Campus Network Design Workshop

Layer 2 Engineering – Advanced VLAN internals

UNIVERSITY OF OREGON

NSRC
Network Startup Resource Center

Rapid Spanning Tree (802.1w)

- Convergence is **much** faster
  - Communication between switches is more interactive
- Edge ports don't participate
  - Edge ports transition to forwarding state immediately
  - If BPDUs are received on an edge port, it becomes a non-edge port to prevent loops

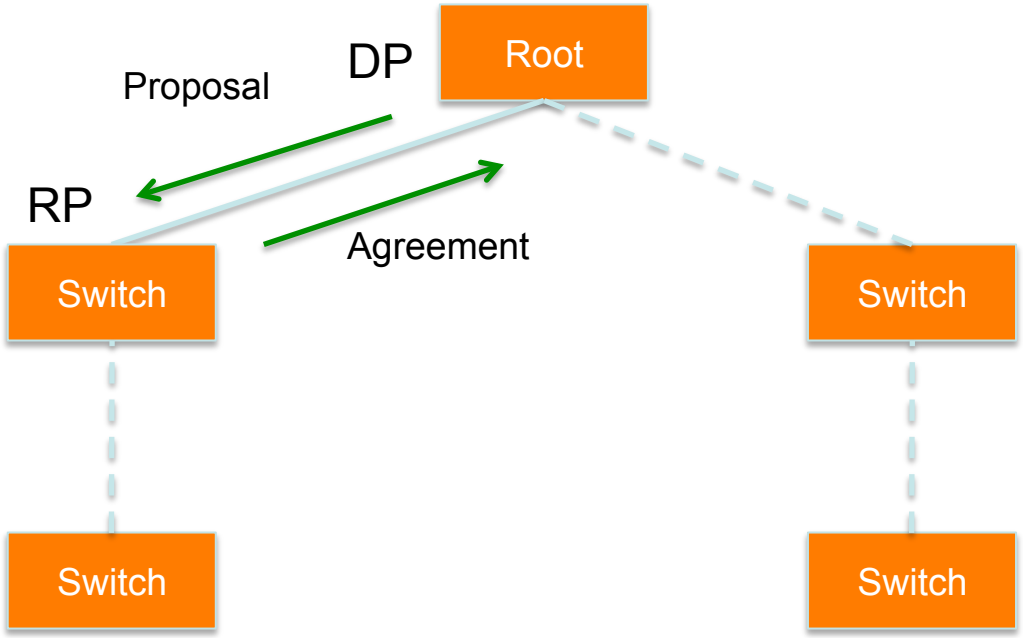
Rapid Spanning Tree (802.1w)

- Defines these port roles:
  - Root Port (same as with 802.1d)
  - Alternate Port
    - A port with an alternate path to the root
  - Designated Port (same as with 802.1d)
  - Backup Port
    - A backup/redundant path to a segment where another bridge port already connects.

Rapid Spanning Tree (802.1w)

- Synchronization process uses a handshake method
  - After a root is elected, the topology is built in cascade, where each switch proposes to be the designated bridge for each point-to-point link
  - While this happens, all the downstream switch links are blocking

Rapid Spanning Tree (802.1w)



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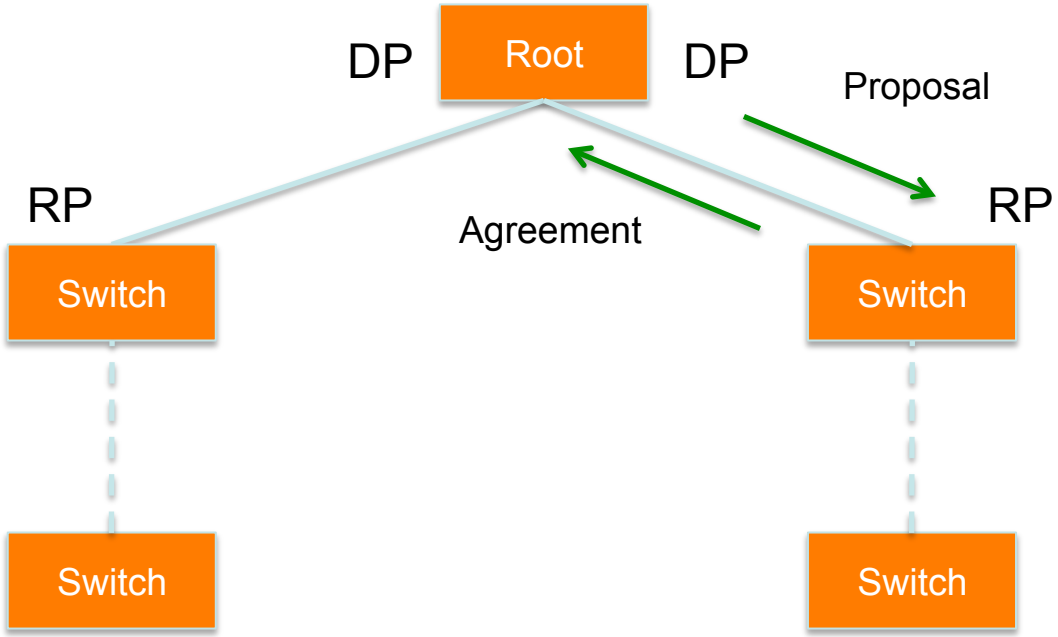

