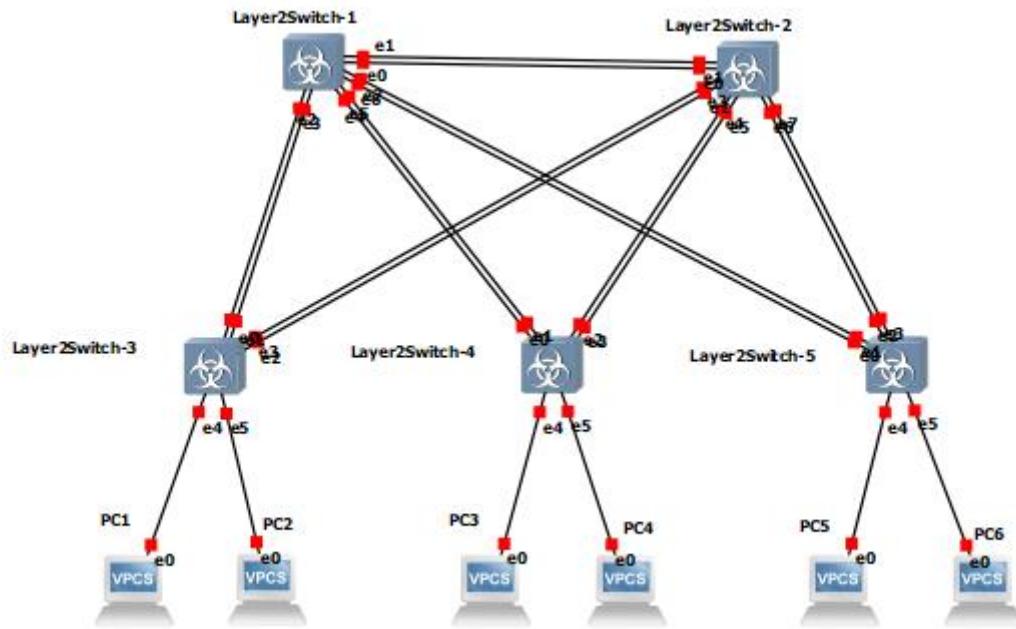


## Настройка протокола STP (IEEE 802.1D)

- 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

Для начала проверим включен ли протокол STP. Зайдём на коммутатор и введём команду `show spanning-tree`

```

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
              Address     0c09.d89f.0000
              This bridge is the root
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769  (priority 32768 sys-id-ext 1)
              Address     0c09.d89f.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
  Gil/0          Desg FWD 4        128.5    Shr
  Gil/1          Desg FWD 4        128.6    Shr

```

Как видим протокол включён. Приоритет по умолчанию 32769. Мы рассматриваем коммутатор Switch3 и он является рутом, промежуток Hello 2 секунды, максимум ждём 20 секунд, если пакеты не поступают и обычная задержка 15 секунд. Данный switch стал рутом, так как его мак-адрес меньше, чем у других свичей, изменим это, присвоив свичу 4 меньший приоритет.

enable

configure

spanning-tree vlan 1 priority 0

exit

write

Снова вызываем show spanning-tree и видим, что адрес рута изменился на мак-адрес свича 4, а также изменился приоритет.

```

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    1
              Address     0ca5.37fb.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     0ca5.37fb.0000
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time   15 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
  Gil/0          Desg FWD 4       128.5    Shr
  Gil/1          Desg FWD 4       128.6    Shr

```

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

Настраиваем IP адреса на компьютерах

PC 1

ip 192.168.100.1 255.255.255.0

save

PC 2

ip 192.168.100.2 255.255.255.0

save

И т.д.

Теперь проверим все пинги.

