flokinet-007 - Climbing the Spanning Tree

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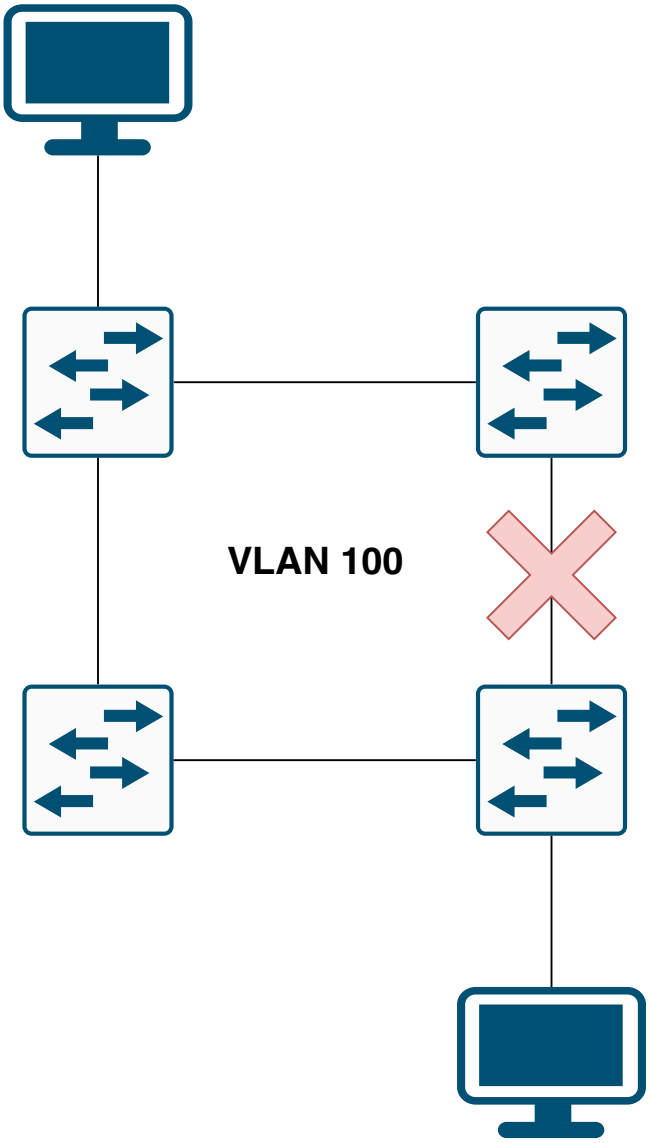
Spanning Tree

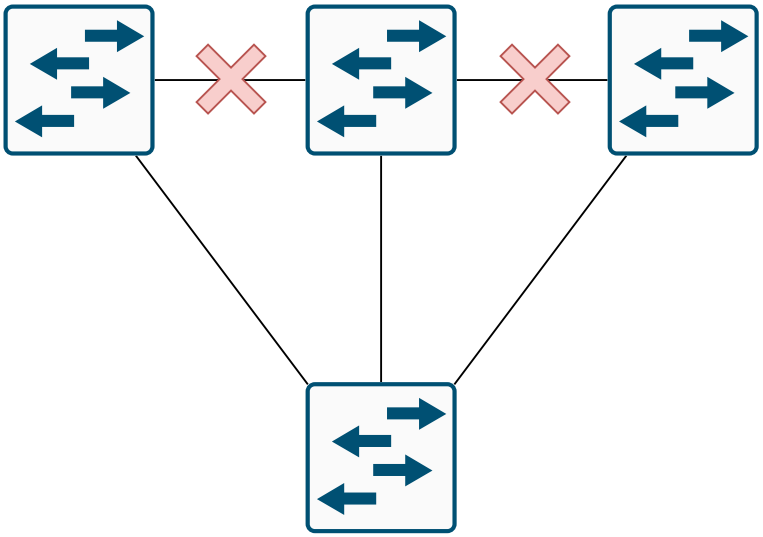
Spanning Tree blocks ports

When a loop is found, a link is chosen to be BLOCKED.



