



# Lecture (05) STP - CDP

---

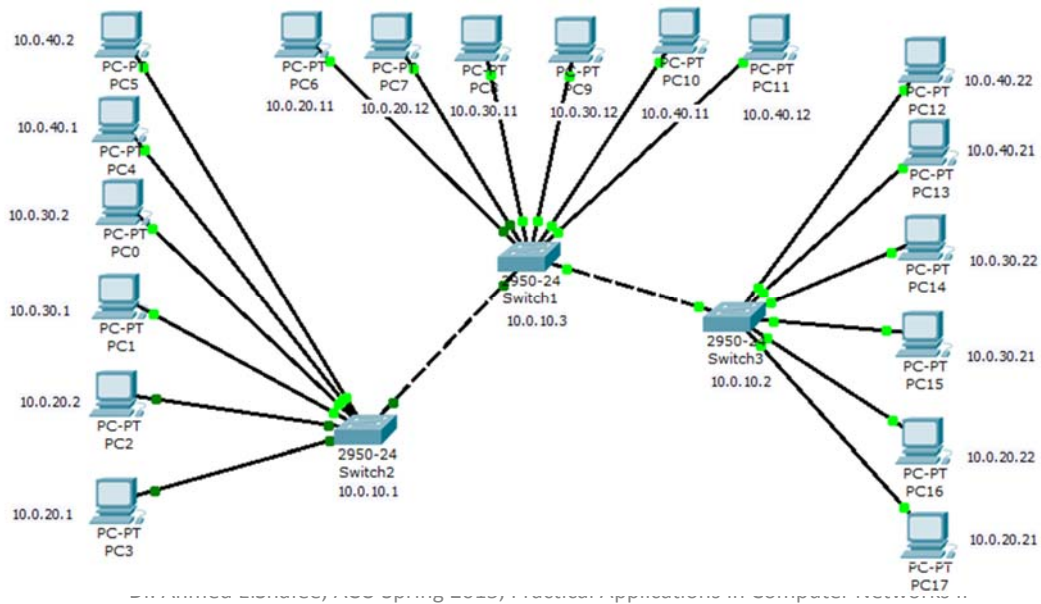
By:

**Dr. Ahmed ElShafee**

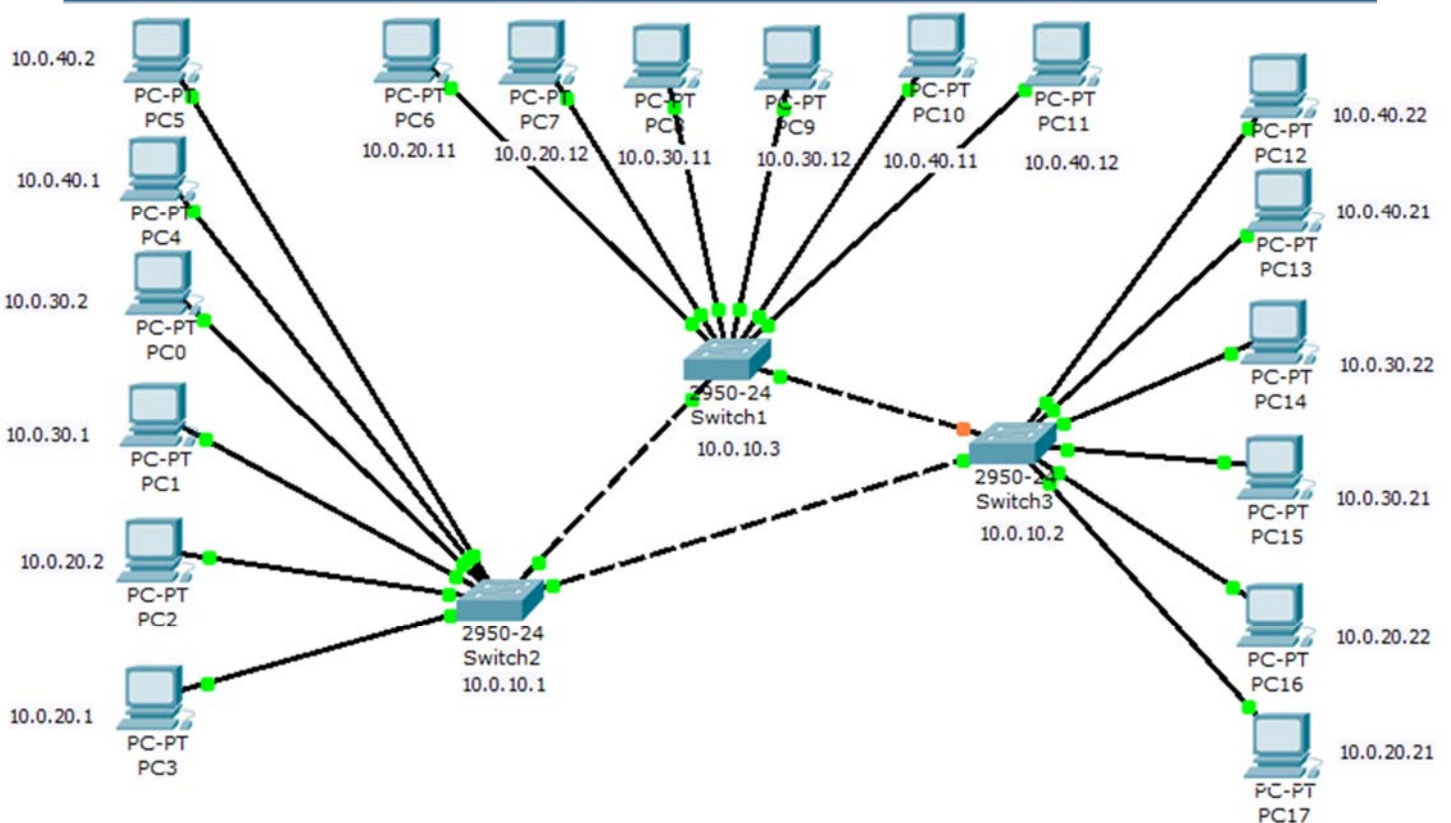
Dr. Ahmed ElShafee, ACU : Fall 2015, Practical App.  
Networks II

