



## **CIS326 - IT Infrastructure Management**

**Project Group Number (in Blackboard): 2**

**Topology no.9**

**Section Number: 9**

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## INTRO:

Internet connectivity is no longer a choice but a necessity, especially in the educational field. Internet and technology play a crucial role in preparing students for the challenges they will face in the years following college. And here our project involved creating a network to reflect a college building.

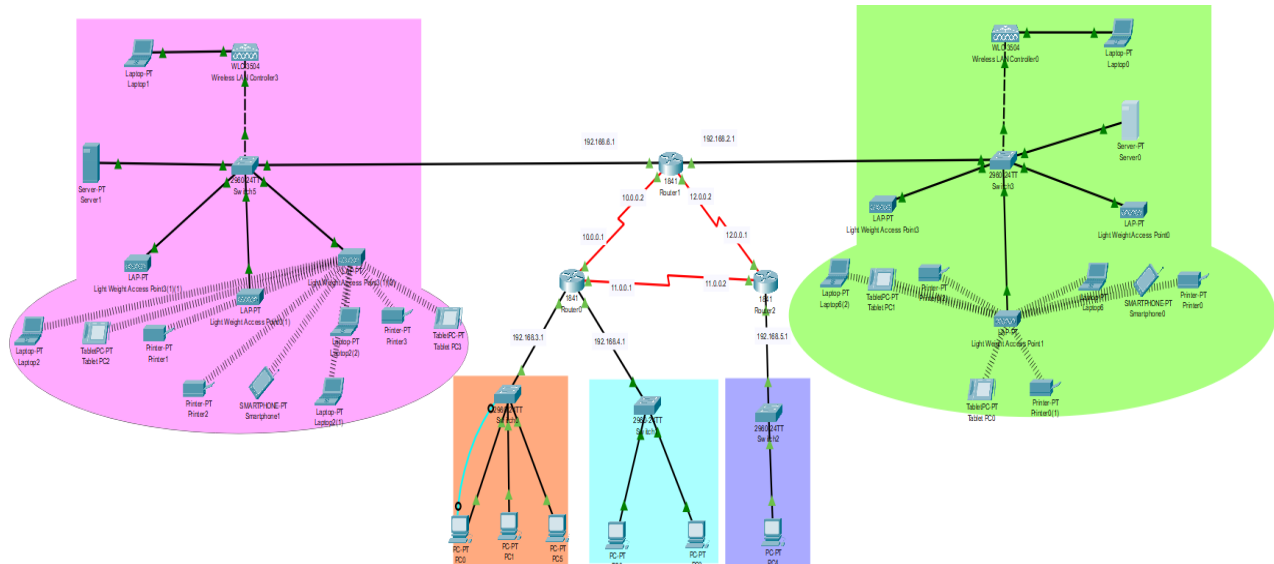
*Here are some of the things that went into designing:*

Here's the topology of the college LAN network that we chose. Which consists of three routers connected by serial cables, each router representing a floor of the building. Additionally, it is connected with switches that are connected to two WLAN controllers, which provide wireless LAN access points (AP) to the different devices.

Our network is analyzed using the Packet Tracer Program in order to depict the overall picture of the network.



## NETWORK TOPOLOGY:



## REQUIREMENTS OF THE TOPOLOGY:

*Here are the tools included in the topology:*

Devices and cables	Quantity
Router	3
PC's	6
Printer	6
Laptop	7
Server	2
WLC	2
Access point	6
Tablet PC	4
Smartphone	2
Console Cable	1
Serial Cables	3
Straight-through Cable	21
Crosse-over Cable	2



## ADDRESSING TABLE:

Device	Interface	IP Address	Subnet Mask	Default Gateway	VLAN
Router0	Serial 0/0/1	11.0.0.1	255.255.255.0	-	-
Router0	Serial 0/0/0	10.0.0.0	255.255.255.0	-	-
Router0	F0/0.3	192.168.3.1	255.255.255.0	-	VLAN3
Router0	F0/1.4	192.168.4.1	255.255.255.0	-	VLAN4
Router1	Serial 0/0/1	12.0.0.2	255.255.255.0	-	-
Router1	Serial 0/0/0	10.0.0.2	255.255.255.0	-	-
Router1	F0/0.12	192.168. 2.1	255.255.255.0	-	VLAN2
Router2	Serial 0/0/0	11.0.0.1	255.255.255.0	-	-
Router2	G0/0.13	192.168.5.1	255.255.255.0	-	VLAN5
Router2	Serial 0/0/1	12.0.0.1	255.255.255.0	-	-
PC0	F0	192.168.3.DHCP	255.255.255.0	192.168.3.1	VLAN3
PC1	F0	192.168.3.DHCP	255.255.255.0	192.168.3.1	VLAN3
PC2	F0	192.168.4.DHCP	255.255.255.0	192.168.4.1	VLAN4
PC3	F0	192.168.4.DHCP	255.255.255.0	192.168.4.1	VLAN4
PC4	F0	192.168.5.DHCP	255.255.255.0	192.168.5.1	VLAN5
PC5	F0	192.168.3.DHCP	255.255.255.0	192.168.3.1	VLAN3
Printer0	Wireless	192.168. 2.DHCP	255.255.255.0	192.168. 2.1	VLAN2
Printer1	Wireless	192.168. 2.DHCP	255.255.255.0	192.168. 2.1	VLAN2
Printer2	Wireless	192.168. 2.DHCP	255.255.255.0	192.168. 2.1	VLAN2
Printer3	Wireless	192.168. 6.DHCP	255.255.255.0	192.168. 6.1	VLAN6
Printer4	Wireless	192.168. 6.DHCP	255.255.255.0	192.168. 6.1	VLAN6
Printer5	Wireless	192.168. 6.DHCP	255.255.255.0	192.168. 6.1	VLAN6
Laptop0	F0	192.168. 2.DHCP	255.255.255.0	192.168.2.1	VLAN2
Laptop1	Wireless	192.168. 2.DHCP	255.255.255.0	192.168. 2.1	VLAN2
Laptop2	Wireless	192.168. 2.DHCP	255.255.255.0	192.168. 2.1	VLAN2
Laptop3	Wireless	192.168. 6.DHCP	255.255.255.0	192.168. 6.1	VLAN6
Laptop4	Wireless	192.168. 6.DHCP	255.255.255.0	192.168. 6.1	VLAN6
Laptop5	Wireless	192.168. 6.DHCP	255.255.255.0	192.168. 6.1	VLAN6
Laptop6	Wireless	192.168. 6.DHCP	255.255.255.0	192.168. 6.1	VLAN6
DHCP Server	F0	192.168. 2.100	255.255.255.0	192.168.2.1	VLAN2
WLC	G0/0	192.168.2.254	255.255.255.0	192.168.2.1	VLAN2



