Experimental report

Experiment name: Experiment 3.3.2: Configuring STP

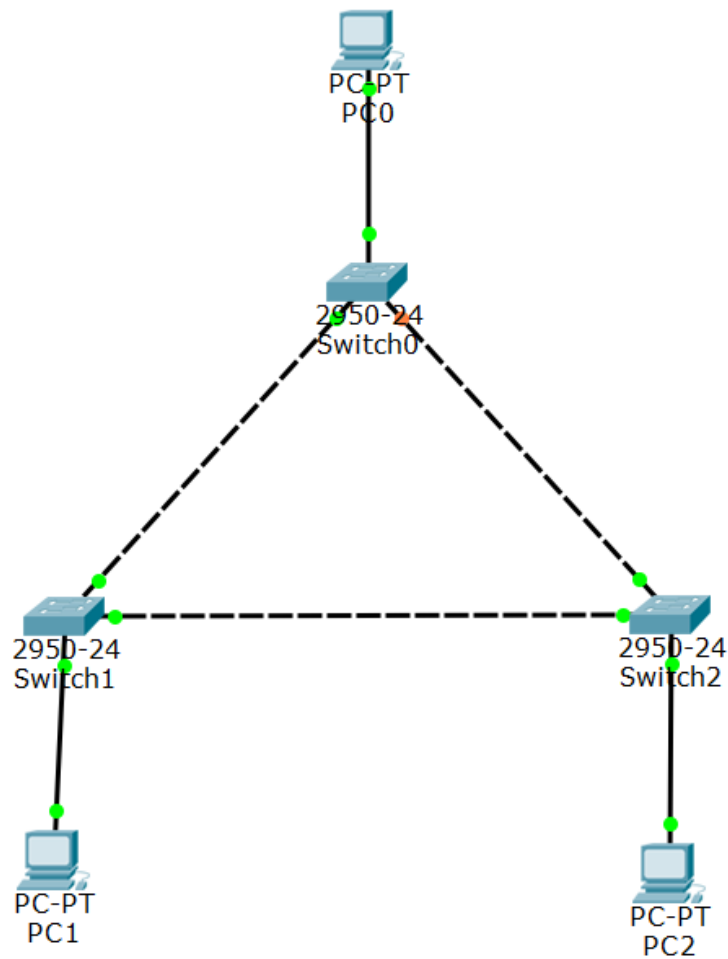# College: Beijing Institute of Technology

Class: Computer Networks

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1. Topology

Topology made with Cisco Packet Tracer (simulations are also conducted through this program)

2. Switch 1 Spanning-Tree

```
Interface        Role Sts Cost        Prio.Nbr Type
---------------- ---- --- --------- --------
--------------------------------
Fa0/1            Root FWD 19           128.1    P2p
Fa0/3            Desg FWD 19           128.3    P2p
Fa0/2            Altn BLK 19           128.2    P2p
```

3. Switch 1 Spanning Fa0/1 port

```
Switch#show spanning-tree interface fa0/1
Vlan               Role Sts Cost        Prio.Nbr Type
---------------- ---- --- --------- --------
------------------------------
VLAN0001           Root FWD 19           128.1    P2p
```

4. Switch 1 Spanning Fa0/2 port

```
Switch#show spanning-tree interface fa0/2
Vlan               Role Sts Cost        Prio.Nbr Type
---------------- ---- --- --------- --------
------------------------------
VLAN0001           Altn BLK 19           128.2    P2p
```

5. Switch 1 Mac-address table

```
Vlan    Mac Address        Type        Ports
----    -----------        --------    -----

  1     00e0.8f29.5c02     DYNAMIC     Fa0/1
```

6. Switch 2 Spanning-Tree

```
Interface        Role Sts Cost        Prio.Nbr Type
---------------- ---- --- --------- --------
--------------------------------
Fa0/3            Desg FWD 19           128.3    P2p
Fa0/1            Desg FWD 19           128.1    P2p
Fa0/2            Desg FWD 19           128.2    P2p
```

7. Switch 2 Spanning Fa0/1 port

```
Switch#sh spanning-tree interface fa0/1
Vlan               Role Sts Cost        Prio.Nbr Type
---------------- ---- --- --------- --------
------------------------------
VLAN0001           Desg FWD 19           128.1    P2p
```

8. Switch 2 Spanning Fa0/2 port

```
Switch#sh spanning-tree interface fa0/2
Vlan                Role Sts Cost       Prio.Nbr Type
--------------- ---- --- --------- --------
-------------------------------
VLAN0001            Desg FWD 19        128.2     P2p
```

9. Switch 2 Mac-address table

```
Vlan    Mac Address          Type         Ports
----    -----------          --------     -----

  1     0001.c769.9b01       DYNAMIC      Fa0/1
  1     0002.17c7.2701       DYNAMIC      Fa0/2
```

