:13:37:00:01	Nearest-Customer-Br...	STP	60	RST. Root = 32768/300/0c:b3:13:37:00:00 Cost = 0 Port = 0x8002[Mal...
1507	241.841080	0c:b3:13:37:00:01	Nearest-Customer-Br...	STP	60	RST. TC + Root = 32768/1/0c:b3:13:37:00:00 Cost = 0 Port = 0x8002
1508	241.966846	0c:b3:13:37:00:01	Nearest-Customer-Br...	STP	60	RST. TC + Root = 32768/1/0c:71:e1:3e:00:00 Cost = 4 Port = 0x8002
1509	242.103064	0c:d5:e6:cd:00:01	Nearest-Customer-Br...	STP	60	RST. TC + Root = 0/1/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8002
1510	242.104678	0c:b3:13:37:00:01	Nearest-Customer-Br...	STP	60	RST. TC + Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8002

> Frame 1395: Packet, 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0 > Ethernet II, Src: 0c:b3:13:37:00:01 (0c:b3:13:37:00:01), Dst: Nearest-Customer-Br... > 802.1Q Virtual LAN, PRI: 0, DEI: 0, ID: 300 > Logical-Link Control > Spanning Tree Protocol Protocol Identifier: Spanning Tree Protocol (0x0000) Protocol Version Identifier: Rapid Spanning Tree (2) BPDU Type: Rapid/Multiple Spanning Tree (0x02) BPDU flags: 0x3c, Forwarding, Learning, Port Role: Designated Root Identifier: 32768 / 300 / 0c:b3:13:37:00:00 Root Path Cost: 0 Bridge Identifier: 32768 / 300 / 0c:b3:13:37:00:00 Port identifier: 0x8002 Message Age: 0 Max Age: 20 Hello Time: 2 Forward Delay: 15 Version 1 Length: 0		0000 01 80 c2 00 00 00 0c b3 13 37 00 01 81 00 01 2c-7-.... 0010 00 27 42 42 03 00 00 02 02 3c 81 2c 0c b3 13 37 -'BB.....<...7 0020 00 00 00 00 00 00 81 2c 0c b3 13 37 00 00 80 02-7-.... 0030 00 00 14 00 02 00 0f 00 00 00 00 00
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Spanning Tree Protocol: Protocol | Пакеты: 1510 · Отображено: 1435 (95.0%) | Профиль: Default

Рисунок 7.3 - Пакеты для Switch2 и Switch1

No.	Time	Source	Destination	Protocol	Length	Info
2000	290.906385	0c:75:7a:d0:00:03	Nearest-Customer-Br...	STP	60	RST. TC + Root = 32768/1/0c:75:7a:d0:00:00 Cost = 0 Port = 0x8004
2001	291.283758	0c:75:7a:d0:00:03	Nearest-Customer-Br...	STP	60	RST. TC + Root = 32768/1/0c:75:7a:d0:00:00 Cost = 0 Port = 0x8004
2002	291.653680	0c:d5:e6:cd:00:03	Nearest-Customer-Br...	STP	60	RST. TC + Root = 0/1/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8004
2003	291.655002	0c:75:7a:d0:00:03	Nearest-Customer-Br...	STP	60	RST. TC + Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8004
2004	292.283894	0c:75:7a:d0:00:03	Nearest-Customer-Br...	STP	60	RST. Root = 32768/100/0c:75:7a:d0:00:00 Cost = 0 Port = 0x8004[Mal...
2005	292.286011	0c:75:7a:d0:00:03	Nearest-Customer-Br...	STP	60	RST. Root = 32768/200/0c:75:7a:d0:00:00 Cost = 0 Port = 0x8004[Mal...
2006	292.290649	0c:75:7a:d0:00:03	Nearest-Customer-Br...	STP	60	RST. Root = 32768/300/0c:75:7a:d0:00:00 Cost = 0 Port = 0x8004[Mal...