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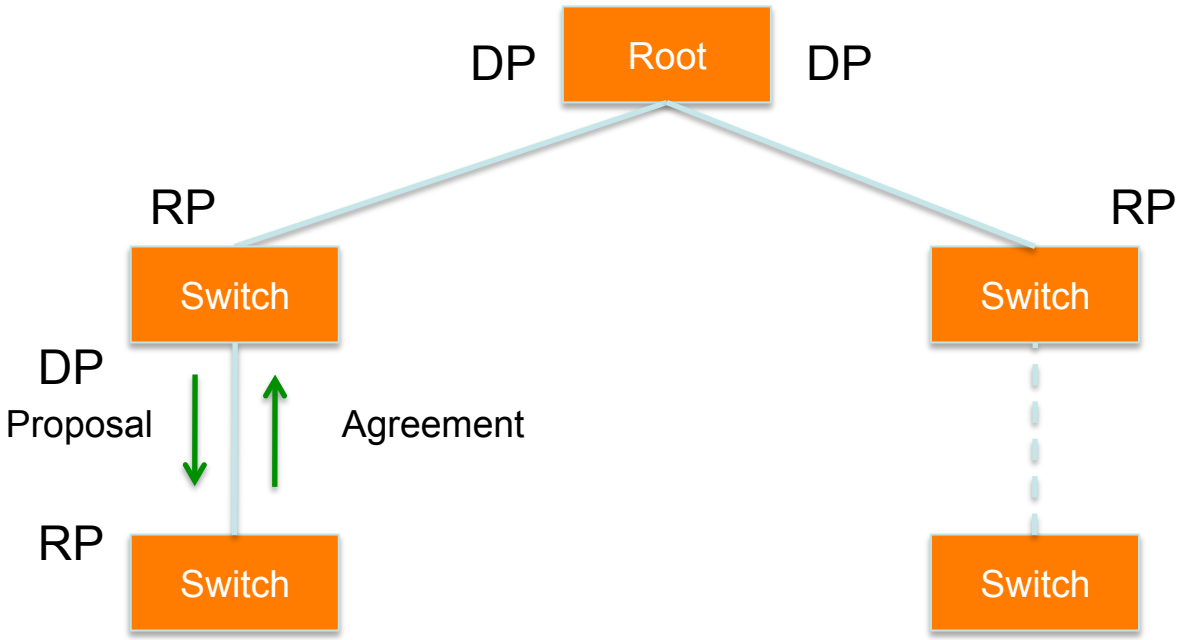

