Advanced Program On Technology Enhanced Learning

Program sponsored

by

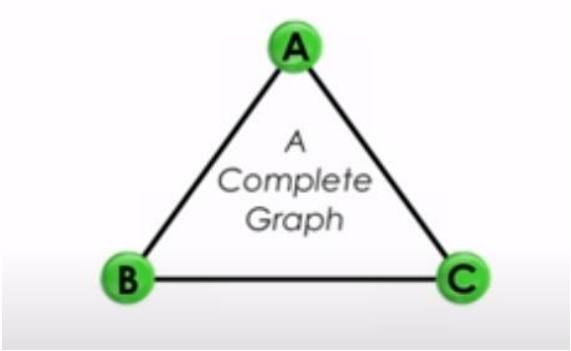
ITOS

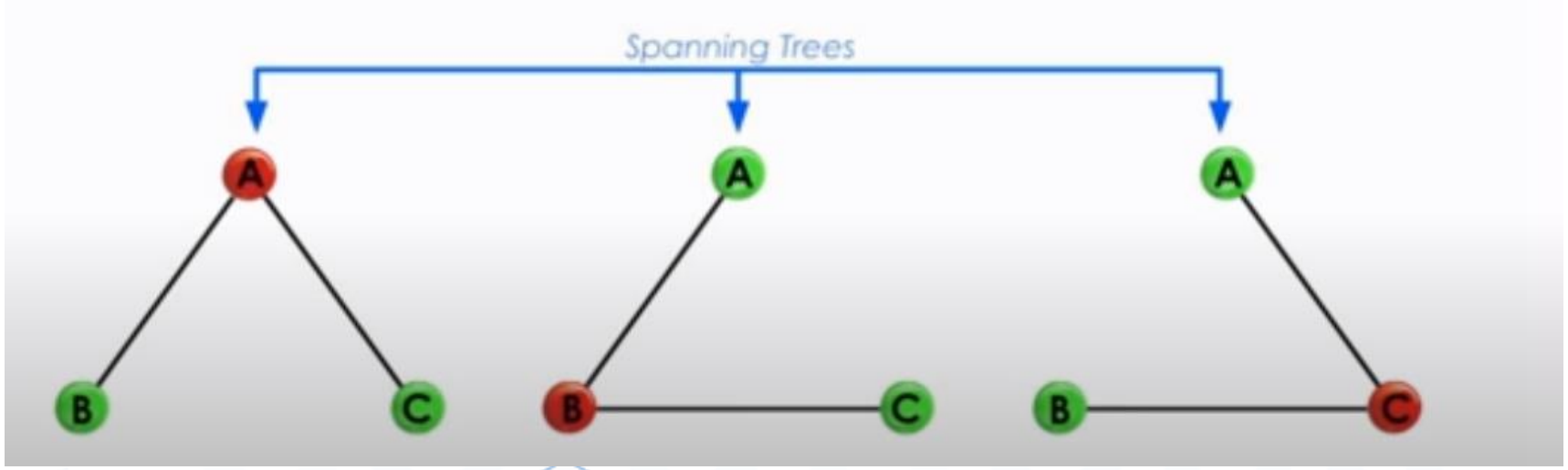
Conducting session Eng.samera nizam

Networking instructor

Spanning Tree Protocol

Complete graph vs spanning graph

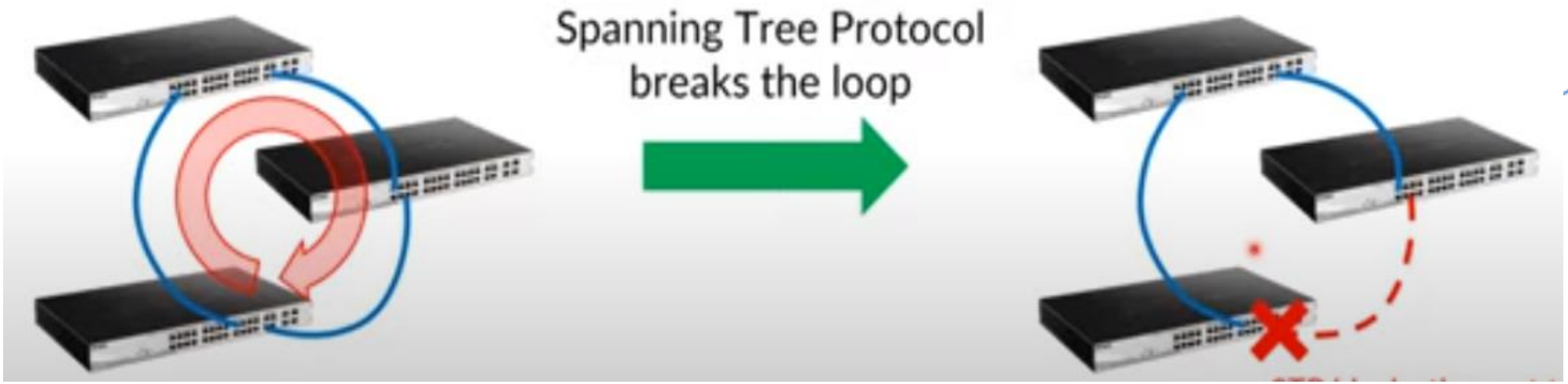




Spanning Tree Protocol

- Spanning Tree Protocol(STP), is layer 2 protocol that runs on bridges and switches and builds a loop-free logical topology .
- The main purpose of STP is to eliminate loop.
- Loop is one more possible path from one location to another
