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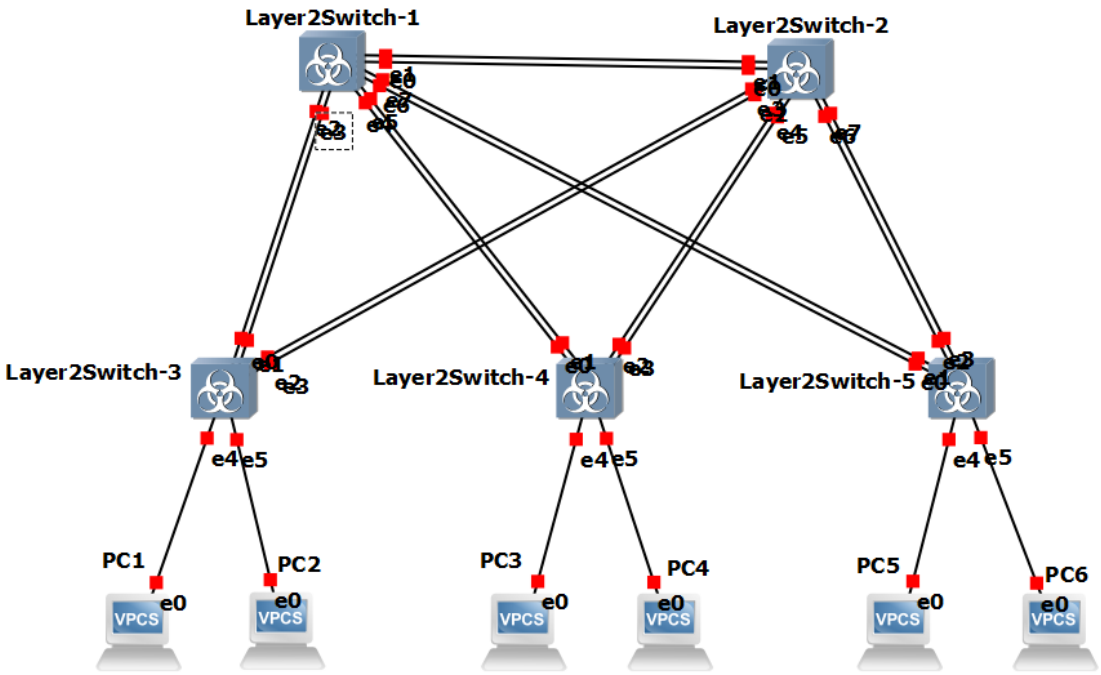
Лабораторная работа №2.

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

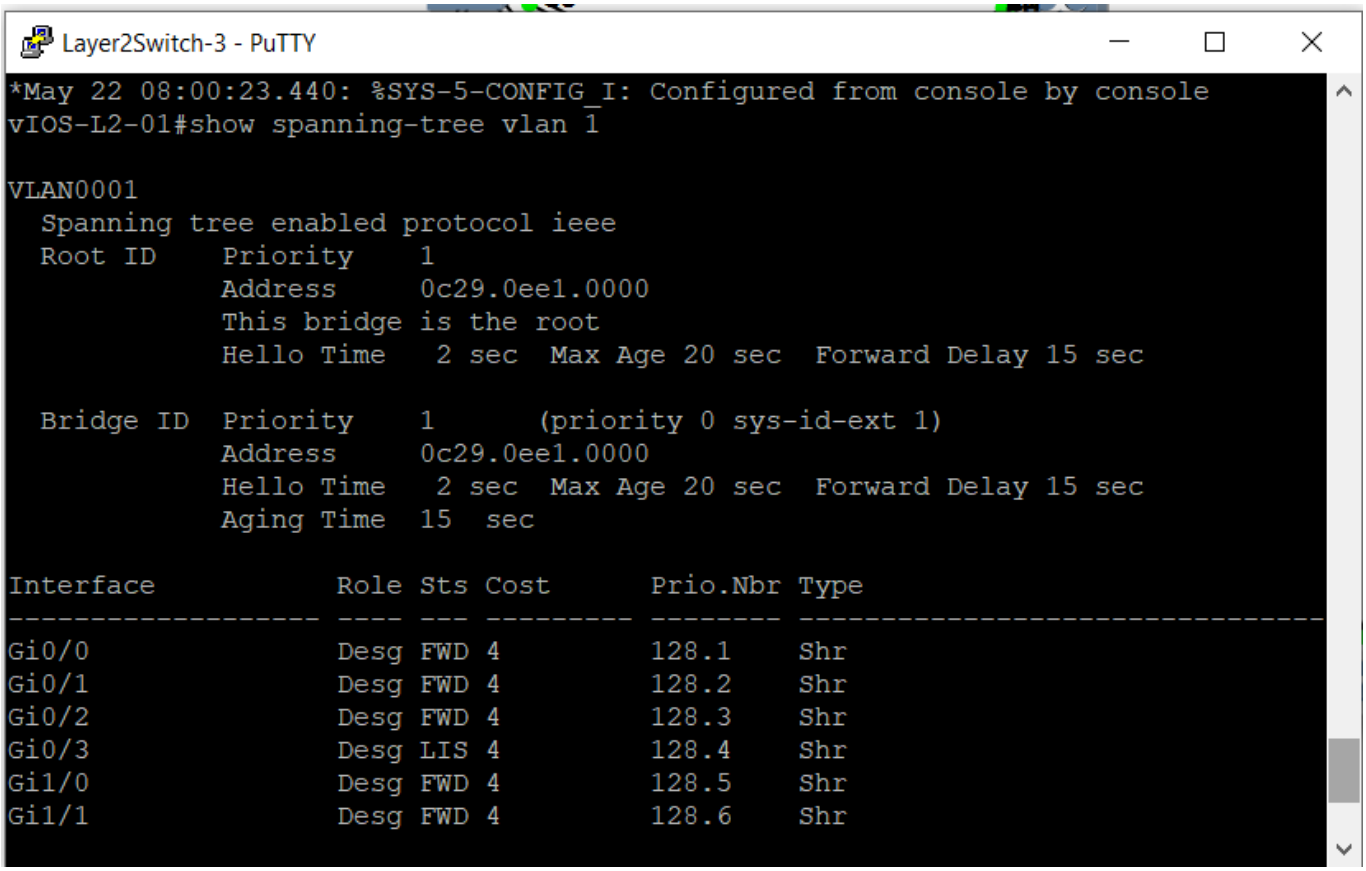
- Исходная схема



Корневым мостом был выбран Layer2Switch - 2, так как при одинаковом приоритете у него оказался самый маленький MAC-адрес.

Явно выберим коммутатор Layer2Switch-3 как корневой. Используем команду spanning-tree vlan 1 priority 0 для назначения корня.

