

10. Rootbridge election process in STP enabled environment

In redundant L2 topology STP ensures loop free path for frames traveling among endpoints blocking redundant paths that cause a loop.

STP – spanning tree protocol uses STA (spanning tree algorithm). STA designates a single switch as root bridge and uses it as reference for all calculations. Switch with lowest bridge ID (BID) becomes root bridge. After root bridge is determined – STA calculates shortest path to root bridge. Each switch use STA determine which ports block. Until STA on all switches is calculated – all traffic on broadcast domain is blocked. Port costs and path to root bridge are considered when determining which path to leave unblocked.

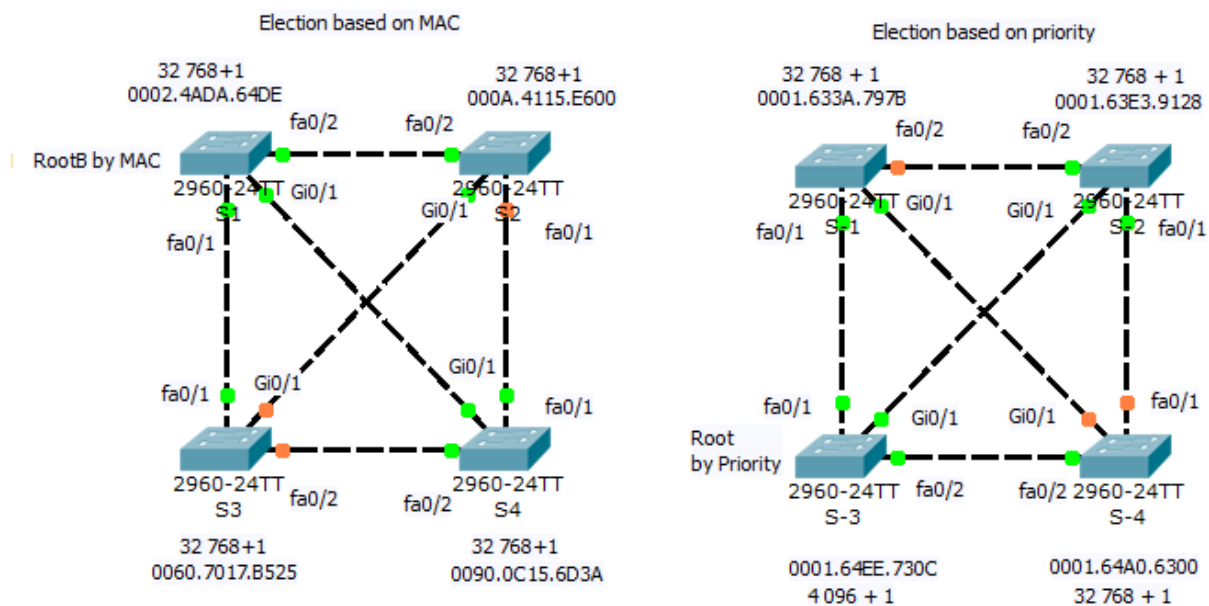
This article will focus on root bridge election in STP enabled network.

When root bridge are elected this mechanism will be used:

- 1) **lower priority** – configured by spanning-tree vlan nr,nr, ... priority nr (1 to 65 536 with increment 4096, default 32 768) is better
- 2) **if priorities are equal** (default 32 768) then lower MAC address is preferred by STA.

Our lab will use these 2 mechanism for root bridge election:

Root bridge election and port roles in spanning tree (ieee or 802.1D)



For configuration root bridge priority in 802.1D(W) on STP capable switches can be used CLI command:

```
sw(config)#spanning-tree vlan number priority Priority_number
```

example **spanning-tree vlan 1,99,150 priority 4096**

or

```
sw(config)# spanning-tree vlan nr root primary
```

```
sw(config)# spanning-tree vlan nr root secondary
```

One of the most important thing is determine which switch is elected as root bridge using CLI commands. You can use show spanning-tree entered at privileged exec prompt as show next picture

Switch S-1 CLI Output:

```

S-1>enable
S-1#show spann
S-1#show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee 802.1D is in use
  Root ID    Priority    4097
            Address    0001.64EE.730C
            Cost        19
            Port        1(FastEthernet0/1)
            Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
            Address    0001.633A.797B
            Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time  20
  this sw S-1

Interface    Role Sts Cost      Prio.Nbr Type
-----
Fa0/1        Root FWD 19       128.1    P2p
Fa0/2        Altn  BLK 19       128.2    P2p
Gi1/1        Desg FWD 4       128.25   P2p
  
```

is not a root bridge because not all ports are in forwarding state

Switch S-3 CLI Output:

```

S-3#show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    4097 not default
            Address    0001.64EE.730C
            Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
            This bridge is the root declare themselves as rootbridge

  Bridge ID  Priority    4097 (priority 4096 sys-id-ext 1) priority + VLAN_ID
            Address    0001.64EE.730C
            Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time  20

Interface    Role Sts Cost      Prio.Nbr Type
-----
Fa0/1        Desg FWD 19       128.1    P2p
Fa0/2        Desg FWD 19       128.2    P2p
Gi1/1        Desg FWD 4       128.25   P2p
  
```

port roles are designated and they are in forwarding state

Network Diagram: Shows four switches (S-1, S-2, S-3, S-4) connected in a mesh topology. S-3 is the root bridge. The diagram illustrates the election process based on priority and MAC address.

What important thing show to us output from commands executed on two different switches?

- 1) Root bridge mark themselves as root bridge (this bridge is ...)
- 2) All root bridge ports are in designated role and are in forwarding state
- 3) 802.1D implementation of STP is in use (not rapid-PVST) because ieee is in output
- 4) Priority 4096 was important for root bridge selection (if equal then lower MAC break the tie and S-1 going to be root bridge)

Our preconfigured training topology can be obtained from here (PKT 5.2 or above required).