- 
- STP
  - CDP

- Such design creates a single point of failure. We could easily tweak this simple design to make it more resilient by adding an extra path between **SW2** and **SW3**



© 2013 Cisco and/or its affiliates. All rights reserved. Cisco Confidential



---

```
SW2
+++
enable
config t
interface fa0/22
switchport mode trunk
end
copy running-config startup-config
```

```
SW03
++++
enable
config t
interface fa0/22
switchport mode trunk
end
copy running-config startup-config
```

Dr. Ahmed ElShafee, ACU Spring 2015, Practical Applications in Computer Networks II

- 
- The redundant connection between **SW2** and **SW3** creates a loop.
  - The loop in turn, will create three serious problems.
    - **Duplicate Frame Delivery**
    - **MAC Address Table Instability**
    - **Broadcast Storm**
  - The last one in the list will eventually render our system unavailable.

---

## STP

- Spanning-Tree Protocol (turned on by default), which will dynamically block redundant connections creating a loop free topology.
- Should the primary link fail, the one that is in the blocking state will start forwarding the traffic in about 30 seconds by default

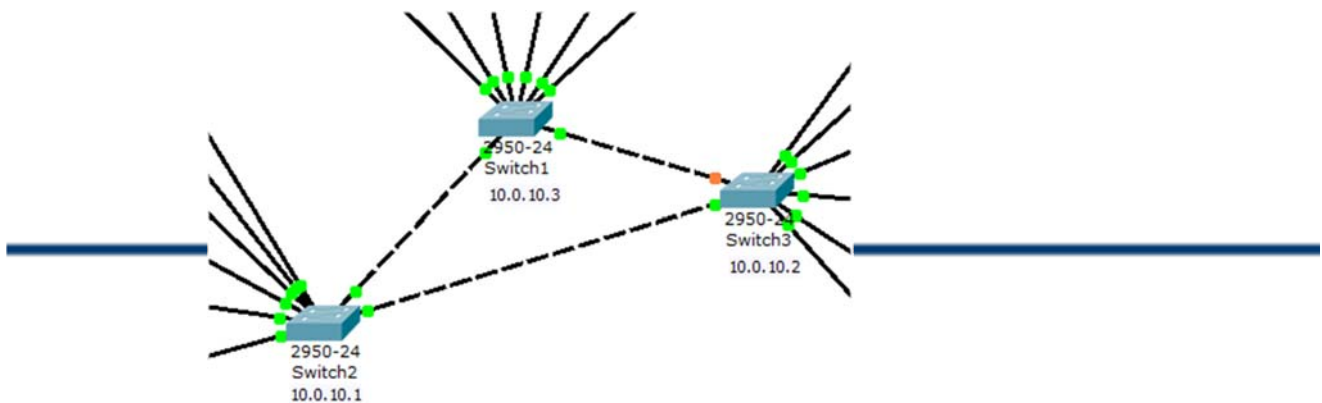
---

## Spanning-Tree Protocol Overview

STP is a layer 2 loop prevention mechanism.