Пример на PC1

ping 192.168.100.2

ping 192.168.100.3

ping 192.168.100.4

ping 192.168.100.5

ping 192.168.100.6

```
PC1> ping 192.168.100.2

84 bytes from 192.168.100.2 icmp_seq=1 ttl=64 time=2.550 ms
84 bytes from 192.168.100.2 icmp_seq=2 ttl=64 time=1.668 ms
84 bytes from 192.168.100.2 icmp_seq=3 ttl=64 time=0.783 ms
84 bytes from 192.168.100.2 icmp_seq=4 ttl=64 time=0.798 ms
84 bytes from 192.168.100.2 icmp_seq=5 ttl=64 time=0.693 ms

PC1> ping 192.168.100.3

84 bytes from 192.168.100.3 icmp_seq=1 ttl=64 time=4.597 ms
84 bytes from 192.168.100.3 icmp_seq=2 ttl=64 time=16.181 ms
84 bytes from 192.168.100.3 icmp_seq=3 ttl=64 time=2.758 ms
84 bytes from 192.168.100.3 icmp_seq=4 ttl=64 time=10.269 ms
84 bytes from 192.168.100.3 icmp_seq=5 ttl=64 time=13.374 ms

PC1> ping 192.168.100.4

84 bytes from 192.168.100.4 icmp_seq=1 ttl=64 time=16.240 ms
84 bytes from 192.168.100.4 icmp_seq=2 ttl=64 time=8.633 ms
84 bytes from 192.168.100.4 icmp_seq=3 ttl=64 time=7.184 ms
84 bytes from 192.168.100.4 icmp_seq=4 ttl=64 time=7.771 ms
84 bytes from 192.168.100.4 icmp_seq=5 ttl=64 time=6.689 ms

PC1> ping 192.168.100.5

84 bytes from 192.168.100.5 icmp_seq=1 ttl=64 time=7.351 ms
84 bytes from 192.168.100.5 icmp_seq=2 ttl=64 time=8.788 ms
84 bytes from 192.168.100.5 icmp_seq=3 ttl=64 time=10.136 ms
84 bytes from 192.168.100.5 icmp_seq=4 ttl=64 time=7.725 ms
84 bytes from 192.168.100.5 icmp_seq=5 ttl=64 time=6.163 ms

PC1> ping 192.168.100.6

84 bytes from 192.168.100.6 icmp_seq=1 ttl=64 time=12.990 ms
84 bytes from 192.168.100.6 icmp_seq=2 ttl=64 time=8.706 ms
84 bytes from 192.168.100.6 icmp_seq=3 ttl=64 time=9.148 ms
84 bytes from 192.168.100.6 icmp_seq=4 ttl=64 time=5.308 ms
84 bytes from 192.168.100.6 icmp_seq=5 ttl=64 time=9.485 ms
```

```
PC2> ping 192.168.100.1

84 bytes from 192.168.100.1 icmp_seq=1 ttl=64 time=2.658 ms
84 bytes from 192.168.100.1 icmp_seq=2 ttl=64 time=12.354 ms
84 bytes from 192.168.100.1 icmp_seq=3 ttl=64 time=0.849 ms
84 bytes from 192.168.100.1 icmp_seq=4 ttl=64 time=3.213 ms
84 bytes from 192.168.100.1 icmp_seq=5 ttl=64 time=2.011 ms

PC2> ping 192.168.100.3

84 bytes from 192.168.100.3 icmp_seq=1 ttl=64 time=5.270 ms
84 bytes from 192.168.100.3 icmp_seq=2 ttl=64 time=5.451 ms
84 bytes from 192.168.100.3 icmp_seq=3 ttl=64 time=3.074 ms
84 bytes from 192.168.100.3 icmp_seq=4 ttl=64 time=3.591 ms
84 bytes from 192.168.100.3 icmp_seq=5 ttl=64 time=7.330 ms

PC2> ping 192.168.100.4

84 bytes from 192.168.100.4 icmp_seq=1 ttl=64 time=17.169 ms
84 bytes from 192.168.100.4 icmp_seq=2 ttl=64 time=10.992 ms
84 bytes from 192.168.100.4 icmp_seq=3 ttl=64 time=10.186 ms
84 bytes from 192.168.100.4 icmp_seq=4 ttl=64 time=2.528 ms
84 bytes from 192.168.100.4 icmp_seq=5 ttl=64 time=4.966 ms

PC2> ping 192.168.100.5

84 bytes from 192.168.100.5 icmp_seq=1 ttl=64 time=7.980 ms
84 bytes from 192.168.100.5 icmp_seq=2 ttl=64 time=8.568 ms
84 bytes from 192.168.100.5 icmp_seq=3 ttl=64 time=12.560 ms
84 bytes from 192.168.100.5 icmp_seq=4 ttl=64 time=6.056 ms
84 bytes from 192.168.100.5 icmp_seq=5 ttl=64 time=17.995 ms

PC2> ping 192.168.100.6

84 bytes from 192.168.100.6 icmp_seq=1 ttl=64 time=9.062 ms
84 bytes from 192.168.100.6 icmp_seq=2 ttl=64 time=12.331 ms
84 bytes from 192.168.100.6 icmp_seq=3 ttl=64 time=10.250 ms
84 bytes from 192.168.100.6 icmp_seq=4 ttl=64 time=13.604 ms
84 bytes from 192.168.100.6 icmp_seq=5 ttl=64 time=6.858 ms
```

```
PC3> ping 192.168.100.1

84 bytes from 192.168.100.1 icmp_seq=1 ttl=64 time=6.289 ms
84 bytes from 192.168.100.1 icmp_seq=2 ttl=64 time=10.641 ms
84 bytes from 192.168.100.1 icmp_seq=3 ttl=64 time=10.140 ms
84 bytes from 192.168.100.1 icmp_seq=4 ttl=64 time=3.104 ms
84 bytes from 192.168.100.1 icmp_seq=5 ttl=64 time=6.444 ms

PC3> ping 192.168.100.2

84 bytes from 192.168.100.2 icmp_seq=1 ttl=64 time=11.391 ms
84 bytes from 192.168.100.2 icmp_seq=2 ttl=64 time=8.075 ms
84 bytes from 192.168.100.2 icmp_seq=3 ttl=64 time=8.018 ms
84 bytes from 192.168.100.2 icmp_seq=4 ttl=64 time=11.062 ms
84 bytes from 192.168.100.2 icmp_seq=5 ttl=64 time=8.671 ms

PC3> ping 192.168.100.4

84 bytes from 192.168.100.4 icmp_seq=1 ttl=64 time=1.452 ms
84 bytes from 192.168.100.4 icmp_seq=2 ttl=64 time=1.804 ms
84 bytes from 192.168.100.4 icmp_seq=3 ttl=64 time=1.870 ms
84 bytes from 192.168.100.4 icmp_seq=4 ttl=64 time=0.981 ms
84 bytes from 192.168.100.4 icmp_seq=5 ttl=64 time=2.176 ms

PC3> ping 192.168.100.5

84 bytes from 192.168.100.5 icmp_seq=1 ttl=64 time=14.395 ms
84 bytes from 192.168.100.5 icmp_seq=2 ttl=64 time=12.290 ms
84 bytes from 192.168.100.5 icmp_seq=3 ttl=64 time=14.307 ms
84 bytes from 192.168.100.5 icmp_seq=4 ttl=64 time=13.335 ms
84 bytes from 192.168.100.5 icmp_seq=5 ttl=64 time=5.928 ms

PC3> ping 192.168.100.6

84 bytes from 192.168.100.6 icmp_seq=1 ttl=64 time=11.161 ms
84 bytes from 192.168.100.6 icmp_seq=2 ttl=64 time=4.465 ms
84 bytes from 192.168.100.6 icmp_seq=3 ttl=64 time=5.207 ms
84 bytes from 192.168.100.6 icmp_seq=4 ttl=64 time=9.447 ms
84 bytes from 192.168.100.6 icmp_seq=5 ttl=64 time=12.527 ms
```

```
PC4> ping 192.168.100.1

84 bytes from 192.168.100.1 icmp_seq=1 ttl=64 time=8.011 ms
84 bytes from 192.168.100.1 icmp_seq=2 ttl=64 time=17.366 ms
84 bytes from 192.168.100.1 icmp_seq=3 ttl=64 time=12.186 ms
84 bytes from 192.168.100.1 icmp_seq=4 ttl=64 time=7.557 ms
84 bytes from 192.168.100.1 icmp_seq=5 ttl=64 time=10.774 ms

PC4> ping 192.168.100.2

84 bytes from 192.168.100.2 icmp_seq=1 ttl=64 time=15.964 ms
84 bytes from 192.168.100.2 icmp_seq=2 ttl=64 time=6.826 ms
84 bytes from 192.168.100.2 icmp_seq=3 ttl=64 time=9.128 ms
84 bytes from 192.168.100.2 icmp_seq=4 ttl=64 time=6.473 ms
84 bytes from 192.168.100.2 icmp_seq=5 ttl=64 time=12.639 ms

PC4> ping 192.168.100.3

84 bytes from 192.168.100.3 icmp_seq=1 ttl=64 time=2.497 ms
84 bytes from 192.168.100.3 icmp_seq=2 ttl=64 time=0.821 ms
84 bytes from 192.168.100.3 icmp_seq=3 ttl=64 time=5.955 ms
84 bytes from 192.168.100.3 icmp_seq=4 ttl=64 time=2.114 ms
84 bytes from 192.168.100.3 icmp_seq=5 ttl=64 time=0.813 ms

PC4> ping 192.168.100.5

84 bytes from 192.168.100.5 icmp_seq=1 ttl=64 time=4.396 ms
84 bytes from 192.168.100.5 icmp_seq=2 ttl=64 time=11.422 ms
84 bytes from 192.168.100.5 icmp_seq=3 ttl=64 time=2.198 ms
84 bytes from 192.168.100.5 icmp_seq=4 ttl=64 time=1.896 ms
84 bytes from 192.168.100.5 icmp_seq=5 ttl=64 time=9.124 ms

PC4> ping 192.168.100.6

84 bytes from 192.168.100.6 icmp_seq=1 ttl=64 time=17.588 ms
84 bytes from 192.168.100.6 icmp_seq=2 ttl=64 time=8.251 ms
84 bytes from 192.168.100.6 icmp_seq=3 ttl=64 time=9.789 ms
84 bytes from 192.168.100.6 icmp_seq=4 ttl=64 time=5.160 ms
84 bytes from 192.168.100.6 icmp_seq=5 ttl=64 time=6.741 ms
```

```
PC5> ping 192.168.100.1

84 bytes from 192.168.100.1 icmp_seq=1 ttl=64 time=4.675 ms
84 bytes from 192.168.100.1 icmp_seq=2 ttl=64 time=8.097 ms
84 bytes from 192.168.100.1 icmp_seq=3 ttl=64 time=5.834 ms
84 bytes from 192.168.100.1 icmp_seq=4 ttl=64 time=7.576 ms
84 bytes from 192.168.100.1 icmp_seq=5 ttl=64 time=9.854 ms

PC5> ping 192.168.100.2

84 bytes from 192.168.100.2 icmp_seq=1 ttl=64 time=8.360 ms
84 bytes from 192.168.100.2 icmp_seq=2 ttl=64 time=4.027 ms
84 bytes from 192.168.100.2 icmp_seq=3 ttl=64 time=3.521 ms
84 bytes from 192.168.100.2 icmp_seq=4 ttl=64 time=19.526 ms
84 bytes from 192.168.100.2 icmp_seq=5 ttl=64 time=4.398 ms

PC5> ping 192.168.100.3

84 bytes from 192.168.100.3 icmp_seq=1 ttl=64 time=2.390 ms
84 bytes from 192.168.100.3 icmp_seq=2 ttl=64 time=11.571 ms
84 bytes from 192.168.100.3 icmp_seq=3 ttl=64 time=11.323 ms
84 bytes from 192.168.100.3 icmp_seq=4 ttl=64 time=13.199 ms
84 bytes from 192.168.100.3 icmp_seq=5 ttl=64 time=9.590 ms

PC5> ping 192.168.100.4

84 bytes from 192.168.100.4 icmp_seq=1 ttl=64 time=4.287 ms
84 bytes from 192.168.100.4 icmp_seq=2 ttl=64 time=15.888 ms
84 bytes from 192.168.100.4 icmp_seq=3 ttl=64 time=11.518 ms
84 bytes from 192.168.100.4 icmp_seq=4 ttl=64 time=18.574 ms
84 bytes from 192.168.100.4 icmp_seq=5 ttl=64 time=2.668 ms

PC5> ping 192.168.100.6

84 bytes from 192.168.100.6 icmp_seq=1 ttl=64 time=1.634 ms
84 bytes from 192.168.100.6 icmp_seq=2 ttl=64 time=0.969 ms
84 bytes from 192.168.100.6 icmp_seq=3 ttl=64 time=0.500 ms
84 bytes from 192.168.100.6 icmp_seq=4 ttl=64 time=0.641 ms
84 bytes from 192.168.100.6 icmp_seq=5 ttl=64 time=1.715 ms
```

```

PC6> ping 192.168.100.1

84 bytes from 192.168.100.1 icmp_seq=1 ttl=64 time=4.878 ms
84 bytes from 192.168.100.1 icmp_seq=2 ttl=64 time=15.298 ms
84 bytes from 192.168.100.1 icmp_seq=3 ttl=64 time=6.945 ms
84 bytes from 192.168.100.1 icmp_seq=4 ttl=64 time=6.197 ms
84 bytes from 192.168.100.1 icmp_seq=5 ttl=64 time=6.812 ms

PC6> ping 192.168.100.2

84 bytes from 192.168.100.2 icmp_seq=1 ttl=64 time=14.656 ms
84 bytes from 192.168.100.2 icmp_seq=2 ttl=64 time=7.325 ms
84 bytes from 192.168.100.2 icmp_seq=3 ttl=64 time=10.268 ms
84 bytes from 192.168.100.2 icmp_seq=4 ttl=64 time=4.387 ms
84 bytes from 192.168.100.2 icmp_seq=5 ttl=64 time=8.050 ms

PC6> ping 192.168.100.3

84 bytes from 192.168.100.3 icmp_seq=1 ttl=64 time=13.224 ms
84 bytes from 192.168.100.3 icmp_seq=2 ttl=64 time=5.988 ms
84 bytes from 192.168.100.3 icmp_seq=3 ttl=64 time=9.808 ms
84 bytes from 192.168.100.3 icmp_seq=4 ttl=64 time=10.310 ms
84 bytes from 192.168.100.3 icmp_seq=5 ttl=64 time=2.926 ms

PC6> ping 192.168.100.4

84 bytes from 192.168.100.4 icmp_seq=1 ttl=64 time=17.065 ms
84 bytes from 192.168.100.4 icmp_seq=2 ttl=64 time=8.662 ms
84 bytes from 192.168.100.4 icmp_seq=3 ttl=64 time=9.088 ms
84 bytes from 192.168.100.4 icmp_seq=4 ttl=64 time=9.245 ms
84 bytes from 192.168.100.4 icmp_seq=5 ttl=64 time=8.194 ms

PC6> ping 192.168.100.5

84 bytes from 192.168.100.5 icmp_seq=1 ttl=64 time=15.237 ms
84 bytes from 192.168.100.5 icmp_seq=2 ttl=64 time=3.099 ms
84 bytes from 192.168.100.5 icmp_seq=3 ttl=64 time=4.739 ms
84 bytes from 192.168.100.5 icmp_seq=4 ttl=64 time=6.190 ms
84 bytes from 192.168.100.5 icmp_seq=5 ttl=64 time=2.284 ms

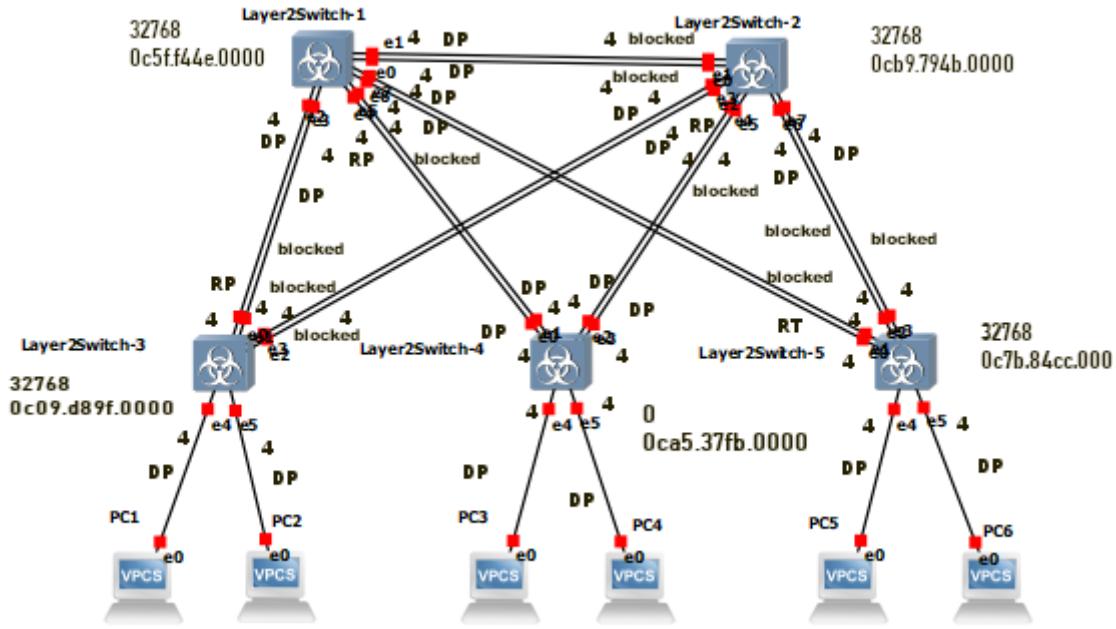
```