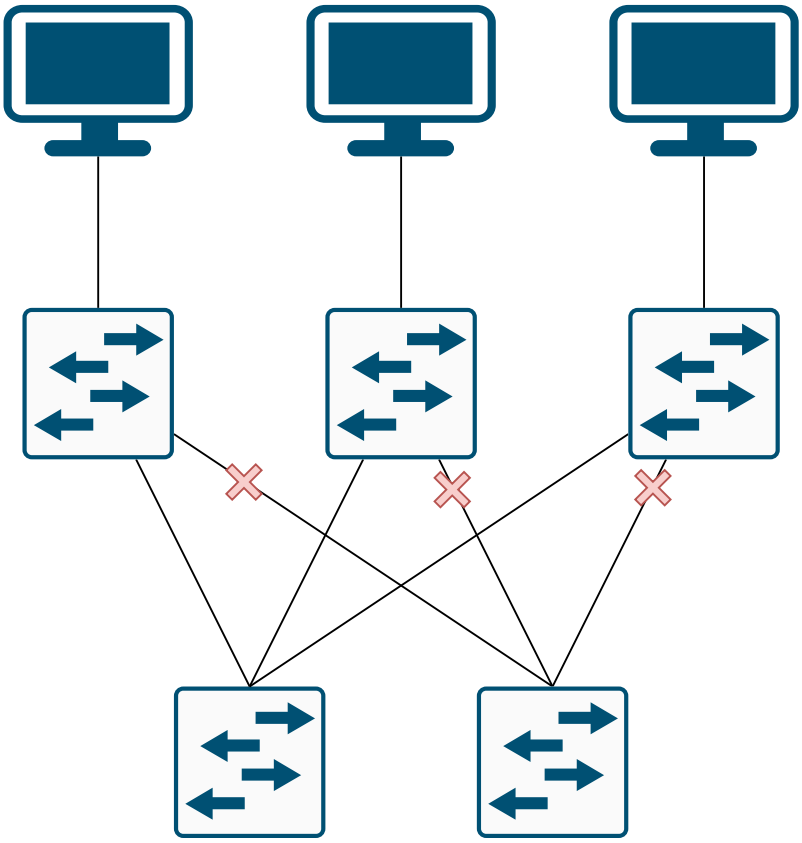
Spanning Tree wants to find the root bridge

The protocol will attempt to keep a path open towards the ROOT BRDIGE.



Spanning Tree is simple

It works with simple or complex topologies.



The Spanning Tree Protocol (802.1d)

- Spanning Tree prevents broadcast storms
- .. by breaking Layer 2 loops
- Spanning Tree flavours are plentiful

  - STP (802.1d): the original Spanning Tree Protocol
  - RSTP (802.1w): Rapid STP; significantly speeds up network convergence
  - PVST: Per-VLAN Spanning Tree; Cisco-proprietary; forms one spanning tree for each VLAN
  - Rapid PVST+: Cisco-proprietary; PVST that is faster.
  - MSTP (802.1q-2014): Multiple Spanning Tree Protocol; like PVST and RSTP, but creates groups of VLANs that share spanning trees (one per group of VLANs, rather than one per VLAN.)
  - Cisco defaults to PVST+ or Rapid PVST+ (depending on the type of switch)
- Arista defaults to MSTP