- Switches running this protocol use special frames called **Bridge Protocol Data Unit (BPDU)**.
- STP let switches create a loop free topology. This is accomplished using three distinct phases:
  1. Select **a single switch** to be the **root bridge** machine which is the central device in the layer 2 network.
- This machine will have all its ports in the forwarding state (**designated port** role).
- 2. All other switches (non-root switches), will select **a single path** towards the root bridge.

- That port is called the '**root port**' and will be forwarding traffic that is destined out of the switch through the root bridge.
  - This path is the least cost (best) path towards the root.
3. All other switches will select a **single path per segment** in order to block stop the loop.
- The port that is forwarding traffic is called **designated port**.
  - The port that is blocking traffic to stop the loop is called **non-designated port**.



- administrator should configure the root bridge.
- Typically, the most powerful switch in the center of the network plays that role.
- You do not want some access switch to be transmitting the frames between other switches.
- Access switches are designed to connect your computers to the network, and not to handle the majority of the traffic between the switches which root bridge must deal with.
- If you do not configure root bridge yourself, the switch with the lowest MAC address becomes the root since the priority is identical on all of them by default.

## Discovering root switch

```
SW01#show spanning-tree vlan 1
VLAN0001
```

Spanning tree enabled protocol ieee

Root ID Priority 32769

Address 000D.BD98.4239

This bridge is the root

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

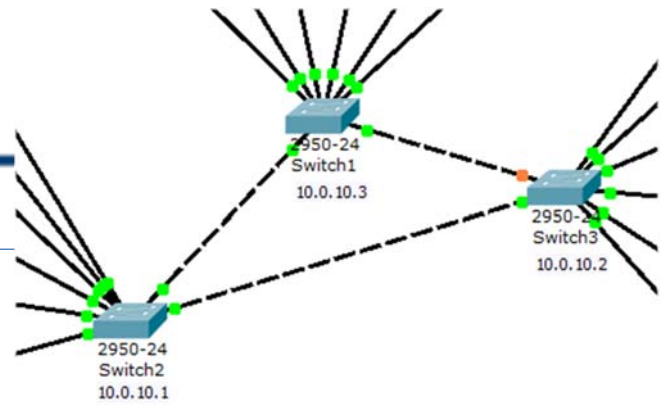
Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)

Address 000D.BD98.4239

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Aging Time 20

Interface	Role	Sts	Cost	Prio.Nbr	Type
<u>Fa0/22</u>	<u>Desg</u>	FWD	19	128.22	P2p
<u>Fa0/24</u>	<u>Desg</u>	FWD	19	128.24	P2p



```
SW02#show spanning-tree vlan 1
```

```
VLAN0001
```

Spanning tree enabled protocol ieee

Root ID Priority 32769

Address 000D.BD98.4239

Cost 19

Port 24(FastEthernet0/24)

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

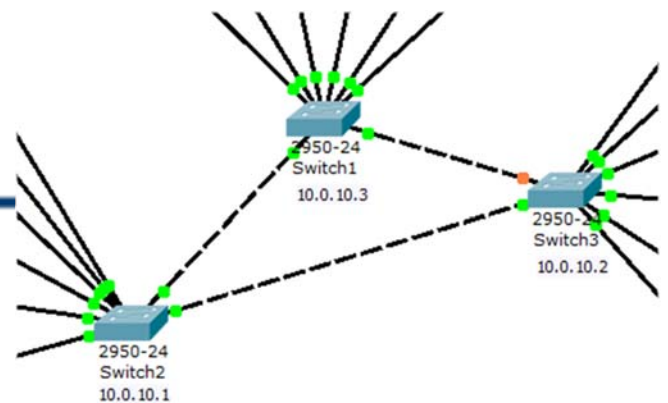
Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)

Address 00D0.9721.49E8

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Aging Time 20

Interface	Role	Sts	Cost	Prio.Nbr	Type
Fa0/23	<u>Desg</u>	FWD	19	128.23	P2p
Fa0/24	<u>Root</u>	FWD	19	128.24	P2p