Оформим таблицу

	PC1	PC2	PC3	PC4	PC5	PC6
PC1	-	5/5	5/5	5/5	5/5	5/5
PC2	5/5	-	5/5	5/5	5/5	5/5
PC3	5/5	5/5	-	5/5	5/5	5/5
PC4	5/5	5/5	5/5	-	5/5	5/5
PC5	5/5	5/5	5/5	5/5	-	5/5
PC6	5/5	5/5	5/5	5/5	5/5	-

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

Вновь пользуемся show spanning-tree и переносим всю информацию на изображение.



У рута как видим все линки служат для передачи (для рассылки пакетов hello). В некоторых свичах линки работают для передачи, но для свича-получателя этот линк заблокирован для отправки пакетов. Это нужно для передачи пакетов hello, на случай если линк к руту окажется не доступен и заблокированный порт перейдет в статус активного.

4) При помощи wireshark отследить передачу пакетов hello от корневого коммутатора на всех линках (nb!), результаты включить в отчет

Начнём с корневого коммутатора.

На PC3

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
2	2.003347	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
4	4.010943	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
5	6.022631	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
6	8.028339	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
7	10.036121	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
8	12.040224	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
10	14.048303	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
11	16.060374	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
14	18.067871	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
15	20.073509	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
16	22.080193	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
18	24.089006	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
19	26.093614	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
20	28.103255	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
21	30.107308	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
22	32.110762	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
24	34.116644	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005
25	36.127033	0:c:a5:37:fb:00:04	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8005

Как видим, BDPU приходят каждые 2 секунды. Рассмотрим сам пакет

```

Frame 1: Packet, 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface -, i
└ IEEE 802.3 Ethernet
  └ Destination: Nearest-Customer-Bridge (01:80:c2:00:00:00)
  └ Source: 0c:a5:37:fb:00:04 (0c:a5:37:fb:00:04)
  └ Length: 38
  └ Padding: 0000000000000000
  └ [Stream index: 0]
└ Logical-Link Control
  └ DSAP: Spanning Tree BPDU (0x42)
    └ 0100 001. = SAP: Spanning Tree BPDU
    └ .... ...0 = IG Bit: Individual
  └ SSAP: Spanning Tree BPDU (0x42)
  └ Control field: U, func=UI (0x03)
└ Spanning Tree Protocol
  └ Protocol Identifier: Spanning Tree Protocol (0x0000)
  └ Protocol Version Identifier: Spanning Tree (0)
  └ BPDU Type: Configuration (0x00)
  └ BPDU flags: 0x00
    └ 0.... .... = Topology Change Acknowledgment: No
    └ .... ...0 = Topology Change: No
  └ Root Identifier: 0 / 1 / 0c:a5:37:fb:00:00
    └ Root Bridge Priority: 0
    └ Root Bridge System ID Extension: 1
    └ Root Bridge System ID: 0c:a5:37:fb:00:00 (0c:a5:37:fb:00:00)
    └ Root Path Cost: 0
  └ Bridge Identifier: 0 / 1 / 0c:a5:37:fb:00:00
    └ Bridge Priority: 0
    └ Bridge System ID Extension: 1
    └ Bridge System ID: 0c:a5:37:fb:00:00 (0c:a5:37:fb:00:00)
  └ Port identifier: 0x8005
  └ Message Age: 0
  └ Max Age: 20
  └ Hello Time: 2
  └ Forward Delay: 15

```

Передача 60 байт по канальному уровню с коммутатора на PC3. Длина (полезная нагрузка) 38, для минимального размера были добавлены нулевые байты. Протокол STP, идентификатор рута – приоритет 0б в системе ID 1 и MAC рута. Стоимость пути до рута - 0. Идентификатор моста совпадает с идентификатором рута, так как рут напрямую связан с PC3. Указан идентификатор порта, время жизни сообщения, максимальное время жизни сообщения, период hello и задержка. В дальнейшем пакеты для будут практически идентичны.

На PC4

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0c:a5:37:fb:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8006
2	2.004889	0c:a5:37:fb:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8006
3	4.012812	0c:a5:37:fb:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8006
5	6.020505	0c:a5:37:fb:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8006
6	8.023239	0c:a5:37:fb:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8006
9	10.025350	0c:a5:37:fb:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8006
10	12.029146	0c:a5:37:fb:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8006
11	14.035999	0c:a5:37:fb:00:05	Nearest-Customer-Br...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 0 Port = 0x8006

На Switch 1 e0

No.	Time	Source	Destination	Protocol	Length	Info
30	6.267735	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
34	7.306907	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
39	8.346611	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
44	9.376650	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
50	10.406423	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
<b>54</b>	<b>11.445426</b>	<b>0:c:a5:37:fb:00:00</b>	<b>Nearest-Customer-Br.. STP</b>	<b>60 Conf.</b>	<b>Root = 0/1:0:c:a5:37:fb:00:00</b>	<b>Cost = 0 Port = 0x8001</b>
60	12.500385	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
64	13.530944	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
68	14.562309	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
72	15.570674	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
76	16.587787	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
80	17.611338	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
84	18.626236	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
88	19.650993	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
92	20.674838	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
96	21.715675	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
102	22.774761	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001
106	23.803449	0:c:a5:37:fb:00:00	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8001

E1

No.	Time	Source	Destination	Protocol	Length	Info
44	9.111064	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
49	10.124067	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
53	11.136711	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
57	12.144886	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
61	13.169256	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
66	14.169215	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
70	15.172232	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
<b>75</b>	<b>16.178956</b>	<b>0:c:a5:37:fb:00:01</b>	<b>Nearest-Customer-Br.. STP</b>	<b>60 Conf.</b>	<b>Root = 0/1:0:c:a5:37:fb:00:00</b>	<b>Cost = 0 Port = 0x8002</b>
79	17.182910	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
83	18.186606	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
87	19.195442	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
91	20.204728	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
95	21.213158	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
99	22.219461	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
103	23.222850	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
108	24.230656	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
112	25.234738	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002
117	26.237357	0:c:a5:37:fb:00:01	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8002

e2

No.	Time	Source	Destination	Protocol	Length	Info
4	8.118098	0:c:a5:37:fb:00:02	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8003
8	1.120912	0:c:a5:37:fb:00:02	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8003
13	2.124783	0:c:a5:37:fb:00:02	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8003
17	3.124725	0:c:a5:37:fb:00:02	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8003
21	4.132538	0:c:a5:37:fb:00:02	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8003
26	5.134315	0:c:a5:37:fb:00:02	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8003
30	6.134183	0:c:a5:37:fb:00:02	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8003
34	7.142067	0:c:a5:37:fb:00:02	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8003
38	8.166487	0:c:a5:37:fb:00:02	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8003
<b>42</b>	<b>9.169725</b>	<b>0:c:a5:37:fb:00:02</b>	<b>Nearest-Customer-Br.. STP</b>	<b>60 Conf.</b>	<b>Root = 0/1:0:c:a5:37:fb:00:00</b>	<b>Cost = 0 Port = 0x8003</b>
45	10.214688	0:c:a5:37:fb:00:02	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8003
52	11.219468	0:c:a5:37:fb:00:02	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8003
54	12.257563	0:c:a5:37:fb:00:02	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8003
60	13.263345	0:c:a5:37:fb:00:02	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8003
62	14.307433	0:c:a5:37:fb:00:02	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8003
69	15.312024	0:c:a5:37:fb:00:02	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8003

