



# **COLLEGE NETWORK PROJECT REPORT**

# **BAHRIA UNIVERSITY ISLAMABAD CAMPUS**

**DCN LAB FINAL PROJECT**

# **MEMEBERS**

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# 01. INTRODUCTION

This College Network Scenario is about designing a topology of a network that is a LAN (Local Area Network) for a college in which various computers of different departments are set up so that they can interact and communicate with each other by interchanging data. To design a networking scenario for a college which connect various departments to each other's, it puts forward communication among different departments. CNS is used to design a systematic and well-planned topology, satisfying all the necessities of the college (i.e. client). CNS come up with a network with good performance.

## 02. OBJECTIVES

The main objective of the proposed network design for the college is to modernize the existing network infrastructure, enhancing its overall capabilities and increasing its flexibility to meet the evolving needs of the institution. By updating the network, the aim is to significantly improve performance, ensuring faster data transmission and reliable connectivity across various departments. This enhancement will support a higher volume of devices and applications, facilitating seamless communication and collaboration among students, faculty, and administrative staff.

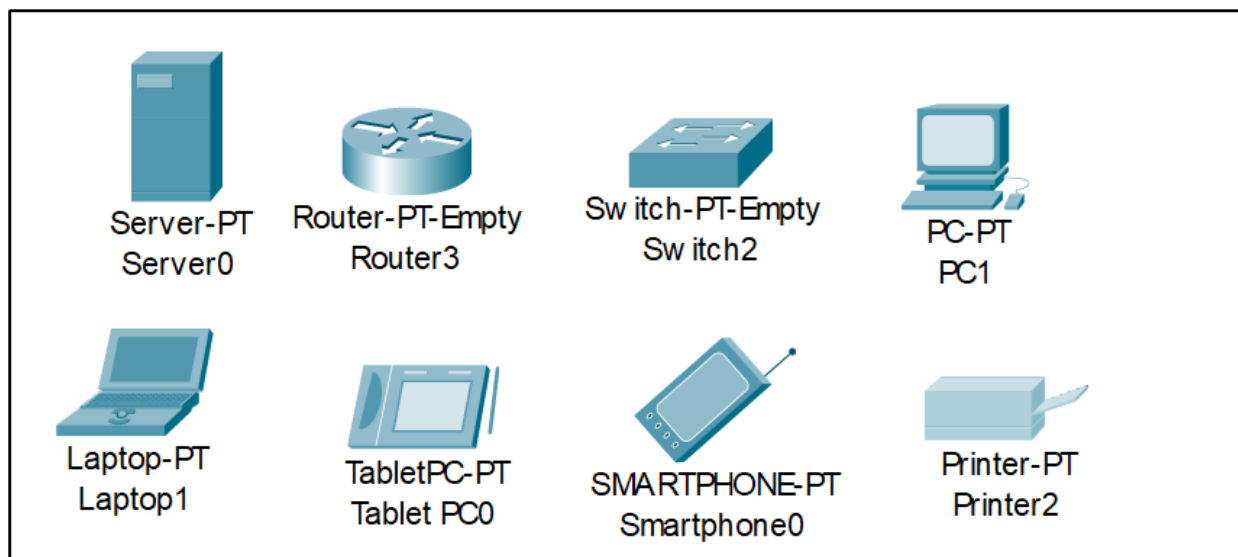
## 03. NETWORK REQUIREMENTS

1. The new system should be able to reduce internet downtime.  
Download and upload links should be.
2. maintained above 5 Mbps speed requirement.
3. The network will be scalable.
4. The system should support remote access.
5. Should comprise of data centers with necessary security features and support.

