

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

>show spa на всех коммутаторах

```

Layer2Switch-1>show spa
VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 32769
Address 0c01.6a73.0000
Cost 5
Port 5 (GigabitEthernet1/0)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 0c01.6a73.0000
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300 sec

Interface Role Sts Cost Prio.Nbr Type
G1/0/0 Altn BLK 4 128.1 Shr
G1/0/1 Desg FWD 4 128.2 Shr
G1/0/2 Desg FWD 4 128.3 Shr
G1/0/3 Desg FWD 4 128.4 Shr
G1/0/4 Root FWD 4 128.5 Shr
G1/0/5 Desg FWD 4 128.6 Shr
G1/0/6 Desg FWD 4 128.7 Shr
G1/0/7 Desg FWD 4 128.8 Shr
G1/0/8 Desg FWD 4 128.9 Shr

VLAN0002
Spanning tree enabled protocol ieee
Root ID Priority 32769
Address 0c01.6a73.0000
Cost 4
Port 5 (GigabitEthernet1/0)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 0c01.6a73.0000
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300 sec

Interface Role Sts Cost Prio.Nbr Type
G1/0/0 Desg FWD 4 128.1 Shr
G1/0/1 Desg FWD 4 128.2 Shr
G1/0/2 Desg FWD 4 128.3 Shr
G1/0/3 Desg FWD 4 128.4 Shr
G1/0/4 Root FWD 4 128.5 Shr
G1/0/5 Desg FWD 4 128.6 Shr
G1/0/6 Desg FWD 4 128.7 Shr
G1/0/7 Desg FWD 4 128.8 Shr
G1/0/8 Desg FWD 4 128.9 Shr

Layer2Switch-2>show spa
VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 32769
Address 0c01.6a73.0000
Cost 5
Port 5 (GigabitEthernet1/0)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 0c01.6a73.0000
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300 sec

Interface Role Sts Cost Prio.Nbr Type
G1/0/0 Desg FWD 4 128.1 Shr
G1/0/1 Desg FWD 4 128.2 Shr
G1/0/2 Desg FWD 4 128.3 Shr
G1/0/3 Desg FWD 4 128.4 Shr
G1/0/4 Root FWD 4 128.5 Shr
G1/0/5 Desg FWD 4 128.6 Shr
G1/0/6 Desg FWD 4 128.7 Shr
G1/0/7 Desg FWD 4 128.8 Shr
G1/0/8 Desg FWD 4 128.9 Shr

Layer2Switch-3>show spa
VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 32769
Address 0c01.6a73.0000
Cost 5
Port 5 (GigabitEthernet1/0)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 0c01.6a73.0000
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300 sec

Interface Role Sts Cost Prio.Nbr Type
G1/0/0 Desg FWD 4 128.1 Shr
G1/0/1 Desg FWD 4 128.2 Shr
G1/0/2 Desg FWD 4 128.3 Shr
G1/0/3 Desg FWD 4 128.4 Shr
G1/0/4 Root FWD 4 128.5 Shr
G1/0/5 Desg FWD 4 128.6 Shr
G1/0/6 Desg FWD 4 128.7 Shr
G1/0/7 Desg FWD 4 128.8 Shr
G1/0/8 Desg FWD 4 128.9 Shr

Layer2Switch-4>show spa
VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 32769
Address 0c01.6a73.0000
Cost 5
Port 5 (GigabitEthernet1/0)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 0c01.6a73.0000
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300 sec

Interface Role Sts Cost Prio.Nbr Type
G1/0/0 Desg FWD 4 128.1 Shr
G1/0/1 Desg FWD 4 128.2 Shr
G1/0/2 Desg FWD 4 128.3 Shr
G1/0/3 Desg FWD 4 128.4 Shr
G1/0/4 Root FWD 4 128.5 Shr
G1/0/5 Desg FWD 4 128.6 Shr
G1/0/6 Desg FWD 4 128.7 Shr
G1/0/7 Desg FWD 4 128.8 Shr
G1/0/8 Desg FWD 4 128.9 Shr

Layer2Switch-5>show spa
VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 32769
Address 0c01.6a73.0000
Cost 5
Port 5 (GigabitEthernet1/0)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 0c01.6a73.0000
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300 sec

Interface Role Sts Cost Prio.Nbr Type
G1/0/0 Desg FWD 4 128.1 Shr
G1/0/1 Desg FWD 4 128.2 Shr
G1/0/2 Desg FWD 4 128.3 Shr
G1/0/3 Desg FWD 4 128.4 Shr
G1/0/4 Root FWD 4 128.5 Shr
G1/0/5 Desg FWD 4 128.6 Shr
G1/0/6 Desg FWD 4 128.7 Shr
G1/0/7 Desg FWD 4 128.8 Shr
G1/0/8 Desg FWD 4 128.9 Shr