E3

No.	Time	Source	Destination	Protocol	Length	Info
3	0.029014	0:c:a5:37:fb:00:03	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8004
9	1.033070	0:c:a5:37:fb:00:03	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8004
11	2.089982	0:c:a5:37:fb:00:03	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8004
17	3.094598	0:c:a5:37:fb:00:03	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8004
20	4.142962	0:c:a5:37:fb:00:03	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8004
26	5.152070	0:c:a5:37:fb:00:03	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8004
28	6.172328	0:c:a5:37:fb:00:03	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8004
<b>34</b>	<b>7.179763</b>	<b>0:c:a5:37:fb:00:03</b>	<b>Nearest-Customer-Br.. STP</b>	<b>60 Conf.</b>	<b>Root = 0/1:0:c:a5:37:fb:00:00</b>	<b>Cost = 0 Port = 0x8004</b>
37	8.202938	0:c:a5:37:fb:00:03	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8004
43	9.209423	0:c:a5:37:fb:00:03	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8004
46	10.234012	0:c:a5:37:fb:00:03	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8004
52	11.238182	0:c:a5:37:fb:00:03	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8004
55	12.279176	0:c:a5:37:fb:00:03	Nearest-Customer-Br.. STP	60 Conf.	Root = 0/1:0:c:a5:37:fb:00:00	Cost = 0 Port = 0x8004

Так как все эти линки соединены с портом на прямую стоимость всегда 0.

Рассмотрим Switch2

E0

No.	Time	Source	Destination	Protocol	Length Info
1	0.000000	0c:5f:f4:4e:00:00	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8001
8	1.031818	0c:5f:f4:4e:00:00	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8001
9	2.053677	0c:5f:f4:4e:00:00	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8001
16	3.081500	0c:5f:f4:4e:00:00	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8001
17	4.102353	0c:5f:f4:4e:00:00	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8001
24	5.119776	0c:5f:f4:4e:00:00	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8001
26	6.139106	0c:5f:f4:4e:00:00	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8001
34	7.155450	0c:5f:f4:4e:00:00	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8001
35	8.172726	0c:5f:f4:4e:00:00	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8001
43	9.187963	0c:5f:f4:4e:00:00	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8001
44	10.203466	0c:5f:f4:4e:00:00	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8001
51	11.230661	0c:5f:f4:4e:00:00	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8001
52	12.250146	0c:5f:f4:4e:00:00	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8001
59	13.277990	0c:5f:f4:4e:00:00	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8001
60	14.303849	0c:5f:f4:4e:00:00	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8001

```

▶ Frame 34: Packet, 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface
  ▶ 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:a5:37:fb:00:00
        Root Path Cost: 4
        ▶ Bridge Identifier: 32768 / 1 / 0c:5f:f4:4e:00:00
          Bridge Priority: 32768
          Bridge System ID Extension: 1
          Bridge System ID: 0c:5f:f4:4e:00:00 (0c:5f:f4:4e:00:00)
        Port identifier: 0x8001
        Message Age: 1
        Max Age: 20
        Hello Time: 2
        Forward Delay: 15
  
```

Стоимость поменялась, а также поменялось время жизни сообщения и идентификатор моста. Источником остался рут, но так как пакет был прислан по линку с другого моста, то в BID записана информация о свиче с которого пришло сообщение switch1.

## E1

No.	Time	Source	Destination	Protocol	Length Info
1	0.000000	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002
8	1.026638	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002
10	2.040134	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002
17	3.065954	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002
19	4.083813	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002
26	5.114673	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002
27	6.140478	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002
34	7.160346	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002
35	8.187334	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002
42	9.222022	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002
43	10.236952	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002
50	11.260790	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002
52	12.281553	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002
59	13.306406	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002
61	14.334319	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002
69	15.359070	0c:5f:f4:4e:00:01	Nearest-Customer-Br..	STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8002

Так как e0, e1 – blocked мы видим только отправку со switch 1, но switch по линкам ничего не отправляет.

## E2

No.	Time	Source	Destination	Protocol	Length	Info
6	0.193740	0c:b9:79:4b:00:03	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8004
8	1.211609	0c:b9:79:4b:00:03	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8004
14	2.240425	0c:b9:79:4b:00:03	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8004
18	3.264312	0c:b9:79:4b:00:03	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8004
24	4.288137	0c:b9:79:4b:00:03	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8004
26	5.304018	0c:b9:79:4b:00:03	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8004
32	6.332543	0c:b9:79:4b:00:03	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8004
34	7.347139	0c:b9:79:4b:00:03	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8004
<b>40</b>	<b>8.365903</b>	<b>0c:b9:79:4b:00:03</b>	<b>Nearest-Customer-Brm...</b>	<b>STP</b>	<b>60</b>	<b>Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8004</b>
42	9.378838	0c:b9:79:4b:00:03	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8004
49	10.399923	0c:b9:79:4b:00:03	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8004

e3

stp & lvlan						
No.	Time	Source	Destination	Protocol	Length	Info
6	0.492588	0c:b9:79:4b:00:02	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8003
10	1.511207	0c:b9:79:4b:00:02	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8003
15	2.527459	0c:b9:79:4b:00:02	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8003
18	3.541993	0c:b9:79:4b:00:02	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8003
23	4.566254	0c:b9:79:4b:00:02	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8003
26	5.593138	0c:b9:79:4b:00:02	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8003
32	6.612550	0c:b9:79:4b:00:02	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8003
<b>35</b>	<b>7.625860</b>	<b>0c:b9:79:4b:00:02</b>	<b>Nearest-Customer-Brm...</b>	<b>STP</b>	<b>60</b>	<b>Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8003</b>
40	8.647417	0c:b9:79:4b:00:02	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8003
44	9.665132	0c:b9:79:4b:00:02	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8003

E6

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0c:b9:79:4b:00:06	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8007
6	1.023779	0c:b9:79:4b:00:06	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8007
10	2.035883	0c:b9:79:4b:00:06	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8007
14	3.056427	0c:b9:79:4b:00:06	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8007
18	4.079220	0c:b9:79:4b:00:06	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8007
22	5.095876	0c:b9:79:4b:00:06	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8007
<b>26</b>	<b>6.116042</b>	<b>0c:b9:79:4b:00:06</b>	<b>Nearest-Customer-Brm...</b>	<b>STP</b>	<b>60</b>	<b>Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8007</b>
30	7.132819	0c:b9:79:4b:00:06	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8007
34	8.151902	0c:b9:79:4b:00:06	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8007
38	9.161086	0c:b9:79:4b:00:06	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8007
43	10.188922	0c:b9:79:4b:00:06	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8007
52	11.199950	0c:b9:79:4b:00:06	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8007
56	12.210209	0c:b9:79:4b:00:06	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8007

E7

No.	Time	Source	Destination	Protocol	Length	Info
4	0.635782	0c:b9:79:4b:00:07	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8008
6	1.852925	0c:b9:79:4b:00:07	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8008
12	2.872459	0c:b9:79:4b:00:07	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8008
14	3.888013	0c:b9:79:4b:00:07	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8008
21	4.897644	0c:b9:79:4b:00:07	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8008
24	5.911626	0c:b9:79:4b:00:07	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8008
<b>31</b>	<b>6.929598</b>	<b>0c:b9:79:4b:00:07</b>	<b>Nearest-Customer-Brm...</b>	<b>STP</b>	<b>60</b>	<b>Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8008</b>
33	7.936844	0c:b9:79:4b:00:07	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8008
40	8.957165	0c:b9:79:4b:00:07	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8008
43	9.974462	0c:b9:79:4b:00:07	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8008
49	10.987245	0c:b9:79:4b:00:07	Nearest-Customer-Brm...	STP	60	Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 4 Port = 0x8008

На этих линках ситуация аналогична, но теперь DPDU рассыпает только switch2, ведь у других коммутаторов порты blocked.

Рассмотрим switch1

E2

stp && !vlan						
No.	Time	Source	Destination	Protocol	Length	Info
3	0.016598	0c:5f:f4:4e:00:02	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8003
8	1.045197	0c:5f:f4:4e:00:02	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8003
11	2.063589	0c:5f:f4:4e:00:02	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8003
16	3.086439	0c:5f:f4:4e:00:02	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8003
19	4.101257	0c:5f:f4:4e:00:02	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8003
25	5.121112	0c:5f:f4:4e:00:02	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8003
29	6.134041	0c:5f:f4:4e:00:02	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8003
<b>35 7.159454</b>	<b>0c:5f:f4:4e:00:02</b>	<b>Nearest-Customer-BR... STP</b>	<b>60 Conf. Root = 0/1/0:c:a5:37:fb:00:00</b>	<b>Cost = 4</b>	<b>Port = 0x8003</b>	
38	8.183624	0c:5f:f4:4e:00:02	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8003
43	9.212564	0c:5f:f4:4e:00:02	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8003
46	10.242116	0c:5f:f4:4e:00:02	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8003