Accesspoint0	F0	192.168. 2.DHCP	255.255.255.0	192.168.2.1	VLAN2
Accesspoint1	F0	192.168. 2.DHCP	255.255.255.0	192.168.2.1	VLAN2
Accesspoint2	F0	192.168. 2.DHCP	255.255.255.0	192.168.2.1	VLAN2
Accesspoint3	F0	192.168. 6.DHCP	255.255.255.0	192.168. 6.1	VLAN6
Accesspoint4	F0	192.168. 6.DHCP	255.255.255.0	192.168. 6.1	VLAN6
Accesspoint5	F0	192.168. 6.DHCP	255.255.255.0	192.168. 6.1	VLAN6
Tablet PC1	Wireless	192.168. 2.DHCP	255.255.255.0	192.168. 2.1	VLAN2
Tablet PC0	Wireless	192.168. 2.DHCP	255.255.255.0	192.168. 2.1	VLAN2
Tablet PC2	Wireless	192.168. 6.DHCP	255.255.255.0	192.168. 6.1	VLAN6
Tablet PC3	Wireless	192.168. 6.DHCP	255.255.255.0	192.168. 6.1	VLAN6
Smartphone0	Wireless	192.168. 2.DHCP	255.255.255.0	192.168. 2.1	VLAN2
Smartphone1	Wireless	192.168. 6.DHCP	255.255.255.0	192.168. 6.1	VLAN6



## Set IP Address for the devices:

To set the IP address for PC, Laptop, printers, Tablet, access points.

We will use the DHCP server

- First click on the server
- Second click on services
- Choose DHCP
- Fill the network information

**SERVICES**

- HTTP
- DHCP**
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT
- VM Management
- Radius EAP

**DHCP**

Interface: **FastEthernet0** Service: ☒ On ☐ Off

Pool Name: **VLAN3**

Default Gateway: **192.168.3.1**

DNS Server: **0.0.0.0**

Start IP Address: **192** **168** **3** **0**

Subnet Mask: **255** **255** **255** **0**

Maximum Number of Users: **100**

TFTP Server: **0.0.0.0**

WLC Address: **0.0.0.0**

**Add** **Save** **Remove**

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
serverPool	0.0.0.0	0.0.0.0	0.0.0.0	255.255....	100	0.0.0.0	0.0.0.0
<b>VLAN3</b>	<b>192.168....</b>	<b>0.0.0.0</b>	<b>192.168....</b>	<b>255.255....</b>	<b>100</b>	<b>0.0.0.0</b>	<b>0.0.0.0</b>
VLAN5	192.168....	0.0.0.0	192.168....	255.255....	100	0.0.0.0	0.0.0.0
VLAN4	192.168....	0.0.0.0	192.168....	255.255....	100	0.0.0.0	0.0.0.0
VLAN6	192.168....	192.168....	192.168....	255.255....	100	0.0.0.0	192.168....

