Практика 2

1) Назначим всем ПК ip-адресса:

1ПК:
- ip 192.168.1.1 24
- save

2ПК:
- ip 192.168.1.2 24
- save

3ПК:
- ip 192.168.1.3 24
- save

4ПК:
- ip 192.168.1.4 24
- save

5ПК:
- ip 192.168.1.5 24
- save

6ПК:
- ip 192.168.1.6 24
- save

2) Назначим корневым коммутатором swich1
- enable
- conf t
- spanning-tree vlan 1 priority 4096
- end
- writy memory
- show spanning-tree vlan 1

```
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID     Priority    4097
              Address     0cf8.8098.0000
              This bridge is the root
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID   Priority    4097   (priority 4096 sys-id-ext 1)
              Address     0cf8.8098.0000
              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
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

Interface           Role Sts Cost      Prio.Nbr Type
------------------- ---- --- --------- -------- --------------------

Gi2/0               Desg FWD 4         128.9    Shr
```

Адресс

На других свичах:

```
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID     Priority    4097
              Address     0cf8.8098.0000
              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     0c29.68ab.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               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
```


Обнаружены несколько vlan-ов на свичах, отключим их, так как работаем в одной сети.

```
vIOS-L2-01>show vlan

VLAN Name                                Status    Ports
---- ----------------------------------- --------- -------
1    default                             active    Gi2/0
100  VLAN100                             active
200  VLAN0200                            active
300  VLAN0300                            active
1002 fddi-default                        act/unsup
1003 trcrf-default                       act/unsup
1004 fddinet-default                     act/unsup
1005 trbrf-default                       act/unsup
```

На всех свичах:

- enable
- conf t
- no vlan 100
- no vlan 200
- no vlan 300
- no spanning-tree vlan 100
- no spanning-tree vlan 200
- no spanning-tree vlan 300

- end
- write memory

3) Проверка доступности каждого ПК (ping):

на ПК1:
- ping 192.168.1.2
- ping 192.168.1.3
- ping 192.168.1.4
- ping 192.168.1.5
- ping 192.168.1.6

на ПК2:
- ping 192.168.1.3
- ping 192.168.1.4
- ping 192.168.1.5
- ping 192.168.1.6