- Spanning tree protocol monitors network status and can re-activate the disabled port .This feature can be used to provide link redundancy.

Eliminate loop



link redundancy

STP re-activates the blocked port

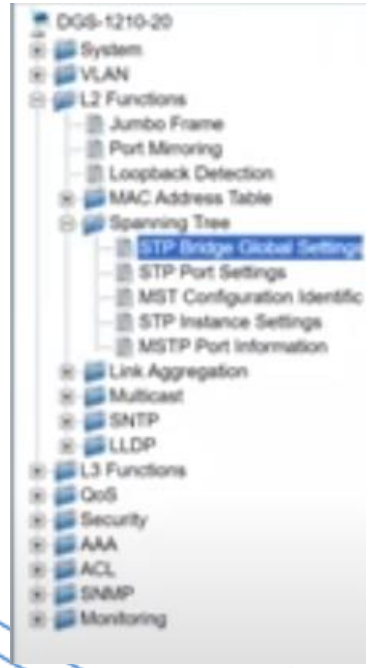
Spanning tree protocol version

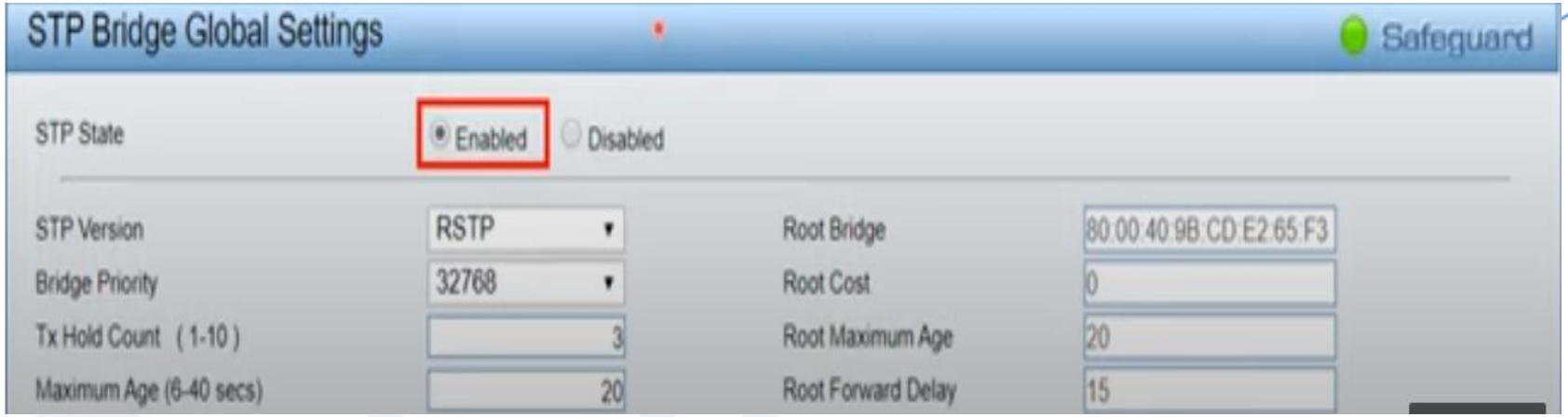
STP	Legacy Spanning Tree Protocol. Slow convergence speed (~1 min)
RSTP	Rapid Spanning Tree Protocol. Fast convergence speed (<1 sec). Most commonly used.
MSTP	Multiple Spanning Tree Protocol. Used when more than once instance of Spanning Tree is required.