> Frame 1868: Packet, 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0 > Ethernet II, Src: 0c:d5:e6:cd:00:03 (0c:d5:e6:cd:00:03), Dst: Nearest-Customer-Br... > 802.1Q Virtual LAN, PRI: 0, DEI: 0, ID: 200 > Logical-Link Control > Spanning Tree Protocol Protocol Identifier: Spanning Tree Protocol (0x0000) Protocol Version Identifier: Rapid Spanning Tree (2) BPDU Type: Rapid/Multiple Spanning Tree (0x02) BPDU flags: 0x3c, Forwarding, Learning, Port Role: Designated Root Identifier: 32768 / 200 / 0c:d5:e6:cd:00:00 Root Path Cost: 0 Bridge Identifier: 32768 / 200 / 0c:d5:e6:cd:00:00 Port identifier: 0x8004 Message Age: 0 Max Age: 20 Hello Time: 2 Forward Delay: 15 Version 1 Length: 0		0000 01 80 c2 00 00 00 0c d5 e6 cd 00 03 81 00 00 c8 0010 00 27 42 42 03 00 00 02 02 3c 80 c8 0c d5 e6 cd -'BB.....<... 0020 00 00 00 00 00 00 80 c8 0c d5 e6 cd 00 00 80 04 0030 00 00 14 00 02 00 0f 00 00 00 00 00
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Рисунок 7.4 - Пакеты для Switch2 и Switch3

No.	Time	Source	Destination	Protocol	Length	Info
1836	315.918727	0c:37:c2:dd:00:02	Nearest-Customer-Br...	STP	60	RST. TC + Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8003
1837	316.280023	0c:37:c2:dd:00:02	Nearest-Customer-Br...	STP	60	RST. TC + Root = 0/1/0c:d5:e6:cd:00:00 Cost = 4 Port = 0x8003
1838	316.936950	0c:37:c2:dd:00:02	Nearest-Customer-Br...	STP	60	RST. Root = 32768/100/0c:37:c2:dd:00:00 Cost = 0 Port = 0x8003[Malf
1839	316.955951	0c:37:c2:dd:00:02	Nearest-Customer-Br...	STP	60	RST. Root = 32768/200/0c:37:c2:dd:00:00 Cost = 0 Port = 0x8003[Malf
1840	316.958119	0c:37:c2:dd:00:02	Nearest-Customer-Br...	STP	60	RST. Root = 32768/300/0c:37:c2:dd:00:00 Cost = 0 Port = 0x8003[Malf
1841	316.984713	0c:d5:e6:cd:00:04	Nearest-Customer-Br...	STP	60	RST. Root = 32768/100/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8005[Malf
1842	316.991422	0c:37:c2:dd:00:02	Nearest-Customer-Br...	STP	60	RST. TC + Root = 32768/1/0c:37:c2:dd:00:00 Cost = 0 Port = 0x8003
1843	317.004200	0c:d5:e6:cd:00:04	Nearest-Customer-Br...	STP	60	RST. Root = 32768/200/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8005[Malf
1844	317.009692	0c:d5:e6:cd:00:04	Nearest-Customer-Br...	STP	60	RST. Root = 32768/300/0c:d5:e6:cd:00:00 Cost = 0 Port = 0x8005[Malf

> Frame 1787: Packet, 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0	0000	01 80 c2 00 00 0c d5 e6 cd 00 04 81 00 00 64	.....
> Ethernet II, Src: 0c:d5:e6:cd:00:04 (0c:d5:e6:cd:00:04), Dst: Nearest-Customer-Br...	0010	00 27 42 42 03 00 00 02 02 3c 80 64 0c d5 e6 cd	..BB....<..d..
> 802.1Q Virtual LAN, PRI: 0, DEI: 0, ID: 100	0020	00 00 00 00 00 00 80 64 0c d5 e6 cd 00 00 80 05	.....d.....
> Logical-Link Control	0030	00 00 14 00 02 00 0f 00 00 00 00 00	.....

Spanning Tree Protocol

Protocol Identifier: Spanning Tree Protocol (0x0000)
 Protocol Version Identifier: Rapid Spanning Tree (2)
 BPDU Type: Rapid/Multiple Spanning Tree (0x02)
 > BPDU flags: 0x3c, Forwarding, Learning, Port Role: Designated
 > Root Identifier: 32768 / 100 / 0c:d5:e6:cd:00:00
 Root Path Cost: 0
 > Bridge Identifier: 32768 / 100 / 0c:d5:e6:cd:00:00
 Port identifier: 0x8005
 Message Age: 0
 Max Age: 20
 Hello Time: 2
 Forward Delay: 15
 Version 1 Length: 0

Рисунок 7.5 - Пакеты для Switch2 и Switch4

STP: Только корневой мост рассылает конфигурационные BPDU.