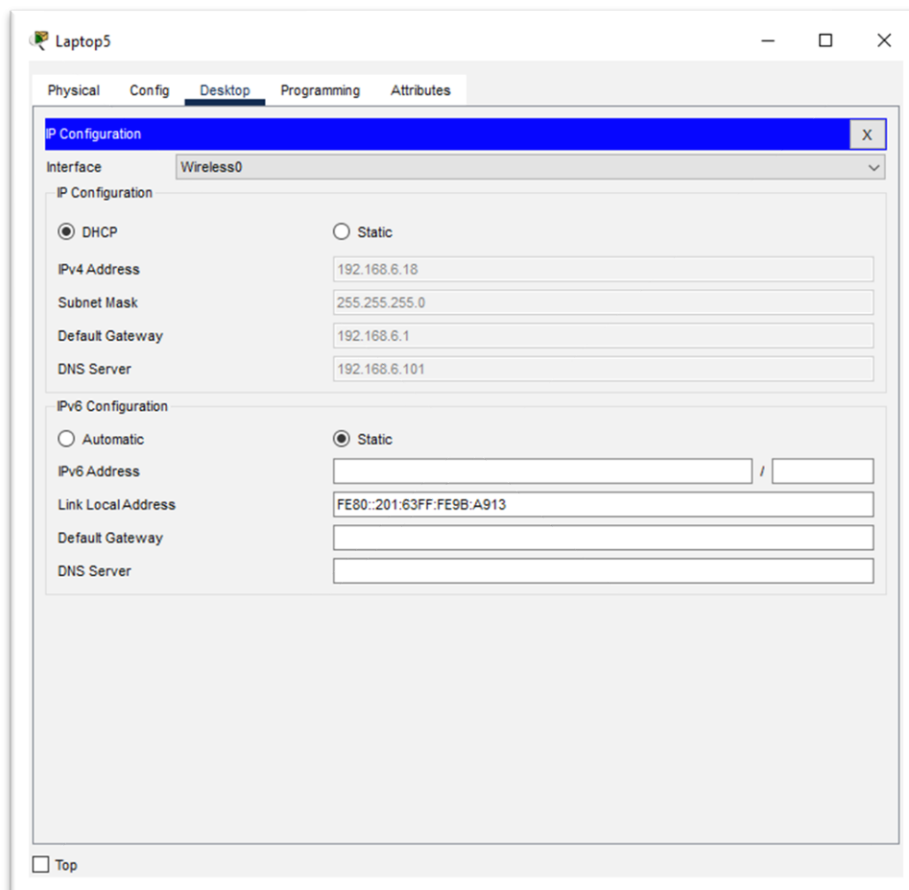
☐ Top



- Now we need to make the server to connect to all devices we must activate IP helper-address command in each port in all routers.

```
interface FastEthernet0/1.4
 encapsulation dot1Q 4
 ip address 192.168.4.1 255.255.255.0
 ip helper-address 192.168.2.100
!
interface Serial0/0/0
 ip address 10.0.0.1 255.255.255.0
 ip helper-address 192.168.2.100
 clock rate 2000000
!
interface Serial0/0/1
 ip address 11.0.0.1 255.255.255.0
 ip helper-address 192.168.2.100
```

- Choose any device then click on IP configuration



- Choose DHCP





## Configure RIP&OSPF Routing:

- Networks connect with Router0:

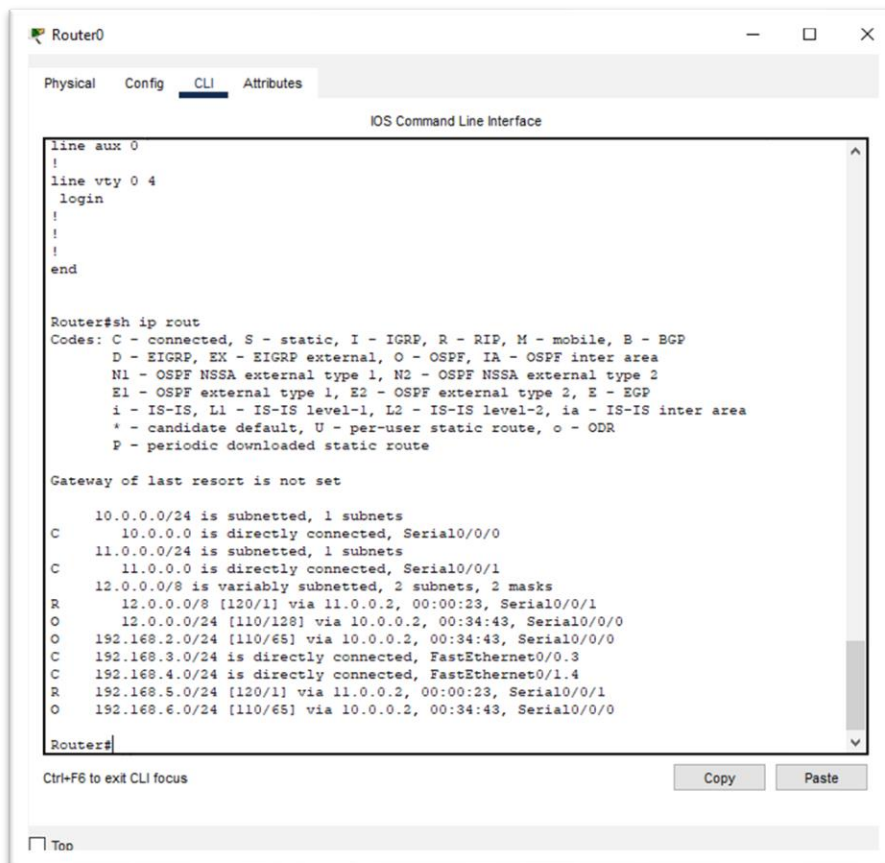
192.168.4.0 , 192.168.3.0 , 11.0.0.0, 10.0.0.0