- Layer2Switch-3



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

- PC1

```
PC1> ping 192.168.1.2

84 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=6.509 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=5.477 ms
84 bytes from 192.168.1.2 icmp_seq=3 ttl=64 time=4.450 ms
84 bytes from 192.168.1.2 icmp_seq=4 ttl=64 time=6.261 ms
84 bytes from 192.168.1.2 icmp_seq=5 ttl=64 time=1.736 ms

PC1> ping 192.168.1.3

84 bytes from 192.168.1.3 icmp_seq=1 ttl=64 time=7.889 ms
84 bytes from 192.168.1.3 icmp_seq=2 ttl=64 time=11.401 ms
84 bytes from 192.168.1.3 icmp_seq=3 ttl=64 time=2.288 ms
84 bytes from 192.168.1.3 icmp_seq=4 ttl=64 time=5.152 ms
84 bytes from 192.168.1.3 icmp_seq=5 ttl=64 time=10.505 ms

PC1> ping 192.168.1.4

84 bytes from 192.168.1.4 icmp_seq=1 ttl=64 time=14.530 ms
84 bytes from 192.168.1.4 icmp_seq=2 ttl=64 time=3.110 ms
84 bytes from 192.168.1.4 icmp_seq=3 ttl=64 time=2.666 ms
84 bytes from 192.168.1.4 icmp_seq=4 ttl=64 time=11.152 ms
84 bytes from 192.168.1.4 icmp_seq=5 ttl=64 time=1.958 ms

PC1> ping 192.168.1.5

84 bytes from 192.168.1.5 icmp_seq=1 ttl=64 time=4.997 ms
84 bytes from 192.168.1.5 icmp_seq=2 ttl=64 time=11.825 ms
84 bytes from 192.168.1.5 icmp_seq=3 ttl=64 time=5.126 ms
84 bytes from 192.168.1.5 icmp_seq=4 ttl=64 time=9.251 ms
84 bytes from 192.168.1.5 icmp_seq=5 ttl=64 time=7.798 ms

PC1> ping 192.168.1.6

84 bytes from 192.168.1.6 icmp_seq=1 ttl=64 time=8.884 ms
84 bytes from 192.168.1.6 icmp_seq=2 ttl=64 time=8.208 ms
84 bytes from 192.168.1.6 icmp_seq=3 ttl=64 time=2.161 ms
84 bytes from 192.168.1.6 icmp_seq=4 ttl=64 time=9.800 ms
84 bytes from 192.168.1.6 icmp_seq=5 ttl=64 time=12.703 ms

PC1>
```

- PC2

```
PC2> ping 192.168.1.1

84 bytes from 192.168.1.1 icmp_seq=1 ttl=64 time=10.260 ms
84 bytes from 192.168.1.1 icmp_seq=2 ttl=64 time=4.534 ms
84 bytes from 192.168.1.1 icmp_seq=3 ttl=64 time=8.968 ms
84 bytes from 192.168.1.1 icmp_seq=4 ttl=64 time=8.302 ms
84 bytes from 192.168.1.1 icmp_seq=5 ttl=64 time=2.378 ms

PC2> ping 192.168.1.3

84 bytes from 192.168.1.3 icmp_seq=1 ttl=64 time=2.932 ms
84 bytes from 192.168.1.3 icmp_seq=2 ttl=64 time=5.135 ms
84 bytes from 192.168.1.3 icmp_seq=3 ttl=64 time=8.396 ms
84 bytes from 192.168.1.3 icmp_seq=4 ttl=64 time=5.039 ms
84 bytes from 192.168.1.3 icmp_seq=5 ttl=64 time=13.659 ms

PC2> ping 192.168.1.4

84 bytes from 192.168.1.4 icmp_seq=1 ttl=64 time=8.671 ms
84 bytes from 192.168.1.4 icmp_seq=2 ttl=64 time=14.188 ms
84 bytes from 192.168.1.4 icmp_seq=3 ttl=64 time=6.294 ms
84 bytes from 192.168.1.4 icmp_seq=4 ttl=64 time=8.010 ms
84 bytes from 192.168.1.4 icmp_seq=5 ttl=64 time=8.323 ms

PC2> ping 192.168.1.5

84 bytes from 192.168.1.5 icmp_seq=1 ttl=64 time=8.974 ms
84 bytes from 192.168.1.5 icmp_seq=2 ttl=64 time=13.645 ms
84 bytes from 192.168.1.5 icmp_seq=3 ttl=64 time=6.017 ms
84 bytes from 192.168.1.5 icmp_seq=4 ttl=64 time=6.336 ms
84 bytes from 192.168.1.5 icmp_seq=5 ttl=64 time=12.147 ms

PC2> ping 192.168.1.6

84 bytes from 192.168.1.6 icmp_seq=1 ttl=64 time=6.088 ms
84 bytes from 192.168.1.6 icmp_seq=2 ttl=64 time=14.600 ms
84 bytes from 192.168.1.6 icmp_seq=3 ttl=64 time=5.455 ms
84 bytes from 192.168.1.6 icmp_seq=4 ttl=64 time=4.096 ms
84 bytes from 192.168.1.6 icmp_seq=5 ttl=64 time=7.521 ms

PC2>
```

- PC3

```
PC3> ping 192.168.1.1

84 bytes from 192.168.1.1 icmp_seq=1 ttl=64 time=8.272 ms
84 bytes from 192.168.1.1 icmp_seq=2 ttl=64 time=5.843 ms
84 bytes from 192.168.1.1 icmp_seq=3 ttl=64 time=8.910 ms
84 bytes from 192.168.1.1 icmp_seq=4 ttl=64 time=7.092 ms
84 bytes from 192.168.1.1 icmp_seq=5 ttl=64 time=3.411 ms

PC3> ping 192.168.1.2

84 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=14.620 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=4.521 ms
84 bytes from 192.168.1.2 icmp_seq=3 ttl=64 time=4.885 ms
84 bytes from 192.168.1.2 icmp_seq=4 ttl=64 time=5.316 ms
84 bytes from 192.168.1.2 icmp_seq=5 ttl=64 time=6.577 ms

PC3> ping 192.168.1.4

84 bytes from 192.168.1.4 icmp_seq=1 ttl=64 time=2.665 ms
84 bytes from 192.168.1.4 icmp_seq=2 ttl=64 time=6.166 ms
84 bytes from 192.168.1.4 icmp_seq=3 ttl=64 time=1.110 ms
84 bytes from 192.168.1.4 icmp_seq=4 ttl=64 time=0.673 ms
84 bytes from 192.168.1.4 icmp_seq=5 ttl=64 time=2.990 ms

PC3> ping 192.168.1.5

84 bytes from 192.168.1.5 icmp_seq=1 ttl=64 time=20.466 ms
84 bytes from 192.168.1.5 icmp_seq=2 ttl=64 time=8.928 ms
84 bytes from 192.168.1.5 icmp_seq=3 ttl=64 time=7.747 ms
84 bytes from 192.168.1.5 icmp_seq=4 ttl=64 time=6.652 ms
84 bytes from 192.168.1.5 icmp_seq=5 ttl=64 time=17.873 ms

PC3> ping 192.168.1.6

84 bytes from 192.168.1.6 icmp_seq=1 ttl=64 time=14.292 ms
84 bytes from 192.168.1.6 icmp_seq=2 ttl=64 time=6.157 ms
84 bytes from 192.168.1.6 icmp_seq=3 ttl=64 time=9.369 ms
84 bytes from 192.168.1.6 icmp_seq=4 ttl=64 time=8.698 ms
84 bytes from 192.168.1.6 icmp_seq=5 ttl=64 time=8.085 ms

PC3>
```

