

Spanning Tree Versions

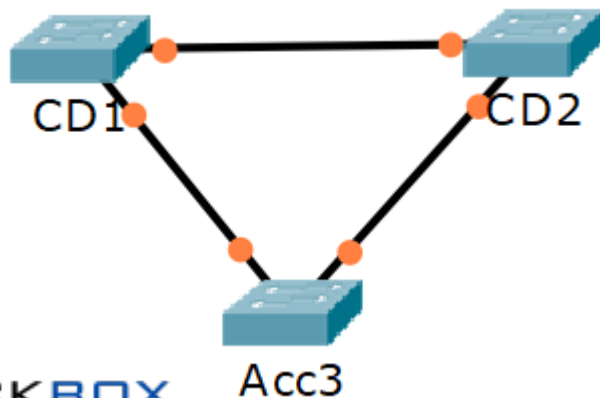


- Spanning Tree is an industry standard protocol and is enabled by default on all vendor's switches
- IEEE Open Standards:
 - **802.1D Spanning Tree Protocol (STP).** The original Spanning Tree implementation. Uses one Spanning Tree for all VLANs in the LAN.
 - **802.1w Rapid Spanning Tree Protocol (RSTP).** Significantly improved convergence time. Uses one Spanning Tree for all VLANs in the LAN.
 - **802.1s Multiple Spanning Tree Protocol (MSTP also known as MST).** 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



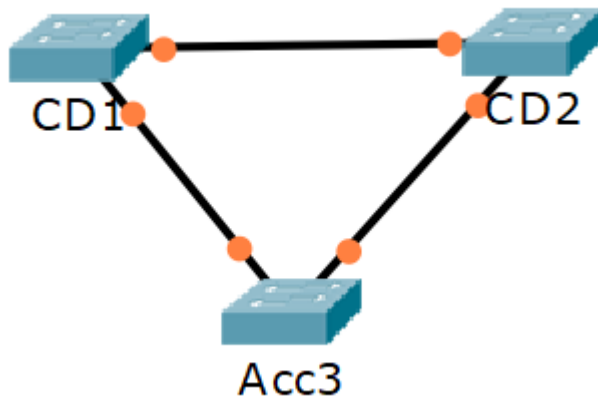
Cisco Versions



- 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 most 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



Cisco Supported Versions



- Most modern Cisco switches support PVST+, RPVST+, and MSTP.
- PVST+ is the default on most Cisco switches.

Spanning Tree Version Configuration

```
CD1(config)#spanning-tree mode ?
```

mst	Multiple spanning tree mode
pvst	Per-Vlan spanning tree mode
rapid-pvst	Per-Vlan rapid spanning tree mode

```
CD1#show spanning-tree summary
```

Switch is in rapid-pvst mode

Root bridge for: none

Extended system ID is enabled

! truncated

Spanning Tree 802.1D Note



- Standard 802.1D-1998 classified legacy classic STP.
- 802.1D-2004 covered RSTP.
- When network engineers say '802.1D' in describing an STP version, we're referring to the original legacy classic STP.
- Newer documents have since been published.

Spanning Tree Port Roles



- Blocking Ports are termed 'Alternate Ports' in the newer Spanning Tree versions

802.1D STP	PVST+, RSTP, RPVST+, MSTP
Root	Root
Designated	Designated
Blocked	Alternate