## SW03#show spanning-tree vlan 1

VLAN0001

Spanning tree enabled protocol ieee

Root ID Priority 32769

Address 000D.BD98.4239

Cost 19

Port 22(FastEthernet0/22)

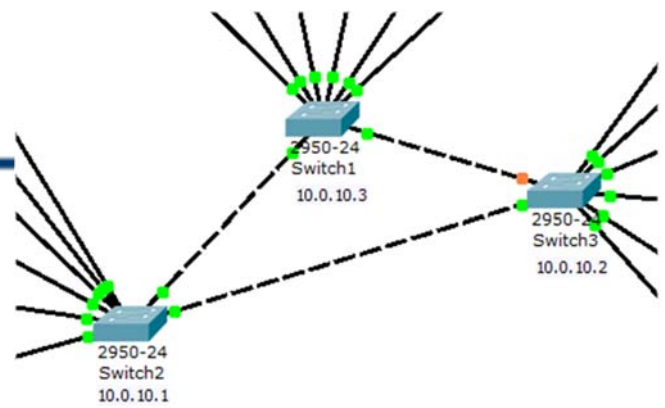
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)

Address 00E0.A303.8D77

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Aging Time 20



Interface	Role	Sts	Cost	Prio.	Nbr	Type
-----------	------	-----	------	-------	-----	------

Fa0/22	Root	FWD	19	128.22	P2p	
--------	------	-----	----	--------	-----	--

Fa0/23	Altn	BLK	19	128.23	P2p	
--------	------	-----	----	--------	-----	--

Dr. Ahmed ElShafee, ACU Spring 2015, Practical Applications in Computer Networks II

## Setting root switch, Method 1

- decrement the priority on **SW1** and leave the default value on the other switches, The lowest priority value allowed is zero and if higher needs to be used, it must be an increment of 4096.