- PC4

```
PC4> ping 192.168.1.1

84 bytes from 192.168.1.1 icmp_seq=1 ttl=64 time=13.477 ms
84 bytes from 192.168.1.1 icmp_seq=2 ttl=64 time=12.154 ms
84 bytes from 192.168.1.1 icmp_seq=3 ttl=64 time=9.407 ms
84 bytes from 192.168.1.1 icmp_seq=4 ttl=64 time=7.717 ms
84 bytes from 192.168.1.1 icmp_seq=5 ttl=64 time=8.244 ms

PC4> ping 192.168.1.2

84 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=5.191 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=13.098 ms
84 bytes from 192.168.1.2 icmp_seq=3 ttl=64 time=9.747 ms
84 bytes from 192.168.1.2 icmp_seq=4 ttl=64 time=5.940 ms
84 bytes from 192.168.1.2 icmp_seq=5 ttl=64 time=18.069 ms

PC4> ping 192.168.1.3

84 bytes from 192.168.1.3 icmp_seq=1 ttl=64 time=7.454 ms
84 bytes from 192.168.1.3 icmp_seq=2 ttl=64 time=0.700 ms
84 bytes from 192.168.1.3 icmp_seq=3 ttl=64 time=0.953 ms
84 bytes from 192.168.1.3 icmp_seq=4 ttl=64 time=1.257 ms
84 bytes from 192.168.1.3 icmp_seq=5 ttl=64 time=3.643 ms

PC4> ping 192.168.1.5

84 bytes from 192.168.1.5 icmp_seq=1 ttl=64 time=2.986 ms
84 bytes from 192.168.1.5 icmp_seq=2 ttl=64 time=7.281 ms
84 bytes from 192.168.1.5 icmp_seq=3 ttl=64 time=8.914 ms
84 bytes from 192.168.1.5 icmp_seq=4 ttl=64 time=2.696 ms
84 bytes from 192.168.1.5 icmp_seq=5 ttl=64 time=7.717 ms

PC4> ping 192.168.1.6

84 bytes from 192.168.1.6 icmp_seq=1 ttl=64 time=2.930 ms
84 bytes from 192.168.1.6 icmp_seq=2 ttl=64 time=10.218 ms
84 bytes from 192.168.1.6 icmp_seq=3 ttl=64 time=8.877 ms
84 bytes from 192.168.1.6 icmp_seq=4 ttl=64 time=5.067 ms
84 bytes from 192.168.1.6 icmp_seq=5 ttl=64 time=3.030 ms

PC4>
```

- PC5

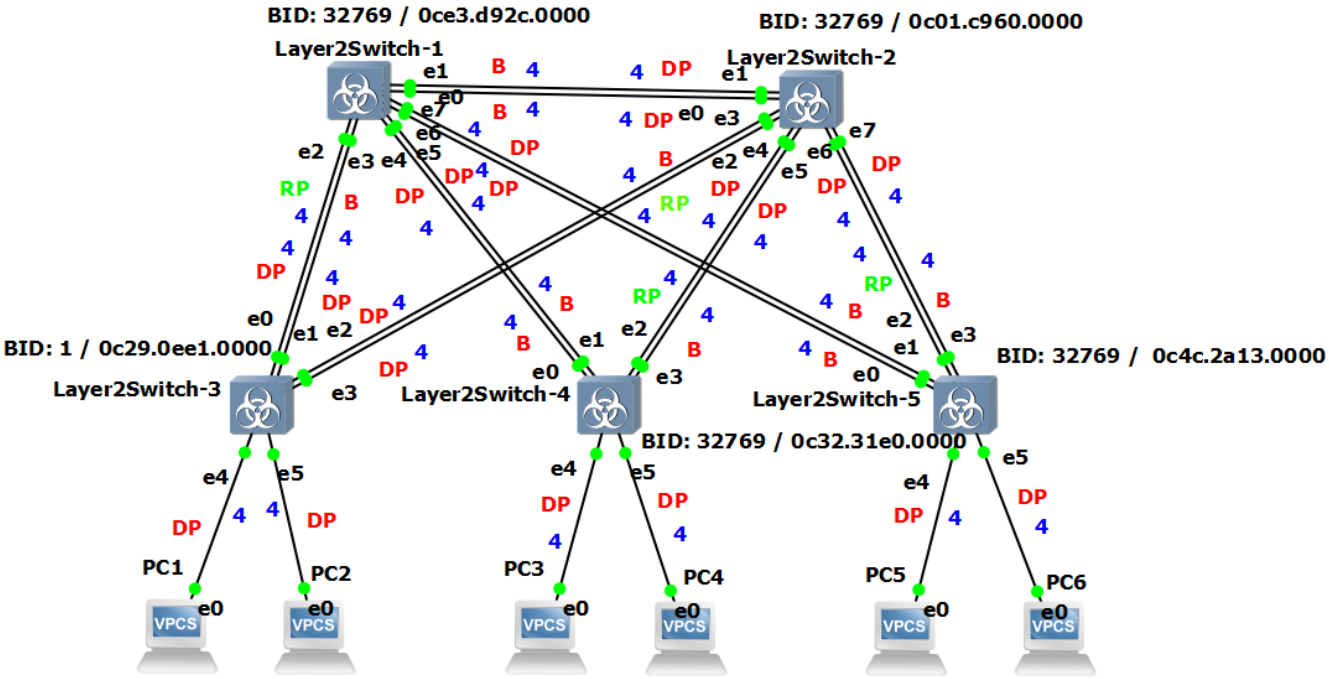
```
PC5> ping 192.168.1.1

84 bytes from 192.168.1.1 icmp_seq=1 ttl=64 time=9.294 ms
84 bytes from 192.168.1.1 icmp_seq=2 ttl=64 time=9.075 ms
84 bytes from 192.168.1.1 icmp_seq=3 ttl=64 time=10.603 ms
84 bytes from 192.168.1.1 icmp_seq=4 ttl=64 time=4.598 ms
84 bytes from 192.168.1.1 icmp_seq=5 ttl=64 time=9.273 ms

PC5> ping 192.168.1.2

84 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=14.854 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=8.466 ms
84 bytes from 192.168.1.2 icmp_seq=3 ttl=64 time=2.417 ms
84 bytes from 192.168.1.2 icmp_seq=4 ttl=64 time=11.656 ms
84 bytes from 192.168.1.2 icmp_seq=5 ttl=64 time=7.192 ms

PC5> ping 192.168.1.3

84 bytes from 192.168.1.3 icmp_seq=1 ttl=64 time=10.600 ms
84 bytes from 192.168.1.3 icmp_seq=2 ttl=64 time=5.212 ms
84 bytes from 192.168.1.3 icmp_seq=3 ttl=64 time=10.753 ms
84 bytes from 192.168.1.3 icmp_seq=4 ttl=64 time=10.147 ms
84 bytes from 192.168.1.3 icmp_seq=5 ttl=64 time=5.907 ms

PC5> ping 192.168.1.4

84 bytes from 192.168.1.4 icmp_seq=1 ttl=64 time=9.587 ms
84 bytes from 192.168.1.4 icmp_seq=2 ttl=64 time=8.223 ms
84 bytes from 192.168.1.4 icmp_seq=3 ttl=64 time=16.777 ms
84 bytes from 192.168.1.4 icmp_seq=4 ttl=64 time=14.489 ms
84 bytes from 192.168.1.4 icmp_seq=5 ttl=64 time=7.859 ms

PC5> ping 192.168.1.6

84 bytes from 192.168.1.6 icmp_seq=1 ttl=64 time=0.698 ms
84 bytes from 192.168.1.6 icmp_seq=2 ttl=64 time=9.545 ms
84 bytes from 192.168.1.6 icmp_seq=3 ttl=64 time=1.061 ms
84 bytes from 192.168.1.6 icmp_seq=4 ttl=64 time=6.253 ms
84 bytes from 192.168.1.6 icmp_seq=5 ttl=64 time=7.626 ms

PC5>
```

