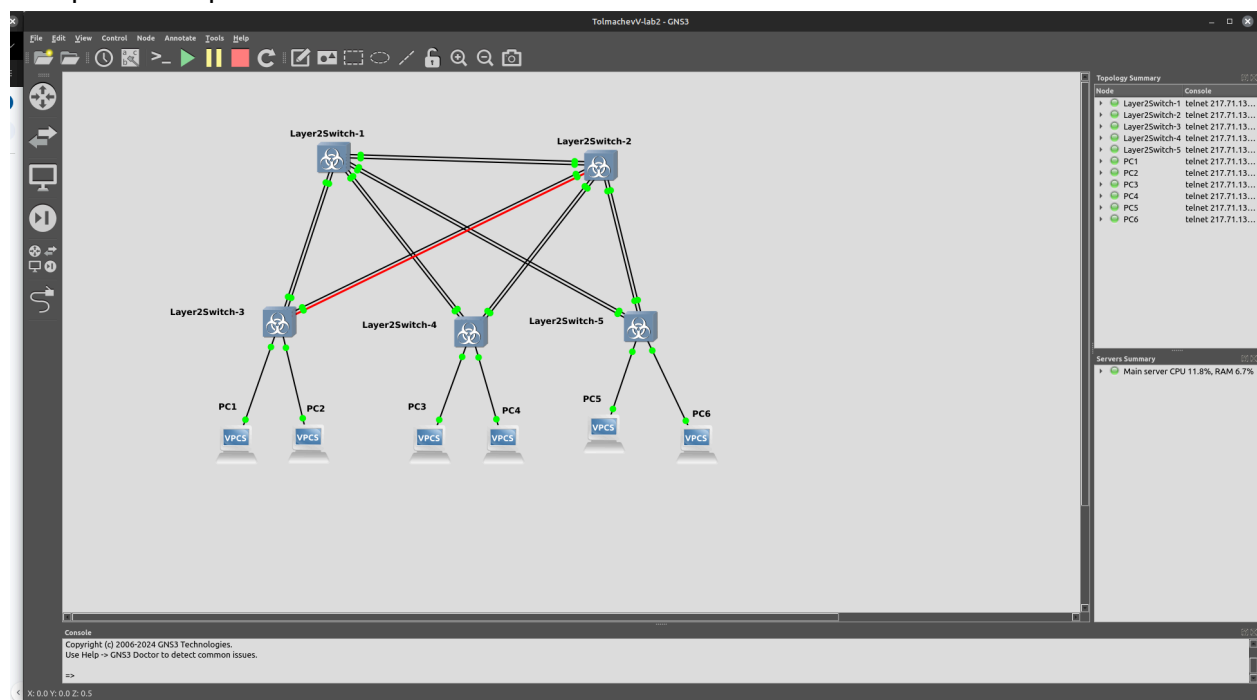


## Копирование проекта



## Изначальная конфигурация протокола STP.

The screenshot displays a network simulation environment with five Layer2 switches and six PCs. The switches are configured with STP (Spanning Tree Protocol) for VLAN0001. The PCs are configured with IP addresses in the 10.10.10.x/24 range.

**Layer2Switch-1 Configuration:**

```

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID: Priority 32769
  Address: 0c2b.8195.0000
  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: 0c2b.8195.0000
  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
  Gi0/4 Desg FWD 4 128.5 Shr
  Gi1/1 Desg FWD 4 128.6 Shr
  
```

**Layer2Switch-2 Configuration:**

```

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID: Priority 32769
  Address: 0c2b.8195.0000
  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: 0c2b.8195.0000
  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 Root FWD 4 128.1 Shr
  Gi0/1 Altn BLK 4 128.2 Shr
  Gi0/2 Altn BLK 4 128.3 Shr
  Gi0/3 Altn BLK 4 128.4 Shr
  Gi0/4 Altn BLK 4 128.5 Shr
  Gi1/1 Altn BLK 4 128.6 Shr
  
```

**Layer2Switch-3 Configuration:**

```

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID: Priority 32769
  Address: 0c2b.8195.0000
  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: 0c2b.8195.0000
  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 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
  Gi0/4 Desg FWD 4 128.5 Shr
  Gi1/1 Desg FWD 4 128.6 Shr
  
```

**Layer2Switch-4 Configuration:**

```

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID: Priority 32769
  Address: 0c2b.8195.0000
  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: 0c2b.8195.0000
  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 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
  Gi0/4 Desg FWD 4 128.5 Shr
  Gi1/1 Desg FWD 4 128.6 Shr
  