- This router will connect RIP routing with OSPF Routing

So, we will use both type

```
router ospf 1
 log-adjacency-changes
 redistribute rip subnets
 network 10.0.0.0 0.0.0.255 area 0
 network 192.168.3.0 0.0.0.255 area 1
 network 192.168.4.0 0.0.0.255 area 2
!
router rip
 redistribute ospf 1 metric 10
 network 11.0.0.0
 network 192.168.3.0
 network 192.168.4.0
```

- Show IP route





➤ Router1 OSPF routing:

```
router ospf 1
log-adjacency-changes
network 10.0.0.0 0.0.0.255 area 0
network 12.0.0.0 0.0.0.255 area 0
network 192.168.2.0 0.0.0.255 area 0
network 192.168.6.0 0.0.0.255 area 0
```

Network address:

192.168.2.0  
192.168.6.0  
10.0.0.0  
12.0.0.0

➤ Show IP route

```
Router1
Physical Config CLI Attributes
IOS Command Line Interface

end

Router(config)#ex
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
Router#
Router#sh ip rou
Router#sh ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
        i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
        * - candidate default, U - per-user static route, o - ODR
        P - periodic downloaded static route

Gateway of last resort is not set

    10.0.0.0/24 is subnetted, 1 subnets
C       10.0.0.0 is directly connected, Serial0/0/0
    11.0.0.0/24 is subnetted, 1 subnets
O E2    11.0.0.0 [110/20] via 10.0.0.1, 00:38:03, Serial0/0/0
    12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
O E2    12.0.0.0/8 [110/20] via 10.0.0.1, 00:38:03, Serial0/0/0
    12.0.0.0/24 is directly connected, Serial0/0/1
C       192.168.2.0/24 is directly connected, FastEthernet0/0.2
O IA    192.168.3.0/24 [110/65] via 10.0.0.1, 00:38:03, Serial0/0/0
O IA    192.168.4.0/24 [110/65] via 10.0.0.1, 00:37:53, Serial0/0/0
O E2    192.168.5.0/24 [110/20] via 10.0.0.1, 00:38:03, Serial0/0/0
C       192.168.6.0/24 is directly connected, FastEthernet0/1

Router#

Ctrl+F6 to exit CLI focus
Copy Paste
Top
```



➤ Router2 RIP routing:

```
router rip
network 11.0.0.0
network 12.0.0.0
network 192.168.5.0
```

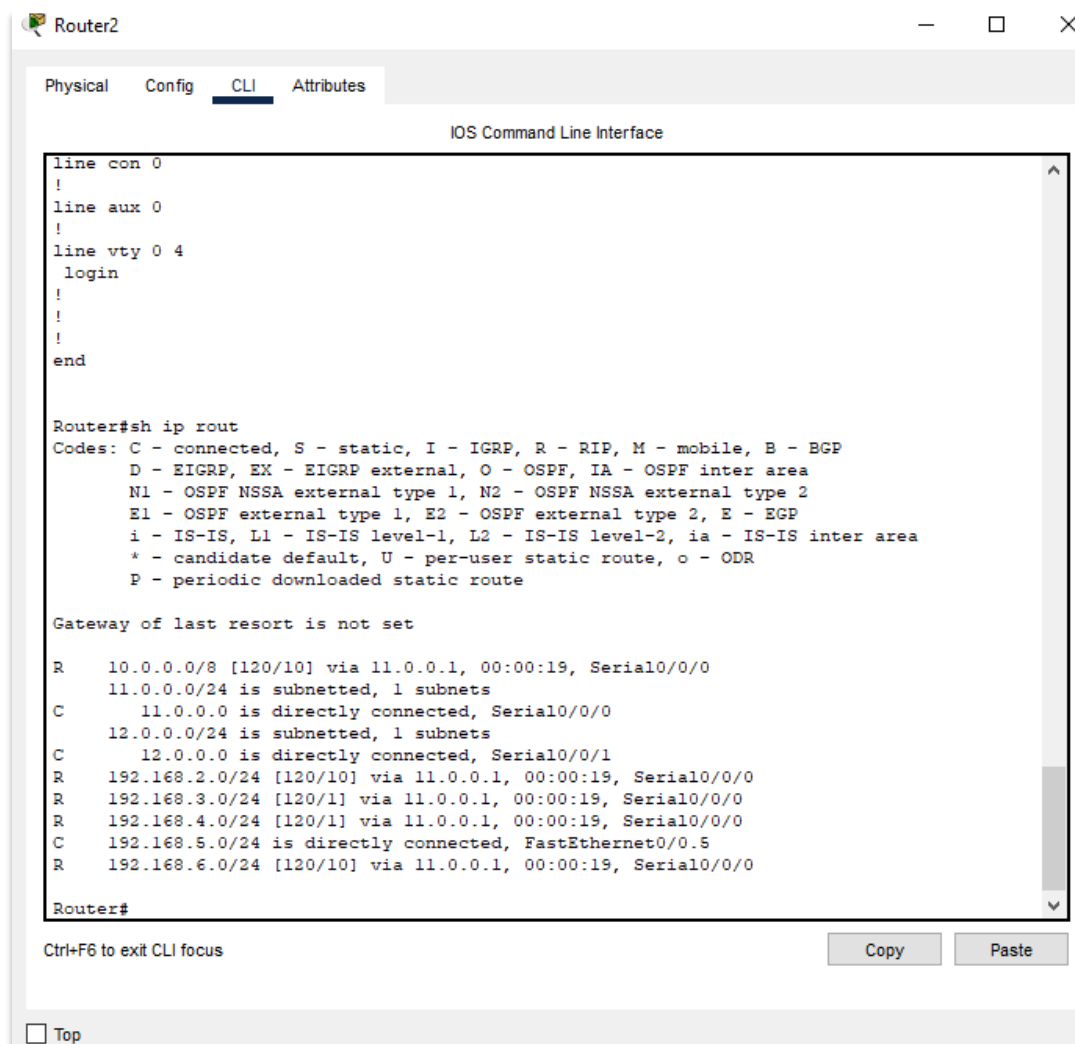
Network address:

192.168.5.1

11.0.0.0

12.0.0.0

➤ Show Ip route



➤ Test the connection after we implement the routing:

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	Laptop2	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC4	Laptop1	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC3	Laptop2	ICMP		0.000	N	2	(edit)	(delete)



## Configure VLAN's:

- Configure VLAN2 in switch3

```
Switch3
Physical Config CLI Attributes
IOS Command Line Interface
%LINK-5-CHANGED: Interface FastEthernet0/5, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/5, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int
Switch(config)#interface r
Switch(config)#interface range f
Switch(config)#interface range fastEthernet 0/1-24
Switch(config-if-range)#swac
Switch(config-if-range)#sw
Switch(config-if-range)#switchport ac
Switch(config-if-range)#switchport access v
Switch(config-if-range)#switchport access vlan 2
Switch(config-if-range)#ex
Switch(config)#int
Switch(config)#interface f
Switch(config)#interface fastEthernet 0/1
Switch(config-if)#sw
Switch(config-if)#switchport m
Switch(config-if)#switchport mode t
Switch(config-if)#switchport mode trunk

Switch(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

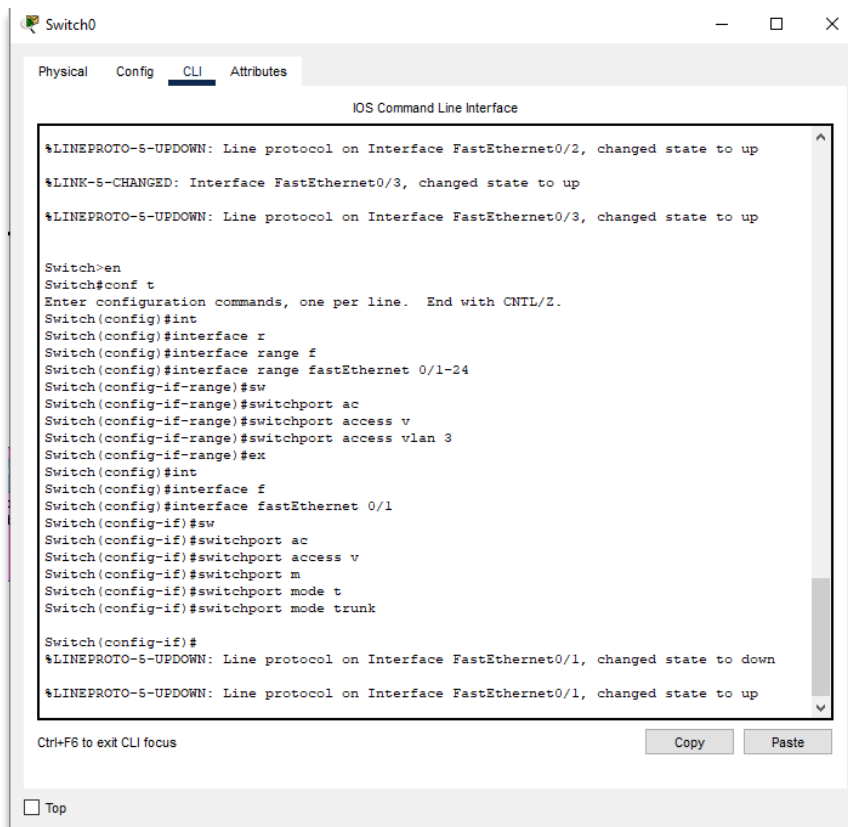
Ctrl+F6 to exit CLI focus
Copy Paste
Top
```

- Show VLAN brief

```
Switch#sh vlan brief
```

VLAN Name	Status	Ports
1 default	active	Gig0/2
2 VLAN0002	active	Fa0/2, Fa0/3, Fa0/4, Fa0/5 Fa0/6, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Fa0/11, Fa0/12, Fa0/13 Fa0/14, Fa0/15, Fa0/16, Fa0/17 Fa0/18, Fa0/19, Fa0/20, Fa0/21 Fa0/22, Fa0/23, Fa0/24