```

На первом коммутаторе:

>enable

#conf t

```
(config)# spa vlan 1 prio 32768
```

```
(config)# end
```

```
# write
```

```
vios-l2-01>show spa
VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 1
Address 0cfa.3c6f.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.3c6f.0000
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300 sec

Interface Role Sts Cost Prio.Nbr Type
G1/0/0 Desg FWD 4 128.4 Shr
G1/0/1 Desg FWD 4 128.5 Shr
G1/1/1 Desg LBR 4 128.6 Shr
G1/2/2 Desg FWD 4 128.7 Shr
G1/3/3 Desg FWD 4 128.8 Shr
G1/2/0 Desg FWD 4 128.9 Shr

vios-l2-01>
vios-l2-01>show spa
VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 1
Address 0cfa.3c6f.0000
This bridge is the root
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Bridge ID Priority 1 (priority 32768 sys-id-ext 1)
Address 0c15.5427.0000
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 15 sec

Interface Role Sts Cost Prio.Nbr Type
G1/0/0 Root FWD 4 128.1 Shr
G1/0/1 Altn BLK 4 128.2 Shr
G1/0/2 Desg FWD 4 128.3 Shr
G1/1/3 Desg FWD 4 128.4 Shr
G1/1/0 Desg FWD 4 128.5 Shr
G1/1/1 Desg FWD 4 128.6 Shr
G1/1/2 Desg FWD 4 128.7 Shr
G1/1/3 Desg FWD 4 128.8 Shr

vios-l2-01>
vios-l2-01>show spa
VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 1
Address 0cfa.3c6f.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 0c1b.3079.0000
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 15 sec

Interface Role Sts Cost Prio.Nbr Type
G1/0/0 Root FWD 4 128.1 Shr
G1/0/1 Altn BLK 4 128.2 Shr
G1/0/2 Desg FWD 4 128.3 Shr
G1/0/3 Desg FWD 4 128.4 Shr
G1/1/0 Desg FWD 4 128.5 Shr
G1/1/1 Desg FWD 4 128.6 Shr
G1/1/2 Desg FWD 4 128.7 Shr
G1/1/3 Desg FWD 4 128.8 Shr

vios-l2-01>
vios-l2-01>show spa
VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 1
Address 0cfa.3c6f.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 0c01.6a73.0000
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 15 sec

Interface Role Sts Cost Prio.Nbr Type
G1/0/0 Root FWD 4 128.1 Shr
G1/0/1 Altn BLK 4 128.2 Shr
G1/0/2 Desg FWD 4 128.3 Shr
G1/0/3 Desg FWD 4 128.4 Shr
G1/1/0 Desg FWD 4 128.5 Shr
G1/1/1 Desg FWD 4 128.6 Shr
G1/1/2 Desg FWD 4 128.7 Shr
G1/1/3 Desg FWD 4 128.8 Shr

vios-l2-01>
```

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

Каждому VPCs назначен ip-адрес от 192.0.0.1/24 до 192.0.0.6/24. С каждого VPC выполнено:

```
> ping 192.0.0.x
```