```

**Layer2Switch-5 Configuration:**

```

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID: Priority 32769
  Address: 0c2b.8195.0000
  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: 0c2b.8195.0000
  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 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
  Gi0/4 Desg FWD 4 128.5 Shr
  Gi1/1 Desg FWD 4 128.6 Shr
  
```

**PC Configuration:**

```

PC1: ip 10.10.10.1/24
PC2: ip 10.10.10.2/24
PC3: ip 10.10.10.3/24
PC4: ip 10.10.10.4/24
PC5: ip 10.10.10.5/24
PC6: ip 10.10.10.6/24
  
```

Далее были назначены ip адреса для VPCS командой `ip 10.10.10.1x/24` где x - число от 0 до 5 в зависимости от номера устройства

```
Layer2Switch-1
vIOS-L2-01>spanning-tree de
^
% Invalid input detected at '^' marker.
vIOS-L2-01>show sp
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
            Address     0c2b.8195.0000
            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     0c2b.8195.0000
            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
```

Можно заметить что корневой коммутатор - LayerSwitch1 по строке This bridge is root.

Назначим корневым коммутатором второй коммутатор:

En

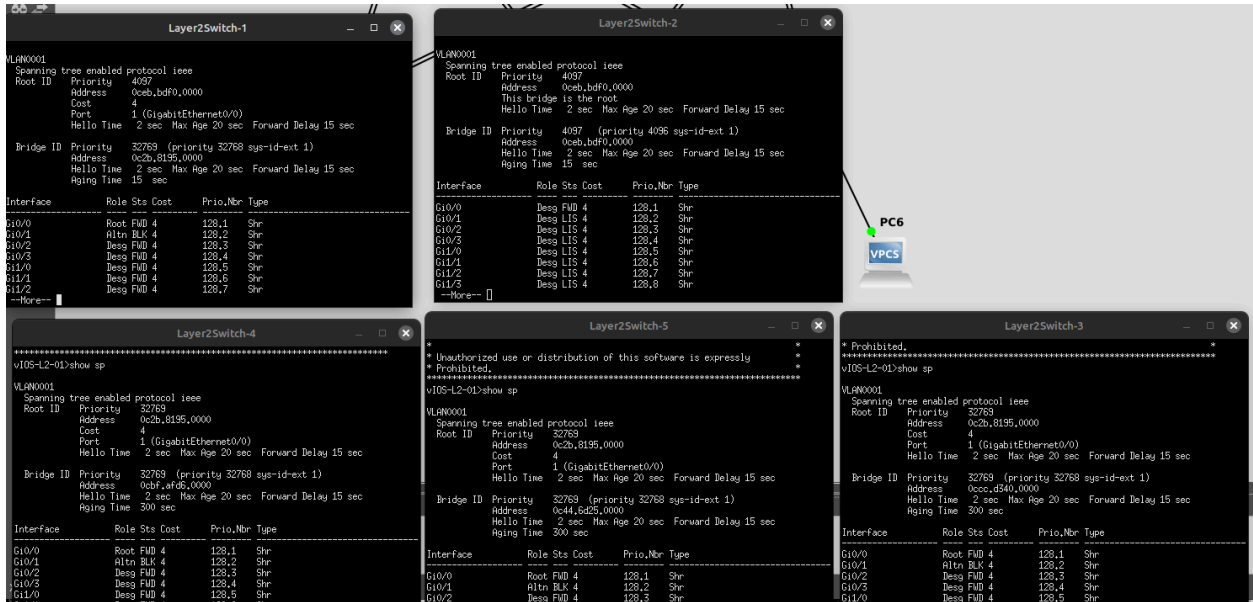
conf

spanning-tree vlan 1 priority 4096

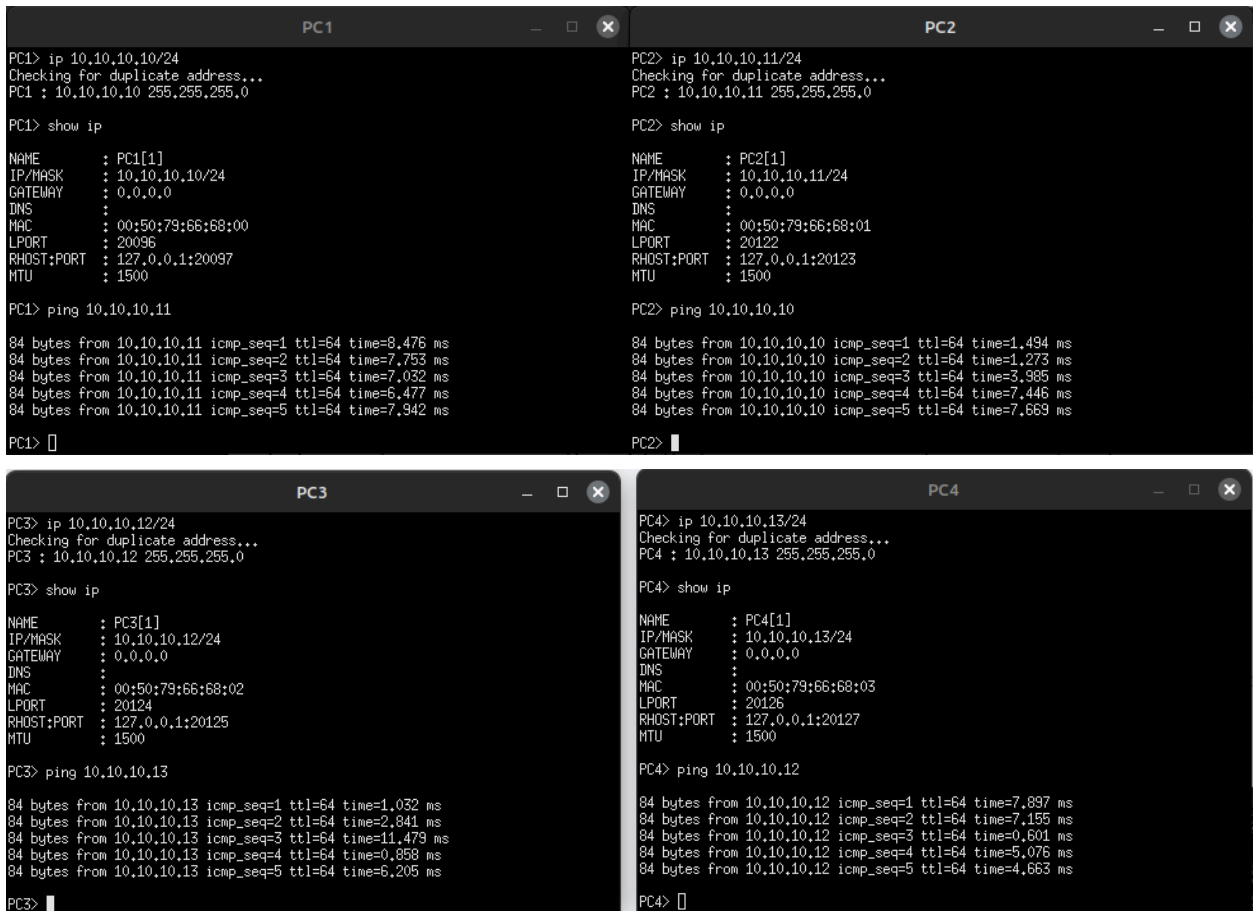
```
Layer2Switch-2
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    4097
            Address     0ceb.bdf0.0000
            This bridge is the root
            Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    4097 (priority 4096 sys-id-ext 1)
            Address     0ceb.bdf0.0000
            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 LIS 4        128.2   Shr
Gi0/2          Desg LIS 4        128.3   Shr
Gi0/3          Desg LIS 4        128.4   Shr
Gi1/0          Desg LIS 4        128.5   Shr
Gi1/1          Desg LIS 4        128.6   Shr
Gi1/2          Desg LIS 4        128.7   Shr
Gi1/3          Desg LIS 4        128.8   Shr
--More--
```