10. Switch 3 Spanning-Tree

```
Interface            Role Sts Cost       Prio.Nbr Type
--------------- ---- --- --------- --------
-------------------------------
Fa0/1                Root FWD 19        128.1     P2p
Fa0/2                Desg FWD 19        128.2     P2p
Fa0/3                Desg FWD 19        128.3     P2p
```

11. Switch 3 Spanning Fa0/1 port

```
Switch#sh spanning-tree interface fa0/1
Vlan                Role Sts Cost       Prio.Nbr Type
--------------- ---- --- --------- --------
-------------------------------
VLAN0001            Root FWD 19        128.1     P2p
```

12. Switch 3 Spanning Fa0/2 port

```
Switch#sh spanning-tree interface fa0/2
Vlan                Role Sts Cost       Prio.Nbr Type
--------------- ---- --- --------- --------
-------------------------------
VLAN0001            Desg FWD 19        128.2     P2p
```

13. Switch 3 Mac-address table

```
Vlan    Mac Address          Type         Ports
----    -----------          --------     -----

  1     0002.17c7.2702       DYNAMIC      Fa0/2
  1     00e0.8f29.5c01       DYNAMIC      Fa0/1
```

14. Comparison Switches STP

Switch 1

```
Interface          Role Sts Cost        Prio.Nbr Type
---------------- ---- --- --------- --------
-------------------------------
Fa0/1              Root FWD 19          128.1    P2p
Fa0/3              Desg FWD 19          128.3    P2p
Fa0/2              Altn BLK 19          128.2    P2p
```

Switch 2

```
Interface          Role Sts Cost        Prio.Nbr Type
---------------- ---- --- --------- --------
-------------------------------
Fa0/3              Desg FWD 19          128.3    P2p
Fa0/1              Desg FWD 19          128.1    P2p
Fa0/2              Desg FWD 19          128.2    P2p
```

Switch 3

```
Interface           Role Sts Cost        Prio.Nbr Type
---------------- ---- --- --------- --------
-------------------------------
Fa0/1               Root FWD 19          128.1    P2p
Fa0/2               Desg FWD 19          128.2    P2p
Fa0/3               Desg FWD 19          128.3    P2p
```

15. BPDU Structure

STP (802.1D) BPDU:

Length: 35 bytes

Fields:

Protocol Identifier: 2 bytes - Indicates the protocol ID, usually set to 0x0000 for STP.

Protocol Version Identifier: 1 byte - Specifies the version of STP being used.

BPDU Type: 1 byte - Specifies the type of BPDU (e.g., Configuration BPDU, Topology Change Notification).

Flags: 1 byte - Flags indicating various conditions such as topology change, TCN acknowledgment.

Root Identifier: 8 bytes - MAC address of the root bridge.

Root Path Cost: 4 bytes - Cost of the path to the root bridge.

Bridge Identifier: 8 bytes - MAC address of the sending bridge.

Port Identifier: 2 bytes - Port ID of the sending port.

Message Age: 2 bytes - Age of the BPDU.

Max Age: 2 bytes - Maximum age of the BPDU.

Hello Time: 2 bytes - Interval between sending BPDUs.

Forward Delay: 2 bytes - Time taken to transition a port to the forwarding state.

Version 3 Length: 1 byte - Length of the version 3 BPDU (for RSTP).

16. BDPU destination

The switch that issues the BPDU is typically the root bridge. The BPDU is sent from the root bridge to all other switches in the network. Each switch, upon receiving the BPDU, processes it and forwards it out of all designated ports to ensure that all switches in the network have up-to-date information about the spanning tree topology.

Therefore, the BPDU is issued from the root bridge and is sent to all other switches in the network.

17. Root bridge and designated bridge

The root bridge is the central switch in the network topology. It is elected based on the lowest bridge ID (Bridge Identifier), which is a combination of the switch's MAC address and its configured priority value. The root bridge is responsible for initiating the spanning tree algorithm and determining the shortest path to all other switches in the network.

On the other hand, designated bridges are switches in the network that have the lowest path cost to reach the root bridge on each segment. Each segment of the network (each LAN or each switch-to-switch link) has one designated bridge, which is responsible for forwarding traffic towards the root bridge. All other switches on the segment will have a non-designated role and will block their ports to prevent loops in the network topology.

In summary, the root bridge is the central switch that initiates the spanning tree algorithm, while designated bridges are switches responsible for forwarding traffic towards the root bridge on each network segment.

18. Root port and designated port

The root port is a port on each non-root bridge that provides the shortest path to the root bridge. It is the port with the lowest path cost among all ports on the bridge, calculated based on the cumulative cost of the path from the local bridge to the root bridge. The root port is responsible for forwarding traffic towards the root bridge and is always in the forwarding state.

On the other hand, a designated port is a port on each network segment that has been selected to forward traffic towards the root bridge. For each network segment, only one port is designated, and it is responsible for forwarding traffic towards the root bridge. All other ports on the segment are in a blocking state to prevent loops in the network topology.

In summary, the root port is a port on a non-root bridge that provides the shortest path to the root bridge, while the designated port is the port on each network segment responsible for forwarding traffic towards the root bridge.