TCP/IP Computer Networks

Laboratory guides — session 3

Session 3: Spanning-Tree Protocol, VLANs

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Spanning-tree protocol, VLANs

TCP/IP Computer Networks Lab 3

Goals

Learn how to login in the switches and how to use some elementary Cisco IOS commands to set up their IP addresses, analyze the switch configuration and the status of interfaces, switching tables.

Know how to introduce VLANs in the network and how these affect the STP protocol

Report

Use this guide to take your notes during the lab class. Write a report on your most relevant findings and try to explain them. The report should have around 5 pages (double spaced, 11 dots) and must be delivered in the class (lab session) that follows the last class (lab session).

Setting-up a Network with Loops

Setup a network as shown in the figure below. Confirm that the PCs' addresses are assigned correctly. Delete the switch configuration and reload a clean configuration.



IP addresses

 SW: 192.168.1.40, 41, 42, ... /24
 CW: 192.168.1.90, 91, 92, .../24
 NW: 192.168.1.10,11, 12, ... /24

 S: 192.168.1.50, 51, 52, ... /24
 C: 192.168.1.70, 71, 72, .../24
 N: 192.168.1.20,21, 22, ... /24

 SE: 192.168.1.60, 61, 62, ... /24
 CW: 192.168.1.80, 81, 82, .../24
 NE: 192.168.1.30,31, 32, ... /24

STP: Fixing a Network with Loops

What problems exist in the above network?

Describe the Spanning-Tree-Protocol:

Login in your workbench's switch and activate the Spanning-Tree-Protocol using the commands:

```
(config)#spanning-tree vlan 1
(config)#spanning-tree mode pvst
#show spanning-tree [summary| detail| active| blocked]
#show spanning-tree interface <interface-id>
#debug spanning tree
```

Capture traffic and analyse the Bridge Protocol Data Units: (1) describe the content of one BPDU, (2) find the costs from your switch to the root switch, (3) find the cost of your interfaces, (4) find the priority of your switch, (5) and find the priority of the root switch.

STP: Finding the Spanning Tree

Analyse the status of your interfaces and draw the spanning tree that the switches computed:

#show spanning-tree [summary| detail| active| blocked]

#spanning-tree interface <interface-id>

STP: Topology Change by Setting Bridges Priorities

This exercise requires you to synchronize your actions with your colleagues in the other benches.

Network reconfigurations can be simulated while shutting down links or changing their transmission rate with interface commands:

(config)#spanning-tree vlan 1 priority XXX

XXX corresponds to the priority of your switch. Draw the new topology. Explain the process.

STP: Topology Change after Link Shutdown/Failure

This exercise requires you to synchronize your actions with your colleagues in the other benches.

Network reconfigurations can be simulated while shutting down links or changing their transmission rate with interface commands:

(config)#interface <interface id>

(config-if) #shutdown

How long did it take to reconfigure and why?

STP: Topology Change after changing link speed

This exercise requires you to synchronize your actions with your colleagues in the other benches.

Network reconfigurations can happen when a link changes its transmission rate with interface commands:

(config)#interface <interface id>

(config-if)#speed 10

How long did it take to reconfigure and why?

Virtual LANs

Define a VLAN with <u>ID 100 in the north side switches</u>, a VLAN with <u>ID 200 in the south side switches</u> and <u>both</u> <u>VLANs in the centre switches</u>. Start by defining the two VLANs on every switch:

```
#vlan database
#vlan 100 name VLAN_NORTH
#vlan 200 name VLAN_SOUTH
#exit
```

Explain the difference between Access and Trunk interfaces:

For each interface, define the interface as Access:

```
(config)#interface range Fal/0/1 - 8
(config-if)#switchport access vlan 100 ! in the north side
(config-if)#switchport access vlan 200 ! in the south side
(config-if)#switchport mode access
(config-if)#end
```

! in the center switches choose one port for VLAN 100 and another for VLAN 200

or as trunk:

```
(config)#interface <interface id>
(config-if)#shutdown
(config-if)#switchport trunk native vlan 1
(config-if)#switchport trunk allowed vlan 100 ! in the north side
(config-if)#switchport trunk allowed vlan 200 ! in the south side
(config-if)#switchport trunk allowed vlan 100, 200 ! in the center
(config-if)#switchport trunk encapsulation dot1Q
(config-if)#switchport mode trunk
(config-if)#no shutdown
(config-if)#end
```

Verify the existing configuration:

#show VLAN brief

#show int trunk

Test the connectivity among computers or switches belonging to the same and to different VLANs. Discover the chosen trees as well as the costs from your switch to the root one.