# 04. NETWORK DEVICES

## Devices Used in The Network

Devices	Quantity
Servers	3
Routers	3
Switches	5
PCs	15
Laptops	1
Tablets	1
Smart Phones	1
Printers	3



# 05. IP ADDRESSING PLAN

IT DEPARTMENT (192.168.1.0)	
IT INSTRUCTOR	192.168.1.2
IT LAB 1	192.168.1.3
IT LAB 2	192.168.1.4
IT LAB 3	192.168.1.5
IT LAB 4	192.168.1.6
PRINTER 0	192.168.1.7

CS DEPARTMENT (192.168.2.0)	
CS INSTRUCTOR	192.168.2.2
CS LAB 1	192.168.2.3
CS LAB 2	192.168.2.4
CS LAB 3	192.168.2.5
CS LAB 4	192.168.2.6
PRINTER 7	192.168.2.7

SERVER ROOM (1.0.0.0)	
FTP SERVER	1.0.0.4
DNS SERVER	1.0.0.2
WEB SERVER	1.0.0.3

INTERNET LAB (192.168.0.0)	
LAB PC2	128.168.0.2
LAB PC3	128.168.0.3
LAB PC4	128.168.0.4
LAB PCS5	128.168.0.5
PRINTER 5	128.168.0.6

PRINCIPAL ROOM (192.168.4.0)	
PC 0	128.168.4.2
LAPTOP 0	128.168.4.3
SMARTPHONE1	128.168.100
TABLE PC 1	128.168.0.101



# 07. IP CONFIGURATION

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

## Router 0

Display Name	Router0	
Hostname	Router	
NVRAM	Erase	Save
Startup Config	Load...	Export...
Running Config	Export...	Merge...

## FastEthernet0/0

IP Configuration	
IPv4 Address	192.168.1.1
Subnet Mask	255.255.255.0

## FastEthernet1/0

IP Configuration	
IPv4 Address	192.168.2.1
Subnet Mask	255.255.255.0

## Serial2/0

IP Configuration	
IPv4 Address	10.10.0.1
Subnet Mask	255.0.0.0

## RIP

Network Address
10.0.0.0
192.168.1.0
192.168.2.0

## Router 1

Display Name	Router1	
Hostname	Router	
NVRAM	Erase	Save
Startup Config	Load...	Export...
Running Config	Export...	Merge...

## FastEthernet0/0

IP Configuration	
IPv4 Address	192.168.3.1
Subnet Mask	255.255.255.0

## FastEthernet1/0

IP Configuration	
IPv4 Address	192.168.4.1
Subnet Mask	255.255.255.0

## Seria2/0

IP Configuration	
IPv4 Address	10.10.0.2
Subnet Mask	255.0.0.0

## Seria3/0

IP Configuration	
IPv4 Address	20.20.0.1
Subnet Mask	255.0.0.0

## RIP

Network Address
10.0.0.0
20.0.0.0
192.168.3.0
192.168.4.0

## Router 2

Display Name	<input type="text" value="Router2"/>	
Hostname	<input type="text" value="Router"/>	
NVRAM	<input type="button" value="Erase"/>	<input type="button" value="Save"/>
Startup Config	<input type="button" value="Load..."/>	<input type="button" value="Export..."/>
Running Config	<input type="button" value="Export..."/>	<input type="button" value="Merge..."/>

## FastEthernet0/0

IP Configuration	
IPv4 Address	<input type="text" value="1.0.0.1"/>
Subnet Mask	<input type="text" value="255.0.0.0"/>

## FastEthernet1/0

IP Configuration	
IPv4 Address	<input type="text" value="128.168.0.1"/>
Subnet Mask	<input type="text" value="255.255.0.0"/>

## Serial2/0

IP Configuration	
IPv4 Address	<input type="text" value="20.20.0.2"/>
Subnet Mask	<input type="text" value="255.0.0.0"/>

## RIP

Network Address
<input type="text" value="1.0.0.0"/>
<input type="text" value="20.0.0.0"/>
<input type="text" value="128.168.0.0"/>

## FTP Server

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	1.0.0.4
Subnet Mask	255.0.0.0
Default Gateway	1.0.0.1
DNS Server	0.0.0.0