E3

stp && !vlan						
No.	Time	Source	Destination	Protocol	Length	Info
4	0.026291	0c:5f:f4:4e:00:03	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8004
9	1.047201	0c:5f:f4:4e:00:03	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8004
13	2.063995	0c:5f:f4:4e:00:03	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8004
18	3.087318	0c:5f:f4:4e:00:03	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8004
22	4.113183	0c:5f:f4:4e:00:03	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8004
26	5.143999	0c:5f:f4:4e:00:03	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8004
30	6.174923	0c:5f:f4:4e:00:03	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8004
34	7.197156	0c:5f:f4:4e:00:03	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8004
38	8.217986	0c:5f:f4:4e:00:03	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8004
<b>42 9.235846</b>	<b>0c:5f:f4:4e:00:03</b>	<b>Nearest-Customer-BR... STP</b>	<b>60 Conf. Root = 0/1/0:c:a5:37:fb:00:00</b>	<b>Cost = 4</b>	<b>Port = 0x8004</b>	
47	10.259763	0c:5f:f4:4e:00:03	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8004

E6

stp && !vlan						
No.	Time	Source	Destination	Protocol	Length	Info
2	0.163607	0c:5f:f4:4e:00:06	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8007
9	1.183478	0c:5f:f4:4e:00:06	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8007
10	2.203260	0c:5f:f4:4e:00:06	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8007
17	3.226457	0c:5f:f4:4e:00:06	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8007
19	4.253986	0c:5f:f4:4e:00:06	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8007
26	5.286924	0c:5f:f4:4e:00:06	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8007
28	6.320656	0c:5f:f4:4e:00:06	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8007
<b>35 7.334235</b>	<b>0c:5f:f4:4e:00:06</b>	<b>Nearest-Customer-BR... STP</b>	<b>60 Conf. Root = 0/1/0:c:a5:37:fb:00:00</b>	<b>Cost = 4</b>	<b>Port = 0x8007</b>	
36	8.355344	0c:5f:f4:4e:00:06	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8007
43	9.372722	0c:5f:f4:4e:00:06	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8007
45	10.398025	0c:5f:f4:4e:00:06	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8007
52	11.418865	0c:5f:f4:4e:00:06	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8007
53	12.437728	0c:5f:f4:4e:00:06	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8007

E7

stp && !vlan						
No.	Time	Source	Destination	Protocol	Length	Info
4	0.022376	0c:5f:f4:4e:00:07	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8008
8	1.047080	0c:5f:f4:4e:00:07	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8008
12	2.065938	0c:5f:f4:4e:00:07	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8008
17	3.085116	0c:5f:f4:4e:00:07	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8008
21	4.121591	0c:5f:f4:4e:00:07	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8008
25	5.147092	0c:5f:f4:4e:00:07	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8008
29	6.169256	0c:5f:f4:4e:00:07	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8008
<b>34 7.182059</b>	<b>0c:5f:f4:4e:00:07</b>	<b>Nearest-Customer-BR... STP</b>	<b>60 Conf. Root = 0/1/0:c:a5:37:fb:00:00</b>	<b>Cost = 4</b>	<b>Port = 0x8008</b>	
39	8.197930	0c:5f:f4:4e:00:07	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8008
43	9.217075	0c:5f:f4:4e:00:07	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8008
47	10.235599	0c:5f:f4:4e:00:07	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8008
51	11.248445	0c:5f:f4:4e:00:07	Nearest-Customer-BR... STP	60 Conf. Root = 0/1/0:c:a5:37:fb:00:00	Cost = 4	Port = 0x8008

Отправляет BPDU только коммутатор 1, а другие порты на линках или blocked или root, но рассыпать пакет root не имеет смысла, так как он является отправителем.

Рассмотрим switch 3

PC1

stp						
No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0c:09:d8:9f:00:04	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005		
2	1.020113	0c:09:d8:9f:00:04	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005		
3	2.040277	0c:09:d8:9f:00:04	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005		
4	3.054884	0c:09:d8:9f:00:04	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005		
<b>5 4.079113</b>	<b>0c:09:d8:9f:00:04</b>	<b>Nearest-Customer-Br... STP</b>	<b>60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005</b>			
6	5.187414	0c:09:d8:9f:00:04	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005		
7	6.125981	0c:09:d8:9f:00:04	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005		
8	7.150139	0c:09:d8:9f:00:04	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005		
10	8.171055	0c:09:d8:9f:00:04	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005		

Со свича 3 передаём сообщение на PC, стоимость вновь увеличилась

PC2

stp						
No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0c:09:d8:9f:00:05	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8006		
2	1.024557	0c:09:d8:9f:00:05	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8006		
5	2.048888	0c:09:d8:9f:00:05	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8006		
7	3.070161	0c:09:d8:9f:00:05	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8006		
8	4.098661	0c:09:d8:9f:00:05	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8006		
9	5.135068	0c:09:d8:9f:00:05	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8006		
<b>10 6.173875</b>	<b>0c:09:d8:9f:00:05</b>	<b>Nearest-Customer-Br... STP</b>	<b>60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8006</b>			
11	7.211747	0c:09:d8:9f:00:05	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8006		

Рассмотрим switch 5

PC5

stp						
No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0c:7b:84:cc:00:04	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005		
2	1.021946	0c:7b:84:cc:00:04	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005		
3	2.041460	0c:7b:84:cc:00:04	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005		
4	3.064817	0c:7b:84:cc:00:04	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005		
<b>5 4.080389</b>	<b>0c:7b:84:cc:00:04</b>	<b>Nearest-Customer-Br... STP</b>	<b>60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005</b>			
6	5.096078	0c:7b:84:cc:00:04	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005		
8	6.117329	0c:7b:84:cc:00:04	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8005		

PC6

stp						
No.	Time	Source	Destination	Protocol	Length	Info
2	0.663073	0c:7b:84:cc:00:05	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8006		
3	1.675960	0c:7b:84:cc:00:05	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8006		
4	2.697733	0c:7b:84:cc:00:05	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8006		
<b>5 3.716301</b>	<b>0c:7b:84:cc:00:05</b>	<b>Nearest-Customer-Br... STP</b>	<b>60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8006</b>			
6	4.743184	0c:7b:84:cc:00:05	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8006		
7	5.762782	0c:7b:84:cc:00:05	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8006		
8	6.775972	0c:7b:84:cc:00:05	Nearest-Customer-Br... STP	60 Conf. Root = 0/1/0c:a5:37:fb:00:00 Cost = 8 Port = 0x8006		

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

Будем редактировать маршрут на коммутаторе Switch1. Посмотрим на какой интерфейсе подключён маршрут до рута – (Gi1/0)

show spanning-tree

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	Root	FWD	4	128.5		Shr
Gi1/1	Altn	BLK	4	128.6		Shr
Gi1/2	Desg	FWD	4	128.7		Shr
--More--						

Изменим стоимость маршрута.

enable

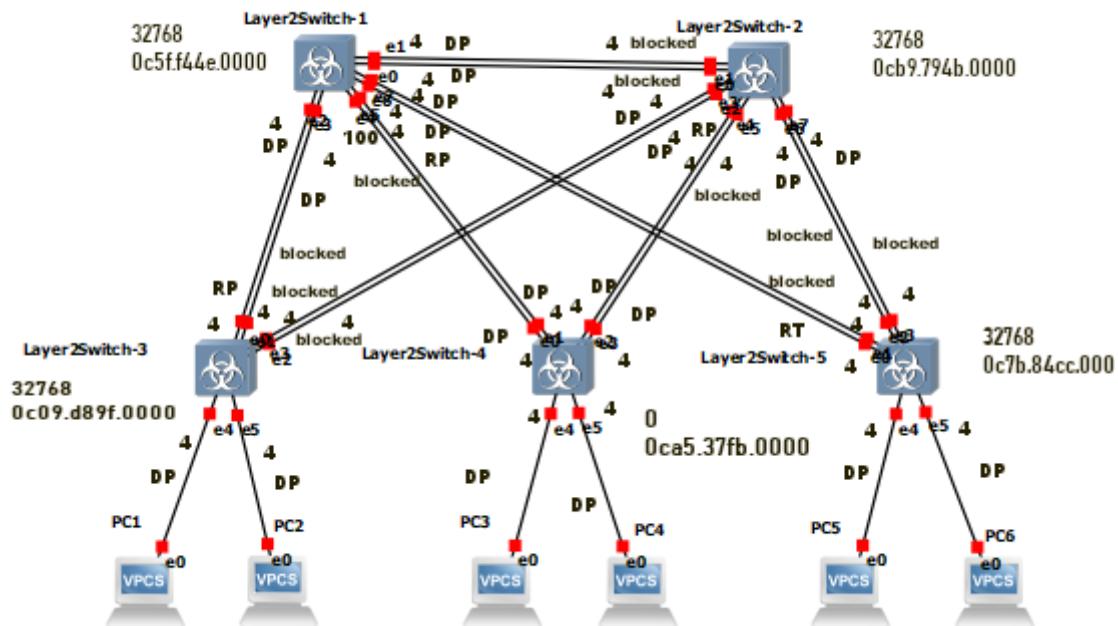
configure terminal

interface Gi1/0

spanning-tree cost 100

exit

write memory



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

Сохраняем конфигурацию для каждого коммутатора.  
enable

show running-config

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

Включим протокол RSTP на каждом коммутаторе

enable

configure terminal

spanning-tree mode rapid-pvst

exit

Теперь вновь сделаем Switch4 корневым.

enable

configure terminal

spanning-tree vlan 1 priority 0

exit

write memory

Проверим результат на switch4, введя show spanning-tree

```
VLAN0001
  Spanning tree enabled protocol rstp
  Root ID      Priority    1
                Address     0cfa.2ef4.0000
                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     0cfa.2ef4.0000
                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
  Gil/0          Desg FWD 4       128.5    Shr
  Gil/1          Desg FWD 4       128.6    Shr
```

Как видим используемый протокол – rstp, приоритет изменился и данный коммутатор является рутом.

