

Secure Campus Network

COMPUTER NETWORKS LAB



INSTRUCTOR:

Ma'am Farwa Shah

SUBMITTED BY:

Muhammad Usama. (2020-CS-652)

Abdullah Arif. (2020-CS-694)

Department of Computer Science, New Campus
University of Engineering and Technology, Lahore, Pakistan

INTRODUCTION

Digitalization is crucial, and educational institutions should adapt to become a "digital campus." Going wireless plays a vital role in this process, making it easy to manage devices and reducing cable usage. The wireless network is essential, providing an efficient way to access educational resources anytime and anywhere, with mobility and flexibility.

● Project Statement

This mini-project demonstrates wireless networking in a simulated campus network, divided into two areas and focusing on mobility. DNS, Email, and HTTP servers are included for maximum resource utilization, providing internet connectivity, data sharing, and web service access for staff and students. A wireless network broadcasts an access signal to the workstations or PCs. This enables mobility among laptops, tablets, and PCs from room to room while maintaining a firm network connection continuously. A wireless network also presents additional security requirements.

Benefits:

Benefits of wireless networking over wired networking^[5]

1. Mobility
2. Less Hassle
3. Accessibility
4. Expandability
5. Guest Access

WORK DONE

In order to make our project understandable, we have divided the content into steps. They are as follows:

1. Software and hardware requirements

Before heading towards the implementation we need to make sure of the following requirements.

- A proper workstation (any mid-high range laptop will suffice).
- Packet Tracer by Cisco
- 8 GB RAM.
- Any 10,000+ Average CPU Mark scored processor.
- 16 GB of dedicated hard disk space.
- USB 3.0+ port

2. Brief knowledge about our approach

The proposed wireless network is implemented for a university campus. We have made a virtual visualization of the network using the Cisco Packet tracer which provides a huge platform for users to test their projects using simulation tools. A Wireless network in an educational campus makes it easier for teachers and students to access educational resources, by enabling an important platform to exchange information.



3. Network Requirements

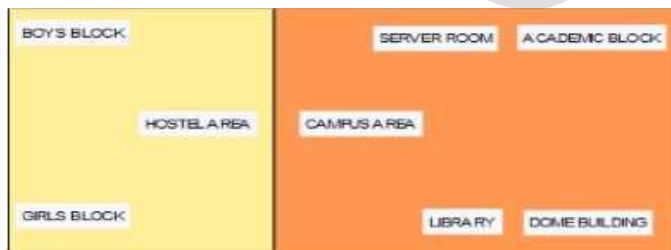
The network is divided into 2 areas:

- **Campus Area**

The Campus area is further divided into various accessing points like Dome building, Library, Academic Blocks (AB1 and AB2), Server Center, and IT consulting.

- **Hostel Area**

The Hostel area is further divided into Boys blocks and Girls blocks respectively.