Где x – от 1 до 6, кроме собственного значения

```
PC2> ping 192.0.0.1
64 bytes from 192.0.0.1 icmp_seq=1 ttl=64 time=11.311 ms
PC2> ping 192.0.0.3
64 bytes from 192.0.0.3 icmp_seq=1 ttl=64 time=13.534 ms
PC2> ping 192.0.0.4
64 bytes from 192.0.0.4 icmp_seq=1 ttl=64 time=10.686 ms
PC2> ping 192.0.0.5
64 bytes from 192.0.0.5 icmp_seq=1 ttl=64 time=6.032 ms
PC2> ping 192.0.0.6
64 bytes from 192.0.0.6 icmp_seq=1 ttl=64 time=13.477 ms
PC2> [REDACTED]

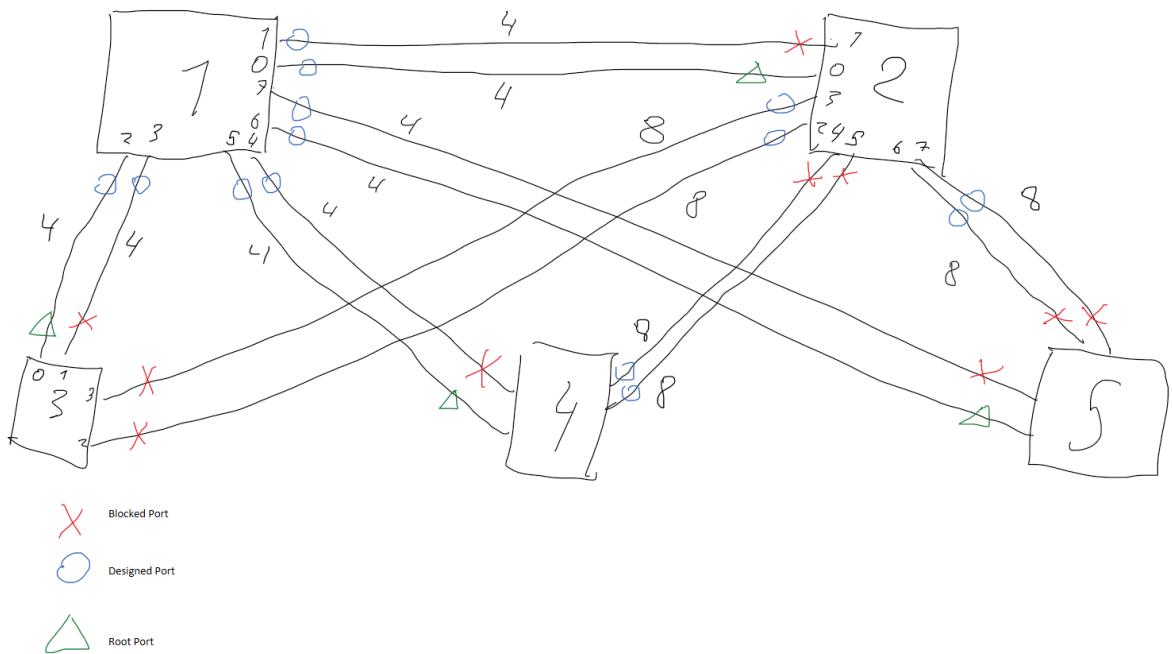
PC3> ping 192.0.0.1
64 bytes from 192.0.0.1 icmp_seq=1 ttl=64 time=4.442 ms
PC3> ping 192.0.0.2
64 bytes from 192.0.0.2 icmp_seq=1 ttl=64 time=9.553 ms
PC3> ping 192.0.0.4
64 bytes from 192.0.0.4 icmp_seq=1 ttl=64 time=0.700 ms
PC3> ping 192.0.0.5
64 bytes from 192.0.0.5 icmp_seq=1 ttl=64 time=12.152 ms
PC3> ping 192.0.0.6
64 bytes from 192.0.0.6 icmp_seq=1 ttl=64 time=10.956 ms
PC3> [REDACTED]

PC4> ping 192.0.0.1
64 bytes from 192.0.0.1 icmp_seq=1 ttl=64 time=4.900 ms
PC4> ping 192.0.0.2
64 bytes from 192.0.0.2 icmp_seq=1 ttl=64 time=7.195 ms
PC4> ping 192.0.0.3
64 bytes from 192.0.0.3 icmp_seq=1 ttl=64 time=1.800 ms
PC4> ping 192.0.0.5
64 bytes from 192.0.0.5 icmp_seq=1 ttl=64 time=13.942 ms
PC4> [REDACTED]

PC5> ping 192.0.0.1
64 bytes from 192.0.0.1 icmp_seq=1 ttl=64 time=6.347 ms
PC5> ping 192.0.0.2
64 bytes from 192.0.0.2 icmp_seq=1 ttl=64 time=6.875 ms
PC5> ping 192.0.0.3
64 bytes from 192.0.0.3 icmp_seq=1 ttl=64 time=2.159 ms
PC5> ping 192.0.0.4
64 bytes from 192.0.0.4 icmp_seq=1 ttl=64 time=6.785 ms
PC5> ping 192.0.0.5
64 bytes from 192.0.0.5 icmp_seq=1 ttl=64 time=7.747 ms
PC5> [REDACTED]

PC6> ping 192.0.0.1
64 bytes from 192.0.0.1 icmp_seq=1 ttl=64 time=6.235 ms
PC6> ping 192.0.0.2
64 bytes from 192.0.0.2 icmp_seq=1 ttl=64 time=6.785 ms
PC6> ping 192.0.0.3
64 bytes from 192.0.0.3 icmp_seq=1 ttl=64 time=2.159 ms
PC6> ping 192.0.0.4
64 bytes from 192.0.0.4 icmp_seq=1 ttl=64 time=6.785 ms
PC6> ping 192.0.0.5
64 bytes from 192.0.0.5 icmp_seq=1 ttl=64 time=7.747 ms
PC6> [REDACTED]
```