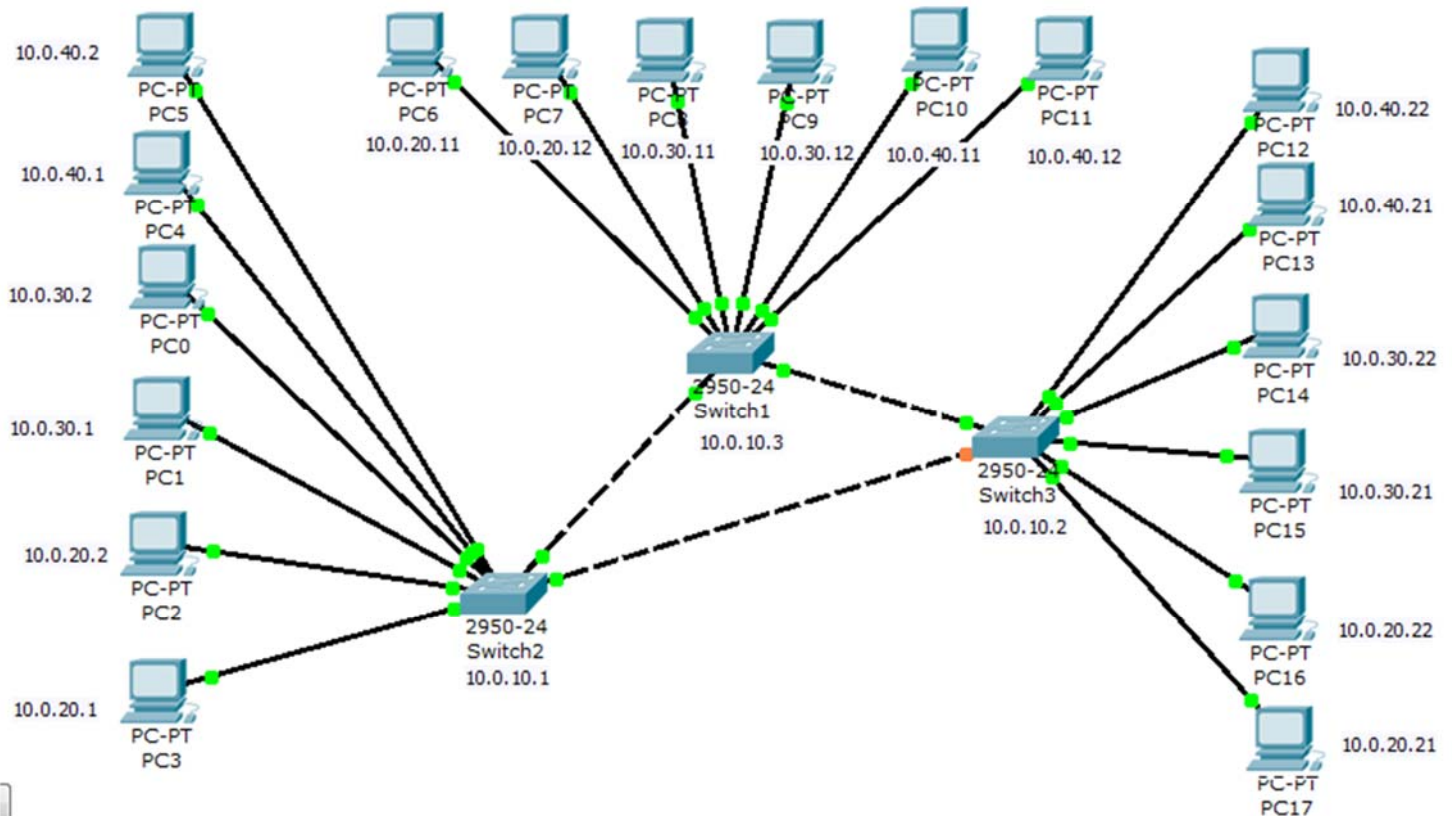
**FL01-R03-SW03#show vlan**

VLAN Name	Status	Ports
1 default	active	Fa0/16, Fa0/17, Fa0/18, Fa0/19 Fa0/20, Fa0/21, Fa0/24
2 Finance	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5
3 HR	active	Fa0/6, Fa0/7, Fa0/8, Fa0/9 Fa0/10
4 Administration	active	Fa0/11, Fa0/12, Fa0/13, Fa0/14 Fa0/15

FL01-R03-SW03(config)#spanning-tree vlan 1,2,3,4 priority 0

FL01-R03-SW03(config)#end

FL01-R03-SW03#copy running-config startup-config





**FL01-R02-SW02#show spanning-tree vlan 1**

VLAN0001

Spanning tree enabled protocol ieee

Root ID Priority 1

Address 00D0.9721.49E8

This bridge is the root

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 1 (priority 0 sys-id-ext 1)

Address 00D0.9721.49E8

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Aging Time 20

Interface	Role	Sts	Cost	Prio.Nbr	Type
Fa0/23	<u>Desg</u>	<u>FWD</u>	19	128.23	P2p
Fa0/24	<u>Desg</u>	<u>FWD</u>	19	128.24	P2p

**sw01#show spanning-tree vlan 1**

VLAN0001

Spanning tree enabled protocol ieee

Root ID Priority 24577

Address 00D0.9721.49E8

This bridge is the root

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 24577 (priority 24576 sys-id-ext 1)

Address 00D0.9721.49E8

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Aging Time 20

Interface	Role	Sts	Cost	Prio.Nbr	Type
Fa0/23	<u>Desg</u>	<u>FWD</u>	19	128.23	P2p
Fa0/24	<u>Desg</u>	<u>FWD</u>	19	128.24	P2p

---

## Setting root switch, Method 2

- Use spanning-tree vlan root primary macro command which decrements the priority value using Cisco best practices.

```
FL01-R03-SW03#show vlan
```

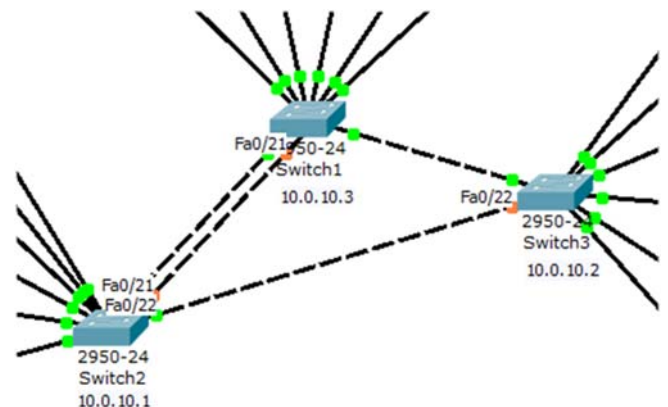
VLAN Name	Status	Ports
1 default	active	Fa0/16, Fa0/17, Fa0/18, Fa0/19 Fa0/20, Fa0/21, Fa0/24
2 Finance	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5
3 HR	active	Fa0/6, Fa0/7, Fa0/8, Fa0/9 Fa0/10
4 Administration	active	Fa0/11, Fa0/12, Fa0/13, Fa0/14 Fa0/15

```
FL01-R03-SW03(config)#spanning-tree vlan 1,2,3,4 root primary
FL01-R03-SW03(config)#end
FL01-R03-SW03#copy running-config startup-config
```

