

Network Strategy

STP

Outline

- ARP
- Switch function
- STP
- STP terminologies

NOTE

- Most of the basic commands that we have studied in the routing of the Network Professionals Bootcamp are the same for Router and Switch.
- The Boot process of Router and Switch is Similar:
 - Step 1: POST is executed
 - Step 2: IOS is loaded from Flash Memory into RAM
 - Step 3: Startup-config is found and loaded into RAM if any
- Like Router, Switches also have ROM, CPU, RAM, NVRAM and Flash Memory.

NOTE

- Like routers, we can connect to Switches using:
 - SSH
 - Telnet
 - Console
- Switches also have three main modes:
 - User EXEC Mode
 - Privilege Mode
 - Global Configuration Mode

ARP

- ARP (Address Resolution Protocol)
- Is used to find the MAC address of a device from its IP address
- ARP Reply comes as a unicast.
- `R#arp -a`

Switch Functions

- 1. Address learning:
 - When a switch receives a frame, the switch adds the source MAC address, port number and VLAN ID into the MAC-Address-Table called address learning.
- 2. Forward Decision:
 - When a switch receives a frame, it looks the MAC address table for the destination MAC address:
 - A: if the destination MAC address is there in the MAC address table, then the frame is forwarded into that specific device.
 - B: If the destination MAC address is not in the MAC address table, the frame is flooded (sent out of all ports except the port it is received on)

MAC Address-Table

- The default aging-time for MAC address-table is 300 seconds
- We can change it using the command
 - Switch(config)#mac address-table aging-time <10-1000000>
- SW#show mac address-table
- SW#show mac address-table aging-time
- SW#show mac address-table static
- SW#show mac address-table count
- SW#show mac address-table int eth 0/0
- SW#show mac address-table dynamic
- SW#clear mac address-table

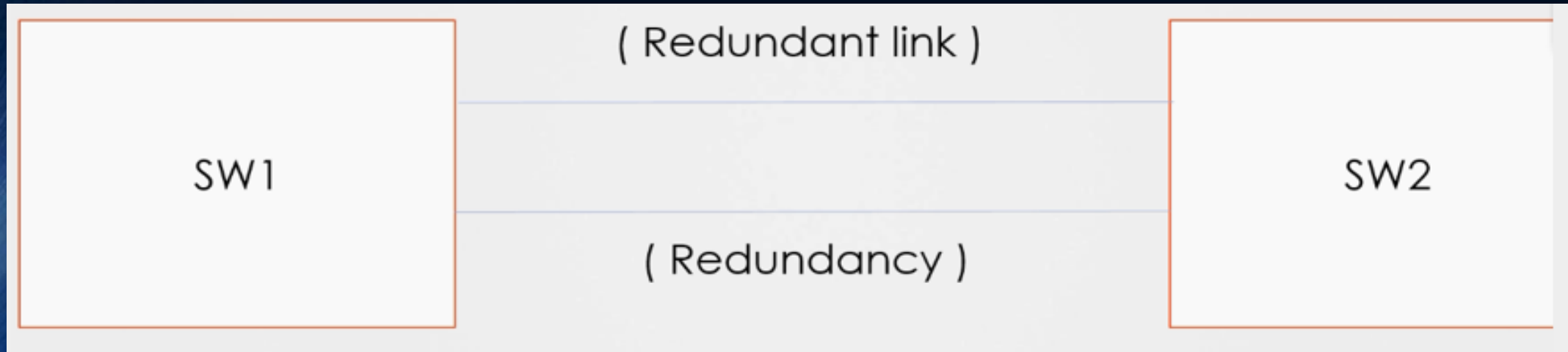
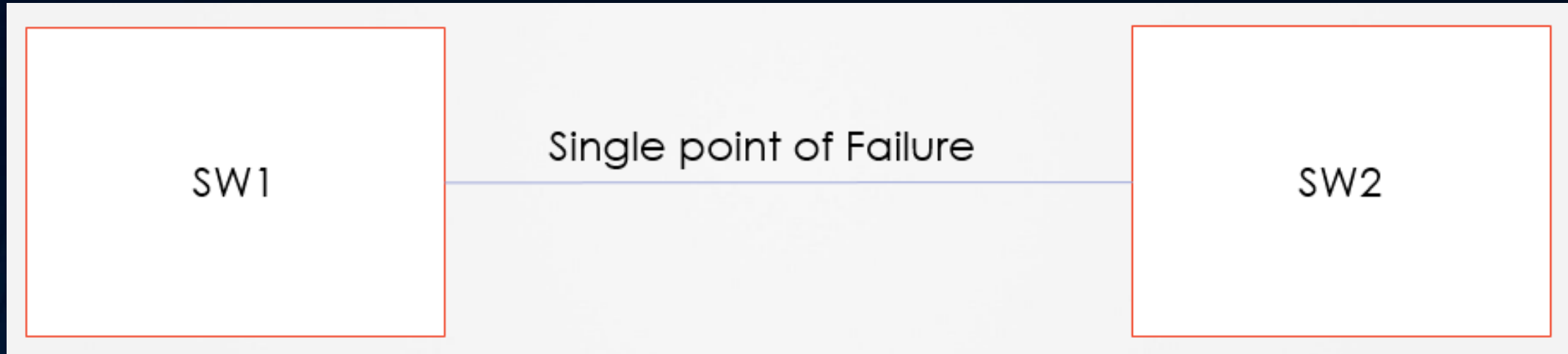
Switch Functions