на ПК3:
- ping 192.168.1.4
- ping 192.168.1.5
- ping 192.168.1.6

на ПК4:
- ping 192.168.1.5
- ping 192.168.1.6

на ПК5:
- ping 192.168.1.6

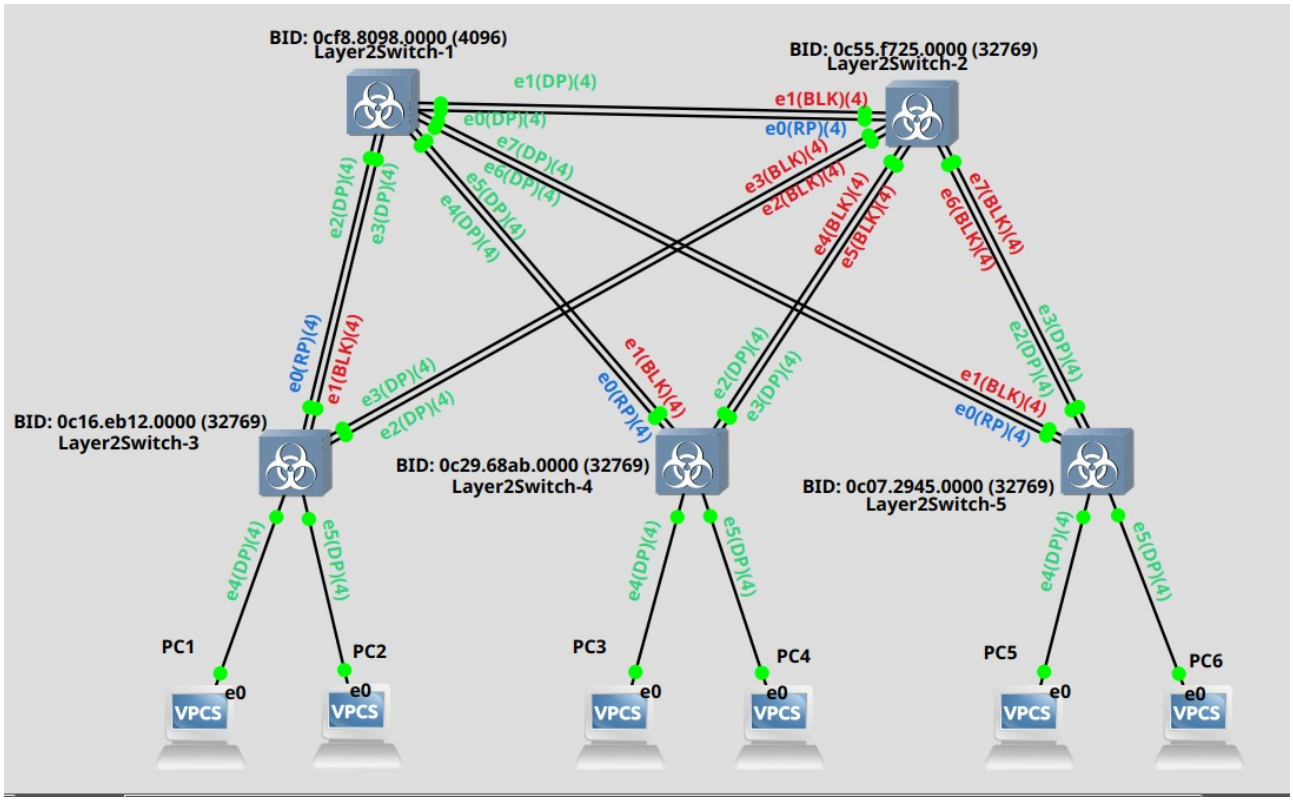
	ПК1	ПК2	ПК3	ПК4	ПК5	ПК6
ПК1		+	+	+	+	+
ПК2	+		+	+	+	+
ПК3	+	+		+	+	+
ПК4	+	+	+		+	+
ПК5	+	+	+	+		+
ПК6	+	+	+	+	+	

```
PC5> ping 192.168.1.6

84 bytes from 192.168.1.6 icmp_seq=1 ttl=64 time=2.276 ms
84 bytes from 192.168.1.6 icmp_seq=2 ttl=64 time=2.946 ms
84 bytes from 192.168.1.6 icmp_seq=3 ttl=64 time=0.493 ms
84 bytes from 192.168.1.6 icmp_seq=4 ttl=64 time=2.363 ms
84 bytes from 192.168.1.6 icmp_seq=5 ttl=64 time=2.784 ms
PC1> ping 192.168.1.6

84 bytes from 192.168.1.6 icmp_seq=1 ttl=64 time=5.995 ms
84 bytes from 192.168.1.6 icmp_seq=2 ttl=64 time=4.682 ms
84 bytes from 192.168.1.6 icmp_seq=3 ttl=64 time=7.756 ms
84 bytes from 192.168.1.6 icmp_seq=4 ttl=64 time=4.717 ms
84 bytes from 192.168.1.6 icmp_seq=5 ttl=64 time=5.066 ms
```

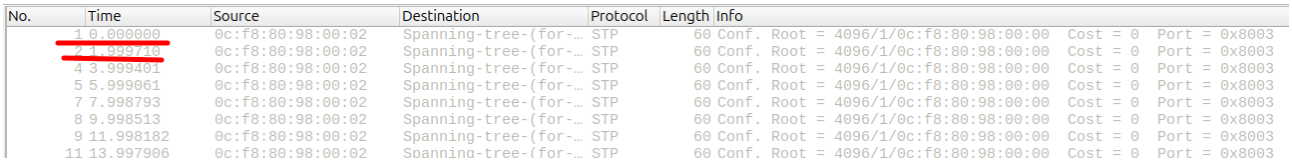
4) Отмечены BID каждого коммутатора и режимы работы портов (RP/DP/blocked) и стоимости маршрутов. (RP- синий, DP-зеленый, blocked — красный, **стоимость после порта**)