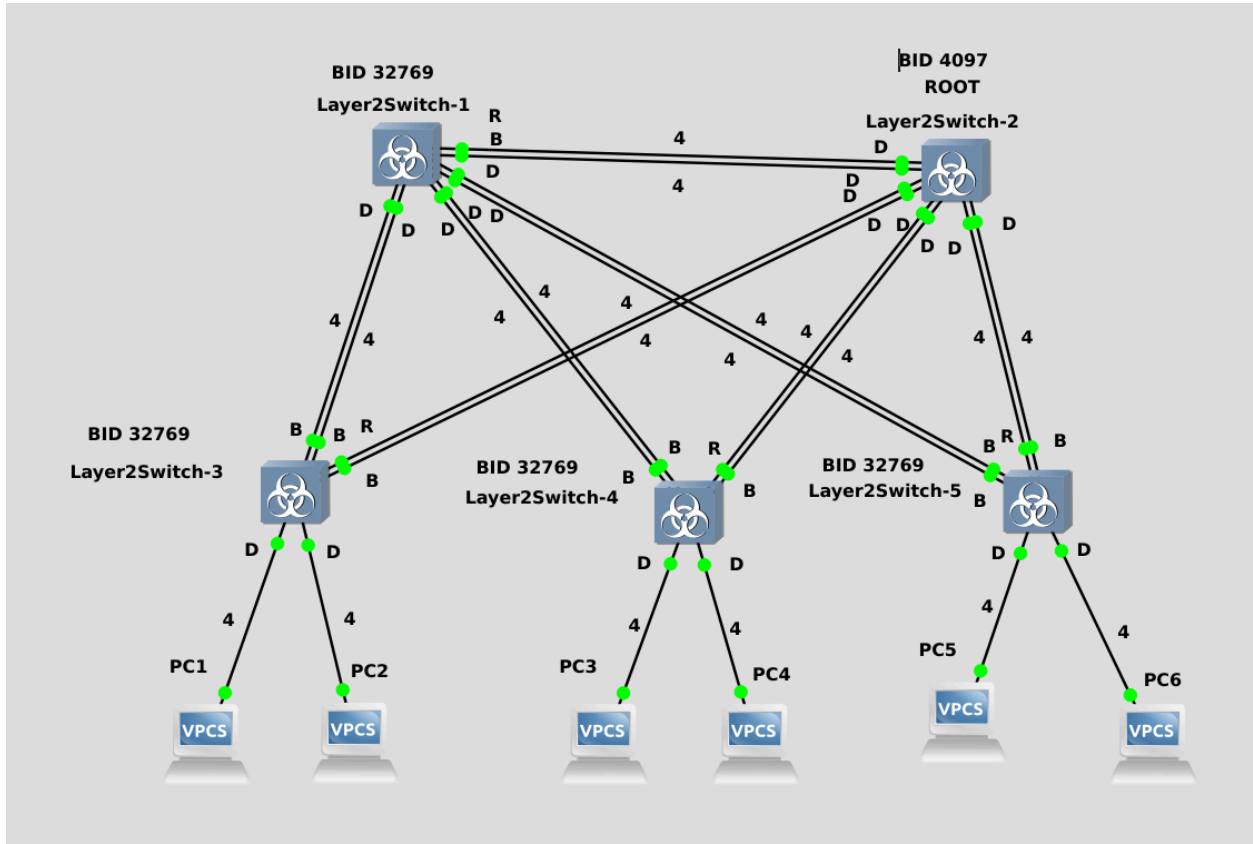
## Проверка доступности устройств командой ping



```
PC5
84 bytes from 10.10.10.10 icmp_seq=1 ttl=64 time=9.711 ms
84 bytes from 10.10.10.10 icmp_seq=2 ttl=64 time=7.967 ms
^C
PC5> show ip
NAME       : PC5[1]
IP/MASK    : 10.10.10.14/24
GATEWAY    : 0.0.0.0
DNS        :
MAC        : 00:50:79:66:68:04
LPORT     : 20128
RHOST:PORT : 127.0.0.1:20129
MTU        : 1500
PC5> ping 10.10.10.15
84 bytes from 10.10.10.15 icmp_seq=1 ttl=64 time=4.559 ms
84 bytes from 10.10.10.15 icmp_seq=2 ttl=64 time=7.142 ms
84 bytes from 10.10.10.15 icmp_seq=3 ttl=64 time=7.374 ms
84 bytes from 10.10.10.15 icmp_seq=4 ttl=64 time=7.897 ms
84 bytes from 10.10.10.15 icmp_seq=5 ttl=64 time=7.051 ms
PC5>

PC6
PC6> ip 10.10.10.15/24
Checking for duplicate address...
PC6 : 10.10.10.15 255.255.255.0
PC6> show ip
NAME       : PC6[1]
IP/MASK    : 10.10.10.15/24
GATEWAY    : 0.0.0.0
DNS        :
MAC        : 00:50:79:66:68:05
LPORT     : 20130
RHOST:PORT : 127.0.0.1:20131
MTU        : 1500
PC6> ping 10.10.10.14
84 bytes from 10.10.10.14 icmp_seq=1 ttl=64 time=5.442 ms
84 bytes from 10.10.10.14 icmp_seq=2 ttl=64 time=8.438 ms
84 bytes from 10.10.10.14 icmp_seq=3 ttl=64 time=4.838 ms
84 bytes from 10.10.10.14 icmp_seq=4 ttl=64 time=6.224 ms
84 bytes from 10.10.10.14 icmp_seq=5 ttl=64 time=3.762 ms
PC6>
```