- 3. Loop Avoidance:
- If there are redundant links between two switches, there is a probability of L2 loops (switch loops). Switches use the STP (Spanning-Tree Protocol) to avoid L2 loops.

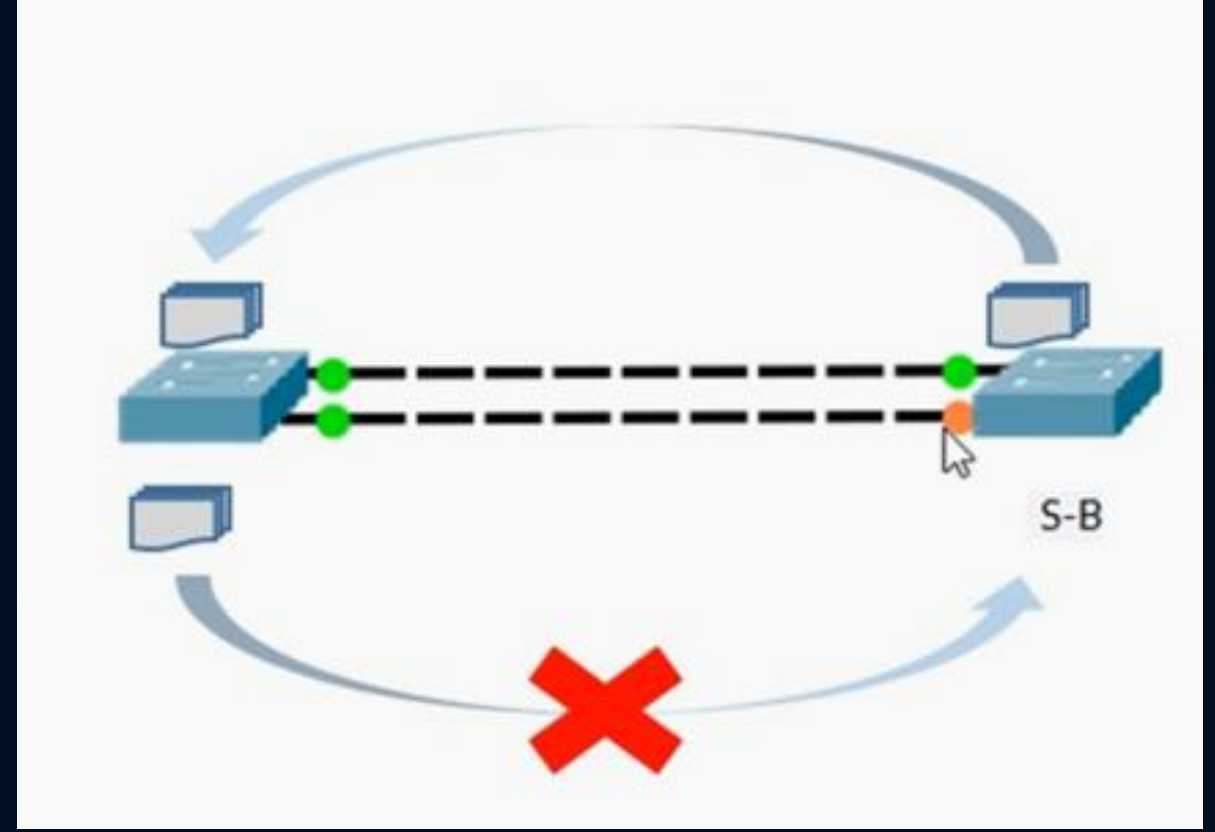
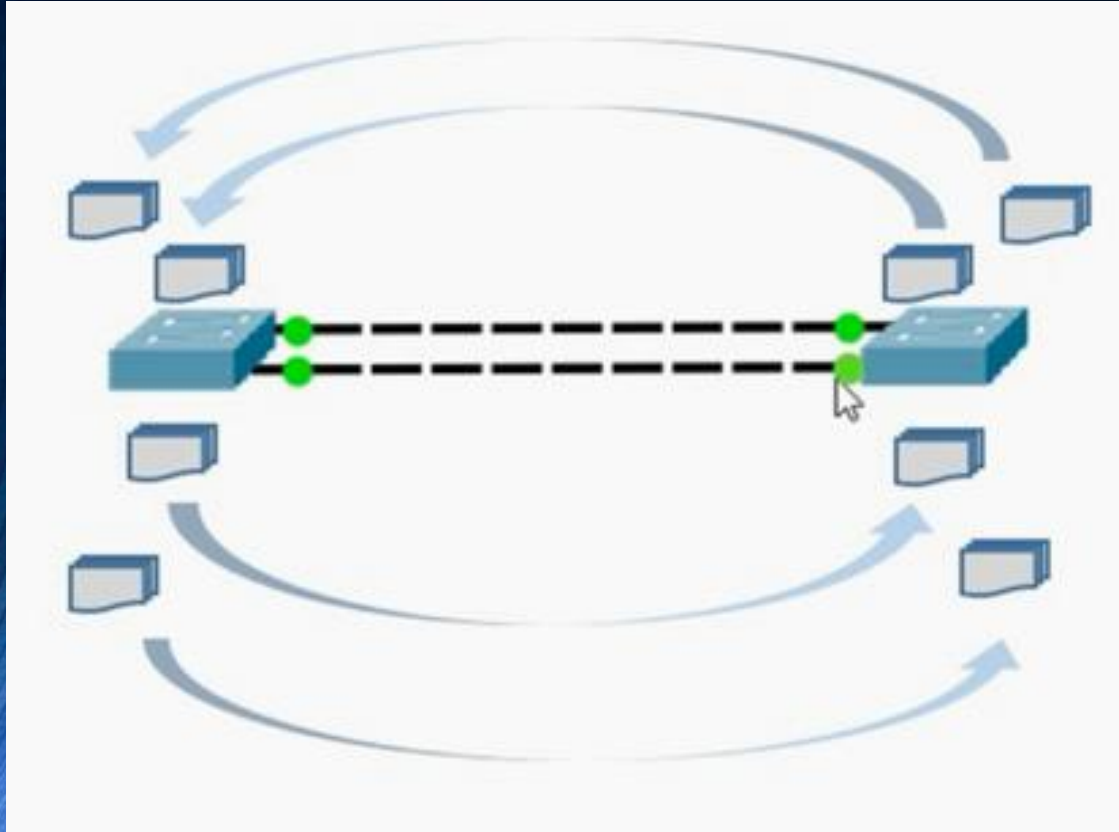
STP