- PC6

```
PC6> ping 192.168.1.1

84 bytes from 192.168.1.1 icmp_seq=1 ttl=64 time=13.983 ms
84 bytes from 192.168.1.1 icmp_seq=2 ttl=64 time=9.401 ms
84 bytes from 192.168.1.1 icmp_seq=3 ttl=64 time=3.466 ms
84 bytes from 192.168.1.1 icmp_seq=4 ttl=64 time=10.709 ms
84 bytes from 192.168.1.1 icmp_seq=5 ttl=64 time=5.604 ms

PC6> ping 192.168.1.2

84 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=20.080 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=6.036 ms
84 bytes from 192.168.1.2 icmp_seq=3 ttl=64 time=14.506 ms
84 bytes from 192.168.1.2 icmp_seq=4 ttl=64 time=9.229 ms
84 bytes from 192.168.1.2 icmp_seq=5 ttl=64 time=6.776 ms

PC6> ping 192.168.1.3

84 bytes from 192.168.1.3 icmp_seq=1 ttl=64 time=8.575 ms
84 bytes from 192.168.1.3 icmp_seq=2 ttl=64 time=6.621 ms
84 bytes from 192.168.1.3 icmp_seq=3 ttl=64 time=2.889 ms
84 bytes from 192.168.1.3 icmp_seq=4 ttl=64 time=9.112 ms
84 bytes from 192.168.1.3 icmp_seq=5 ttl=64 time=17.313 ms

PC6> ping 192.168.1.4

84 bytes from 192.168.1.4 icmp_seq=1 ttl=64 time=5.786 ms
84 bytes from 192.168.1.4 icmp_seq=2 ttl=64 time=9.029 ms
84 bytes from 192.168.1.4 icmp_seq=3 ttl=64 time=19.407 ms
84 bytes from 192.168.1.4 icmp_seq=4 ttl=64 time=10.095 ms
84 bytes from 192.168.1.4 icmp_seq=5 ttl=64 time=8.984 ms

PC6> ping 192.168.1.5

84 bytes from 192.168.1.5 icmp_seq=1 ttl=64 time=0.744 ms
84 bytes from 192.168.1.5 icmp_seq=2 ttl=64 time=9.382 ms
84 bytes from 192.168.1.5 icmp_seq=3 ttl=64 time=1.595 ms
84 bytes from 192.168.1.5 icmp_seq=4 ttl=64 time=2.005 ms
84 bytes from 192.168.1.5 icmp_seq=5 ttl=64 time=3.737 ms

PC6>
```

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

- Схема

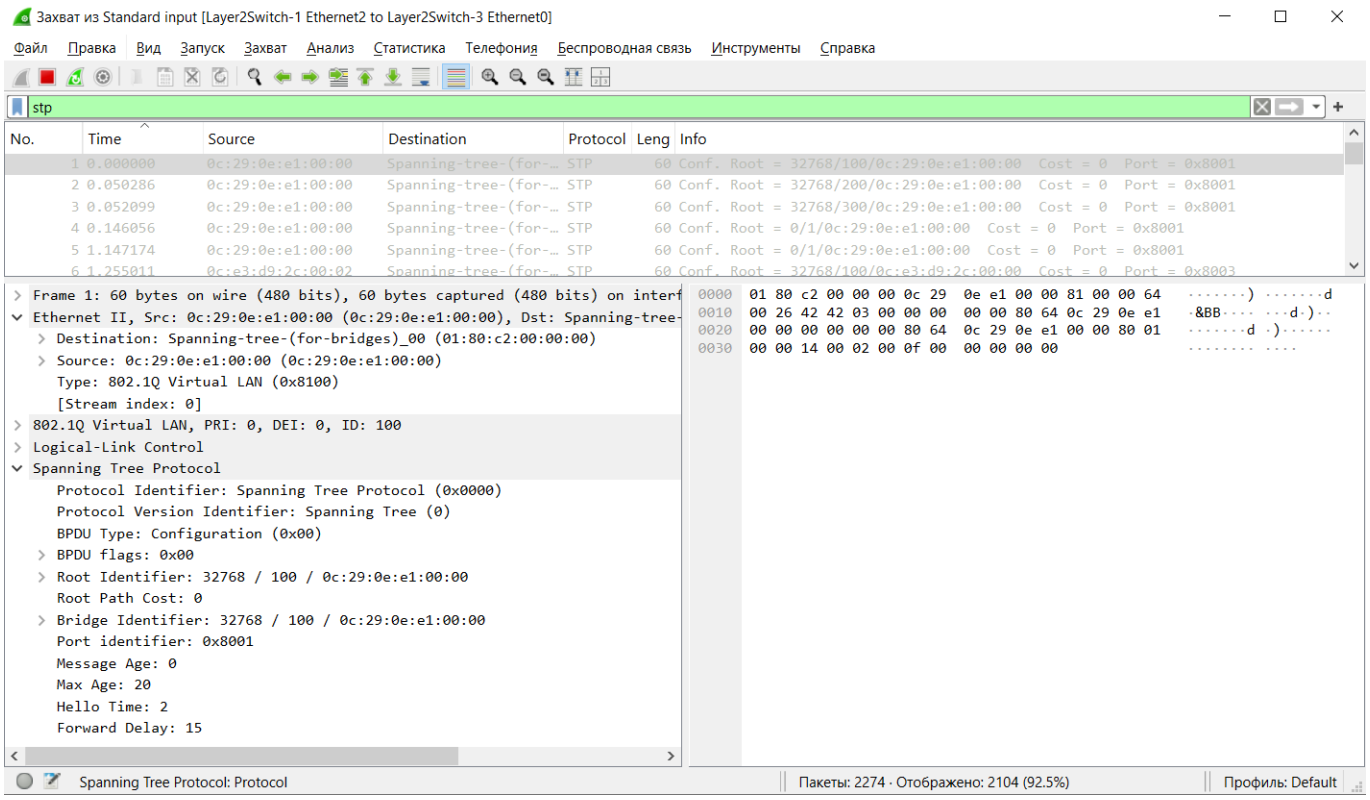


Стоимость пути к корневому мосту для Layer2switch-1, Layer2switch-2 равна 4.

