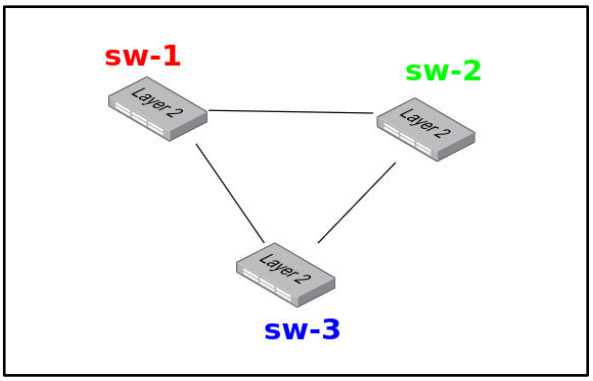
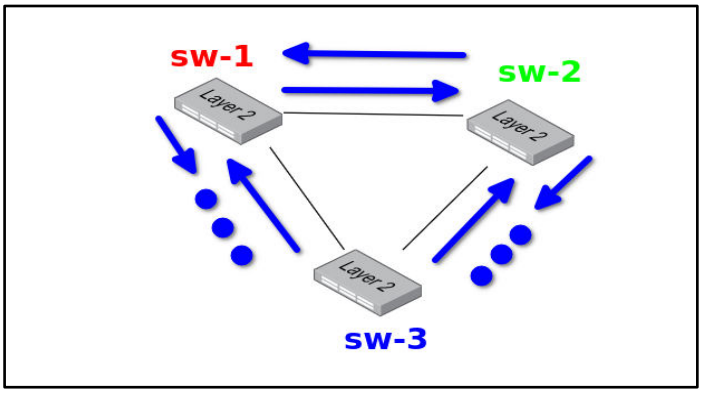
Spanning Tree Protocol

Before explaining how STP works, in order understand why we need it, some problems we'd encounter because of lack of STP need to be mentioned.

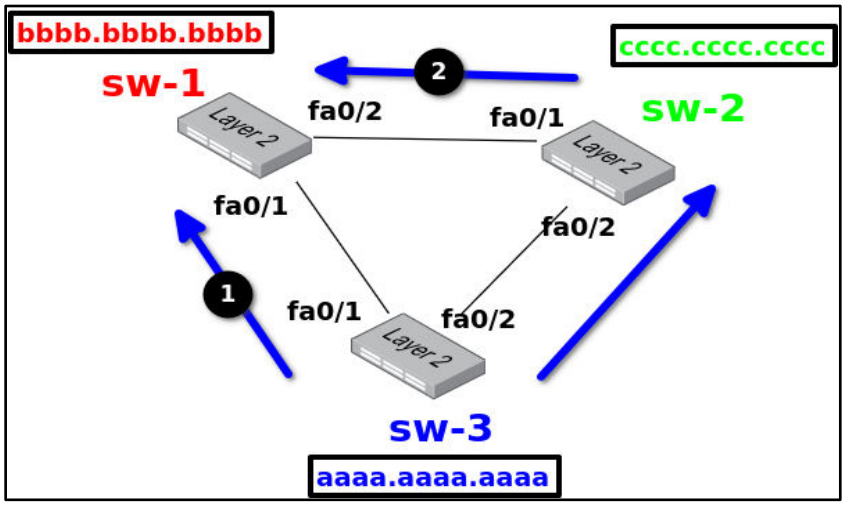
Problem 1 – Infinite Loop



Lets assume **switch-3** performed a broadcast message. In that case since other switches will forward that broadcast message, it'll end up being an infinite loop. And same goes for every switch in that network.



Problem 2 – Unstable MAC Address Table



Let's assume **switch-3** broadcasted again, when first broadcast message(arrow 1) reached the **switch-2** it'll save this record into its mac address table as following:

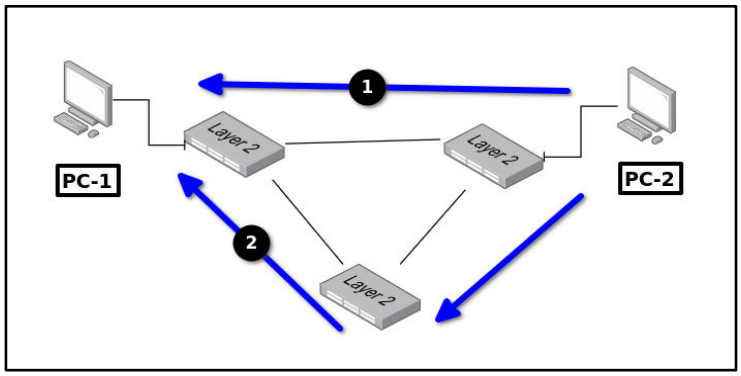
MAC Address	Port
aaaa.aaaa.aaaa	FastEthernet 0/1

However after a while, it'll get same message from fa0/2, since it's in a loop. After it received new message, switch'll update its mac address table like so:

MAC Address	Port
aaaa.aaaa.aaaa	FastEthernet 0/2

This process will be performed again and again, so it'll cause a non-stable mac address table for every switch in this network.

