

Spanning Tree Versions

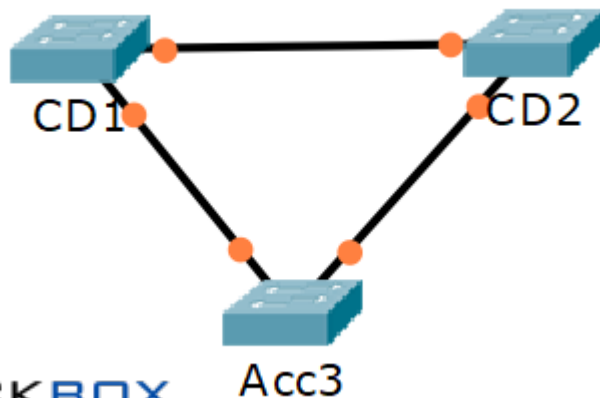


- Spanning Tree is an industry standard protocol and is enabled by default on all vendor's switches
- IEEE Open Standards:
 - **802.1D Spanning Tree Protocol (STP)**. The original Spanning Tree implementation. Uses one Spanning Tree for all VLANs in the LAN.
 - **802.1w Rapid Spanning Tree Protocol (RSTP)**. Significantly improved convergence time. Uses one Spanning Tree for all VLANs in the LAN.
 - **802.1s Multiple Spanning Tree Protocol (MSTP)**. Enables grouping and mapping VLANs into different spanning tree instances for load balancing.

MSTP Load Balancing Example



- The Access Layer switches have PCs attached in multiple VLANs
- CD1 is made the Root Bridge for VLANs 10– 19
- Traffic for these VLANs is forwarded on the link to CD1 and blocked on the link to CD2
- CD2 is made the Root Bridge for VLANs 20– 29
- Traffic for these VLANs is forwarded on the link to CD2 and blocked on the link to CD1
- Two Spanning Tree instances run, one for each group of VLANs

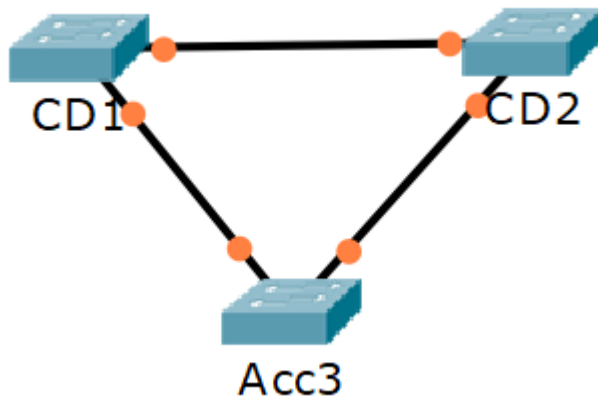




- Cisco released enhancements to the open standards.
 - **Per VLAN Spanning Tree Plus (PVST+):** Cisco enhancement to 802.1D. Uses a separate Spanning Tree instance for every VLAN. This is the default on Cisco switches.
 - **Rapid Per VLAN Spanning Tree Plus (RPVST+):** Cisco enhancement to 802.1w RSTP. Significantly improved convergence time over PVST+. Uses a separate Spanning Tree instance for every VLAN.
- The Cisco versions do not support grouping multiple VLANs into the same instance

PVST+ and RPVST+ Load Balancing Example

- The Access Layer switches have PCs attached in multiple VLANs
- CD1 is made the Root Bridge for VLANs 10– 19
- Traffic for these VLANs is forwarded on the link to CD1 and blocked on the link to CD2
- CD2 is made the Root Bridge for VLANs 20– 29
- Traffic for these VLANs is forwarded on the link to CD2 and blocked on the link to CD1
- Twenty Spanning Tree instances run, one for each VLAN



PVST+ Port Roles



- PVST+ will assign the Root, Designated or Alternate role to ports
- Alternate Ports are Blocking Ports