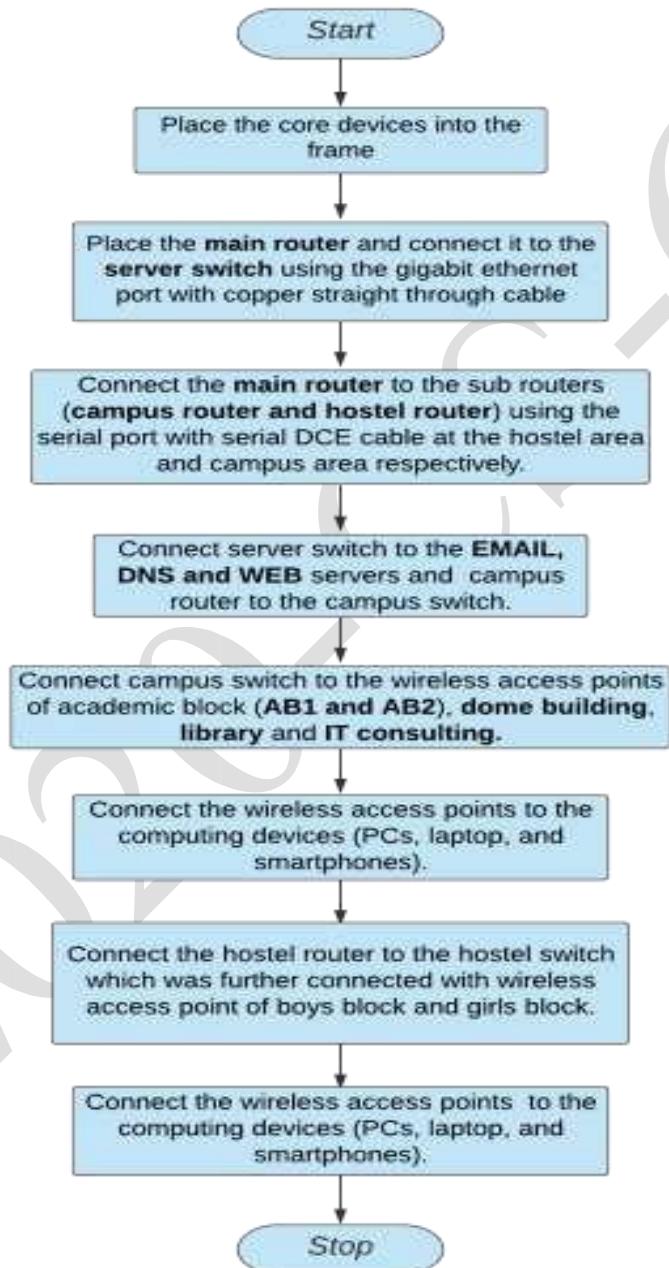
Devices used in the network

Devices	Quantity
1) Router (1941)	3
2) Switches (2960-24TT)	3
3) EMAIL server	1
4) DNS server	1
5) WEB server (HTTP)	1
6) Wireless Device (Access Point)	7
7) PCs	12
8) Laptops	10
9) Smartphones	2

Devices used in the network



4. Flow Diagram



5. Configuring IP Addresses

We have attached the screenshots of all the IP configuration below:

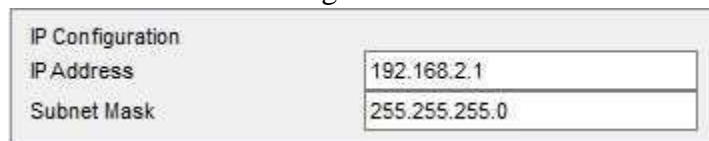
- Main Router configuration



Global Settings

Display Name	main_router	
Hostname	main_router	
NVRAM	Erase	Save
Startup Config	Load...	Export...
Running Config	Export...	Merge...

GigabitEthernet0/1



IP Configuration

IP Address	192.168.2.1
Subnet Mask	255.255.255.0

Serial0/1/0



IP Configuration

IP Address	10.0.0.1
Subnet Mask	255.0.0.0

Serial0/1/1



IP Configuration

IP Address	11.0.0.1
Subnet Mask	255.0.0.0

RIP



Network Address
10.0.0.0
11.0.0.0
192.168.1.0
192.168.2.0

- DNS SERVER

IP Configuration

☐ DHCP ☒ Static

IP Address: 192.168.2.3

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.2.1

DNS Server: 192.168.2.3

Global Settings

Display Name: DNS

Gateway/DNS IPv4:

☐ DHCP ☒ Static

Gateway: 192.168.2.1

DNS Server: 192.168.2.3

- COLLEGE ROUTER

Global Settings

Display Name: College Router

Hostname: Router1

Network Address: 11.0.0.0

192.168.1.0

GigabitEthernet0/0

IP Configuration

IP Address: 192.168.1.1

Subnet Mask: 255.255.255.0

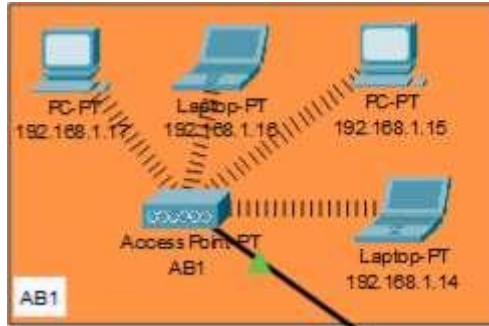
Serial0/1/0

IP Configuration

IP Address: 11.0.0.2

Subnet Mask: 255.0.0.0

- **ACADEMIC BLOCK 1**



IP Address are as follows

192.168.1.14- Laptop

192.168.1.15- PC

192.168.1.16- Laptop

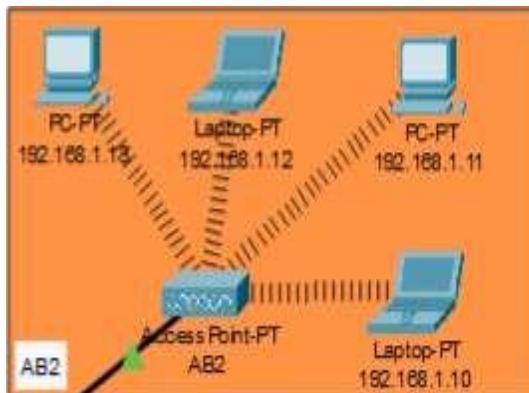
192.168.1.17- PC

Subnet Mask- 255.255.255.0

Default Gateway- 192.168.1.1

DNS Server- 192.168.2.3

- **ACADEMIC BLOCK 2**



IP Address are as follows

192.168.1.10- Laptop

192.168.1.11- PC

192.168.1.12- Laptop

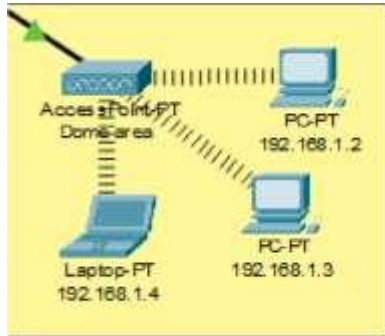
192.168.1.13- PC

Subnet Mask- 255.255.255.0

Default Gateway- 192.168.1.1

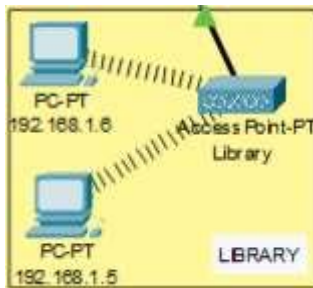
DNS Server- 192.168.2.3

- **DOME BUILDING**



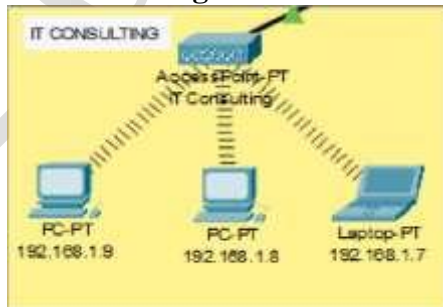
IP Addresses are as follows
 192.168.1.2- PC
 192.168.1.3- PC
 192.168.1.4- Laptop
 Subnet Mask- 255.255.255.0
 Default Gateway- 192.168.1.1
 DNS Server- 192.168.2.3

- **LIBRARY**



IP Addresses are as follows
 192.168.1.5- PC
 192.168.1.6- PC
 Subnet Mask- 255.255.255.0
 Default Gateway- 192.168.1.1
 DNS Server- 192.168.2.3

- **IT Consulting**



IP Addresses are as follows
 192.168.1.7- Laptop
 192.168.1.8- PC

192.168.1.9- PC
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.1.1
DNS Server- 192.168.2.3

- **HOSTEL ROUTER**

Global Settings		Network Address
Display Name	Hostel Router	10.0.0.0
Hostname	Router2	192.168.3.0

