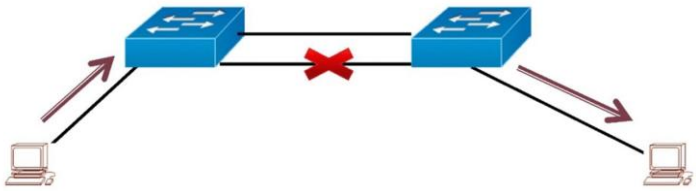
Spanning-tree protocol

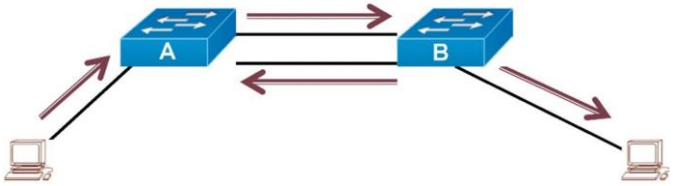
Bridging loops

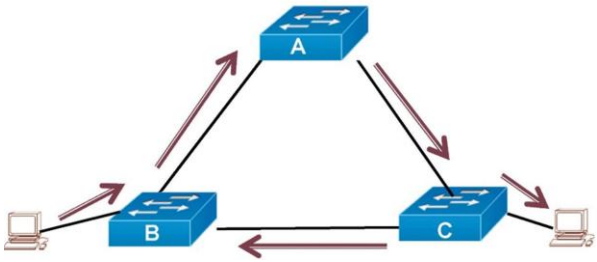
Redundant link between switches provides redundancy.

Also possibility to create loops when switches do broadcasts.

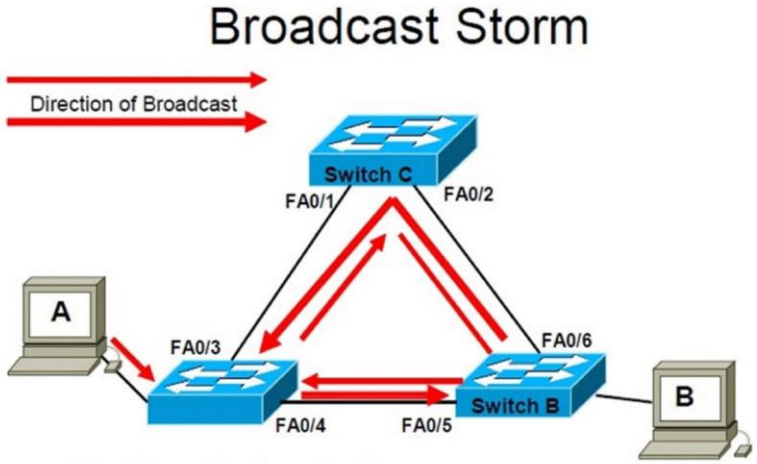
1. Broadcast storms
2. Mac-table instability
3. Multiple frame transmissions







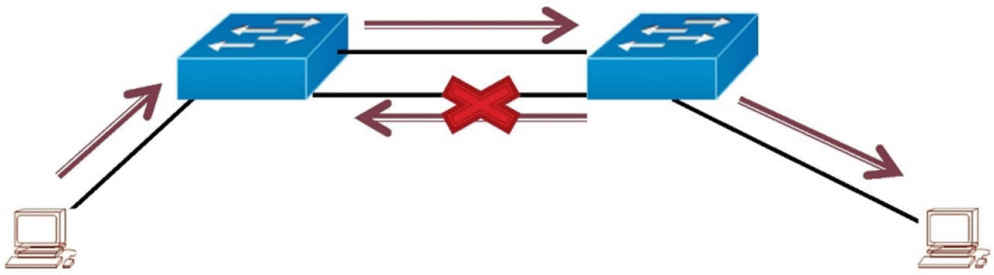
Bridging loops



- **Host A sends a broadcast.**
- **Switches continue to propagate broadcast traffic over and over**

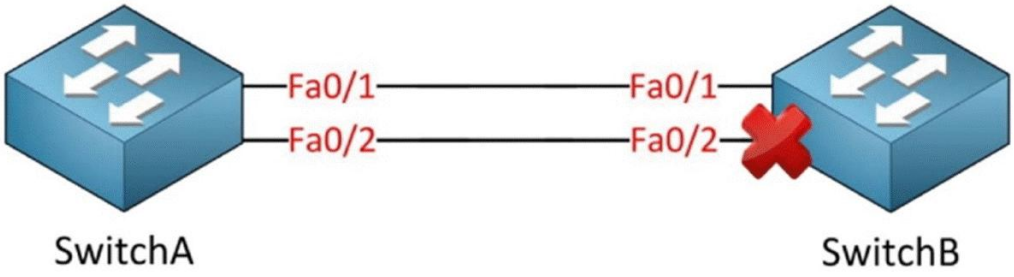
Bridging loops (solution)