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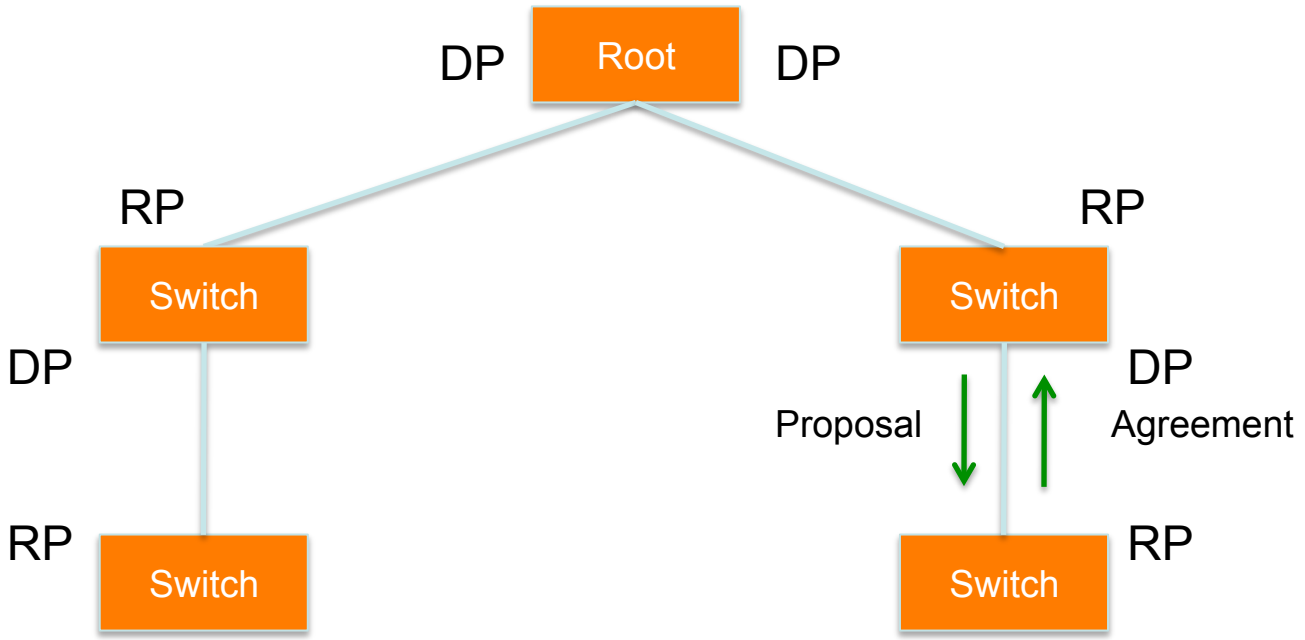
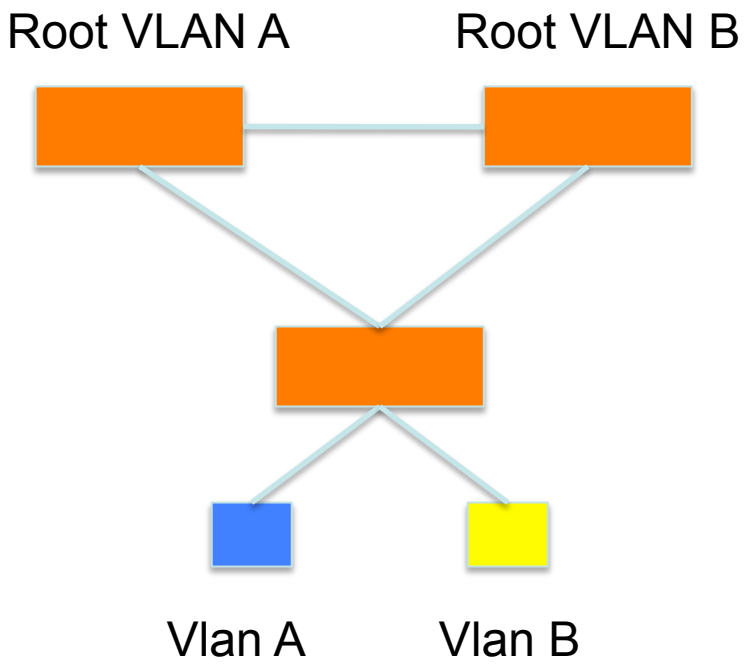


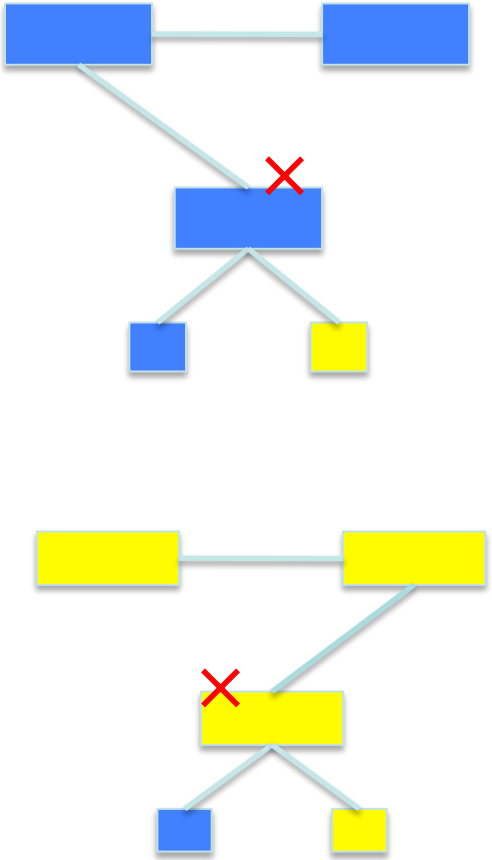
Questions?