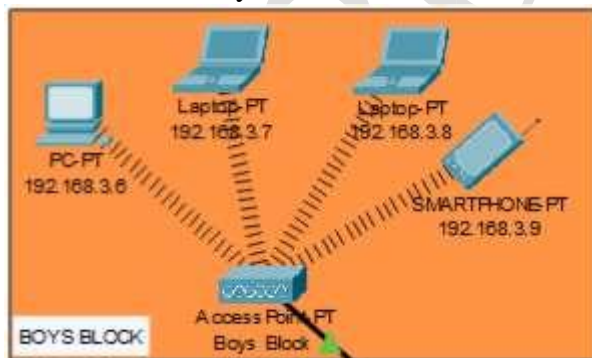
GigabitEthernet0/0

IP Configuration	
IP Address	192.168.3.1
Subnet Mask	255.255.255.0

Serial0/1/0

IP Configuration	
IP Address	10.0.0.2
Subnet Mask	255.0.0.0

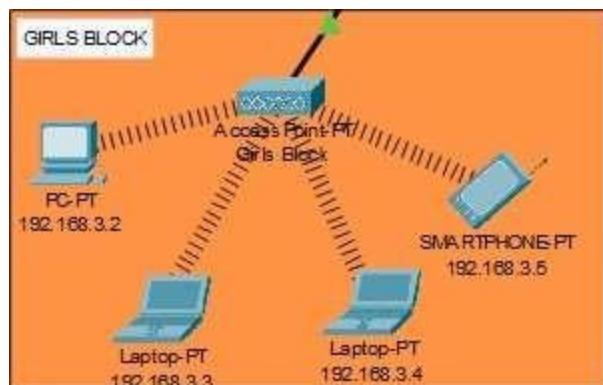
- **Boys Block**



IP Addresses are as follows
192.168.3.6- PC
192.168.3.7- Laptop
192.168.3.8- PC
192.168.3.9- Smartphone
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.3.1

DNS Server- 192.168.2.3

- Girls Block



IP Addresses are as follows

192.168.3.2- PC

192.168.3.3- Laptop

192.168.3.4- PC

192.168.3.5- Smartphone

Subnet Mask- 255.255.255.0

Default Gateway- 192.168.3.1

DNS Server- 192.168.2.3

WIRELESS ACCESS POINT

SSID	Password
1)muj_dome	1234567890
2)muj_library	1234567890
3)muj_ITC	1234567890
4)muj_AB1	1234567890
5)muj_AB2	1234567890
6)muj_boys	1234567890
7)muj_girls	1234567890

Port 1

Port Status ☒ 0

SSID

2.4 GHz Channel

Coverage Range (meters)

Authentication

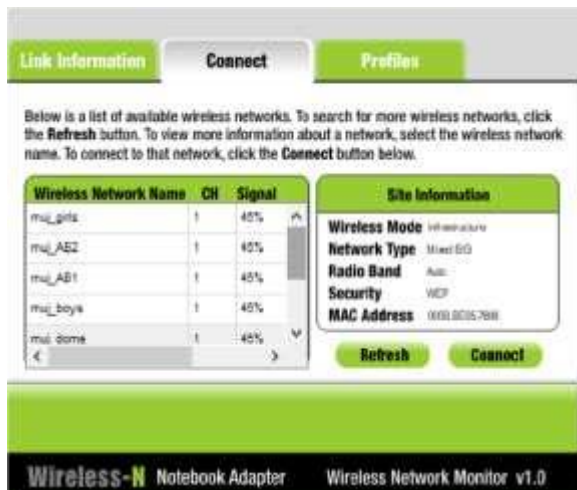
☐ Disabled ☒ WEP WEP Key

☐ WPA-PSK ☐ WPA2-PSK PSK Pass Phrase

6. Securing the network

Passwords are used in accessing the router and all the wireless networks (mentioned in step 5 wireless access point) to make the access limited to University authorized users only.