Однако если будем смотреть свитч с подключением к РС можем обнаружить что порты к РС заблокированы. Нужно указать, что на пути к эти портам не может быть петли и блокировать их не нужно.

```
enable  
configure terminal  
interface Gi1/0  
spanning-tree portfast  
no shutdown  
exit  
write memory
```

Также некоторые порты могут войти в err-disabled. Нужно снова их включить

```
enable  
configure terminal  
interface Gi0/2  
shutdown  
no shutdown  
exit  
interface Gi0/3  
shutdown  
no shutdown  
exit  
write memory
```

Пример настройки на switch3

```

VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    1
              Address     0cfa.2ef4.0000
              Cost        8
              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     0cb4.ae2f.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
  Gil/0          Desg FWD 4      128.5   Shr Edge
  Gil/1          Desg FWD 4      128.6   Shr Edge

```

Точно также настраиваем IP как в п.2 и пингуем.

На PC1

ip 192.168.100.1/24

save

```

PC1> ping 192.168.100.2

84 bytes from 192.168.100.2 icmp_seq=1 ttl=64 time=8.014 ms
84 bytes from 192.168.100.2 icmp_seq=2 ttl=64 time=0.738 ms
84 bytes from 192.168.100.2 icmp_seq=3 ttl=64 time=1.169 ms
84 bytes from 192.168.100.2 icmp_seq=4 ttl=64 time=4.190 ms
84 bytes from 192.168.100.2 icmp_seq=5 ttl=64 time=1.087 ms

PC1> ping 192.168.100.3

host (192.168.100.3) not reachable

PC1> ping 192.168.100.4

host (192.168.100.4) not reachable

PC1> ping 192.168.100.5

host (192.168.100.5) not reachable

PC1> ping 192.168.100.6

host (192.168.100.6) not reachable

```

На PC2

```
ping 192.168.100.1

84 bytes from 192.168.100.1 icmp_seq=1 ttl=64 time=8.891 ms
84 bytes from 192.168.100.1 icmp_seq=2 ttl=64 time=5.974 ms
84 bytes from 192.168.100.1 icmp_seq=3 ttl=64 time=1.323 ms
84 bytes from 192.168.100.1 icmp_seq=4 ttl=64 time=6.988 ms
84 bytes from 192.168.100.1 icmp_seq=5 ttl=64 time=6.226 ms

PC2> ping 192.168.100.3

host (192.168.100.3) not reachable

PC2> ping 192.168.100.4

host (192.168.100.4) not reachable

PC2> ping 192.168.100.5

host (192.168.100.5) not reachable

PC2> ping 192.168.100.6

host (192.168.100.6) not reachable
```

Ha PC3

```
PC3> ping 192.168.100.1

host (192.168.100.1) not reachable

PC3> ping 192.168.100.2

host (192.168.100.2) not reachable

PC3> ping 192.168.100.4

84 bytes from 192.168.100.4 icmp_seq=1 ttl=64 time=1.893 ms
84 bytes from 192.168.100.4 icmp_seq=2 ttl=64 time=17.328 ms
84 bytes from 192.168.100.4 icmp_seq=3 ttl=64 time=1.311 ms
84 bytes from 192.168.100.4 icmp_seq=4 ttl=64 time=5.547 ms
84 bytes from 192.168.100.4 icmp_seq=5 ttl=64 time=5.887 ms

PC3> ping 192.168.100.5

host (192.168.100.5) not reachable

PC3> ping 192.168.100.6

host (192.168.100.6) not reachable
```

Ha PC4

```
PC4> ping 192.168.100.1
host (192.168.100.1) not reachable

PC4> ping 192.168.100.2
host (192.168.100.2) not reachable

PC4> ping 192.168.100.3
84 bytes from 192.168.100.3 icmp_seq=1 ttl=64 time=3.667 ms
84 bytes from 192.168.100.3 icmp_seq=2 ttl=64 time=18.102 ms
84 bytes from 192.168.100.3 icmp_seq=3 ttl=64 time=3.536 ms
84 bytes from 192.168.100.3 icmp_seq=4 ttl=64 time=1.806 ms
84 bytes from 192.168.100.3 icmp_seq=5 ttl=64 time=6.748 ms

PC4> ping 192.168.100.5
host (192.168.100.5) not reachable

PC4> ping 192.168.100.6
host (192.168.100.6) not reachable
```

Ha PC5

```
PC5> ping 192.168.100.6
84 bytes from 192.168.100.6 icmp_seq=1 ttl=64 time=1.001 ms
84 bytes from 192.168.100.6 icmp_seq=2 ttl=64 time=6.087 ms
84 bytes from 192.168.100.6 icmp_seq=3 ttl=64 time=4.035 ms
84 bytes from 192.168.100.6 icmp_seq=4 ttl=64 time=17.263 ms
84 bytes from 192.168.100.6 icmp_seq=5 ttl=64 time=5.814 ms

PC5> ping 192.168.100.1
host (192.168.100.1) not reachable

PC5> ping 192.168.100.2
host (192.168.100.2) not reachable

PC5> ping 192.168.100.3
host (192.168.100.3) not reachable

PC5> ping 192.168.100.4
host (192.168.100.4) not reachable
```

Ha PC6

```

PC6> ping 192.168.100.1
host (192.168.100.1) not reachable

PC6> ping 192.168.100.2
host (192.168.100.2) not reachable

PC6> ping 192.168.100.3
host (192.168.100.3) not reachable

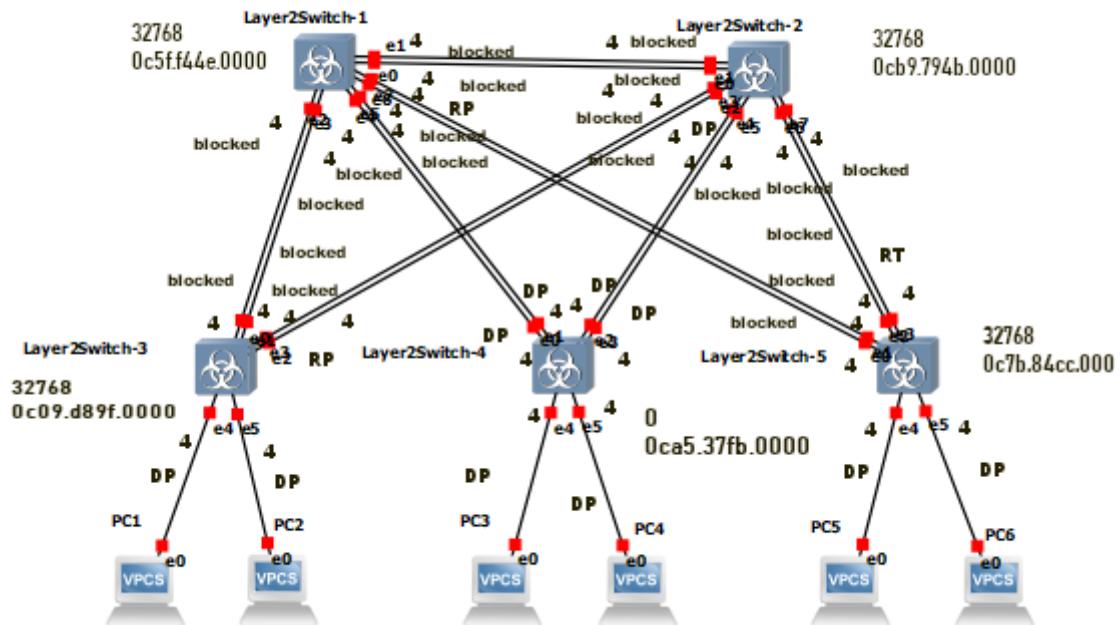
PC6> ping 192.168.100.4
host (192.168.100.4) not reachable

PC6> ping 192.168.100.5
84 bytes from 192.168.100.5 icmp_seq=1 ttl=64 time=6.080 ms
84 bytes from 192.168.100.5 icmp_seq=2 ttl=64 time=7.835 ms
84 bytes from 192.168.100.5 icmp_seq=3 ttl=64 time=2.188 ms
84 bytes from 192.168.100.5 icmp_seq=4 ttl=64 time=6.919 ms
84 bytes from 192.168.100.5 icmp_seq=5 ttl=64 time=4.388 ms

```

Так как RSTP устанавливает более жёсткие правила для блокировки портов, то пинг проходит только для PC в одном сегменте сети, так как порты, ведущие к другим коммутаторам, оказались blocked.

В итоге связь в сети выглядит следующим образом:



Посмотрим передачу пакетов hello на всех линках.