- Configure VLAN3 in switch0

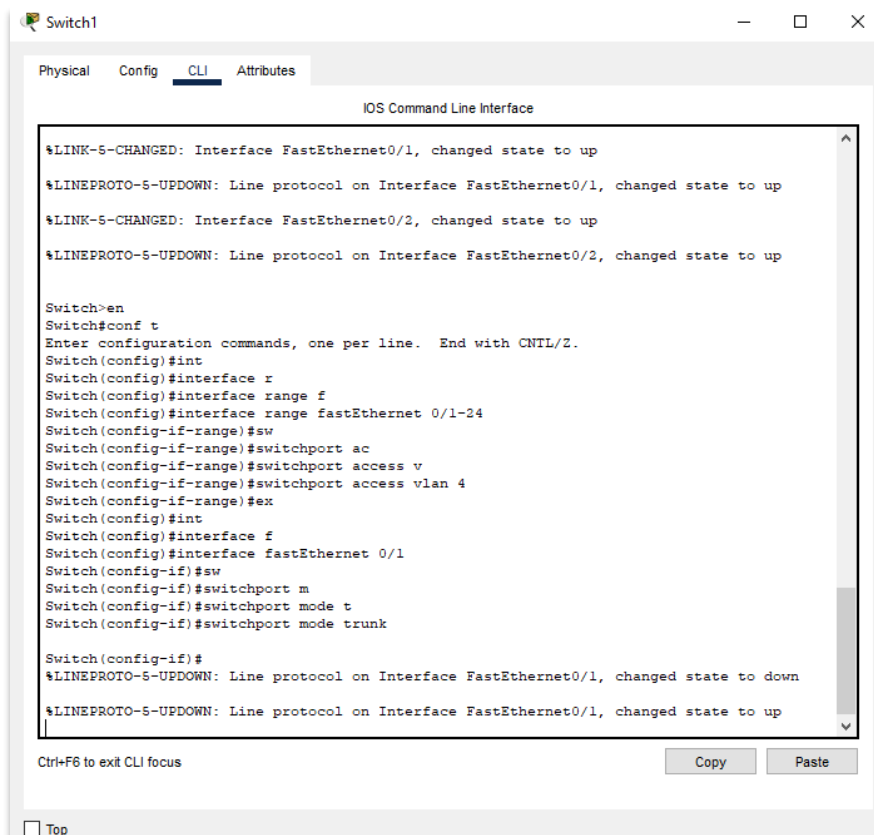


### ➤ Show VLAN brief

Switch#sh vlan brief

VLAN	Name	Status	Ports
1	default	active	Gig0/2
3	VLAN0003	active	Fa0/2, Fa0/3, Fa0/4, Fa0/5 Fa0/6, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Fa0/11, Fa0/12, Fa0/13 Fa0/14, Fa0/15, Fa0/16, Fa0/17 Fa0/18, Fa0/19, Fa0/20, Fa0/21 Fa0/22, Fa0/23, Fa0/24

### ➤ Configure VLAN4 in switch1



➤ Show VLAN brief

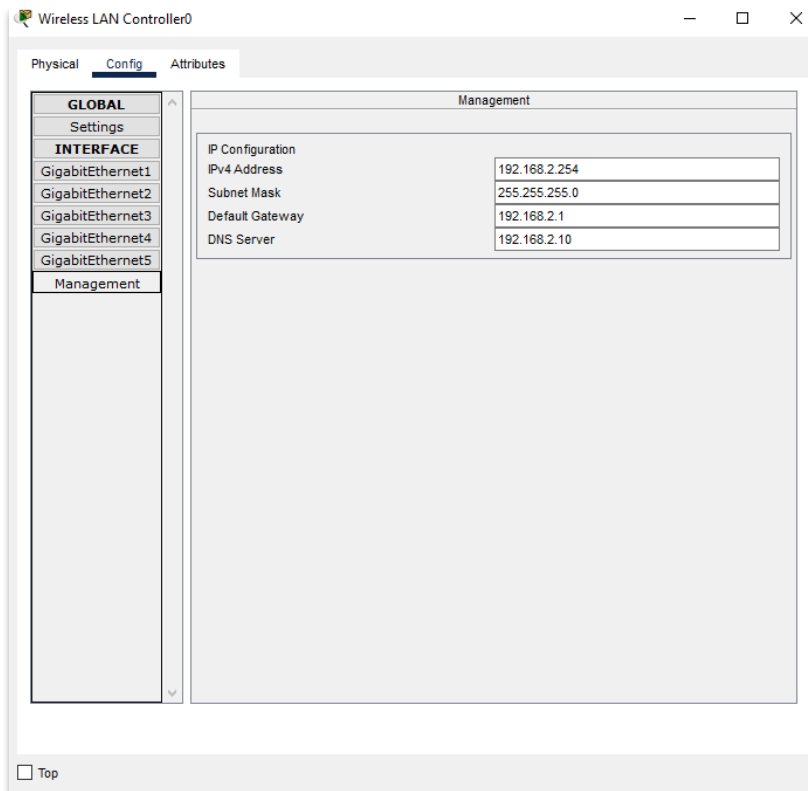
1	default	active	Gig0/2
4	VLAN0004	active	Fa0/2, Fa0/3, Fa0/4, Fa0/5 Fa0/6, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Fa0/11, Fa0/12, Fa0/13 Fa0/14, Fa0/15, Fa0/16, Fa0/17 Fa0/18, Fa0/19, Fa0/20, Fa0/21 Fa0/22, Fa0/23, Fa0/24