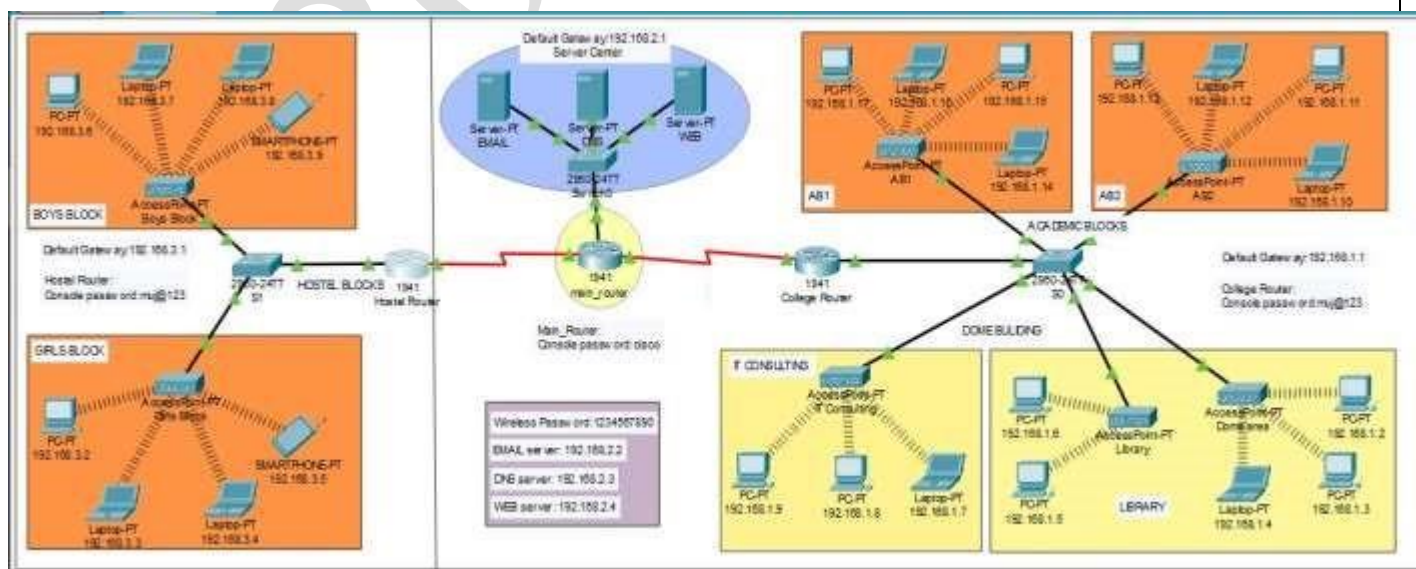
Router Name	Passwords
1)main_router	Console password: cisco
2)Router1(College Router)	Console password:muj@123
3)Router2(Hostel Router)	Console password:muj@123



Connectivity of wireless network on computing devices

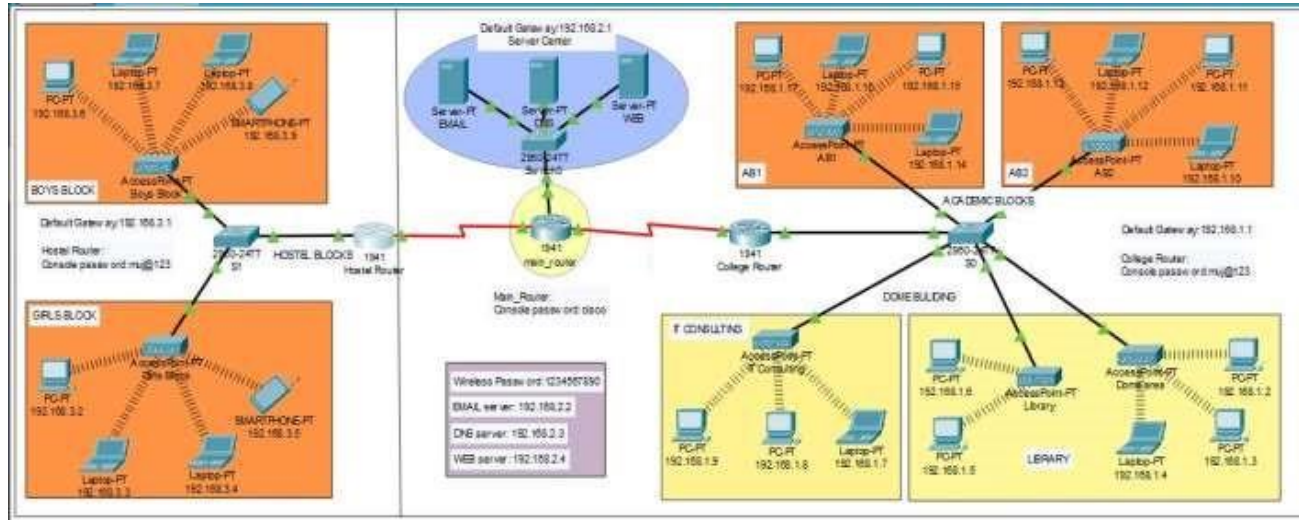
RESULT & DISCUSSION

Finally, we have combined all the steps as mentioned in chapter 3 (work done) and implemented the desired wireless network for University. We have the complete network providing various facilities to the teaching staff, non-teaching staff, and students.