На всех свичах выполнена команда:

- **show spanning-tree vlan 1**

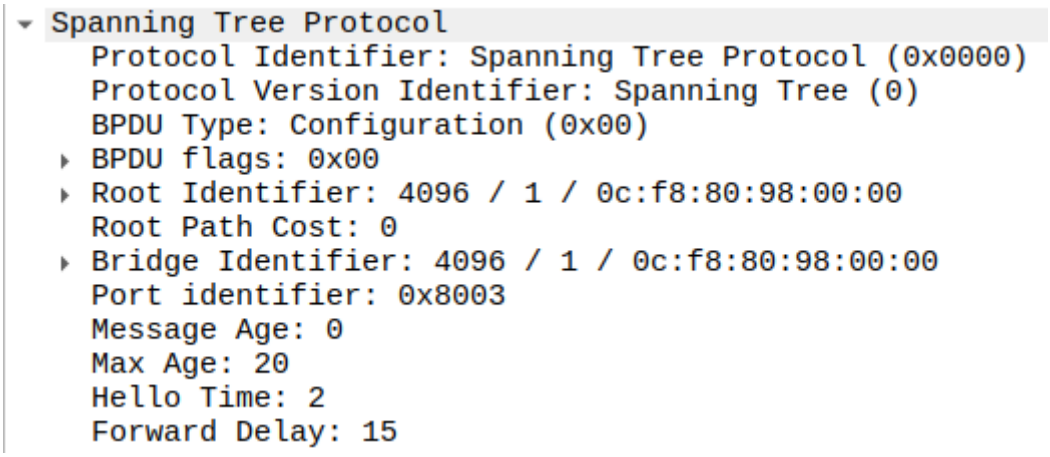


5)Захват и анализ пакетов в wireshark:
Захват линка от 1 до 3 свича:
Передача пакетов hello происходит раз в 2 секунды.



No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0c:f8:80:98:00:02	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 0 Port = 0x8003
2	1.999716	0c:f8:80:98:00:02	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 0 Port = 0x8003
4	3.999401	0c:f8:80:98:00:02	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 0 Port = 0x8003
5	5.999061	0c:f8:80:98:00:02	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 0 Port = 0x8003
7	7.998793	0c:f8:80:98:00:02	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 0 Port = 0x8003
8	9.998513	0c:f8:80:98:00:02	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 0 Port = 0x8003
9	11.998182	0c:f8:80:98:00:02	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 0 Port = 0x8003
11	13.997906	0c:f8:80:98:00:02	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 0 Port = 0x8003

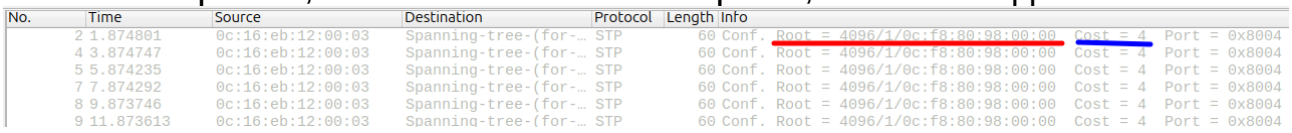
Свич 1 говорит то, что он корень, стоимость до меня 0.