Spanning tree configuration

Spanning tree can be enabled under:

- L2 functions>spanning tree >STP Bridge global setting





STP operation

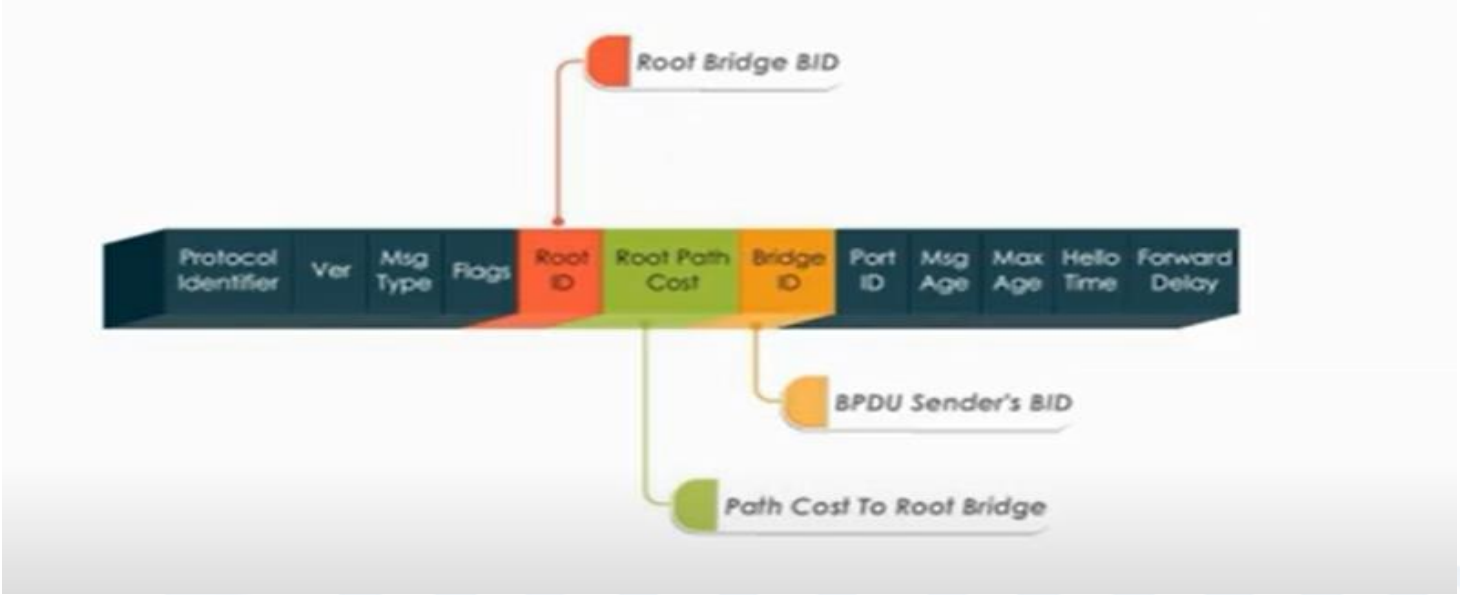
- It selects one switch as root bridge

Root bridge :is the central point on the network

- It chooses the shortest path(the least cost)from a switch to the root bridge
- It blocks links that could cause loops while maintain this links as backups

