

# STP, Spanning Tree Protocol (IEEE 802.1D)

**Spanning tree** network protocol provides a loop free topology for any bridged LAN (or vLAN). The Spanning Tree Protocol, which is also referred to as **STP**, is defined in the IEEE Standard 802.1D. STP is used in switched networks to prevent loops, and has been standardized by IEEE 802.1D. STP finds a spanning tree within the mesh formed by the network creator and disables the links that are not part of that tree. The Rapid Spanning Tree Protocol (RSTP; IEEE 802.1w) developed STP further to support new and faster layer-3 switches.

If more than one open path were to be active at once then there would be problems - a broadcast storm caused by broadcast packets [looping](#).

## STP switch port modes:

- **Listening** - The switch processes BPDUs and determines the network topology
- **Learning** - The switch builds a switching table that maps [MAC](#) addresses to port numbers
- **Blocking** - A port that would cause a switching loop, no user data is sent or received but it may go into forwarding mode if the trunk link in use were to fail. BPDUs are still sent and received in blocking mode
- **Forwarding** - A port receiving and sending data, normal operation
- **Disabled** - Not strictly part of STP, a network administrator can manually disable a port

*To prevent the delay when connecting hosts to a switch Rapid STP was developed and standardised by IEEE 802.1w which allows a switch port to go immediately into forwarding mode when an end device is attached - faster spanning tree convergence after a topology change*

## Electing a root bridge

Each switch has a [MAC address](#) and a configurable [priority number](#), both of these numbers make up the bridge identifier (BID); if this is a tie then the numerically lowest MAC address wins. One switch should always be successfully elected as the root bridge using bandwidth as a measurement and so produce a loop free [tree topology](#). The network administrator wishes a particular switch to be elected; otherwise the whole process is totally automatic.

## Protocol operation

- Elect a root bridge.
- Find least cost (mean
- Disable links that

## Bridge P

BID

I think that I shall never see  
A graph more lovely than a tree.  
A tree whose crucial property  
Is [loop-free connectivity](#).  
A tree which must be sure to  
So packets can reach every  
First the Root must be  
By ID it is elected  
[Least cost paths](#) for  
In the tree the  
A mesh is  
Then

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