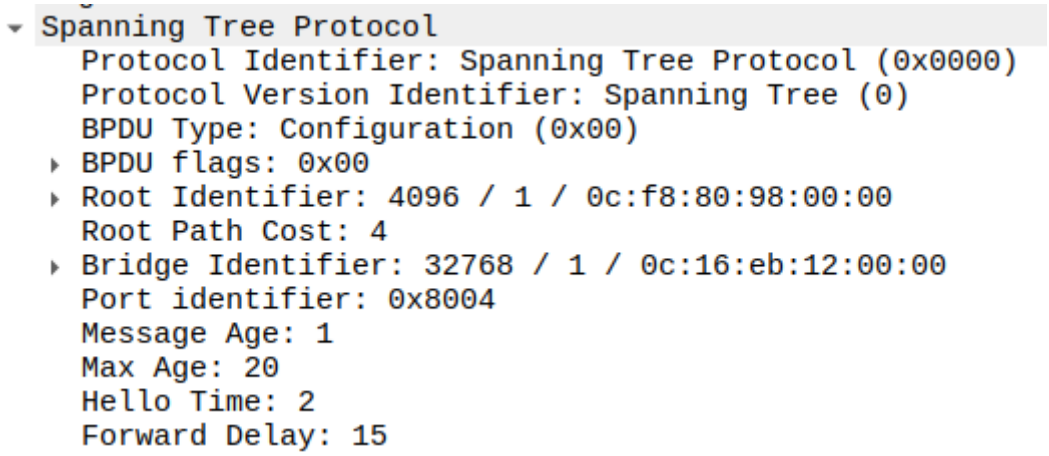
```
▾ Spanning Tree Protocol
    Protocol Identifier: Spanning Tree Protocol (0x0000)
    Protocol Version Identifier: Spanning Tree (0)
    BPDU Type: Configuration (0x00)
  ▸ BPDU flags: 0x00
  ▸ Root Identifier: 4096 / 1 / 0c:f8:80:98:00:00
    Root Path Cost: 0
  ▸ Bridge Identifier: 4096 / 1 / 0c:f8:80:98:00:00
    Port identifier: 0x8003
    Message Age: 0
    Max Age: 20
    Hello Time: 2
    Forward Delay: 15
```

Захват линка от 3 до 2 свича:

свич 3 говорит то, что 1 свич является корнем, стоимость до него 4.



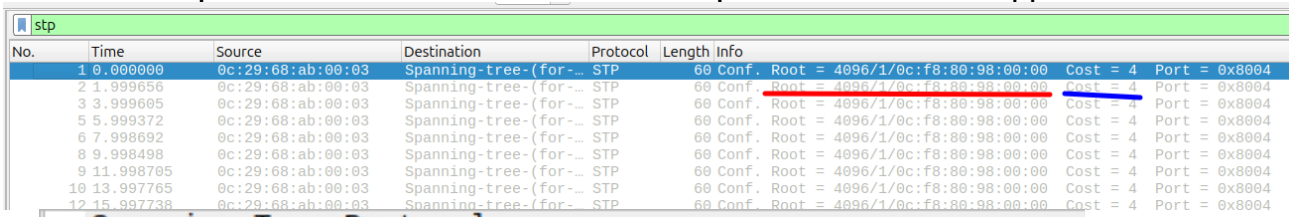
No.	Time	Source	Destination	Protocol	Length	Info
2	1.874801	0c:16:eb:12:00:03	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 4 Port = 0x8004
4	3.874747	0c:16:eb:12:00:03	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 4 Port = 0x8004
5	5.874235	0c:16:eb:12:00:03	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 4 Port = 0x8004
7	7.874292	0c:16:eb:12:00:03	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 4 Port = 0x8004
8	9.873746	0c:16:eb:12:00:03	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 4 Port = 0x8004
9	11.873613	0c:16:eb:12:00:03	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 4 Port = 0x8004



```
▾ Spanning Tree Protocol
    Protocol Identifier: Spanning Tree Protocol (0x0000)
    Protocol Version Identifier: Spanning Tree (0)
    BPDU Type: Configuration (0x00)
  ▸ BPDU flags: 0x00
  ▸ Root Identifier: 4096 / 1 / 0c:f8:80:98:00:00
    Root Path Cost: 4
  ▸ Bridge Identifier: 32768 / 1 / 0c:16:eb:12:00:00
    Port identifier: 0x8004
    Message Age: 1
    Max Age: 20
    Hello Time: 2
    Forward Delay: 15
```