- Only one link between switches (no redundancy)
- Shutdown extra link temporarily
  - Manually (shutdown command)
  - Automatically block extra links (done by STP)



Spanning-tree Protocol

- STP stop the loops which occurs when you have multiple links between switches
- STP stops avoiding Broadcast Storms, Multiple Frame Copies & Database instability.
- STP is a open standard (IEEE 802.1D)
- STP is enabled by default on all Cisco Catalyst switches

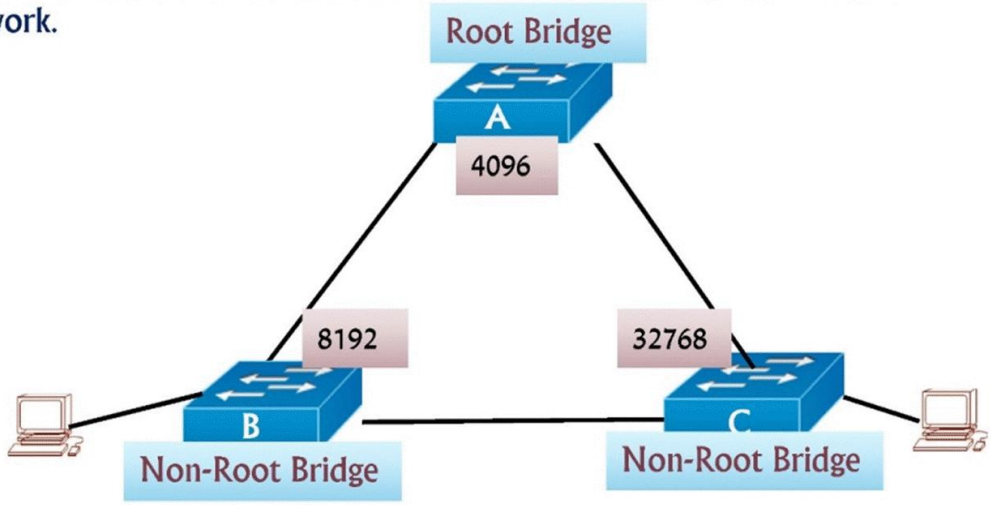


How STP works

1. Selecting the Root Bridge
2. Selecting the Root Port
3. Selecting Designated port & Non Designated port

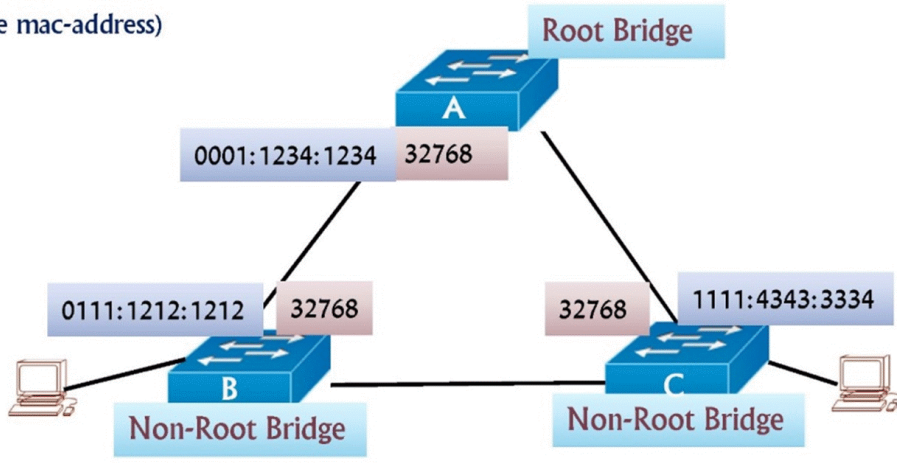
1) Selecting the Root Bridge

- The bridge with the Best (Lowest) Bridge ID.
- Bridge ID = Priority + MAC address of the switch (least is best)
- Out of all the switches in the network, one is elected as a root bridge that becomes the focal point in the network.