Bridge protocol data unit (BPDUs)

- BPDU is a frame containing information about Spanning Tree Protocol
- Hello BPDU is used to configure a loop-free network

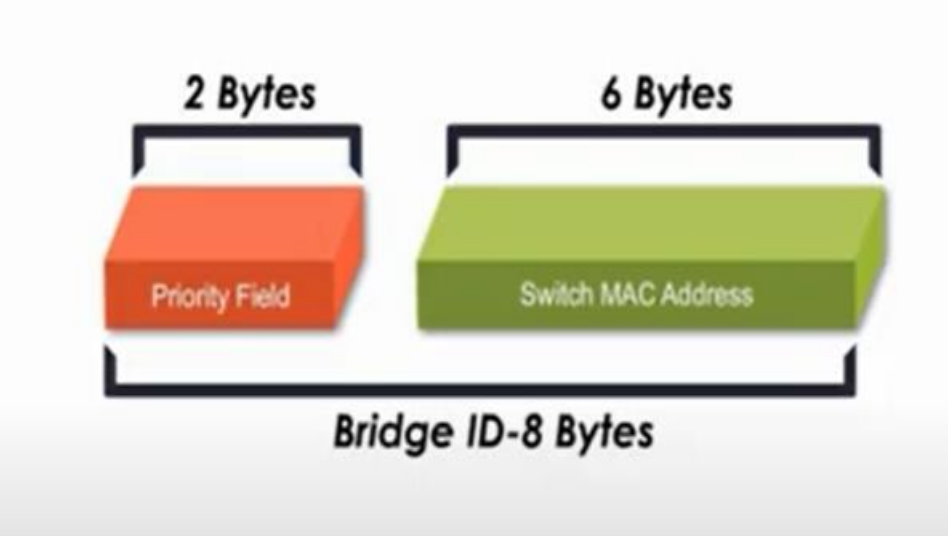


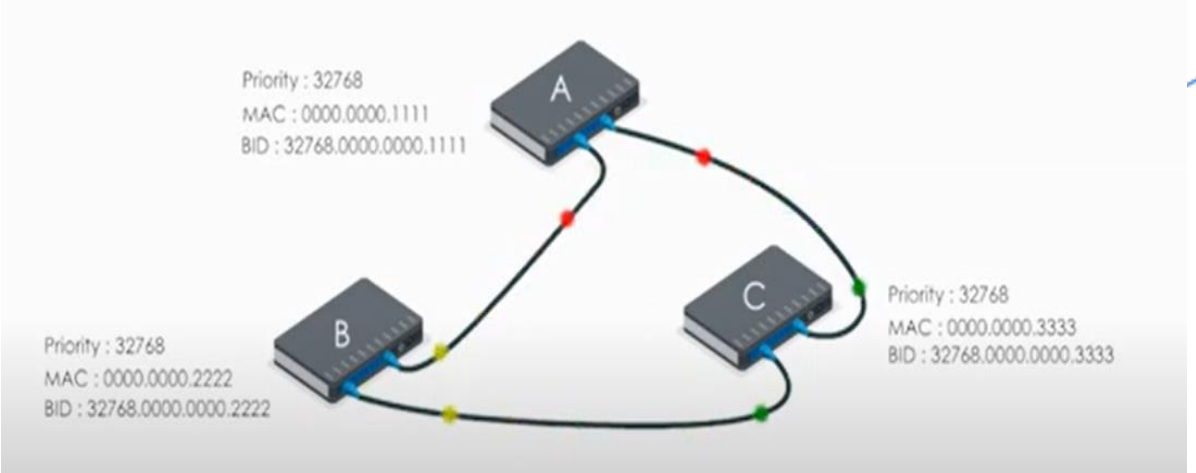
BPDUs

- Switches use **Bridge Protocol Data Units(BPDUs)** to share information About themselves and their connections.