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



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

1-2

797 183.368039	0c:1a:3c:6f:00:01	Nearest-Customer-Bridge STP	60 Conf. Root = 0/1/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8002
798 184.146991	0c:15:54:27:00:01	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/100/0c:15:54:27:00:00 Cost = 0 Port = 0x8002
799 184.150968	0c:15:54:27:00:01	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/200/0c:15:54:27:00:00 Cost = 0 Port = 0x8002
800 184.159965	0c:15:54:27:00:01	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/300/0c:15:54:27:00:00 Cost = 0 Port = 0x8002

1-3

323 74.062058	0c:1a:3c:6f:00:02	Nearest-Customer-Bridge STP	60 Conf. Root = 0/1/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8003
324 74.102883	0c:1a:3c:6f:00:02	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/100/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8003
325 74.111853	0c:1a:3c:6f:00:02	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/200/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8003
326 74.115881	0c:1a:3c:6f:00:02	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/300/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8003
328 74.604058	0c:18:30:79:00:00	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/100/0c:18:30:79:00:00 Cost = 0 Port = 0x8001
329 74.606135	0c:18:30:79:00:00	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/200/0c:18:30:79:00:00 Cost = 0 Port = 0x8001
330 74.608043	0c:18:30:79:00:00	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/300/0c:18:30:79:00:00 Cost = 0 Port = 0x8001
331 75.065036	0c:1a:3c:6f:00:02	Nearest-Customer-Bridge STP	60 Conf. Root = 0/1/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8003

1-4

119 27.145266	0c:1a:3c:6f:00:04	Nearest-Customer-Bridge STP	60 Conf. Root = 0/1/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8005
121 28.000942	0c:01:6a:73:00:00	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/100/0c:01:6a:73:00:00 Cost = 0 Port = 0x8001
122 28.003672	0c:01:6a:73:00:00	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/200/0c:01:6a:73:00:00 Cost = 0 Port = 0x8001
123 28.007923	0c:01:6a:73:00:00	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/300/0c:01:6a:73:00:00 Cost = 0 Port = 0x8001
124 28.145432	0c:1a:3c:6f:00:04	Nearest-Customer-Bridge STP	60 Conf. Root = 0/1/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8005
125 28.247331	0c:1a:3c:6f:00:04	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/100/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8005
126 28.256618	0c:1a:3c:6f:00:04	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/200/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8005
127 28.261309	0c:1a:3c:6f:00:04	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/300/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8005

1-5

65 15.012064	0c:1a:3c:6f:00:07	Nearest-Customer-Bridge STP	60 Conf. Root = 0/1/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8008
66 15.110060	0c:1a:3c:6f:00:07	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/100/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8008
67 15.118029	0c:1a:3c:6f:00:07	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/200/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8008
68 15.123051	0c:1a:3c:6f:00:07	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/300/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8008
69 16.012924	0c:1a:3c:6f:00:07	Nearest-Customer-Bridge STP	60 Conf. Root = 0/1/0c:1a:3c:6f:00:00 Cost = 0 Port = 0x8008
70 16.605597	0c:e3:d9:02:00:01	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/100/0c:e3:d9:02:00:00 Cost = 0 Port = 0x8002
71 16.607095	0c:e3:d9:02:00:01	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/200/0c:e3:d9:02:00:00 Cost = 0 Port = 0x8002
72 16.611170	0c:e3:d9:02:00:01	Nearest-Customer-Bridge STP	60 Conf. Root = 32768/300/0c:e3:d9:02:00:00 Cost = 0 Port = 0x8002

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

На втором коммутаторе:

```
> ena  
# conf t  
(config)# int gi0/0  
(config-if)# spa cost 50  
(config-if)# end  
# write
```

