

Spanning-Tree Golden Rules

1) Root Bridge election for the whole NETWORK (per Broadcast Domain)

There is exactly one Root Bridge for each Spanning Tree instance.

1. Lowest Bridge ID (Bridge Priority + MAC Address)

2) Root Port election on each NoN-Root Bridge

Each (NoN-Root) bridge has exactly one Root Port, which represents the best path to the Root Bridge.

1. Lowest Path Cost to Root
2. Lowest Sender Bridge ID
3. Lowest Sender Port ID (Port Priority + Port#)
4. Lowest Local Port ID (Port Priority + Port#)

3) Designated Port election on each Segment

There is exactly one Designated Port giving access to each LAN Segment.

1. Lowest Path Cost to Root
2. Lowest Bridge ID (Bridge Priority + MAC Address)

4) All ports which are neither Root Ports nor Designated Ports are put into a Blocking state

BPDUs are not transmitted but are received, and no user traffic passes. These represent redundant links. Port role elections may be recalculated at any time.

With 802.1W, blocked ports are each given an Alternate port (Root port stand-in) or Backup port (Designated port stand-in) role, to pre-stage a more rapid failover.

Hidden Rule: All ports in Root Bridge will become Designated Ports.

802.1D STP Port States:

- **Blocking** - A port that would cause a switching loop if it were active. No user data is sent or received over a blocking port, but it may go into forwarding mode if the other links in use fail and the spanning tree algorithm determines the port may transition to the forwarding state. BPDU data is still received in blocking state. Prevents the use of looped paths.
- **Listening** - The switch processes BPDUs and awaits possible new information that would cause it to return to the blocking state. It does not populate the MAC address table and it does not forward frames.
- **Learning** - While the port does not yet forward frames it does learn source addresses from frames received and adds them to the filtering database (switching database). It populates the MAC address table, but does not forward frames.
- **Forwarding** - A port receiving and sending data, normal operation. STP still monitors incoming BPDUs that would indicate it should return to the blocking state to prevent a loop.
- **Disabled** - Not strictly part of STP, a network administrator can manually disable a port

802.1D STP Port Roles:

- **Root Port** - A forwarding port that is the best port from non-root bridge to root bridge.
- **Designated Port** - A forwarding port for every LAN segment.
- **Blocked Port** – A Blocking port. Which neither Root Port nor Designated Port.

802.1W RSTP Port States:

- **Discarding** - No user data is sent over the port
- **Learning** - The port is not forwarding frames yet, but is populating its MAC-address-table
- **Forwarding** - The port is fully operational

802.1W RSTP Port Roles:

- **Root** - A forwarding port that is the best port from non-root bridge to root bridge
- **Designated** - A forwarding port for every LAN segment
- **Alternate** - An alternate path to the root bridge. This path is different from using the root port
- **Backup** - A backup/redundant path to a segment where another bridge port already connects
- **Disabled** - Not strictly part of STP, a network administrator can manually disable a port

802.1D State	802.1w State	Default Port Operational Status	Port in Active Topology?	Port Learning MAC Addresses?
Disabled	Discarding	Enabled	No	No
Blocking	Discarding	Enabled	No	No
Listening	Discarding	Enabled	Yes	No
Learning	Learning	Enabled	Yes	Yes
Forwarding	Forwarding	Enabled	Yes	Yes