Начнём с switch3

Switch3-PC1

No.	Time	Source	Destination	Protocol	Length Info
1	0.000000	0c:b4:ae:2f:00:04	Nearest-Customer-Brm	STP	60 RST. Root = 0/1/0c:fa:2e:f4:00:00 Cost = 8 Port = 0x8005
2	0.332196	0c:b4:ae:2f:00:04	Nearest-Customer-Brm	STP	60 RST. Root = 0/1/0c:fa:2e:f4:00:00 Cost = 8 Port = 0x8005
3	1.011914	0c:b4:ae:2f:00:04	Nearest-Customer-Brm	STP	60 RST. Root = 0/1/0c:fa:2e:f4:00:00 Cost = 20 Port = 0x8005
4	1.015118	0c:b4:ae:2f:00:04	Nearest-Customer-Brm	STP	60 RST. Root = 0/1/0c:fa:2e:f4:00:00 Cost = 16 Port = 0x8005
5	1.018385	0c:b4:ae:2f:00:04	Nearest-Customer-Brm	STP	60 RST. Root = 0/1/0c:fa:2e:f4:00:00 Cost = 20 Port = 0x8005
6	1.021120	0c:b4:ae:2f:00:04	Nearest-Customer-Brm	STP	60 RST. Root = 0/1/0c:fa:2e:f4:00:00 Cost = 24 Port = 0x8005
7	1.041181	0c:b4:ae:2f:00:04	Nearest-Customer-Brm	STP	60 RST. Root = 0/1/0c:fa:2e:f4:00:00 Cost = 28 Port = 0x8005
9	1.399512	0c:b4:ae:2f:00:04	Nearest-Customer-Brm	STP	60 RST. Root = 0/1/0c:fa:2e:f4:00:00 Cost = 36 Port = 0x8005

## Switch3-PC2

No.	Time	Source	Destination	Protocol	Length Info
92	29.912234	0c:b4:ae:2f:00:05	Nearest-Customer-Brm	STP	60 RST. Root = 32768/1/0c:6a:27:57:00:00 Cost = 4 Port = 0x8006
93	30.967335	0c:b4:ae:2f:00:05	Nearest-Customer-Brm	STP	60 RST. Root = 0/1/0c:fa:2e:f4:00:00 Cost = 8 Port = 0x8006
94	31.920678	0c:b4:ae:2f:00:05	Nearest-Customer-Brm	STP	60 RST. Root = 0/1/0c:fa:2e:f4:00:00 Cost = 8 Port = 0x8006
95	32.040161	0c:b4:ae:2f:00:05	Nearest-Customer-Brm	STP	60 RST. Root = 0/1/0c:fa:2e:f4:00:00 Cost = 12 Port = 0x8006
96	32.050926	0c:b4:ae:2f:00:05	Nearest-Customer-Brm	STP	60 RST. Root = 0/1/0c:fa:2e:f4:00:00 Cost = 24 Port = 0x8006
97	32.067026	0c:b4:ae:2f:00:05	Nearest-Customer-Brm	STP	60 RST. Root = 0/1/0c:fa:2e:f4:00:00 Cost = 36 Port = 0x8006
98	32.147256	0c:b4:ae:2f:00:05	Nearest-Customer-Brm	STP	60 RST. Root = 0/1/0c:fa:2e:f4:00:00 Cost = 48 Port = 0x8006
99	32.160401	0c:b4:ae:2f:00:05	Nearest-Customer-Brm	STP	60 RST. Root = 0/1/0c:fa:2e:f4:00:00 Cost = 60 Port = 0x8006
100	32.161666	0c:b4:ae:2f:00:05	"	STP	60 RST. Root = 32768/1/0c:6a:27:57:00:00 Cost = 4 Port = 0x8006

До PC доходит BDPU пакеты, доставляемых по разным маршрутам.

## Switch3-Switch1 (e0)

No.	Time	Source	Destination	Protocol	Length Info
154	17.445710	0c:96:2d:f2:00:02	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 8 Port = 0x8003
155	17.448915	0c:b4:ae:2f:00:00	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 12 Port = 0x8001
156	17.453645	0c:96:2d:f2:00:02	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 20 Port = 0x8003
157	17.455356	0c:b4:ae:2f:00:00	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 24 Port = 0x8001
158	17.457232	0c:b4:ae:2f:00:00	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 28 Port = 0x8001
159	17.458018	0c:96:2b:f2:00:02	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 20 Port = 0x8003
160	17.464181	0c:b4:ae:2f:00:00	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 24 Port = 0x8001
161	17.465725	0c:96:2d:f2:00:02	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 32 Port = 0x8003
162	17.474526	0c:b4:ae:2f:00:00	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 36 Port = 0x8001
164	18.190917	0c:b4:ae:2f:00:00	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 36 Port = 0x8001
168	18.286658	0c:96:2b:f2:00:02	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 32 Port = 0x8003
170	18.290195	0c:b4:ae:2f:00:00	Nearest-Customer-Brm	STP	60 RST. TC + Root = 32768/1/0c:b4:ae:2f:00:00 Cost = 8 Port = 0x8001
173	18.504155	0c:96:2b:f2:00:02	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 4 Port = 0x8003
174	18.506941	0c:b4:ae:2f:00:00	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 8 Port = 0x8001
175	18.617046	0c:b4:ae:2f:00:00	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 8 Port = 0x8001
176	19.310758	0c:b4:ae:2f:00:00	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 8 Port = 0x8001
177	19.467268	0c:96:2b:f2:00:02	Nearest-Customer-Brm	STP	60 RST. TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 4 Port = 0x8003
178	19.573921	0c:96:2b:f2:00:02	Nearest-Customer-Brm	STP	60 RST. TC + Root = 32768/1/0c:6a:27:57:00:00 Cost = 4 Port = 0x8003
179	19.578068	0c:96:2b:f2:00:02	Nearest-Customer-Brm	STP	60 RST. TC + Root = 32768/1/0c:6a:27:57:00:00 Cost = 4 Port = 0x8003

Рассмотрим изменения в пакете

```

Protocol Identifier: Spanning Tree Protocol (0x0000)
Protocol Version Identifier: Rapid Spanning Tree (2)
BPDU Type: Rapid/Multiple Spanning Tree (0x02)
▼ BPDU flags: 0x0f, Port Role: Designated, Proposal, Topology Change
  0.... .... = Topology Change Acknowledgment: No
  .0... .... = Agreement: No
  ..0. .... = Forwarding: No
  ...0 .... = Learning: No
  .... 11.. = Port Role: Designated (3)
  .... ..1. = Proposal: Yes
  .... .1.. = Topology Change: Yes

```

Используется протокол RSTP. Порт является Designated, RSTP недавно изменило топологию.

## Switch3-Switch1 (e1)

\* Standard input [Layer2Switch1-1 Ethernet3 to Layer2Switch3-3 Ethernet1]

Файл Правка Вид Запуск Захват Анализ Статистика Телефония Беспроводная связь Инструменты Справка

stp && I VLAN

No.	Time	Source	Destination	Protocol	Length	Info
19	2.682726	0:c:b4:ae:2f:00:01	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 4	Port = 0x8002
20	2.084935	0:c:96:2b:f2:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 4	Port = 0x8004
21	2.259621	0:c:96:2b:f2:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:96:2b:f2:00:00	Cost = 0	Port = 0x8004
22	2.254772	0:c:b4:ae:2f:00:01	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:96:2b:f2:00:00	Cost = 4	Port = 0x8002
23	2.388125	0:c:b4:ae:2f:00:01	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:96:2b:f2:00:00	Cost = 4	Port = 0x8002
27	2.519774	0:c:96:2b:f2:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:96:2b:f2:00:00	Cost = 0	Port = 0x8004
31	2.538827	0:c:b4:ae:2f:00:01	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:b4:ae:2f:00:00	Cost = 0	Port = 0x8002
33	3.073883	0:c:96:2b:f2:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 4	Port = 0x8004
34	3.076702	0:c:b4:ae:2f:00:01	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 8	Port = 0x8002
35	3.726497	0:c:96:2b:f2:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 4	Port = 0x8004
36	4.080935	0:c:96:2b:f2:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:96:2b:f2:00:00	Cost = 0	Port = 0x8004
37	4.083615	0:c:b4:ae:2f:00:01	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:96:2b:f2:00:00	Cost = 4	Port = 0x8002
38	4.088632	0:c:96:2b:f2:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 4	Port = 0x8004
39	4.092643	0:c:96:2b:f2:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 4	Port = 0x8004
40	4.093634	0:c:b4:ae:2f:00:01	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 4	Port = 0x8002
44	4.575611	0:c:96:2b:f2:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:96:2b:f2:00:00	Cost = 0	Port = 0x8004
45	4.577417	0:c:b4:ae:2f:00:01	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:96:2b:f2:00:00	Cost = 4	Port = 0x8002
46	4.579196	0:c:96:2b:f2:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:96:2b:f2:00:00	Cost = 0	Port = 0x8004
47	4.961492	0:c:96:2b:f2:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:96:2b:f2:00:00	Cost = 8	Port = 0x8004

BPDU Type: Rapid/Multiple Spanning Tree (0x02)

BPDU flags: 0x05, Port Role: Alternate or Backup, Topology Change

- 0.... .... = Topology Change Acknowledgment: No
- .0.... .... = Agreement: No
- ..0.... .... = Forwarding: No
- ...0.... .... = Learning: No
- ....01... = Port Role: Alternate or Backup (1)
- ....0...0. = Proposal: No
- ....0...1 = Topology Change: Yes

Port Identifier: 0 / 1 / 0x1fa:2e:f4:00:00

В этом случае порт, с которого пришёл пакет является запасным.