Multiple Spanning Tree (802.1s)

- Allows separate spanning trees per VLAN group
  - Different topologies allow for load balancing between links
  - Each group of VLANs are assigned to an “instance” of MST
- Compatible with STP and RSTP

Multiple Spanning Tree (802.1s)





Multiple Spanning Tree (802.1s)

- MST Region
  - Switches are members of a region if they have the same set of attributes:
    - MST configuration name
    - MST configuration revision
    - Instance-to-VLAN mapping
  - A digest of these attributes is sent inside the BPDUs for fast comparison by the switches
  - One region is usually sufficient

Multiple Spanning Tree (802.1s)

- CST = Common Spanning Tree
  - In order to interoperate with other versions of Spanning Tree, MST needs a common tree that contains all the other islands, including other MST regions

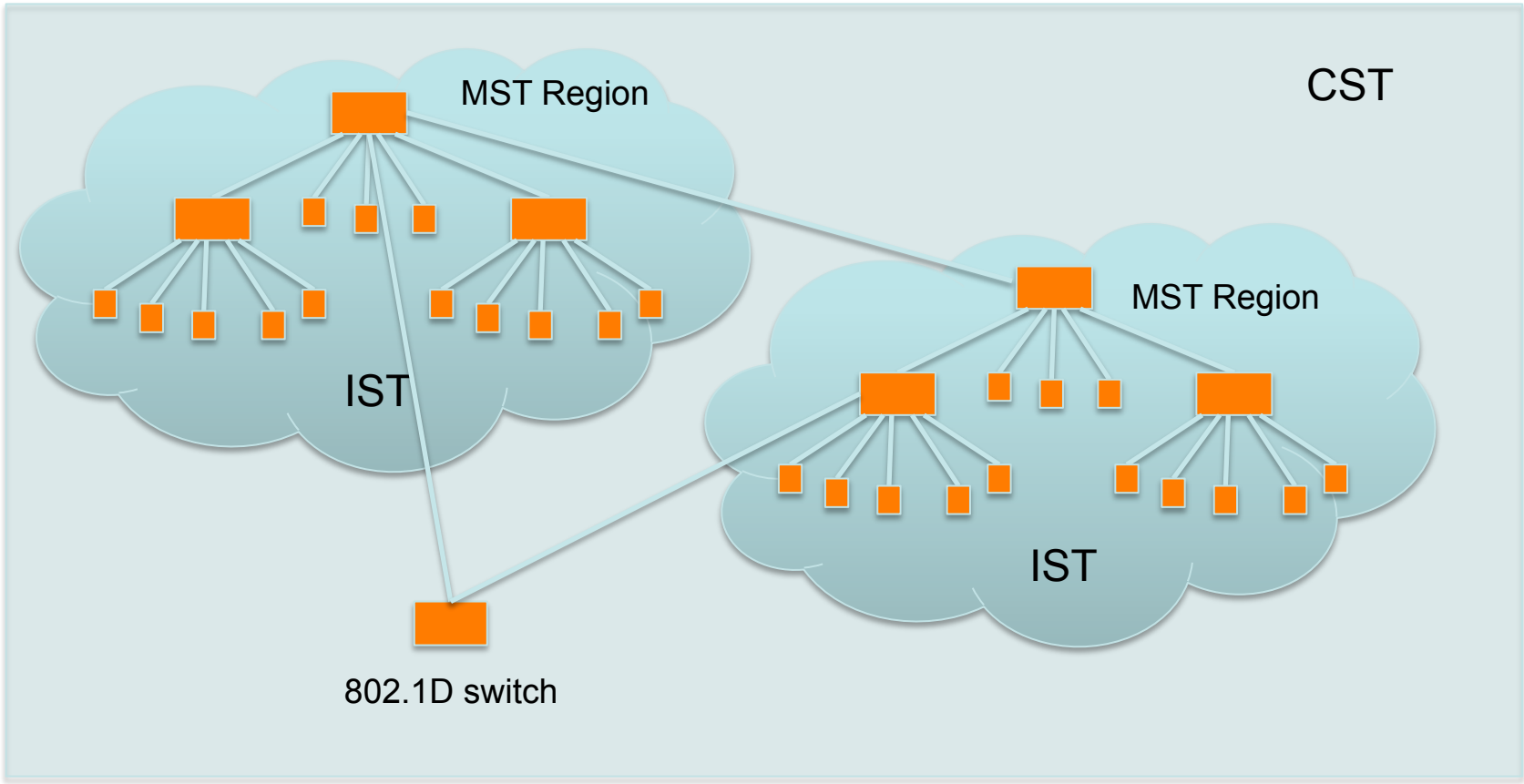
Multiple Spanning Tree (802.1s)

- IST = Internal Spanning Tree
  - Internal to the Region, that is
  - Presents the entire region as a single virtual bridge to the CST outside

Multiple Spanning Tree (802.1s)

- MST Instances
  - Groups of VLANs are mapped to particular Spanning Tree instances
  - These instances will represent the alternative topologies, or forwarding paths
  - You specify a root and alternate root for each instance

Multiple Spanning Tree (802.1s)



Multiple Spanning Tree (802.1s)

- Design Guidelines
  - Determine relevant forwarding paths, and distribute your VLANs equally into instances matching these topologies
  - Assign different root and alternate root switches to each instance
  - Make sure all switches match region attributes
  - Do not assign VLANs to instance 0, as this is used by the IST

Questions?