Switches and Bridges

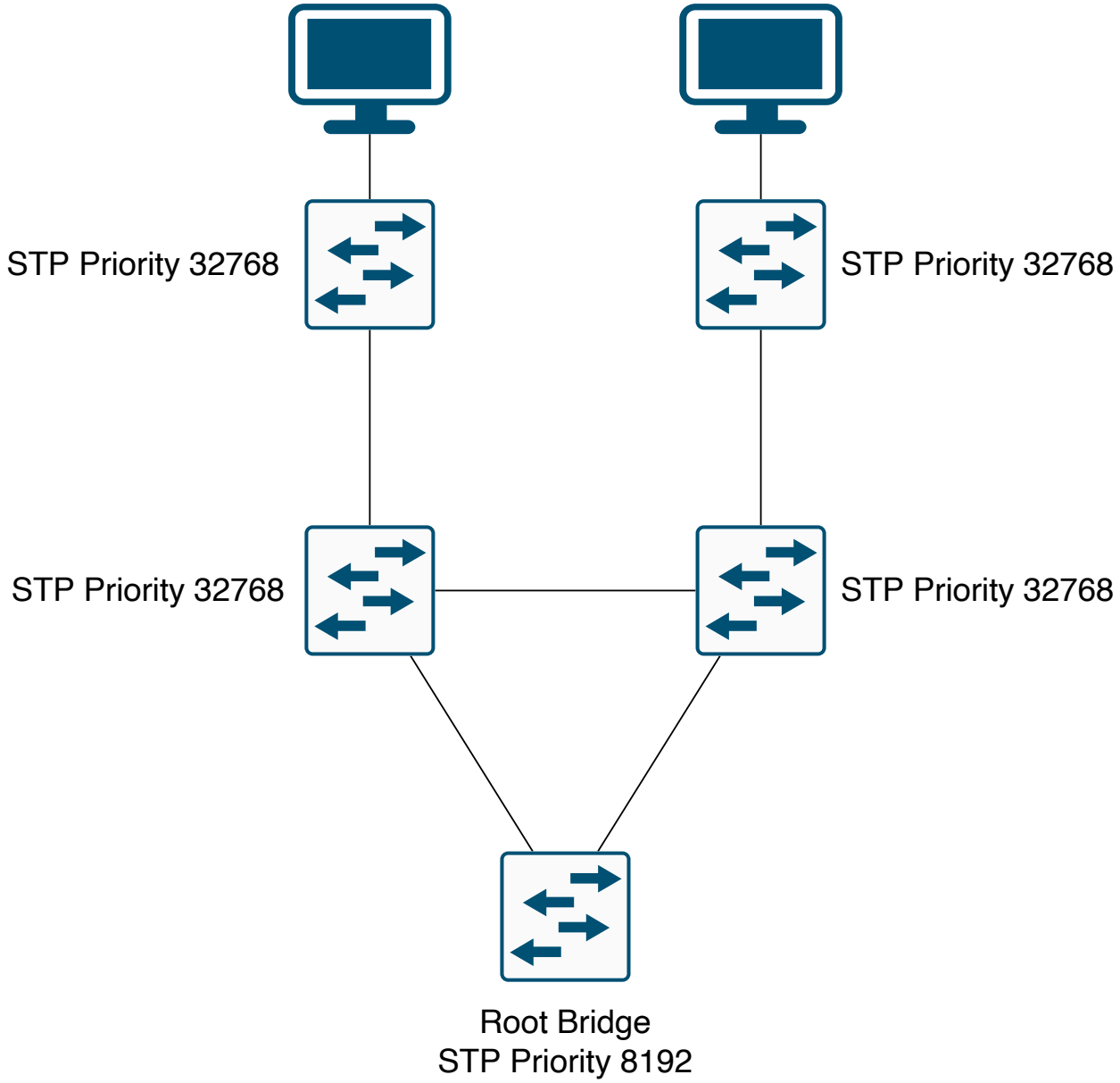
- Spanning Tree often refers to switches as bridges
- A bridge is just a switch with very few ports
- When you see “bridge” in a modern networking context, just think “switch”

STP’s general mechanism

- Switches regularly send BPDU (Bridge Protocol Data Unit) packets out of every port
- BPDU contains unique identifier of the Switch
- BPDU also contains a “path cost” field. Cost depends on the speed of the interface.
- BPDU contains a “bridge priority” field too. Lowest bridge priority wins.
- BPDUs received from other switches are forwarded out of every port except the port it was received on
- the Path Cost in the received BPDU is increased before it’s forwarded
- if a switch receives its own BPDU:
  - it knows there must be a loop
  - it does not forward the BPDU

Root Bridge

A simple layer 2 topology showing the root bridge.