**Note:** We will do the same steps for VLAN5&6



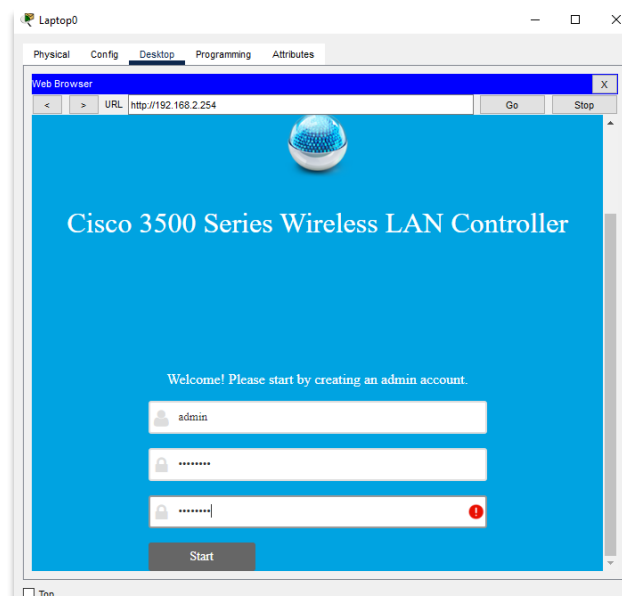
## WLC and Access Point configuration:

- Go to the WLC
- Click config
- Choose management
- Add the IP address , subnet mask and default gateway.



The IP address should be in the same network with DHCP server.

- Open the laptop which connected with WLC and Click Web brows





- In URL field Enter <http://192.168.2.254> to reach the settings for the WLC.
- Enter username and password to create account.

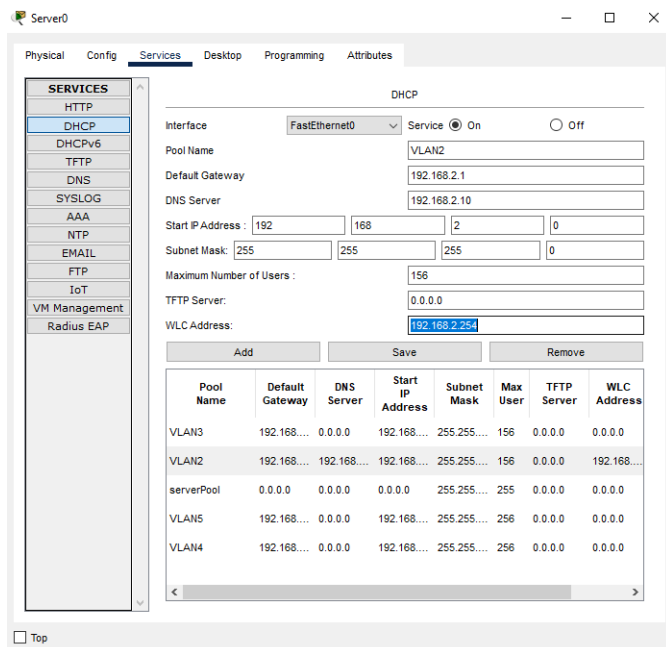
Now we will add the information for the SSID:

- Click Apply to make the WLC to create new SSID.





- To connect the access point with WLC we need to add WLC IP in DHCP server to send the WLC IP address to All access point in the Network.



- Now we will check the access

Device Name: Light Weight Access Point1  
Device Model: LAP-PT

Port	Link	IP Address	MAC Address
GigabitEthernet0	Up	192.168.2.6/24	0009.7C26.6001
Dot11Radio0	Up	<not set>	0009.7C26.6002

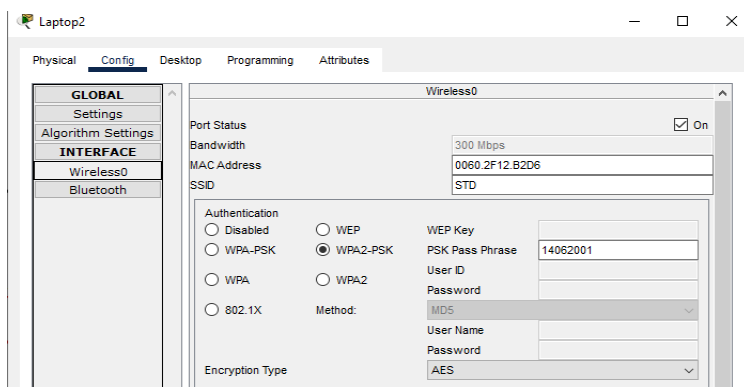
CAPWAP Status: Connected to 192.168.2.254

Providing WLANs:  
CCSIT-TEACHERS (CCSIT-TEACHERS)  
student (STD)  
guest (GUEST)

Physical Location: Intercity > Home City > Corporate Office >

- Now the WLC send the SSID to the access point to let devices connect with it.
- Connect the devices to the wireless network:

**Note:** only devices support Wireless connection can connect with the WLAN





➤ Check the connectivity

```
Laptop2
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ipconfig

Wireless0 Connection:(default port)

Connection-specific DNS Suffix...:
Link-local IPv6 Address.....: FE80::260:2FFF:FE12:B2D6
IPv6 Address.....: ::
IPv4 Address.....: 192.168.2.10
Subnet Mask.....: 255.255.255.0
Default Gateway.....: ::
192.168.2.1

Bluetooth Connection:

Connection-specific DNS Suffix...:
Link-local IPv6 Address.....: ::
IPv6 Address.....: ::
IPv4 Address.....: 0.0.0.0
Subnet Mask.....: 0.0.0.0
Default Gateway.....: ::
0.0.0.0

C:\>
```



## CONCLUSION:

By placing routers, switches, servers, WLCs, and devices on the topology, we were able to create a successful connected network for the small business. Colleagues in the organization may now communicate with colleagues in different departments to improve collaboration and data and information exchange.



