# LAB SESSION WEEK 9 – TUTORIAL NOTES

## GENERAL INFO

1. Final Assessments will be online

   Final VLSM Defence on Week 12. This is an 8 mins. interview to partially complete 1 exercise

   Final Skills Demo during Final Assessment Period. This is a 15 mins. interview to complete 2 tasks

   MUST READ assessment information pages on Canvas

   MUST READ Convenor's announcements
2. VLSM Test 1 one-to-one feedback today if not received last week
3. Mid-Sem Skills assessment one-to-one feedback today
4. VLSM Test 2 next week

   30 mins. to complete

   Not a classful major network
5. Today you will complete labs 7a and 8a. **Do NOT do these on Packet Tracer.**

   Not all STP configuration commands available in PT.

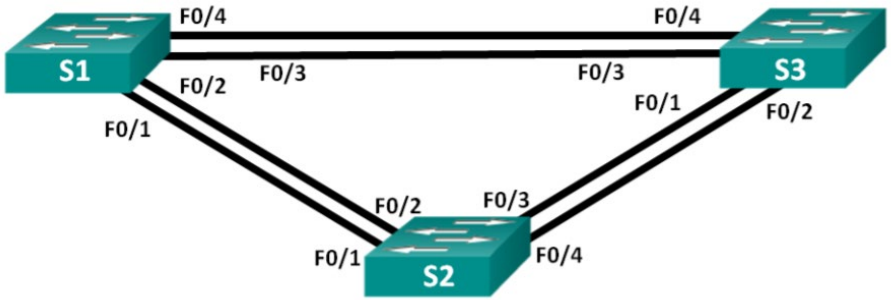
   Also, remember your Final Skills Demos are done on ATC equipment

# TUTORIAL

## L2 redundancy issues and Spanning Tree Protocol

1. Link and hardware redundancy in a network are necessary → increased network availability
2. But, L2 redundancy can cause several issues:
    - L2 Loops
    - Broadcast storms
    - Duplicated unicast frames
    - MAC address table instability

    The network will then become unavailable

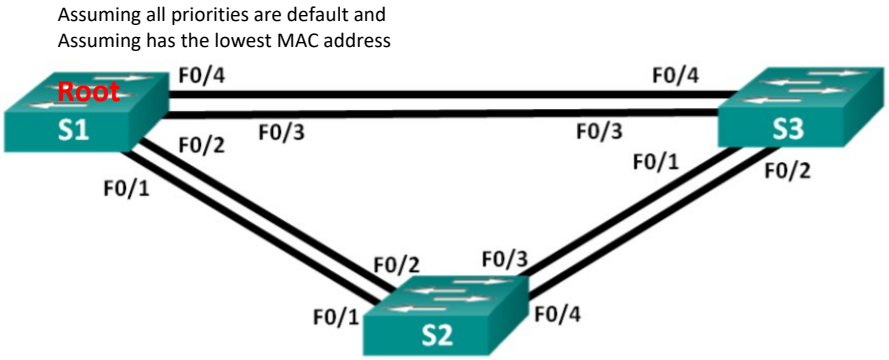



3. STP will allow you to have redundancy in place, but avoiding L2 loop issues by **blocking alternative paths**
4. If the active path becomes unavailable → alternative paths will be unblocked
5. How to determine the active and alternative paths → **Root Bridge and Root path selection***

*This is the reason you will see ports in orange when first booting up a switch or plugging in a cable, STP is running by default, and it needs to work out/update the topology.

## STP root bridge selection

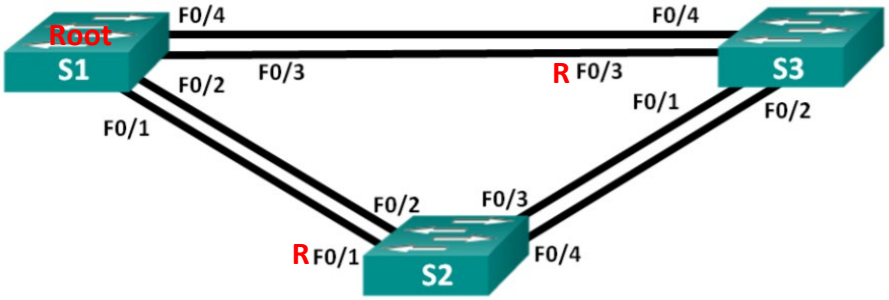
1. Switch with the lowest Bridge ID
2. Bridge ID determined by:
    a. A priority value → 32768 by default
    b. MAC address of the switch
    c. Optional extended ID