STP Root Bridge Election

- the Spanning Tree root bridge is elected based on the bridge priority field in the received BPDUs
  - the Root Priority is configured manually!
- lowest bridge priority becomes the root bridge
- now, the job of every switch is to find the cheapest path to the root

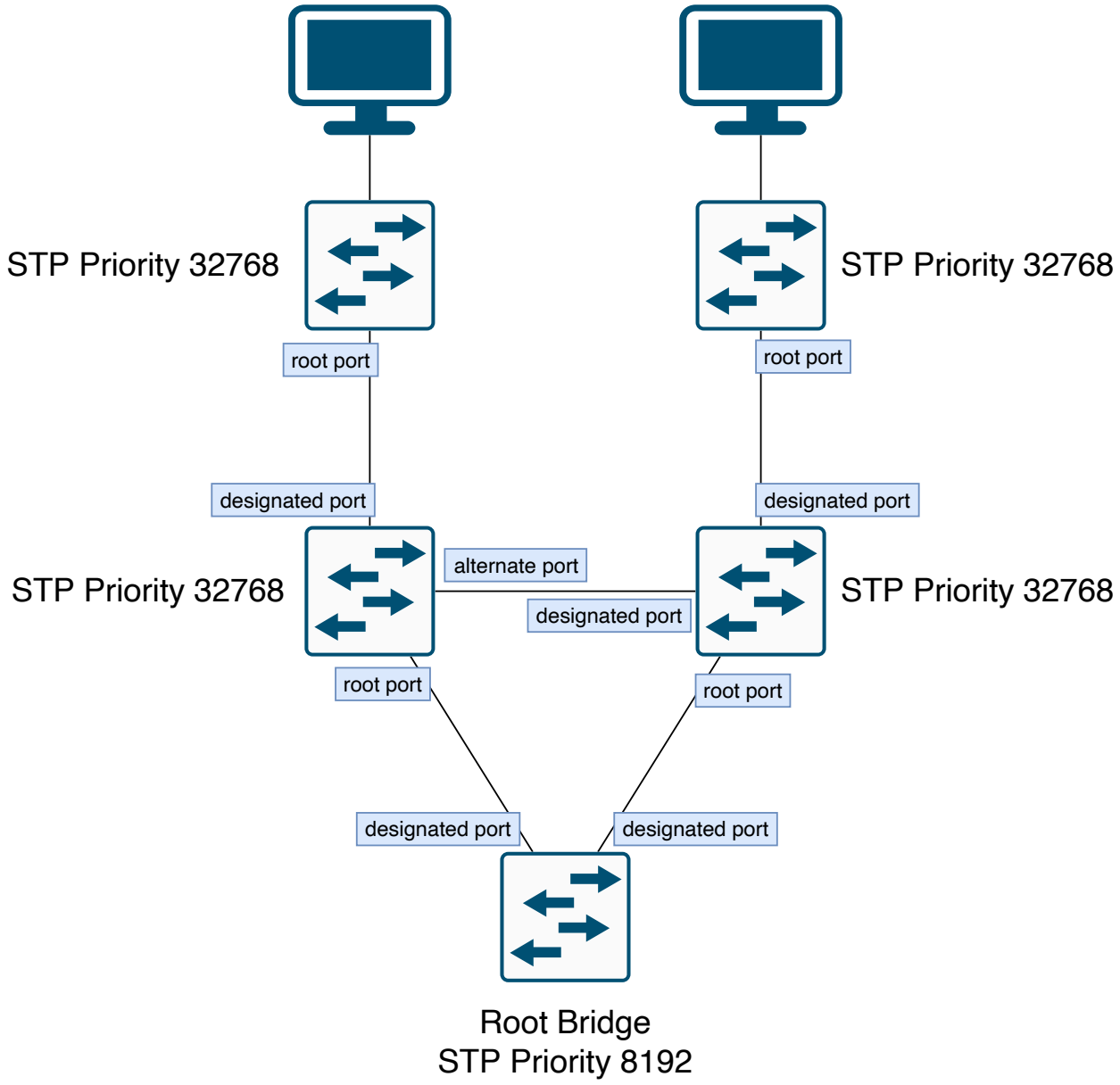
Root Path Selection

- a given switch may have received multiple BPDUs from the root bridge
  - (one per path!)
- if there are multiple paths to the root bridge, one must be chosen

  - there can be only one
- the path with the cheapest cost is chosen
  - this interface is called the **ROOT** port
- the other paths are blocked
  - these interfaces are labelled as **ALTERNATE**

Port types

STP might decide that these are the port states:



Next...

A lab with experiments!