# CASE STUDY



## Cloud and Grid computing:

### *Differences between Grid Computing and Cloud Computing.*

There is always the possibility that anything that refers to an existing object could be lost or disappear at any time, and data is no exception. In this case, virtualization can be beneficial. In the case of saving data, it's opened a new horizon with alternative methods of saving & backing up data. Provides quick and convenient protection of data against external and internal disasters, including the failure of systems as well.

Grid computing, also known as distributed computing, is a method that combines a group of computers in order to carry out complex tasks simultaneously and with a high level of performance as one supercomputer. This system provides the user with a powerful, robust system and storage [1]. Grid computing's key benefits are that it increases user productivity by offering transparent access to resources and allows work to be finished faster [7]. In contrast, Cloud computing refers to a network of servers connected to the internet to facilitate various tasks, including storing, sharing, and retrieving information and resources [2]. Cloud computing has become a popular choice for businesses because to its numerous benefits, including cost savings, greater productivity, efficiency, and performance, data backups, disaster recovery, and security [7]. We will discuss the differences between the grid computing and cloud computing in the next section.

Firstly, the architecture used and rescuers. For grid computing it's used in distributed architecture that takes one task and divided it in subtasks among the computing unit. Which can be allocated in different zones and countries. But in cloud computing each user have the ability to own their private resources used in event-driven and service-oriented architectures client architecture in centralized manner.

Next, the payment. In grid computing, there is no defined model in terms of prices, so the user doesn't have to pay anything, whereas in cloud computing, the user does. Cloud users pay to use the service. Grid computing requires the installation of the software component, which must be done locally. Cloud computing does not require any kind of software setup. [6]

The other difference is flexibility. Cloud computing can be easily fixed as opposed to grid computing. Also, in comparison to grid computing, cloud computing provides greater accessibility, owing to the differences in end-users who use the two types of computing.[6]



In cloud computing, the term "cloud" refers to the internet, The cloud manages data, security requirements, work queues, and so on by removing the needs and complexity of purchasing hardware and software to build applications that will be supplied as a service through the cloud, Grid computing is mostly used in academic research and is capable of handling large numbers of limited-duration job with huge amounts of data.[3]



As an IT expert, describe a scenario for each cloud solution where you will recommend AWS (Amazon), Azure (Microsoft) and Google cloud.

#### Scenario 1:

A multinational corporation that intends to launch an internet video streaming network. The desire of this firm to rely entirely on a cloud-based service poses a hurdle. Millions of people are anticipated to view extended films on the company's platform at the same time.

#### Recommendation for Scenario 1:

As members of the project team, we know that their platform will be crowded with visitors and members, thus the company's goal to make a positive first impression on its visitors cannot be overstated. It is critical to give them with a faultless video streaming service. As a result, we strongly suggest using AWS (Amazon Web Services) in this situation. The ability to process video streaming smoothly is one of the main reasons for adopting this solution. Second, because of the projected high amount of visitors, it will keep the company from becoming a pandemic. Furthermore, this business provides excellent support for huge corporations. [8]

#### Scenario 2:

An owner of a huge website with a lot of data and based on machine learning chose to integrate it with another large website in order to expand the range of common clients. The problem is that he is unfamiliar with cloud computing. For his strategy, he wants a dependable, integrated, and simple-to-use solution.

#### Recommendation for Scenario 2:

We strongly advise this business owner to use Google Cloud Platform for a variety of reasons. This company's owner needs a solution that can manage massive volumes of data, especially after merging two massive-data websites. This is undeniably possible with Google Cloud, since this service ensures that customers' massive data is processed using techniques such as artificial intelligence (AI) and machine learning. Massive data can be simply managed this way. Google Cloud also provides a platform that allows developers, data scientists, and data engineers to collaborate on machine learning projects. [9]



### Scenario 3:

A business aims to better itself, achieve its objectives, and progress while lowering costs and spending on consultancy and on-site resources for cloud services. It requires a business that can give technical and technological assistance 24 hours a day, seven days a week. This firm likewise wants to use cloud computing all around the world.

### Recommendation for Scenario 3:

This situation was discovered to be comparable to a real-life case in a case. As a result, going with Microsoft Azure is a terrific choice because it will strengthen the company's plan and prepare it for the market. The beautiful thing about Azure is that it will enable them to reach out to help desk support at any time. It will also save them money because they used to spend a lot of money on products that can be had for less money. [10]





## Recourses:

- [1] International Journal of Recent Trends in Engineering and Research, 2018. A Novel Resource Selection Method for Cost Optimized Workflow Scheduling with Deadline Constraint using Particle Swarm Optimization for IaaS Cloud. 3(10), pp.283-296.
- [2] thinkIT Solutions. n.d. What is Cloud Computing? | How Does Cloud Computing Work?. [online] Available at: <<https://www.thinkitsolutions.com/what-is-cloud-computing-how-does-it-work/>> [Accessed 6 May 2022].
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