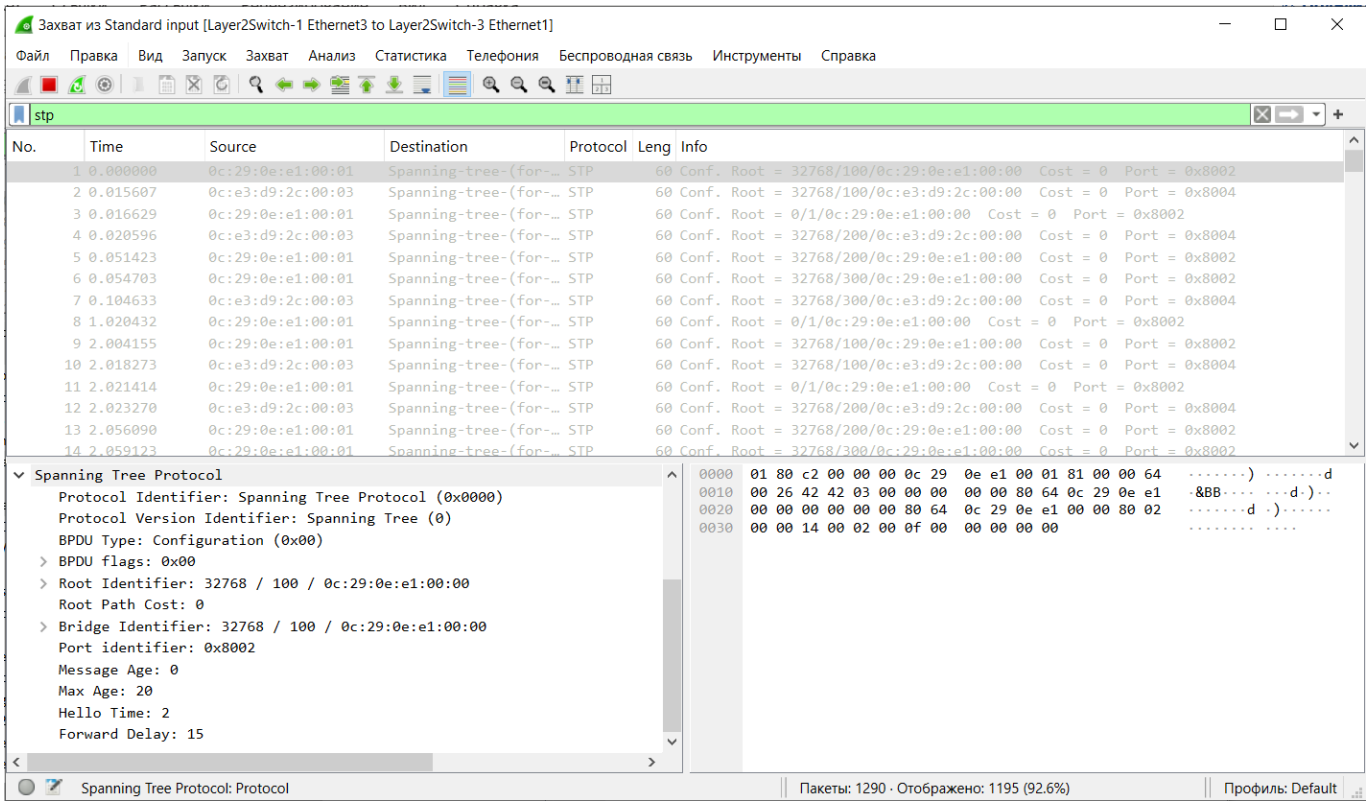
Стоимость пути к корневому мосту для Layer2switch-4, Layer2switch-5 равна 8.

4) При помощи wireshark отследить передачу пакетов hello от корневого коммутатора на всех линках (nb!), результаты включить в отчет. **Корневой у нас Layer2switch-3.**

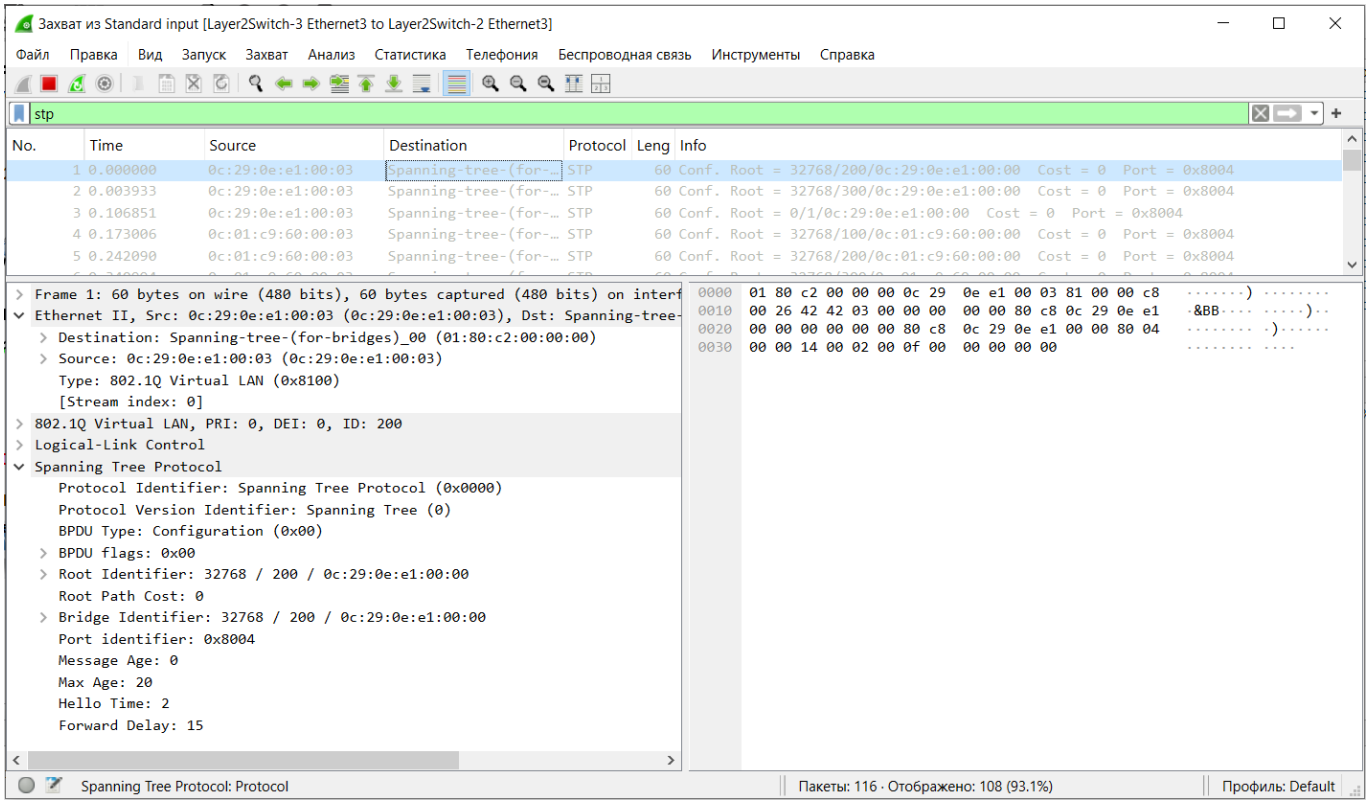
- Линк Layer2Switch-1_Ethernet2_to_Layer2Switch-3_Ethernet0.