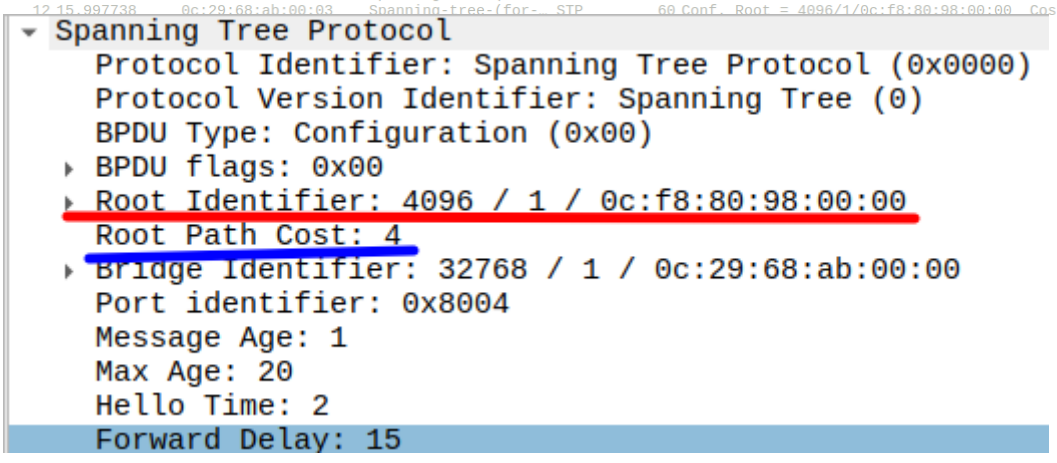
Захват линка от 4 до 2 свича:

свич 4 говорит то, что 1 свич является корнем, стоимость до него 4.



stp

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0c:29:68:ab:00:03	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 4 Port = 0x8004
2	1.999656	0c:29:68:ab:00:03	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 4 Port = 0x8004
3	3.999605	0c:29:68:ab:00:03	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 4 Port = 0x8004
5	5.999372	0c:29:68:ab:00:03	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 4 Port = 0x8004
6	7.998692	0c:29:68:ab:00:03	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 4 Port = 0x8004
8	9.998498	0c:29:68:ab:00:03	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 4 Port = 0x8004
9	11.998705	0c:29:68:ab:00:03	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 4 Port = 0x8004
10	13.997765	0c:29:68:ab:00:03	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 4 Port = 0x8004
12	15.997738	0c:29:68:ab:00:03	Spanning-tree-(for-…	STP	60	Conf. Root = 4096/1/0c:f8:80:98:00:00 Cost = 4 Port = 0x8004



```
▾ Spanning Tree Protocol
    Protocol Identifier: Spanning Tree Protocol (0x0000)
    Protocol Version Identifier: Spanning Tree (0)
    BPDU Type: Configuration (0x00)
  ▸ BPDU flags: 0x00
  ▸ Root Identifier: 4096 / 1 / 0c:f8:80:98:00:00
    Root Path Cost: 4
  ▸ Bridge Identifier: 32768 / 1 / 0c:29:68:ab:00:00
    Port identifier: 0x8004
    Message Age: 1
    Max Age: 20
    Hello Time: 2
    Forward Delay: 15
```

Передача пакетов Hello проходит успешно, все коммутаторы понимают, что 1 является корнем.

6) Изменить стоимость маршрута для порта RP произвольного назначенного (designated) коммутатора

