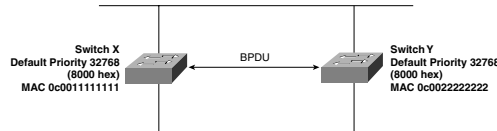


## Selecting the Root Bridge

Switches running the Spanning-Tree Protocol exchange information at regular intervals using a frame called the *bridge protocol data unit* (BPDU). Each bridge has a unique bridge ID. The bridge ID contains the bridge MAC address and a priority number. The midrange value of 32768 is the default priority. The bridge with the lowest bridge ID is selected as the root bridge. When switches have the same priority, the one with the lowest MAC address is the root bridge. In the figure, Switch X is the root bridge.



## Port States

Frames take a finite amount of time to travel or propagate through the network. This delay is known as *propagation delay*. When a link goes down, spanning tree activates previously blocked links. This information is sent throughout the network, but not all switches receive this information at the same time. To prevent temporary loops, switches wait until the entire network is updated before they set any ports to the forwarding state. Each switch port in a network running the Spanning-Tree Protocol is in one of the following states:

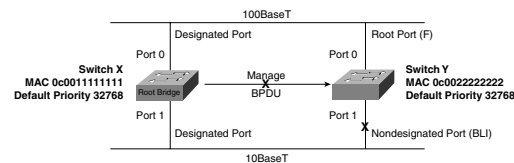
- Blocking
- Listening
- Learning
- Forwarding

The forward delay is the time it takes for a port to go to a higher state. It usually takes 50 seconds for a port to go from the blocking state to the forwarding state (20 max age + 15 listening + 15 learning), but the timers can be adjusted.

## Spanning-Tree Recalculation

When a link fails, the network topology must change. Connectivity is reestablished by placing key blocked ports in the forwarding state.

## 1 Edit not clear in illustration below



In the figure, if switch X fails, switch Y does not receive the BPDU. If the BPDU is not received before the max age timer expires, spanning tree begins recalculating the network. In the figure,

switch Y is now the root bridge. If switch X comes back up, spanning tree recalculates the network, and switch X is again the root bridge.

## Time to Converge

A network is said to have converged when all ports in a switched network are in either the blocked or forwarding state after a topology change.

## Spanning-Tree Protocol Summary

- The Spanning-Tree Protocol prevents loops in a redundant network.
- Spanning-Tree Protocol assigns a root bridge, root ports for nonroot bridges, and designated port segments. In a converged network, ports are either in forwarding or blocking state.
- BPDUs are exchanged every two seconds. The bridge ID is made up of the MAC address and priority. The bridge with the lowest bridge ID is the root bridge.
- The four port states are blocking, listening, learning, and forwarding.
- When a link fails, spanning tree adjusts the network topology to ensure connectivity.

## Configuring the Catalyst 1900 Switch

An IP address must be assigned to a switch to use Telnet or Simple Network Management Protocol (SNMP).

A 32-bit subnet mask denotes which bits in the IP address correspond to the host and network portions of the address.

The default gateway is used when the switch must send traffic to a different IP network.

The default gateway is a Layer 3 device (router) that can access other networks.