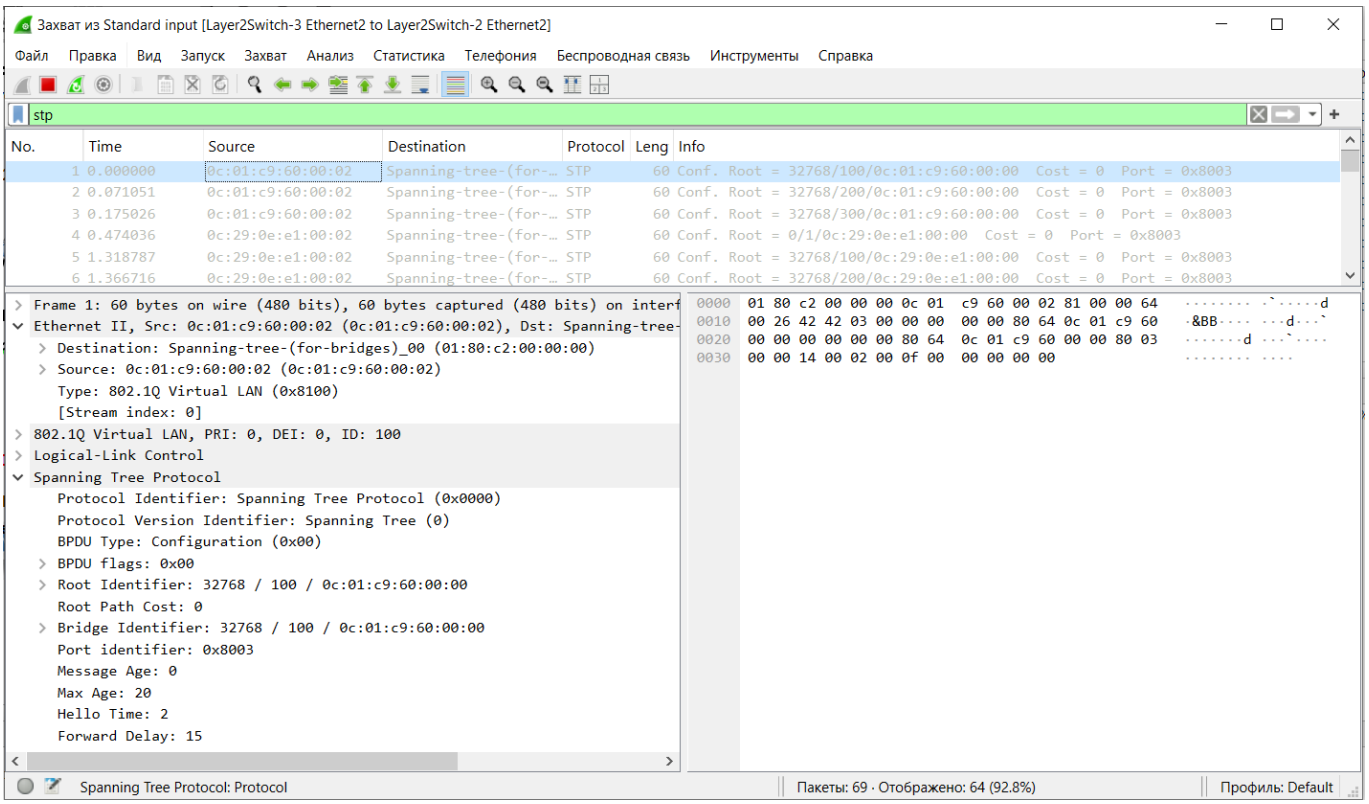
- Линк Layer2Switch-1_Ethernet3_to_Layer2Switch-3_Ethernet1.



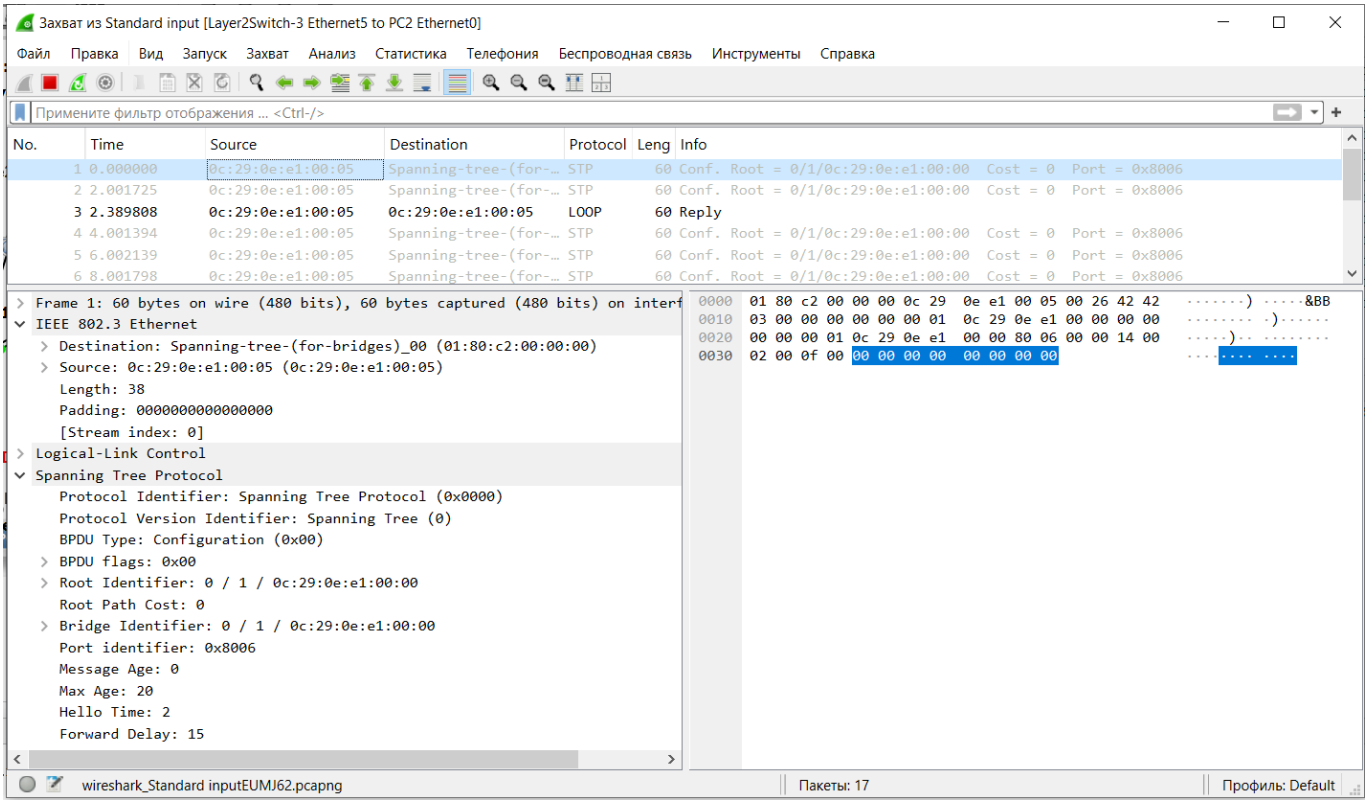
- Линк Layer2Switch-3_Ethernet3_to_Layer2Switch-2_Ethernet3