- BPDUs are used to elect the root bridge, root ports, designated ports, and alternate ports.
- Each BPDU contains a Bridge ID (BID) that identifies which switch send the BPDU
- The **lowest BID** value is determined by the combination of these three fields.

Root bridge election

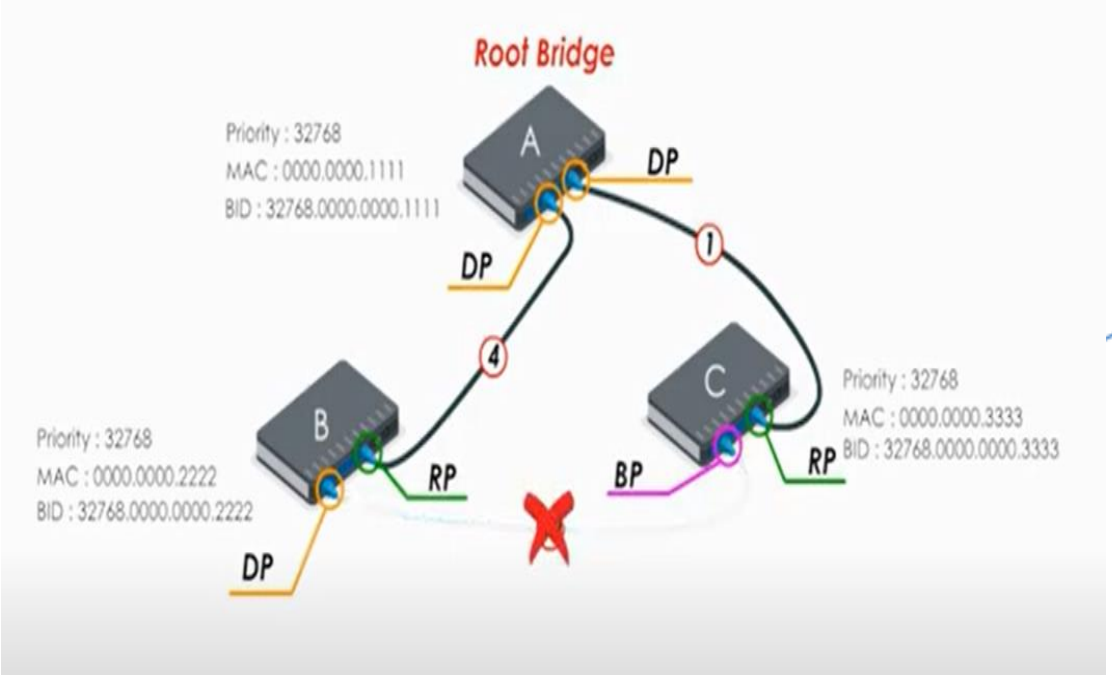
Root bridge election is based on a switch bridge ID (BID)