- STP is used by switches to prevent L2 loops
- STP allows redundant links while preventing L2 loops by blocking one or more ports.
- When the primary link fails, the blocked ports automatically go to UP state.
- STP is known as the 802.1D standard of IEEE.
- STP is enabled by default in all Cisco Switches.

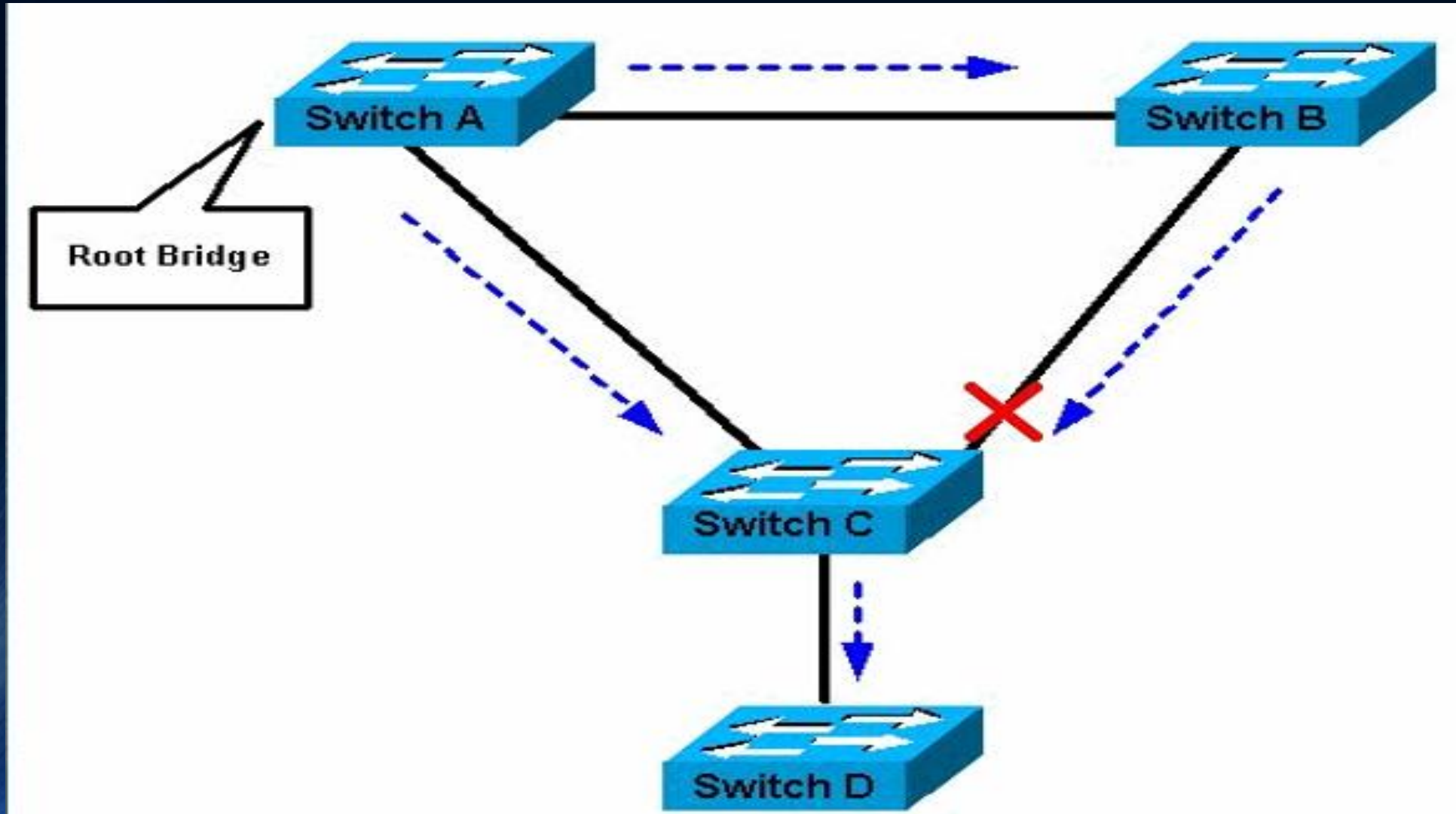
STP



STP



STP



STP Terminology

- Root Bridge:
 - One of the switches is elected as the Root Bridge (the root bridge is the decision maker and decides which ports to be blocked)
 - The switch with the lowest Bridge ID is elected as Root Bridge
- Bridge ID Contains:
 - Bridge Priority:
 - 0-61440, an increment of 4096
 - System ID Extension:
 - 0-4095
 - MAC Address:

STP Terminology

- Root Bridge:
 - By default, the priority of the switch is 32768
 - The priority of the switch is modified using the command:
 - `SW(config)#spanning-tree vlan 1 priority 4096`
 - The priority must be a multiplier of 4096
 - If the priority of all switches is the same, then the MAC address of the switches is considered to be the tie breaker.

STP Terminology

- Root port:
 - Root port is an upstream port facing towards root bridge.
 - The root port is selected based on the lower cost or cumulative cost of all links to get to the root bridge.
 - If the cost is the same, then:
 - Choose the lowest upstream Bridge ID
 - Choose lowest upstream port ID

■ <u>Bandwidth</u>	<u>Cost</u>
■ Ethernet (10Mbps)	100
■ FastEthernet (100Mbps)	19
■ GigaBitEthernet (1000Mbps)	4
■ 10GigaBitEthernet (10000Mbps)	2

STP Terminology

- Designated port:
 - Designated port is a port which connects a switch to the downstream switches.
 - Designated port is always in the forwarding status.
 - Like root port, it is selected based on:
 - Lowest cost
 - Lowest Bridge ID
 - Lowest Port ID

STP Terminology

- All other ports go to blocking state called Non-Designated port or Alternate ports:
 - Are the ports on the none root bridges and are in the blocking state in order to avoid L2 loops.
 - Receives BPDU
 - Drops all other traffic, can not send traffic
- BPDU (Bridge Protocol Data Units):
 - Every switch claims to be the root bridge and informs other switches about their priority and MAC address information using BPDU frames.
 - Switches send BPDUs every 2 seconds