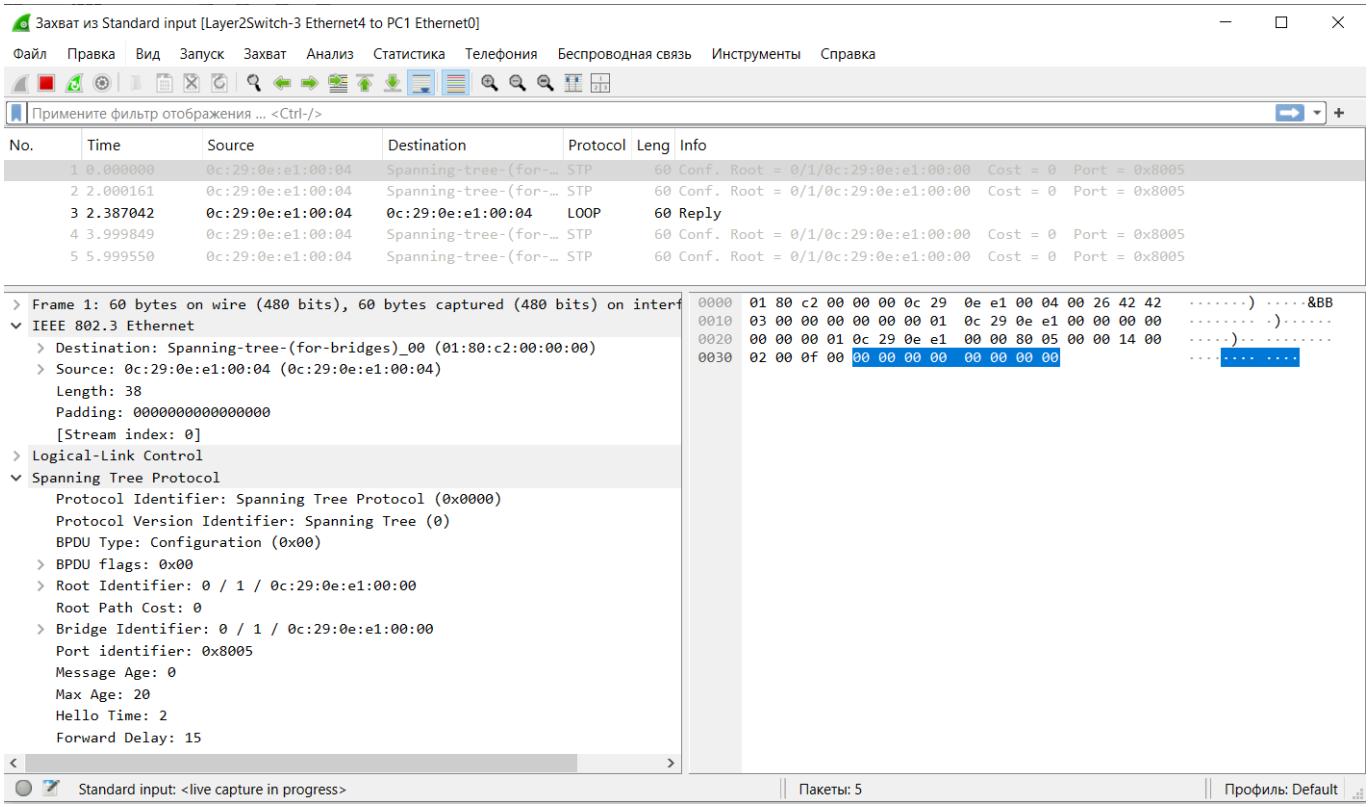
- Линк Layer2Switch-3_Ethernet2_to_Layer2Switch-2_Ethernet2



- Линк Layer2Switch-3_Ethernet5_to_PC2_Ethernet0



- Линк Layer2Switch-3_Ethernet4_to_PC1_Ethernet0



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

Изменим стоимость маршрута у **Layer2Switch-1.**

vIOS-L2-01>enable

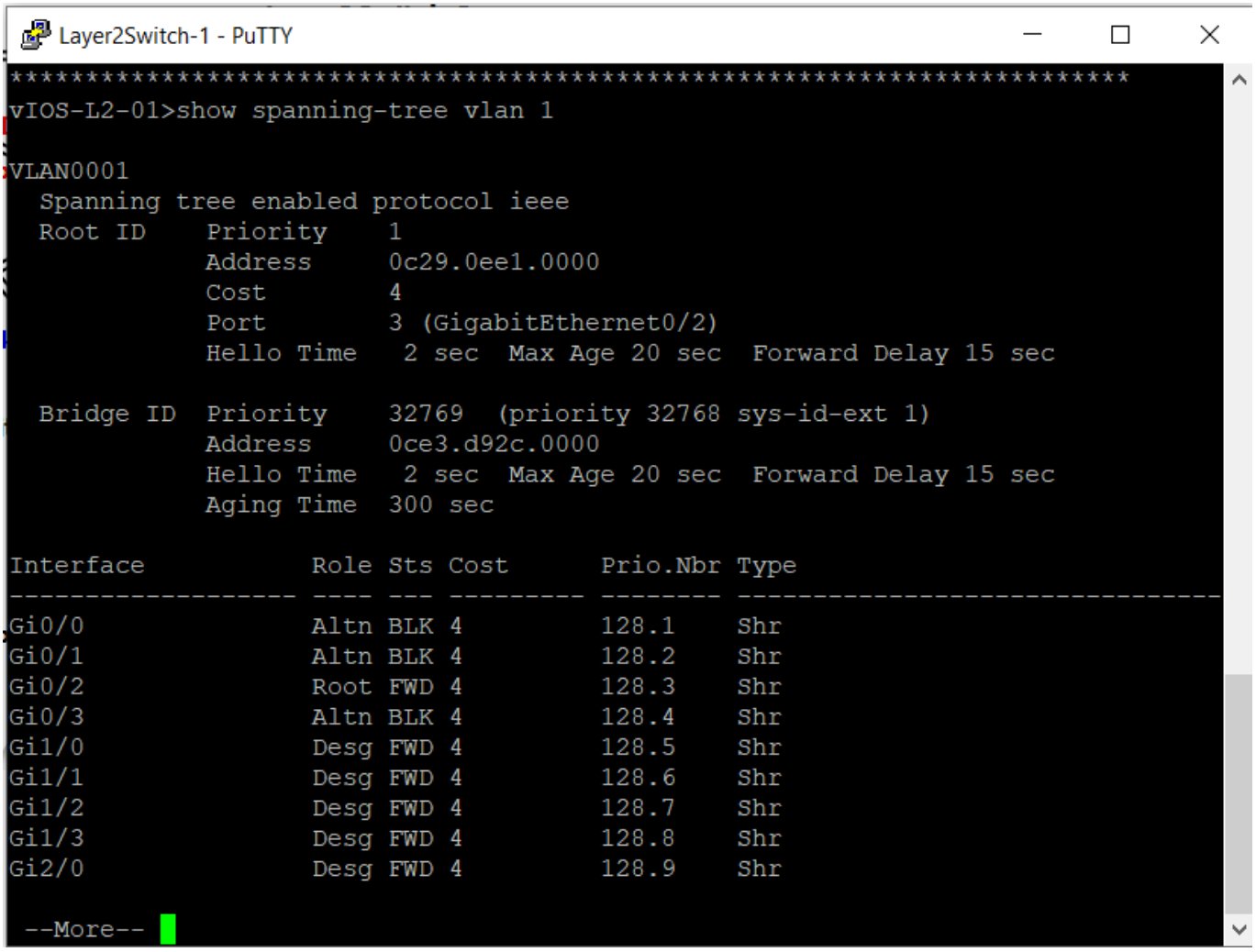
vIOS-L2-01#conf ter

Enter configuration commands, one per line. End with CNTL/Z.