## Switch3-Switch2 (e3)

stp && I VLAN

No.	Time	Source	Destination	Protocol	Length	Info
78	9.567668	0:c:6a:27:57:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 0	Port = 0x8004
79	9.568631	0:c:b4:ae:2f:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 4	Port = 0x8004
82	10.612630	0:c:b4:ae:2f:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 8	Port = 0x8004
84	10.614060	0:c:6a:27:57:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 4	Port = 0x8004
85	10.621686	0:c:6a:27:57:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 4	Port = 0x8004
86	11.698266	0:c:6a:27:57:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 0	Port = 0x8004
87	11.698273	0:c:b4:ae:2f:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 4	Port = 0x8004
88	11.698297	0:c:b4:ae:2f:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 4	Port = 0x8004
98	11.678844	0:c:b4:ae:2f:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:b4:ae:2f:00:00	Cost = 0	Port = 0x8004
93	11.810762	0:c:b4:ae:2f:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:b4:ae:2f:00:00	Cost = 0	Port = 0x8004
97	12.768476	0:c:6a:27:57:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 4	Port = 0x8004
98	12.711583	0:c:b4:ae:2f:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 8	Port = 0x8004
99	12.810085	0:c:6a:27:57:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 4	Port = 0x8004
100	13.782675	0:c:6a:27:57:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 0	Port = 0x8004
101	13.784198	0:c:b4:ae:2f:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 4	Port = 0x8004
102	13.945967	0:c:b4:ae:2f:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 4	Port = 0x8004
107	13.951832	0:c:b4:ae:2f:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 8	Port = 0x8004
108	13.963124	0:c:b4:ae:2f:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:96:2b:f2:00:00	Cost = 4	Port = 0x8004
111	14.874944	0:c:6a:27:57:00:03	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 8	Port = 0x8004

## Switch3-Switch2 (e2)

stp && I VLAN

No.	Time	Source	Destination	Protocol	Length	Info
61	8.051875	0:c:b4:ae:2f:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:4a:ae:2f:00:00	Cost = 0	Port = 0x8003
64	8.320135	0:c:6a:27:57:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 0	Port = 0x8003
65	8.324523	0:c:b4:ae:2f:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 4	Port = 0x8003
66	8.511873	0:c:b4:ae:2f:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 4	Port = 0x8003
67	9.373992	0:c:b4:ae:2f:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 8	Port = 0x8003
68	9.385620	0:c:6a:27:57:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 8	Port = 0x8003
69	9.385650	0:c:b4:ae:2f:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 8	Port = 0x8003
71	9.584566	0:c:b4:ae:2f:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 8	Port = 0x8003
76	10.398695	0:c:6a:27:57:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 0	Port = 0x8003
77	10.498566	0:c:6a:27:57:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:6a:27:57:00:00	Cost = 0	Port = 0x8003
79	10.509351	0:c:b4:ae:2f:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:96:2b:f2:00:00	Cost = 4	Port = 0x8003
82	10.668073	0:c:b4:ae:2f:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:96:2b:f2:00:00	Cost = 4	Port = 0x8003
83	11.169306	0:c:b4:ae:2f:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 32768/1/0:c:96:2b:f2:00:00	Cost = 4	Port = 0x8003
84	11.483313	0:c:b4:ae:2f:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 8	Port = 0x8003
85	11.486568	0:c:6a:27:57:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 4	Port = 0x8003
86	11.488235	0:c:b4:ae:2f:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 8	Port = 0x8003
87	11.666688	0:c:6a:27:57:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 4	Port = 0x8003
88	11.726664	0:c:b4:ae:2f:00:02	Nearest-Customer-Brm... STP	60 RST, TC + Root = 0/1/0:c:fa:2e:f4:00:00	Cost = 8	Port = 0x8003

В протоколе RSTP BPDU-пакеты рассылают все порты, независимо от статуса, поэтому мы видим на линках множество пакетов от разных отправителей, с разной стоимостью.

Посмотрим связь на руте switch4-switch1

No.	Time	Source	Destination	Protocol	Length Info
83 13.131756	0c:96:2b:f1:00:04	Nearest-Customer-Brm STP	60 RST, TC + Root = 32768/1/0c:6a:27:57:00:00 Cost = 4 Port = 0x8005		
86 13.171717	0c:96:2b:f2:00:04	Nearest-Customer-Brm STP	60 RST, TC + Root = 32768/1/0c:6a:27:57:00:00 Cost = 4 Port = 0x8005		
87 14.121031	0c:fa:2e:f4:00:00	Nearest-Customer-Brm STP	60 RST, TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 0 Port = 0x8001		
88 14.131220	0c:96:2b:f2:00:04	Nearest-Customer-Brm STP	60 RST, TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 4 Port = 0x8005		
93 15.136632	0c:96:2b:f2:00:04	Nearest-Customer-Brm STP	60 RST, TC + Root = 32768/1/0c:6a:27:57:00:00 Cost = 4 Port = 0x8005		
94 15.139692	0c:96:2b:f2:00:04	Nearest-Customer-Brm STP	60 RST, TC + Root = 32768/1/0c:6a:27:57:00:00 Cost = 4 Port = 0x8005		
97 15.462249	0c:96:2b:f2:00:04	Nearest-Customer-Brm STP	60 RST, TC + Root = 32768/1/0c:6a:27:57:00:00 Cost = 4 Port = 0x8005		
98 16.140746	0c:fa:2e:f4:00:00	Nearest-Customer-Brm STP	60 RST, TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 0 Port = 0x8001		
99 16.152907	0c:96:2b:f2:00:04	Nearest-Customer-Brm STP	60 RST, TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 4 Port = 0x8005		
100 16.628334	0c:96:2b:f2:00:04	Nearest-Customer-Brm STP	60 RST, TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 4 Port = 0x8005		
105 17.153325	0c:96:2b:f2:00:04	Nearest-Customer-Brm STP	60 RST, TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 8 Port = 0x8005		
106 17.161037	0c:96:2b:f2:00:04	Nearest-Customer-Brm STP	60 RST, TC + Root = 32768/1/0c:6a:27:57:00:00 Cost = 4 Port = 0x8005		
107 17.165221	0c:96:2b:f2:00:04	Nearest-Customer-Brm STP	60 RST, TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 20 Port = 0x8005		
109 17.171557	0c:96:2b:f2:00:04	Nearest-Customer-Brm STP	60 RST, TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 32 Port = 0x8005		
110 17.173535	0c:96:2b:f2:00:04	Nearest-Customer-Brm STP	60 RST, TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 32 Port = 0x8005		
114 17.802443	0c:96:2b:f2:00:04	Nearest-Customer-Brm STP	60 RST, TC + Root = 32768/1/0c:6a:27:57:00:00 Cost = 4 Port = 0x8005		
115 18.150419	0c:fa:2e:f4:00:00	Nearest-Customer-Brm STP	60 RST, TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 0 Port = 0x8001		
116 18.150001	0c:96:2b:f2:00:04	Nearest-Customer-Brm STP	60 RST, TC + Root = 0/1/0c:fa:2e:f4:00:00 Cost = 4 Port = 0x8005		

Руту тоже приходят пакеты с других портов, которые просто сообщают ему о стоимости маршрута.

В остальном на всех оставшихся линках картина одинакова.

Изменим cost на switch1

enable

configure terminal

interface Gi0/2

spanning-tree cost 100

exit

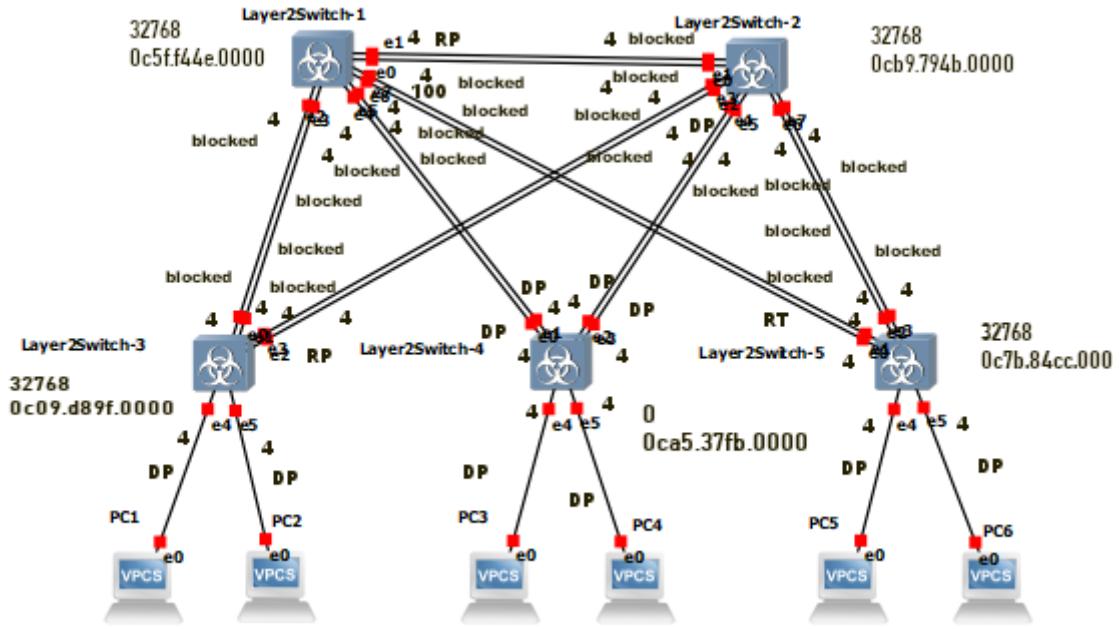
write memory

show spanning-tree

```
VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority      1
              Address       0cfa.2ef4.0000
              Cost          40
              Port          2 (GigabitEthernet0/1)
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority      32769 (priority 32768 sys-id-ext 1)
              Address       0c96.2bf2.0000
              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 BLK 4        128.1    P2p
  Gi0/1          Root FWD 4        128.2    P2p
  Gi0/2          Desg BLK 100     128.3    P2p
  Gi0/3          Desg BLK 4        128.4    P2p
  Gil/0          Desg BLK 4        128.5    P2p
  Gil/1          Desg BLK 4        128.6    P2p
  Gil/2          Desg BLK 4        128.7    Shr
```



В отличие от STP произошло не просто переключение на альтернативный порт – дерево перестроилось, изменились активные порты как на switch1, так и связанным с ним switch5.

Сохраним конфигурации.

enable

show running-config