RSTP: Каждый коммутатор генерирует и отправляет свои BPDU с каждым Hello-таймером, независимо от получения их от корня.

Пункт 5

Схема сохранена под названием schema7_5.png

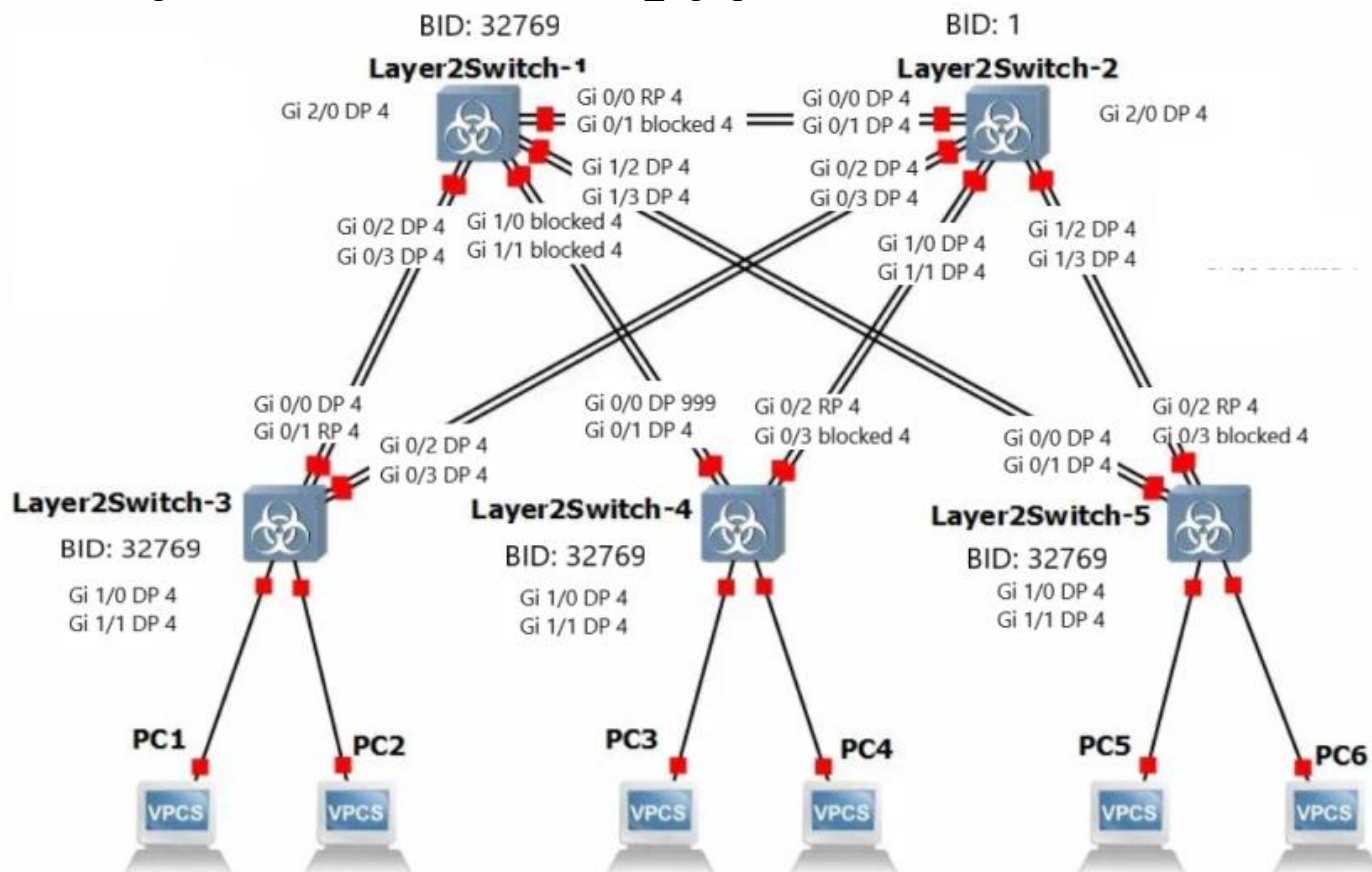


Рисунок 7.6 - Схема для пункта 5

Пункт 6

Сохраненные файлы находятся в папке `configs7`.