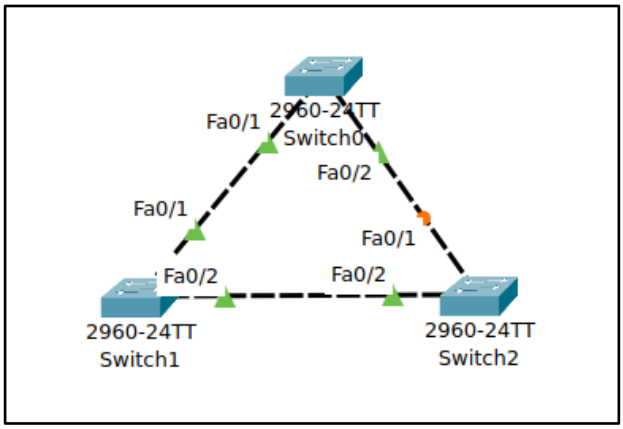
Problem 3 – Duplicate Frames



Let's assume PC-2 want to talk with PC-1, since they are in a network includes a loop, PC-1'll receive same message two times.

How STP Prevents It to Happen

STP basically blocks enough amount of interfaces on switches in same network, so these interfaces act like terminators and prevent frames to go through. In image below we can see that STP decided to block **Switch2**'s **Fa0/1** interface. By doing that it prevented a loop to happen.



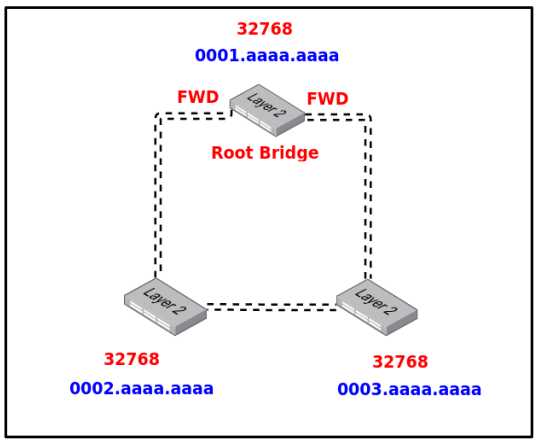
How STP Works

- ## Selecting Root Bridge

  Root Bridge is like a king among switches, they make a selection which is performed via looking **Bridge ID** information they get via **BPDU** messages. Bridge ID is combination of **Priority Number** and **MAC Address** of related switch. The switch that has smallest Bridge ID becomes Root Bridge. And again they share their Bridge ID information via BPDU messages constantly with other switches, so whenever a root switch is selected, other switches know it.

  All active ports of Root Bridge continue forwarding frames.

  (Red = Priority Number, Blue = MAC Address)

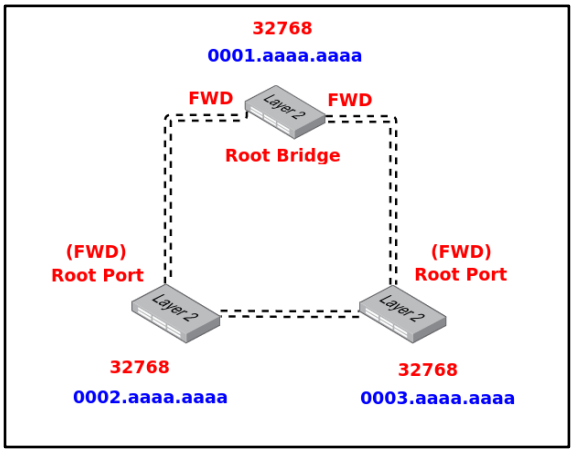


- ## Selecting Root Port

  Every non-Root Bridge looks for best way to reach Root Bridge. The port that makes best connection to Root Bridge becomes Root Port, it continues forwarding frames.

  It decides whether the path is best or not by looking following matters:

  1. Least cost (speed)
  2. The lowest **forwarding** Switch ID (Bridge ID)
  3. The lowest **forwarding** Physical Port Number



- ## Selecting Designated port & Blocking Port

  Choosing designated port is very similar to choosing root port, only main difference between them instead of looking forwarding Switch ID and Physical Port Number, it looks their local Switch ID and Physical Port Number. Cost is the same. According to the table below, designated port is elected and keeps forwarding frames, the port across to designated port, becomes blocking port(non-designated port) and starts to block frames.

  - Least cost (speed)
  - The lowest **local** Switch ID (Bridge ID)
  - The lowest **local** Physical Port Number