## STP root port selection

1. The root path → the path with the lowest path cost along the way from a switch to the root bridge
2. The path cost → sum of the cost of all links along the way
3. What is the cost of a link:
    a. By default, is determined by the speed

| Data rate | STP Cost |
|---|---|
| 4 Mbps | 250 |
| 10 Mbps | 100 |
| 16 Mbps | 62 |
| 100 Mbps | 19 |
| 1 Gbps | 4 |
| 2 Gbps | 3 |
| 10 Gbps | 2 |



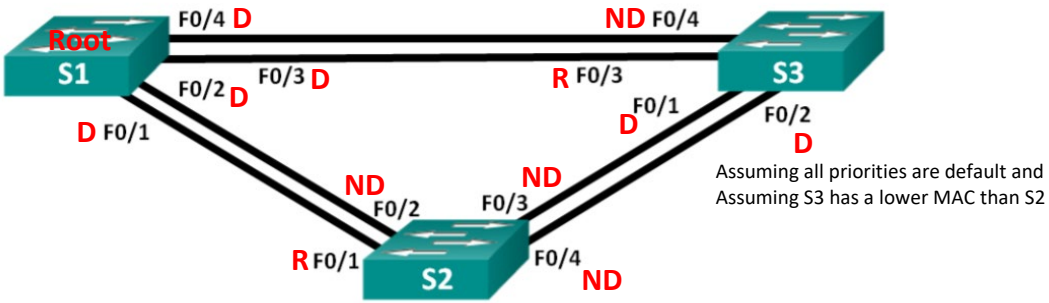

    b. A switchport STP cost can be customized

4. If 2+ ports have the same path cost to the root:
   Lowest *received* BID wins (i.e. the port connected to the bridge with the lowest BID)
5. If the 2+ ports are connected to the same bridge (i.e. equal received BID)
   Lowest *received* port priority (i.e. the port connected to the port with lowest priority at the other end)
   What is the port priority? 128 by default or customized by configuration command
6. If the 2+ ports are connected to ports with equal priority
   The interface ID breaks the tie: the lowest *received* interface ID wins

## STP port roles: Root, Designated, Non-designated or Alternate

### 1. Root Port

- Exist only on non-root bridges
- It's the port facing the root path (lowest path cost)
- **Only one root port per switch**
- Root ports forward traffic → passing frames and populate the MAC table




### 2. Designated Port

- All ports in the root bridge are designated
- Only one designated port per segment → the other one is either root, or alternate
- How to determine which port in a segment is designated or alternate?

  Root path cost (lowest path to root bridge from the switch)

  If path cost the same → Bridge ID breaks the tie: lower BID wins
- Designated ports forward traffic → passing frames populate the MAC table

### 3. Alternate port

- Goes to the blocking state → do not forward traffic, frames arriving to these ports will not populate the MAC table.

## STP versions

1. By default, cisco 2960 in the lab run PVST → a cisco proprietary version of STP standard 802.1d
   Builds a STP topology for each VLAN → different topologies for different VLANs allow load balancing
   Bridge priority, port-priority and port cost can be customized per VLAN
2. Rapid STP standard 802.1w is and evolution 802.1d → allows for faster network convergence
   Most prominent changes are the states of the ports (we will not go in details)
3. By default, cisco 3650 in the lab run rapid PVSTP is the cisco proprietary version of 802.1w

## Fine Tuning Spanning Tree

1. We can modify STP default values to control the STP topology
2. Selection of root bridge:
   - Change the bridge priority to something lower than the default
   - Or use explicit command (which effectively lowers the priority) → preferred method
3. Selection of secondary root bridge
   - Change de bridge priority to something lower than the default but higher than the primary
   - Or use explicit command (again, effectively lowers the priority) → preferred method
4. **PortFast** feature sets a port to go into the forwarding state before STP converges
   - Used on switchports connected to host ports to speed access to the network
   - NOT to be used on switchports connected to other switches, hubs or routers
   - A port with PortFast on will still send/receive BPDUs and participate on STP
5. **BPDU Guard** feature → disables PortFast on a port when BPDU received
   - If a BPDU is received, it means there is a switch at the other end → PortFast should not be enable
   - This is used to protect the STP topology