Схема с дополненными BID коммутаторов , режимами работы коммутаторов и стоимостями маршрутов



## Захват пакетов hello при помощи Wireshark

[illegible]

Смена стоимости маршрута для порта R на 4 коммутаторе

Layer2Switch4

en

conf

interface Gi0/3

spanning-tree cost 10

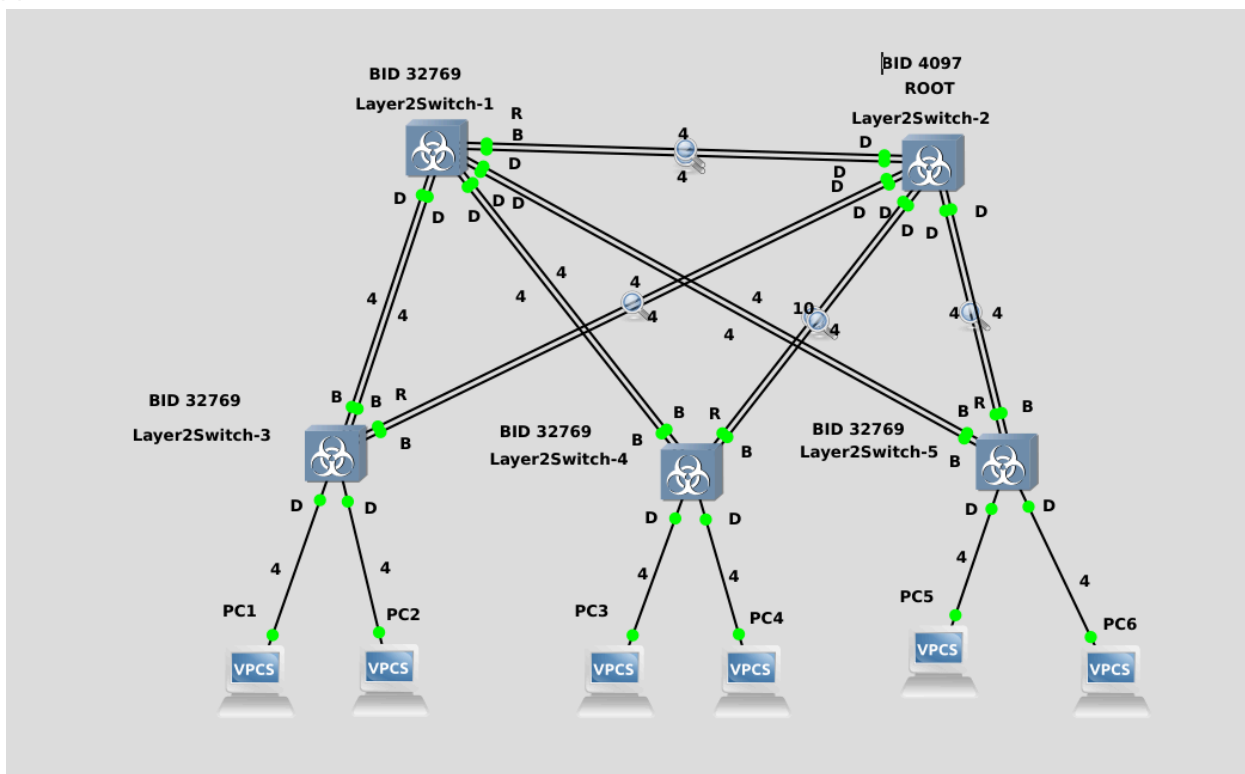
```
Layer2Switch-4
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    4097
             Address    0ceb.bdf0.0000
             Cost        4
             Port        3 (GigabitEthernet0/2)
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
             Address    0cbf.afd6.0000
             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 4         128.1   Shr
Gi0/1          Altn BLK 4         128.2   Shr
Gi0/2          Root LRN 4         128.3   Shr
Gi0/3          Altn BLK 10        128.4   Shr
Gi1/0          Desg FWD 4         128.5   Shr
Gi1/1          Desg FWD 4         128.6   Shr

--More--
```

## Дополненная схема



При экспорте файлов конфигураций столкнулся с проблемой того что устройства, которые я использовал не поддерживают эту функцию