1) Selecting the Root Bridge

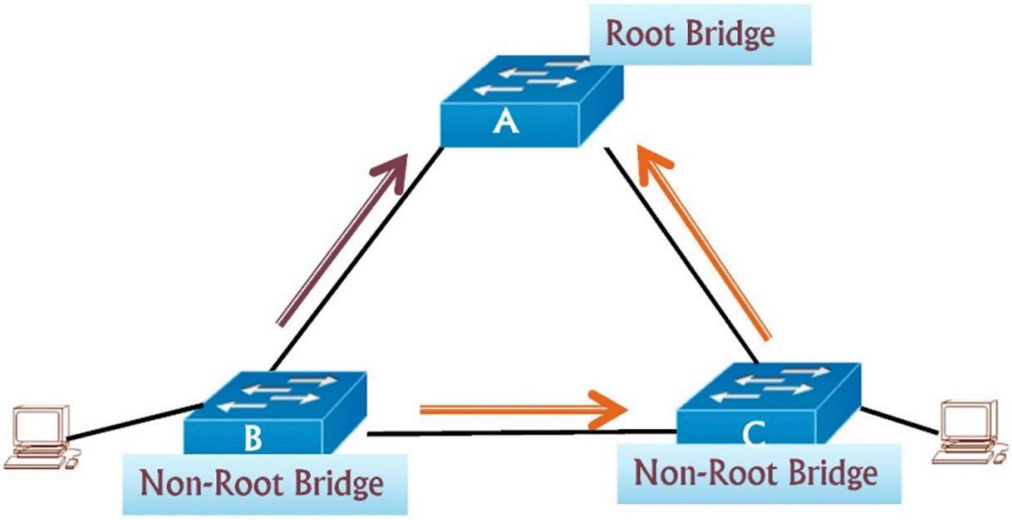
- The bridge with the Best (Lowest) Bridge ID.
- Bridge ID = Priority + MAC address of the switch (least is best)
- Default priority on cisco switches = 32768
- Show version (to verify base mac-address)



- Every LAN will have only one Root Bridge
- and all the remaining switches will be considered as Non-root Bridges.

2) Selecting the Root Port:

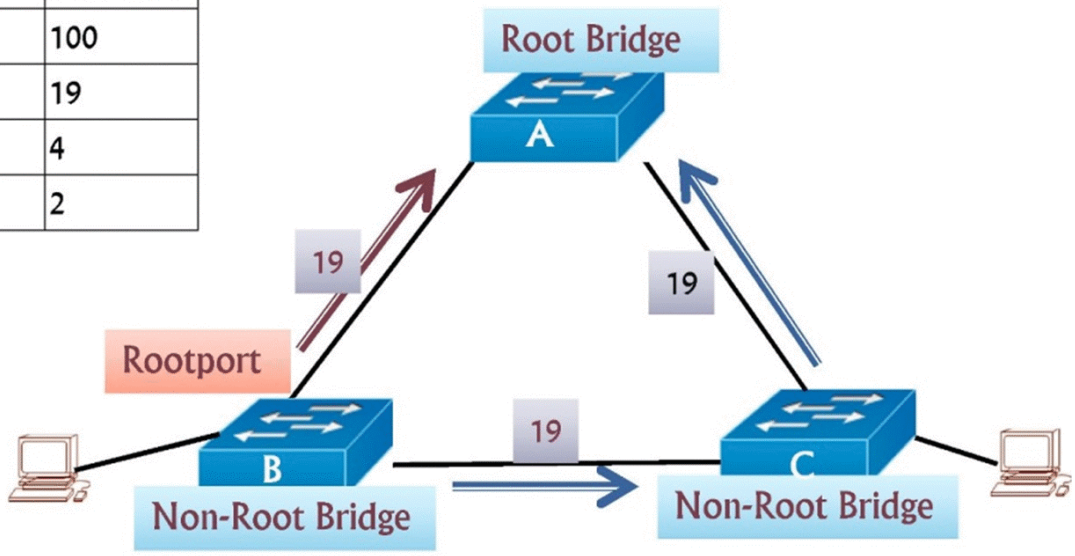
- Shortest path to the Root bridge
- Every Non-root Bridge looks the best way to go Root-bridge



Root port selection based on Cost

- least cost (Speed)