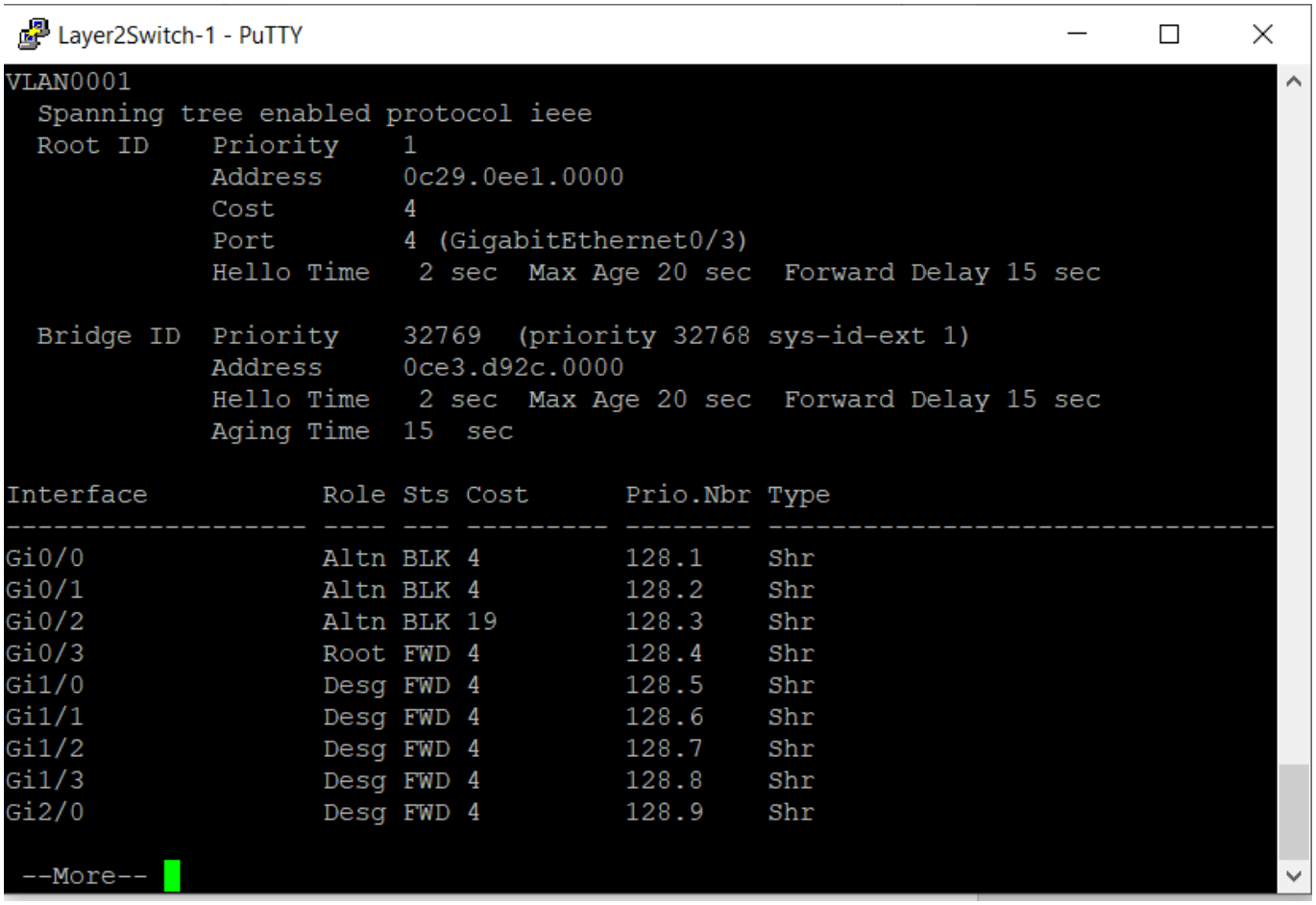
vIOS-L2-01(config)#interface GigabitEthernet0/2

vIOS-L2-01(config-if)#spanning-tree cost 19

- **ДО**


Layer2Switch-1 - PuTTY
vIOS-L2-01>show spanning-tree vlan 1
VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 1
Address 0c29.0ee1.0000
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 0ce3.d92c.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 Altn BLK 4 128.1 Shr
Gi0/1 Altn BLK 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
Gi1/2 Desg FWD 4 128.7 Shr
Gi1/3 Desg FWD 4 128.8 Shr
Gi2/0 Desg FWD 4 128.9 Shr
--More--

- **После**

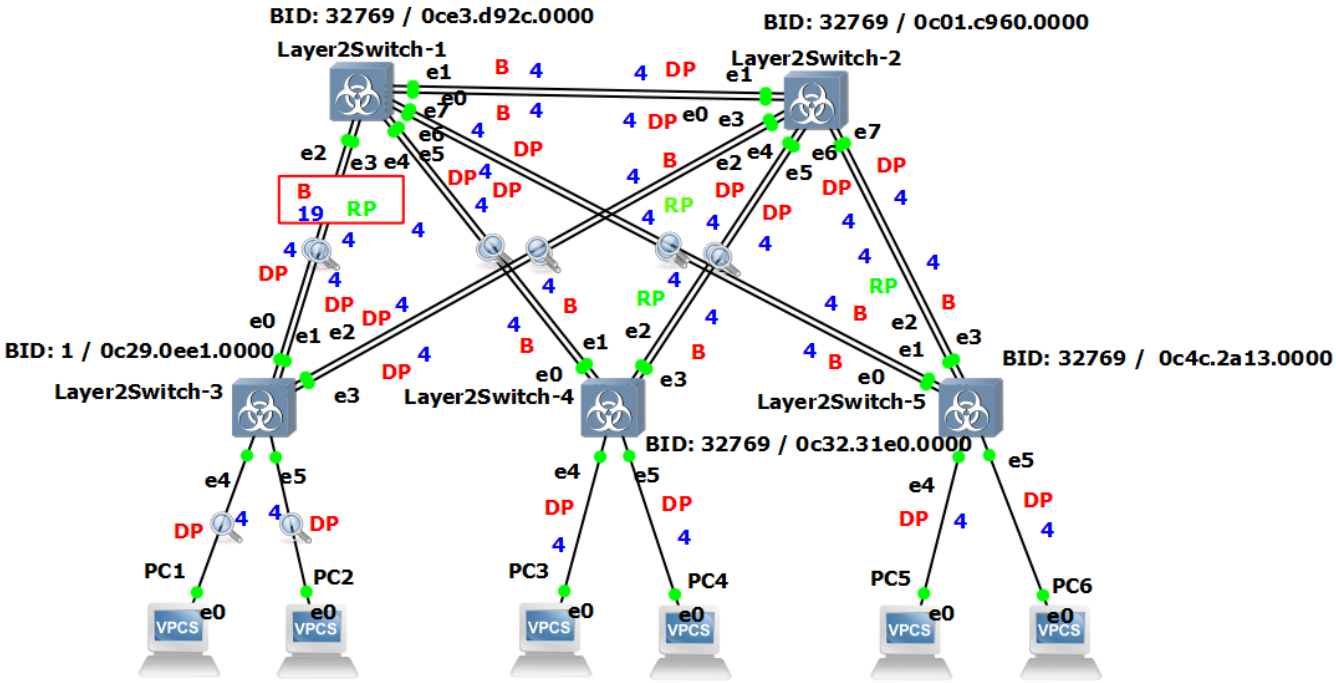


Стоимость Gi0/2 изменилась с 4 на 19 и порт Gi0/2 заблокировался **(B)**, а порт Gi0/3 стал **RD**. Для остальных коммутаторов Layer2switch-1, Layer2switch-2, Layer2switch-4, Layer2switch-5 режимы работы портов не изменился.

— **Layer2switch-1, Layer2switch-2 равна 4.**

— **Layer2switch-4, Layer2switch-5 равна 8.**

- **Схема**



Конфигурация была сохранена в файл **Layer2Switch-1_after_change_cost.conf**

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