---

## Changing root ports

- Firstly lets add redundant connection between SW 1,2
- Collect spanning-tree information on vlan 1 of both SW01, SW02



```

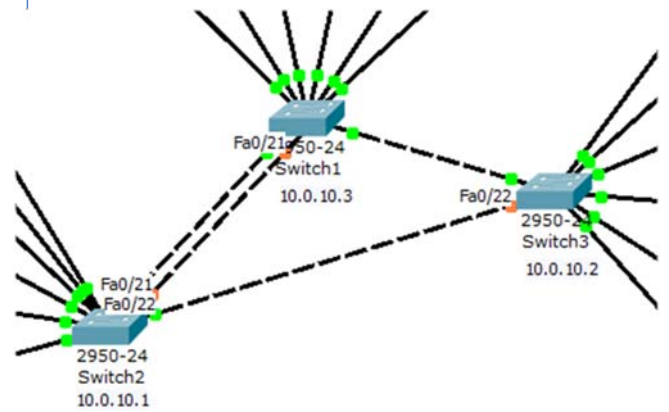
SW01
++++
enable
config t
interface fa0/21
switchport mode trunk
end
copy running-config startup-config

```

```

SW02
++++
enable
config t
interface fa0/21
switchport mode trunk
end
copy running-config startup-config

```



```

sw01#show spanning-tree vlan 1
VLAN0001

```

```

Spanning tree enabled protocol ieee
Root ID Priority 24577
    Address 00D0.9721.49E8
    This bridge is the root
    Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

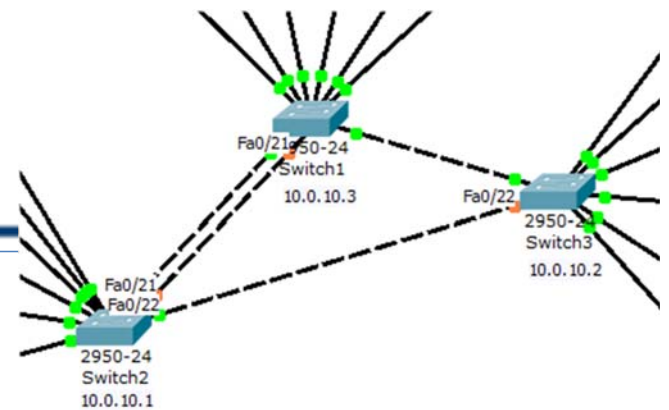
```

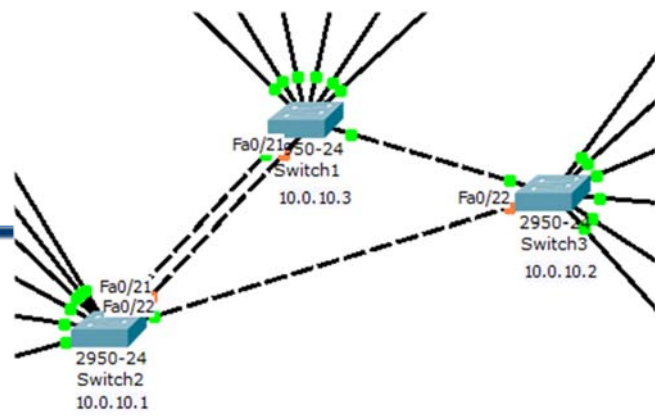
```

Bridge ID Priority 24577 (priority 24576 sys-id-ext 1)
    Address 00D0.9721.49E8
    Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
    Aging Time 20

```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Fa0/21	Desg	FWD	19	128.21	P2p
Fa0/23	Desg	FWD	19	128.23	P2p
Fa0/24	Desg	FWD	19	128.24	P2p





**SW02#show spanning-tree vlan 1**

VLAN0001

Spanning tree enabled protocol ieee

Root ID Priority 24577

Address 00D0.9721.49E8

Cost 19

Port 21(FastEthernet0/21)

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)

Address 000D.BD98.4239

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Aging Time 20

Interface	Role	Sts	Cost	Prio.	Nbr	Type
Fa0/21	Root	FWD	19	128.21		P2p
Fa0/22	Desg	FWD	19	128.22		P2p
Fa0/24	Altn	BLK	19	128.24		P2p