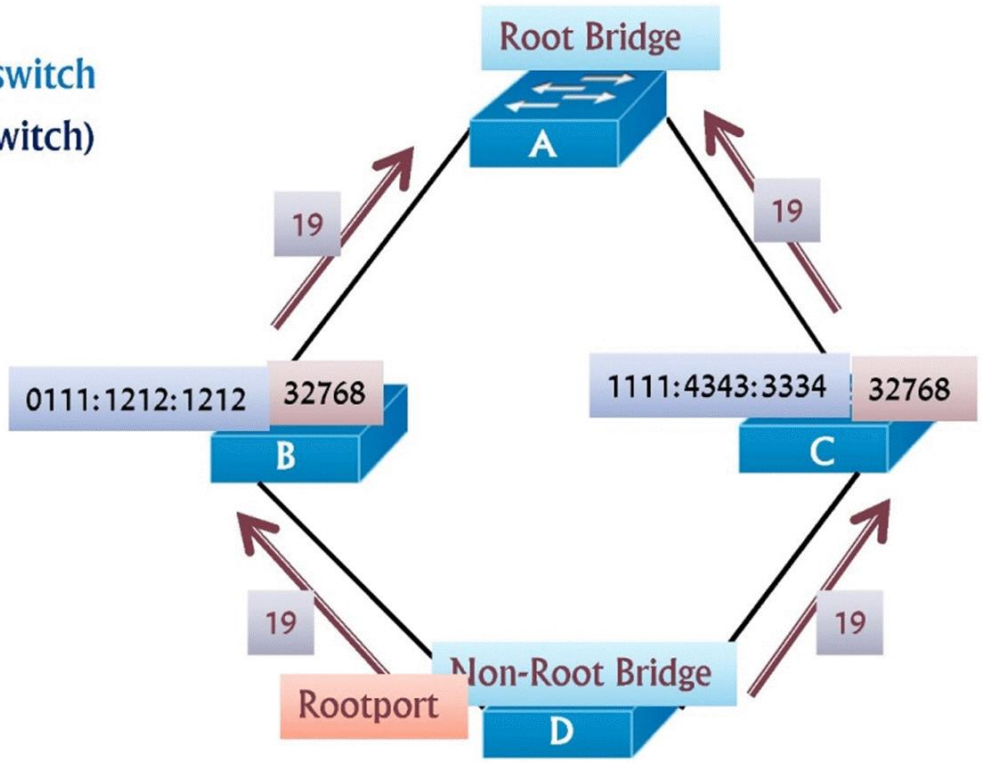
Bandwidth	Port Cost
10 Mbps	100
100 Mbps	19
1-Gigabit Ethernet	4
10-Gigabit Ethernet	2



- For every non-root bridge there is only one root port.

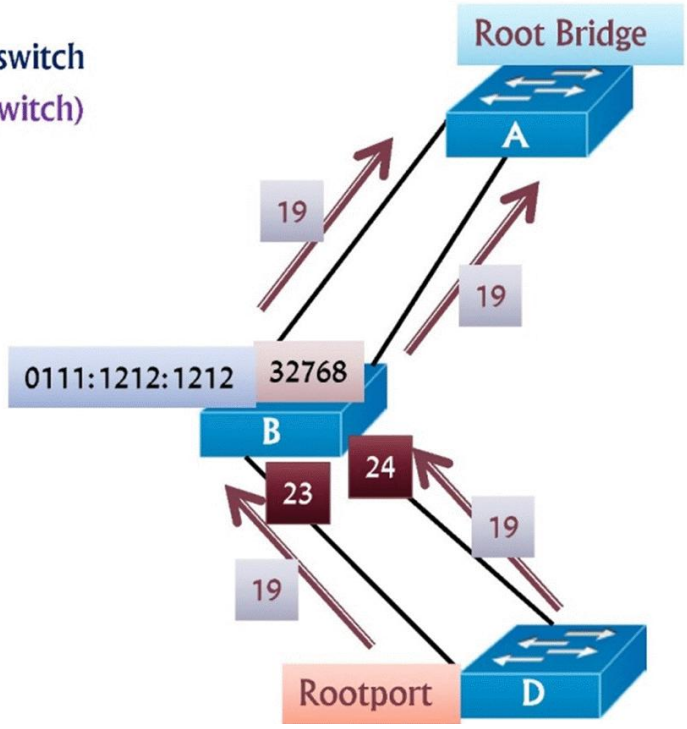
Root port selection

- least cost (Speed)
- Bridge-ID of forwarding switch
- Least port (forwarding switch)



