**STP Operations**

Spanning Tree Protocol (STP) prevents network loops by outlining its four-step process:

* Elect the root bridge: This is the central switch in the network.
* Elect the root ports: Each non-root switch selects its best path to the root bridge.
* Elect designated ports: Each network segment has a designated port, which is the port closest to the root bridge.
* Elect alternate (blocked) ports: Redundant ports are blocked to prevent loops.

A diagram of a computer system

AI-generated content may be incorrect.The process relies on Bridge Protocol Data Units (BPDUs), which switches use to share information, including their Bridge ID (BID). The BID, consisting of a priority value, an extended system ID, and the switch's MAC address, is crucial for determining the root bridge and port roles. The switch with the lowest BID becomes the root bridge. The image below demonstrates the BID (Bridge ID) elements:

- Bridge Priority (Gía trị ưu tiên cầu): This is a configurable value. Lower values are given preference during the root bridge election

- Extended System ID (ID Hệ thống mở rộng); In modern STP implementations, this often includes VLAN (Virtual Local Area Network) information. This allows for per-VLAN spanning tree instances.

- MAC Address

**B. Elect the root bridge:** lowest BID (Bridge ID) will become the root bridge

**C.** A computer screen shot of a diagram

AI-generated content may be incorrect.**Impact of default BIDs:**

* When switches have the same default Bridge Priority (32768), the MAC address determines the root bridge.
* The switch with the lowest MAC address wins the election.
* It's best practice to manually configure a lower priority on the desired root bridge.
* In the example provided all switches had a priority of 32769, this is due to the default priority of 32768, plus the extended system ID of VLAN 1.
* In the example, S2 became the root bridge because it had the lowest MAC address.

**D. Determine the Root Path Cost**

* After the root bridge is elected, STP calculates the best paths to it.
* The "internal root path cost" is the sum of port costs along the path to the root bridge.
* BPDUs carry the root path cost from the sending switch to the root.
* Receiving switches add their ingress port cost to calculate their own path cost.
* Default port costs are based on port speed (IEEE standards).
* Cisco uses 802.1D (short path cost) by default, but 802.1w (long path cost) is recommended for 10 Gbps+ links

**E. Electing the root ports**

* After the root bridge is chosen, STA selects root ports on non-root switches.
* The root port is the port with the lowest cost path to the root bridge.
* The "internal root path cost" is the sum of port costs to the root bridge.
* Lower cost paths are preferred; redundant paths are blocked.
* A diagram of a computer network

  AI-generated content may be incorrect.In the example, S2's F0/1 becomes the root port because it has the lowest cost path to S1.

**F. Electing designated ports**

* After root ports are chosen, STP selects designated ports.
* Each segment between switches has one designated port.
* The designated port has the lowest internal root path cost to the root bridge.
* It's the best path to receive traffic towards the root bridge.
* Ports that are neither root nor designated become alternate (blocked) ports.
* This ensures a single, loop-free path from each switch to the root bridge.

**G. Elect Alternate (Blocked) Ports**

* STP prevents loops by blocking redundant ports.
* Ports that are neither root nor designated become alternate (blocked) ports.
* In the example, port F0/2 on switch S3 is an alternate port and is in a blocking state.
* This blocked port does not forward traffic, thus preventing loops.
* All other interswitch ports are forwarding traffic.

1. Without configuration changes, all switches will have the default STP priority of 32,768. If all priorities are the same, the switch with the lowest MAC address value will become the root bridge.  
2. The switch with the lowest bridge ID will become the root bridge.  
3. The root port is the switch port on a switch with the lowest path cost to the root bridge.  
4. The designated port is the switch port on a segment with the lowest path cost to the root bridge.  
5. Designated ports and root ports will forward Ethernet frames.  
6. The root path cost is the sum of individual port costs along the path from the switch to the root bridge.  
7. BPDUs are send every 2 seconds by default.