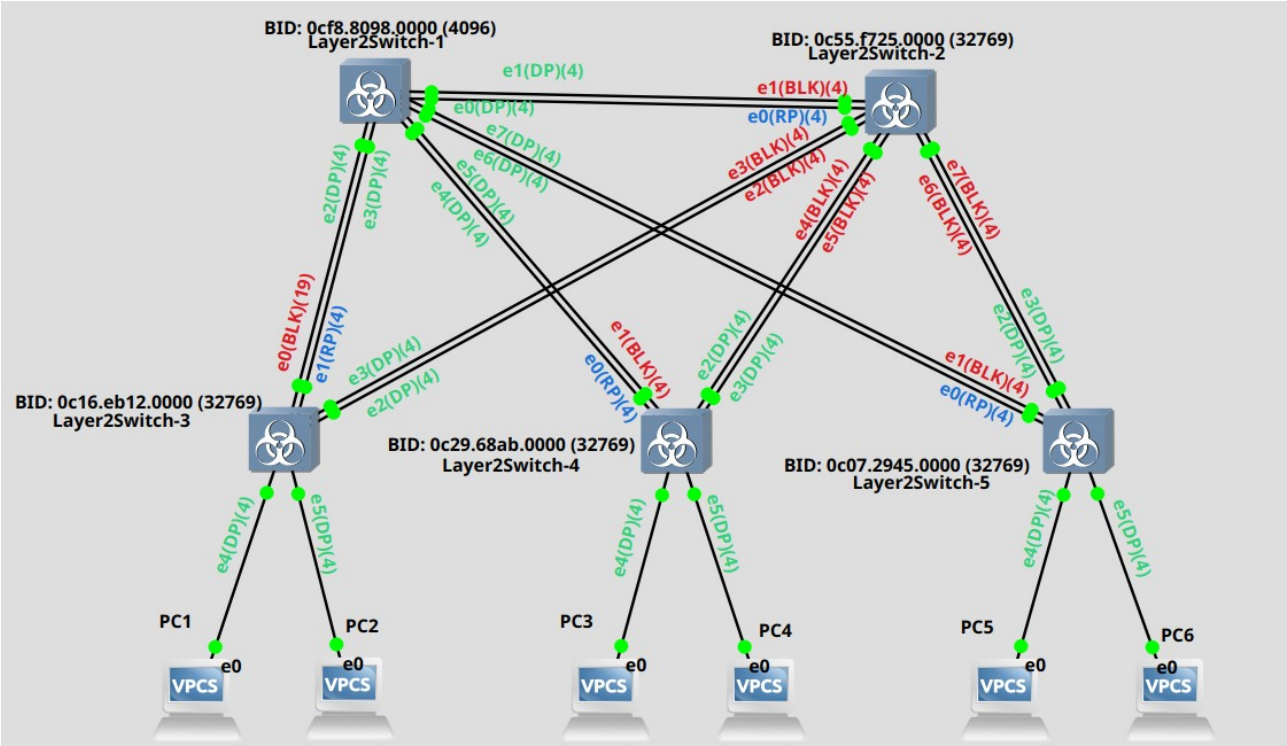
Увеличим стоимость маршрута для порта RP у 3 коммутатора.

- enable
- conf t
- interface Gi0/0
- spanning-tree vlan 1 cost 19
- exit
- write memory

Порты у 3 коммутатора поменялись:

```
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID     Priority    4097
              Address     0cf8.8098.0000
              Cost        4
              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     0c16.eb12.0000
              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               Altn BLK 19        128.1    Shr
Gi0/1               Root 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
```

Измененная схема:



Порты Gi0/0 и Gi0/1 поменялись.

7)Протокол RSTP

Поменяем типы порта в shr на P2p и Порты, к которым подключены ПК, назначим граничными портами

на ПК1:

- enable
- conf t
- interface range Gi0/0 - 3, Gi1/0 - 3, Gi2/0
- spanning-tree link-type point-to-point
- end
- write memory

На ПК2:

- enable
- conf t
- interface range Gi0/0 - 3, Gi1/0 - 3, Gi2/0
- spanning-tree link-type point-to-point
- end
- write memory

На ПК3:

- enable
- conf t
- interface range Gi0/0 - 3
- spanning-tree link-type point-to-point
- exit
- interface range Gi1/0-1
- spanning-tree portfast
- end
- write memory

На ПК4:

- enable
- conf t
- interface range Gi0/0 - 3
- spanning-tree link-type point-to-point
- exit
- interface range Gi1/0-1
- spanning-tree portfast
- end
- write memory

На ПК5:

- enable
- conf t
- interface range Gi0/0 - 3
- spanning-tree link-type point-to-point
- exit
- interface range Gi1/0-1
- spanning-tree portfast
- end

```
VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    4097
             Address     0cf8.8098.0000
             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     0c16.eb12.0000
             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    P2p
Gi0/1               Altn BLK 4         128.2    P2p
Gi0/2               Desg FWD 4         128.3    P2p
Gi0/3               Desg FWD 4         128.4    P2p
Gi1/0               Desg FWD 4         128.5    Shr Edge
Gi1/1               Desg FWD 4         128.6    Shr Edge
```