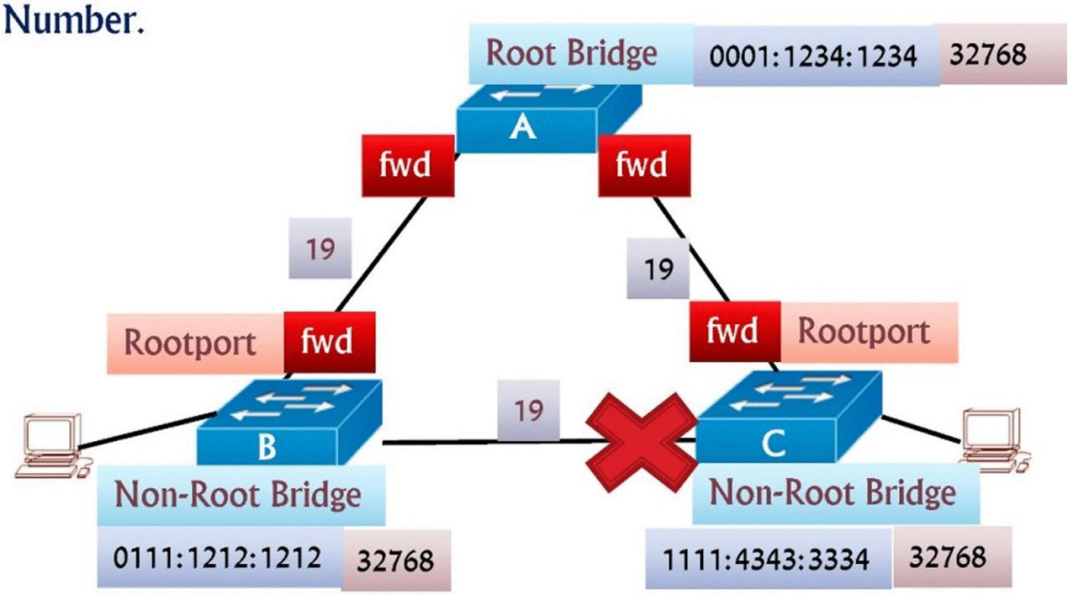
Root port selection

- least cost (Speed)
- Bridge-ID of forwarding switch
- Least port (forwarding switch)

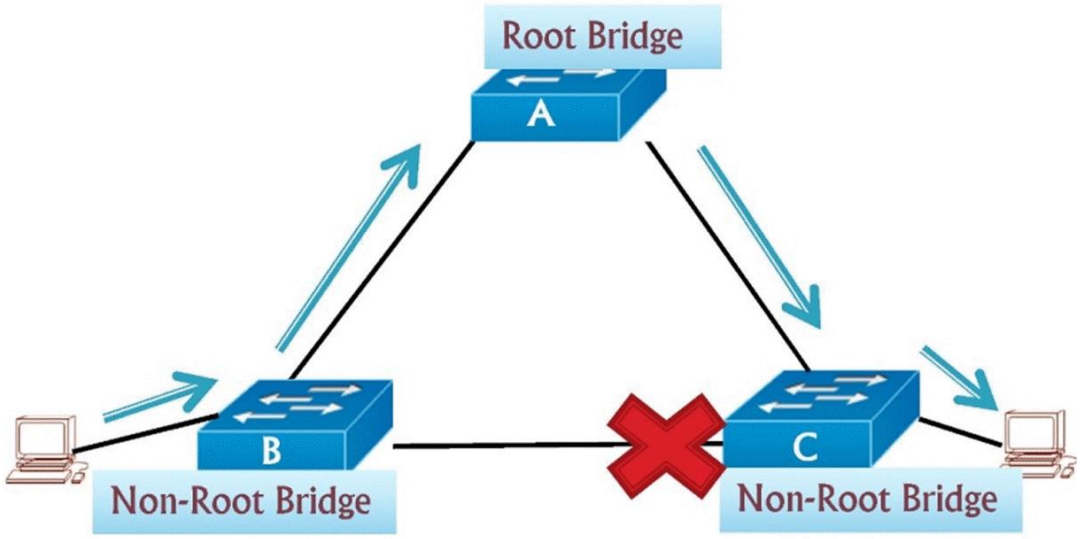


3) Selecting Designated port & Non Designated port

- least cost (Speed)
- The least local Switch ID.
- Lowest local Port Number.