**Swap alternative and root ports in SW02 (24, 21)**

- @ root switch (SW1) decrease priority of alternative port (24) to 64

```

en
config t
interface fa0/24
spanning-tree vlan 1 port-priority 64
end
copy running-config startup-config
  
```

## SW02#show spanning-tree vlan 1

VLAN0001

Spanning tree enabled protocol ieee

Root ID Priority 24577

Address 00D0.9721.49E8

Cost 19

Port 24(FastEthernet0/24)

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)

Address 000D.BD98.4239

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Aging Time 20

Interface	Role	Sts	Cost	Prio.Nbr	Type
-----------	------	-----	------	----------	------

Fa0/21	<u>Altn</u>	<u>BLK</u>	<u>19</u>	128.21	P2p
Fa0/22	<u>Desg</u>	<u>FWD</u>	<u>19</u>	128.22	P2p
Fa0/24	<u>Root</u>	<u>FWD</u>	<u>19</u>	128.24	P2p

## Load balancing between redundant ports

- @ root switch (SW01), Check spanning tree on shared ports

```
sw01#show spanning-tree interface FastEthernet 0/21
```

Vlan	Role	Sts	Cost	Prio.Nbr	Type
------	------	-----	------	----------	------

VLAN0001	Desg	FWD	19	128.21	P2p
VLAN0002	Desg	FWD	19	128.21	P2p
VLAN0003	Desg	FWD	19	128.21	P2p
VLAN0004	Desg	FWD	19	128.21	P2p

```
sw01#show spanning-tree interface FastEthernet 0/24
```

Vlan	Role	Sts	Cost	Prio.Nbr	Type
------	------	-----	------	----------	------

VLAN0001	Desg	FWD	19	128.24	P2p
VLAN0002	Desg	FWD	19	128.24	P2p
VLAN0003	Desg	FWD	19	128.24	P2p
VLAN0004	Desg	FWD	19	128.24	P2p

- @ SW02, Check spanning tree on shared ports

```
SW02>en
SW02#show spanning-tree interface FastEthernet 0/21
```

Vlan	Role	Sts	Cost	Prio.Nbr	Type
VLAN0001	Root	FWD	19	128.21	P2p
VLAN0002	Root	FWD	19	128.21	P2p
VLAN0003	Root	FWD	19	128.21	P2p
VLAN0004	Root	FWD	19	128.21	P2p

```
SW02#show spanning-tree interface fa0/24
```

Vlan	Role	Sts	Cost	Prio.Nbr	Type
VLAN0001	Altn	BLK	19	128.24	P2p
VLAN0002	Altn	BLK	19	128.24	P2p
VLAN0003	Altn	BLK	19	128.24	P2p
VLAN0004	Altn	BLK	19	128.24	P2p

٢٧

Dr. Ahmed ElShafee, ACU Spring 2015, Practical Applications in Computer Networks II

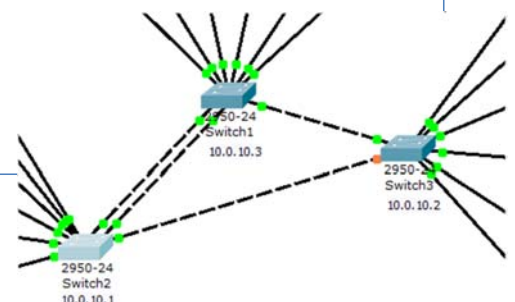
- @ root switch (SW01) decrease vlan3,4 priorities

```
interface FastEthernet 0/24
spanning-tree vlan 3 port-priority 64
spanning-tree vlan 4 port-priority 64
```

- Check spanning tree on SW02 shared ports

```
SW02#show spanning-tree interface FastEthernet 0/21
```

Vlan	Role	Sts	Cost	Prio.Nbr	Type
VLAN0001	Root	FWD	19	128.21	P2p
VLAN0002	Root	FWD	19	128.21	P2p
VLAN0003	Altn	BLK	19	128.21	P2p
VLAN0004	Altn	BLK	19	128.21	P2p