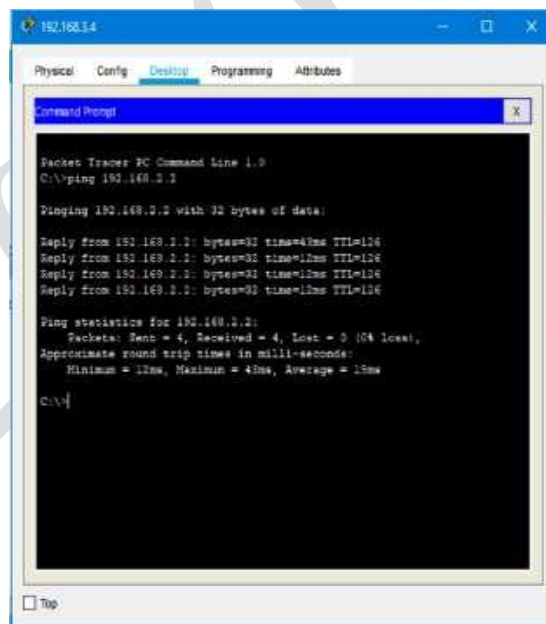
Final Simulation:

In Simulation Mode, you can watch your network run at a slower pace, observing the paths that packets take and inspecting them in detail. The proposed architecture, when simulated on Cisco Packet Tracer, produced results which are demonstrated as follows:

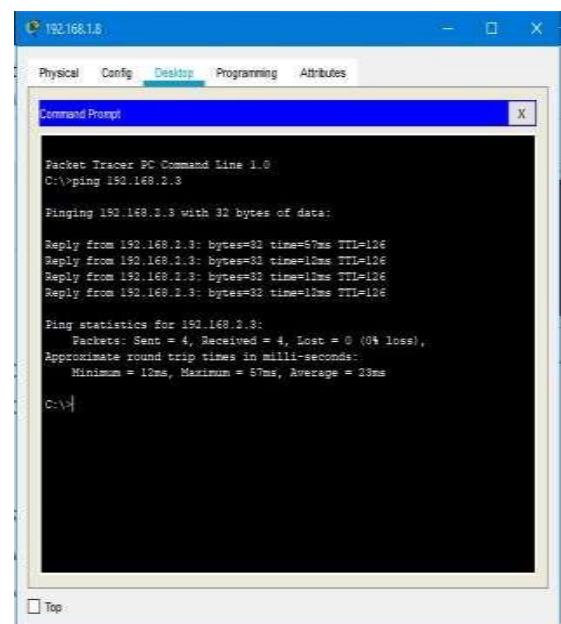


Ping Test:

Network connectivity and communication can be tested using the ping command, followed by the domain name or the IP address of the device (equipment) whose connectivity one wishes to verify.



PingTest for EMAIL server



Ping Test for DNS server



```
192.168.1.2
Physical Config Desktop Programming Accessories

Command Prompt

Packet Tracer PC Command Line 1.0
C:\>ping 192.168.2.4

Pinging 192.168.2.4 with 32 bytes of data:

Request timed out.
Reply from 192.168.2.4: bytes=32 time=11ms TTL=126
Reply from 192.168.2.4: bytes=32 time=11ms TTL=126
Reply from 192.168.2.4: bytes=32 time=11ms TTL=126

Ping statistics for 192.168.2.4:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 11ms, Average = 11ms

C:\>
```

Ping Test for WEB server

CONCLUSION AND FUTURE WORK

We started our discussion with the word “digitalization” and in order to achieve it, we aimed to start with an educational institute, and finally, we designed a network for a University, which is wireless. As we mentioned, mobility and efficiency are the key aspects of wireless networks, which were our main goal, and hence, we decided to shift to a wireless network instead of a wired one, making our network clean and less chaotic.

In this project, we designed a University Network using Cisco Packet Tracer that uses a networking topology implemented using servers, routers, switches, and end devices in a multiple area networks. We have covered all the necessary features that are required for a network to function properly. We have included a DNS server and a web server for establishing a smooth communication system between different areas of our network and specifically for the communication between students and teachers. We have included an email server to facilitate intra university communication through emails within the domain.

REFERENCES

[3]<https://computernetworking747640215.wordpress.com/2018/07/05/secure-shell-sshconfigurationon-a-switch-and-router-in-packet-tracer/>

[4]<http://router.over-blog.com/article-how-to-configure-cisco-router-password-106850439.html>

[5]<https://www.cognoscape.com/benefits-going-wireless/>

2020-CS-652