STP builds a loop free topology

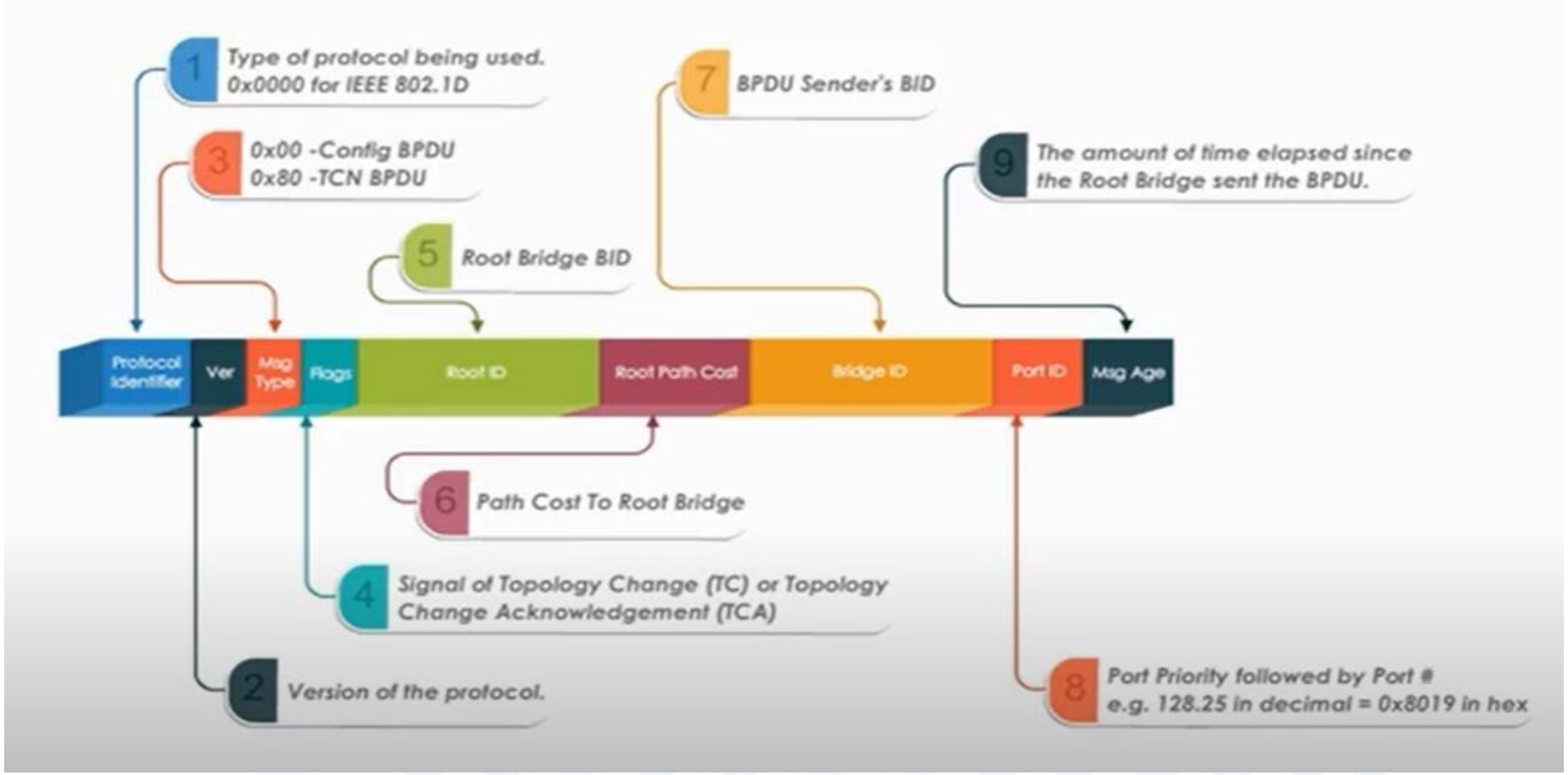
1. elect the root bridge
2. elect the root port
3. elect designated ports
4. elect alternate (blocked ports)



BPDU timer

- How STP gets a loop-free networks ?
- How STP reacts to network changes?
- How STP is different from other flavor of STP ,such as Rapid STP.?