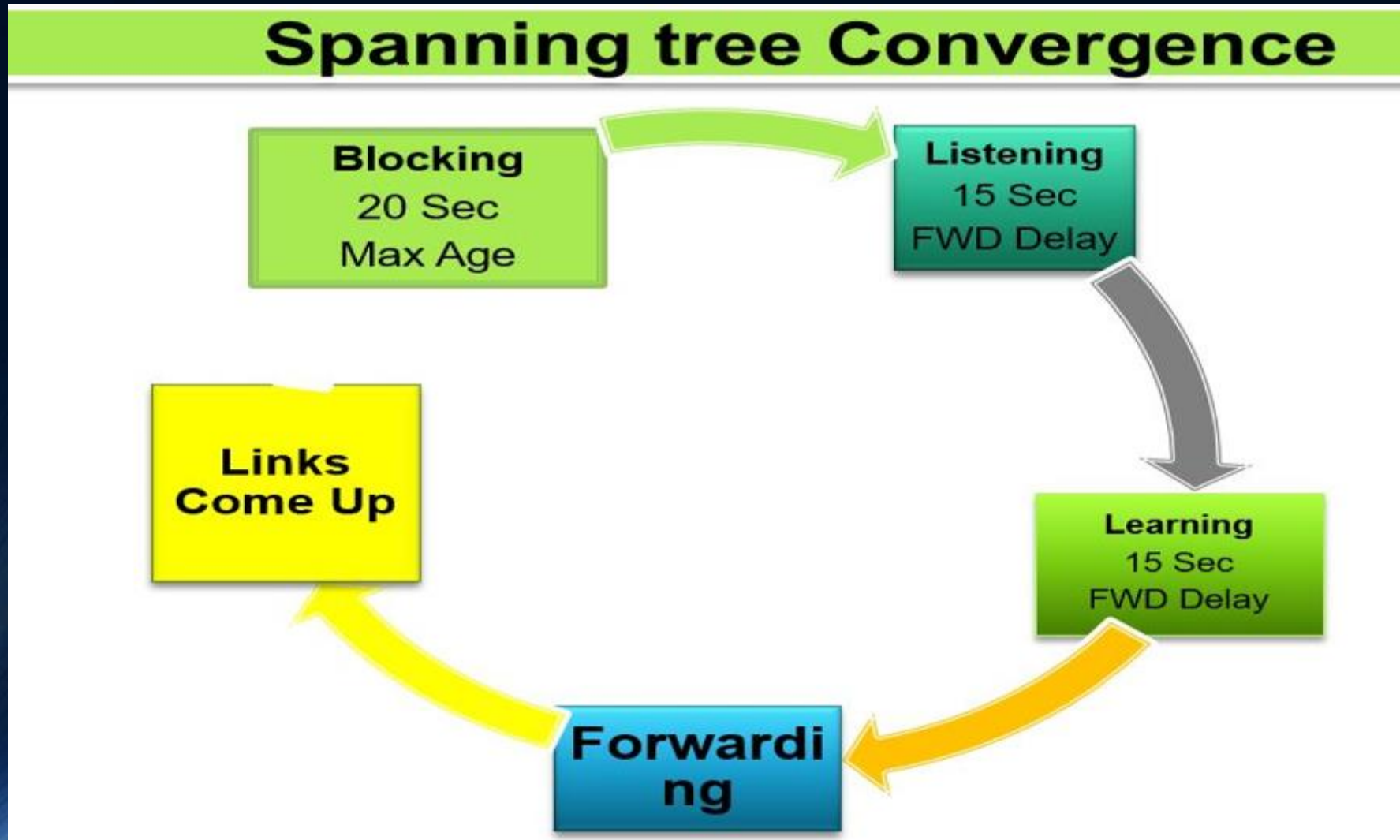
STP Port States

- Disabled:
 - Port is not operational (shutdown)
- Blocking:
 - The blocking port will only receive BPDU but can not send or receive data.
 - If the primary port goes down, the blocking port will change to forwarding state.
- Listening:
 - Can send and receive BPDU and participate in STP election but can not send or receive data.

STP Port States

- Learning:
 - Can send and receive BPDU but not data.
- Forwarding:
 - Can send and receive BPDU and data.
 - Port is fully operational

STP Port States



Verification commands

- SW#show spanning-tree
- SW#show spanning-tree root
- SW#show spanning int eth 0/0 detail

THANK YOU