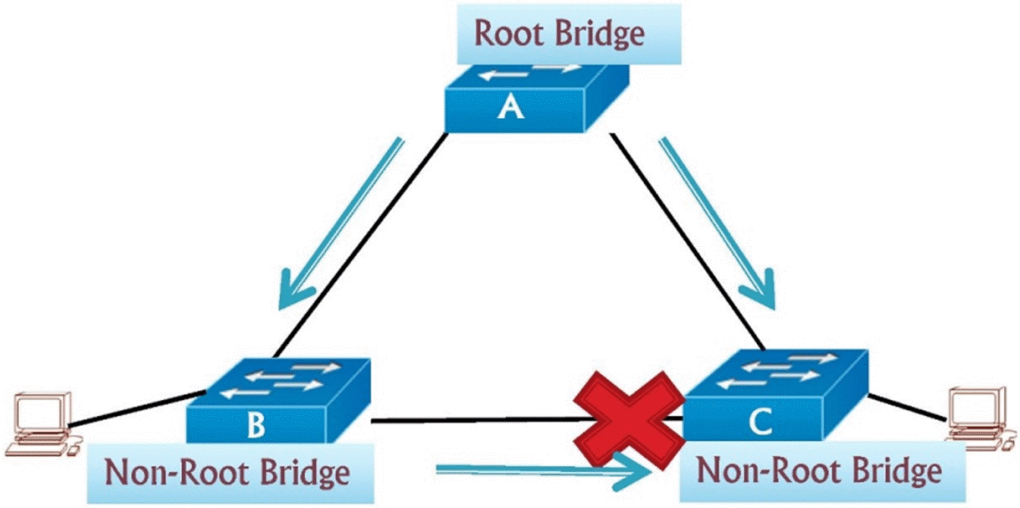


Root bridge – central switch all the traffic forwarded.



BPDU

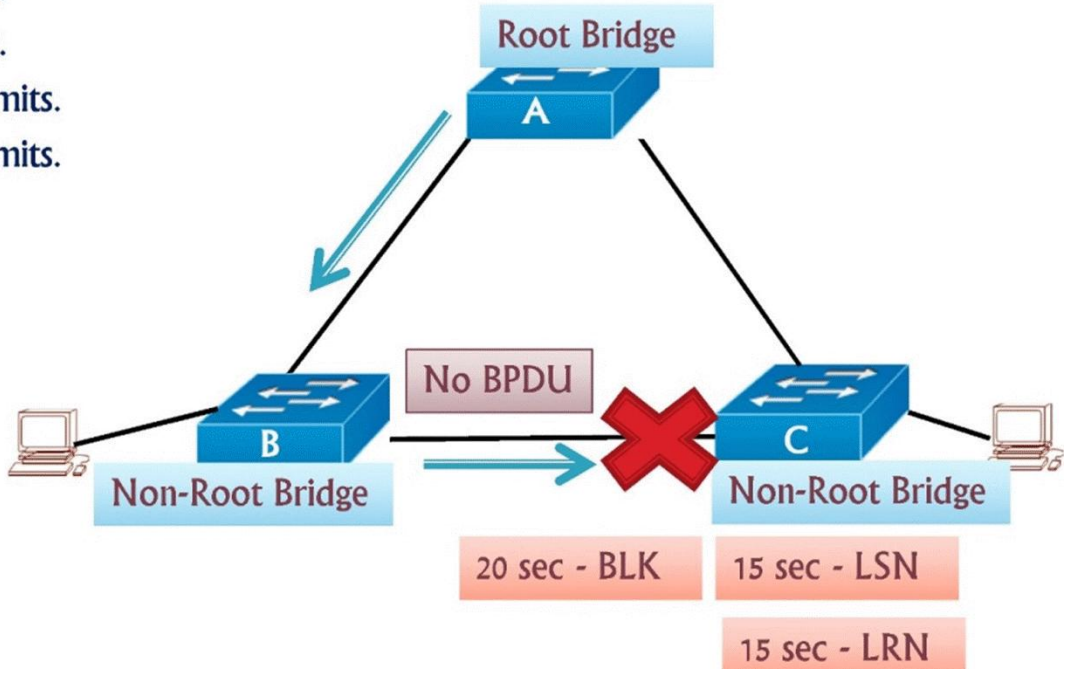
- All switches exchange information through what is called as Bridge Protocol Data Units (BPDUs)
- BPDUs are sent every 2 sec and dead = 20 sec
- A BPDU contains information regarding ports, switches, port priority and addresses.



STP Convergence

STP port states

- Blocking — 20 Sec or No Limits.
- Listening — 15 Sec.
- Learning — 15 Sec.
- Forwarding — No Limits.
- Disable — No Limits.



Lab : verifying spanning-tree

Show Spanning-tree