BPDU Frame


1 Type of protocol being used. 0x0000 for IEEE 802.1D
3 0x00 -Config BPDU 0x80 -TCN BPDU
5 Root Bridge BID
7 BPDU Sender's BID
9 The amount of time elapsed since the Root Bridge sent the BPDU.
Protocol Identifier
Ver
Msg Type
Flags
Root ID
Root Path Cost
Bridge ID
Port ID
Msg Age
6 Path Cost To Root Bridge
4 Signal of Topology Change (TC) or Topology Change Acknowledgement (TCA)
2 Version of the protocol.
8 Port Priority followed by Port # e.g. 128.25 in decimal = 0x8019 in hex

Port roles and port state

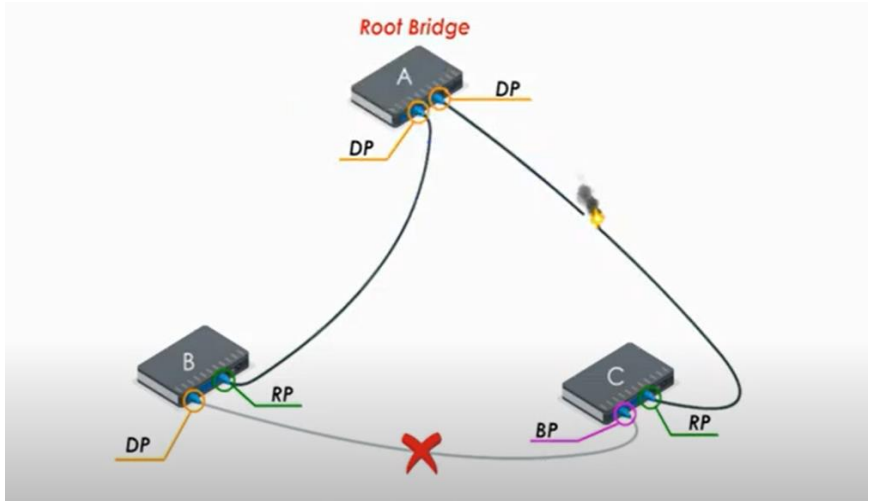
3 Types of Port Roles

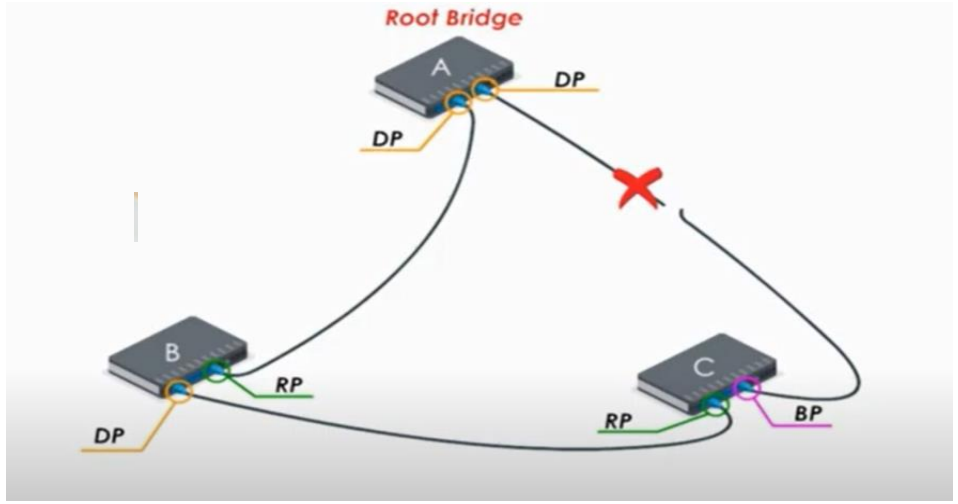
Root Port	A port on a switch to reach the root bridge with the shortest path.
Designated Port	The other end of a Root port .
Blocked Port	A port blocked to prevent a loop .

5 Types of Port States

Forwarding	Any port in the forwarding state will process BPDUs. receiving/forwarding frames.
Learning	The learning port starts learning about BPDUs. Transitioning and temporary.
Listening	The listening port is listening to BPDUs before transitioning to the learning state. Transitioning and temporary.
Blocking	Receiving but dropping any BPDUs.
Disabled	Non-operational in STP.

How STP reacts to a link failure





Q&A