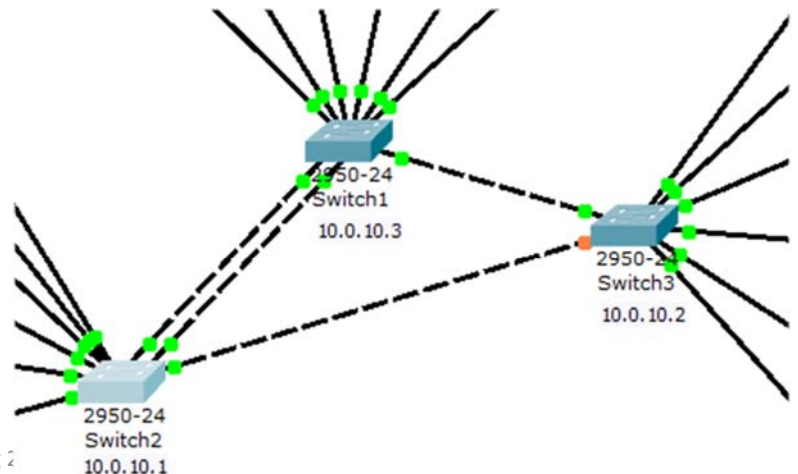


٢٨

Dr. Ahmed ElShafee, ACU Spring 2015, Practical Applications in Computer Networks II

```
SW02#show spanning-tree interface FastEthernet 0/24
```

Vlan	Role	Sts	Cost	Prio.	Nbr	Type
VLAN0001	Altn	BLK	19	128.24	P2p	
VLAN0002	Altn	BLK	19	128.24	P2p	
VLAN0003	Root	FWD	19	128.24	P2p	
VLAN0004	Root	FWD	19	128.24	P2p	



٢٩

Dr. Ahmed ElShafee, ACU Spring 2

## CDP (CSICO Discovery Protocol)

- Every Cisco device using this protocol, reports information about itself by advertising special packets out of its all active interfaces. The important pieces of information it advertise include its:
  - Hostname
  - Platform
  - Ports where CDP packets are advertised
  - IOS version
  - IP address
- CDP can help administrator discover Cisco devices connected and create a topology diagram

٣٠

Dr. Ahmed ElShafee, ACU Spring 2015, Practical Applications in Computer Networks II

**SW02#show CDP**

Global CDP information:

- Sending CDP packets every 60 seconds
- Sending a holdtime value of 180 seconds
- Sending CDPv2 advertisements is enabled

**SW02#show CDP interface**

FastEthernet0/1 is up, line protocol is up  
Sending CDP packets every 60 seconds  
Holdtime is 180 seconds  
FastEthernet0/2 is up, line protocol is up  
Sending CDP packets every 60 seconds  
Holdtime is 180 seconds

.....

**SW02#config t**

Enter configuration commands, one per line. End with CNTL/Z.

```
SW02(config)#interface Fas0/1
SW02(config-if)#no cdp enable
SW02(config-if)#end
```

**SW02#show cdp**

Global CDP information:

- Sending CDP packets every 60 seconds
- Sending a holdtime value of 180 seconds
- Sending CDPv2 advertisements is enabled

SW02#show cdp interface

FastEthernet0/2 is up, line protocol is up  
Sending CDP packets every 60 seconds  
Holdtime is 180 seconds  
FastEthernet0/3 is down, line protocol is down  
Sending CDP packets every 60 seconds  
Holdtime is 180 seconds

**config t**

```
interface range fa0/1 - 2 , fa0/5 , fa0/8
no cdp enable
end
```



**SW02#show cdp neighbor**

Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge

S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone

Device ID	Local Infrfce	Holdtme	Capability	Platform	Port ID
sw03	Fas 0/22	175	S 2950	Fas 0/22	
sw01	Fas 0/21	175	S 2950	Fas 0/21	
sw01	Fas 0/24	175	S 2950	Fas 0/24	

**SW02#show cdp entry sw01**

Device ID: sw01

Entry address(es):

IP address : 10.0.10.2

Platform: cisco 2950, Capabilities: Switch

Interface: FastEthernet0/21, Port ID (outgoing port): FastEthernet0/21

Holdtime: 125

Version :

Cisco Internetwork Operating System Software

IOS (tm) C2950 Software (C2950-I6Q4L2-M), Version 12.1(22)EA4,  
RELEASE SOFTWARE(fc1)

Copyright (c) 1986-2005 by cisco Systems, Inc.

Compiled Wed 18-May-05 22:31 by jharirba

**SW02(config)#no cdp run****SW02(config)#end**

SW02#

%SYS-5-CONFIG\_I: Configured from console by console

**SW02#show cdp**

% CDP is not enabled

SW02#



**Thanks,..**  
**See you next week (ISA),...**

Dr. Ahmed ElShafee, ACU : Fall 2015, Practical App.  
Networks II