Display Name	FTP
Gateway/DNS IPv4	
<input type="radio"/> DHCP	
<input checked="" type="radio"/> Static	
Default Gateway	1.0.0.1
DNS Server	

## WEB Server

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	1.0.0.3
Subnet Mask	255.0.0.0
Default Gateway	1.0.0.1
DNS Server	0.0.0.0

Display Name	WEB
Gateway/DNS IPv4	
<input type="radio"/> DHCP	
<input checked="" type="radio"/> Static	
Default Gateway	1.0.0.1
DNS Server	

## DNS Server

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	1.0.0.2
Subnet Mask	255.0.0.0
Default Gateway	1.0.0.1
DNS Server	0.0.0.0

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	1.0.0.2
Subnet Mask	255.0.0.0

# 06. ROUTING PROTOCOL PLAN

Routing Information Protocol (RIP) is a dynamic routing protocol which uses hop count as a routing metric to find the best path between the source and the destination network. It is a distance vector routing protocol which has AD value 120 and works on the application layer of OSI model.

Router 0:

The screenshot displays the Cisco Packet Tracer interface. On the left, a network diagram shows a central router (Router0) connected to several other devices, including a switch and multiple PCs. The network is divided into two main sections: a green section at the top and a red section at the bottom. The green section contains a switch and several PCs, while the red section contains a switch and more PCs. The router is connected to both sections. The right side of the image shows the Router0 CLI window, which displays the following output:

```
IOS Command Line Interface
E3488K bytes of ATA CompactFlash (Read/Write)
Press RETURN to get started!

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
%LINK-5-CHANGED: Interface Serial2/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

Router>enable
Router#show 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

R    1.0.0.0/8 [120/2] via 10.10.0.2, 00:00:10, Serial2/0
C    10.0.0.0/8 is directly connected, Serial2/0
R    20.0.0.0/8 [120/1] via 10.10.0.2, 00:00:10, Serial2/0
R    128.169.0.0/16 [120/2] via 10.10.0.2, 00:00:10, Serial2/0
C    192.169.1.0/24 is directly connected, FastEthernet0/0
C    192.169.2.0/24 is directly connected, FastEthernet1/0
R    192.169.4.0/24 [120/1] via 10.10.0.2, 00:00:10, Serial2/0

Router#
```

At the bottom of the CLI window, there is a table showing the status of the network:

Destination	Type	Color	Time(sec)	Periodic	Num	Edit
IT LAB 3	ICMP		0.000	N	15	(ec
Tablet PC1	ICMP		0.000	N	16	(ec

# Router 1

Press RETURN to get started!

\$LINK-5-CHANGED: Interface Serial2/0, changed state to up

\$LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up

\$LINK-5-CHANGED: Interface Serial3/0, changed state to up

\$LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up

Router>enable

Router#show 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

R 1.0.0.0/8 [120/1] via 20.20.0.2, 00:00:14, Serial3/0

C 10.0.0.0/8 is directly connected, Serial2/0

C 20.0.0.0/8 is directly connected, Serial3/0

R 128.168.0.0/16 [120/1] via 20.20.0.2, 00:00:14, Serial3/0

R 192.168.1.0/24 [120/1] via 10.10.0.1, 00:00:08, Serial2/0

R 192.168.2.0/24 [120/1] via 10.10.0.1, 00:00:08, Serial2/0

C 192.168.4.0/24 is directly connected, FastEthernet1/0

Router#

Ctrl+F6 to exit CLI focus

Copy Paste

# Router 2

Press RETURN to get started!

\$LINK-5-CHANGED: Interface Serial2/0, changed state to up

\$LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

\$LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up

\$LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

Router>enable

Router#show 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

C 1.0.0.0/8 is directly connected, FastEthernet0/0

R 10.0.0.0/8 [120/1] via 20.20.0.1, 00:00:01, Serial2/0

C 20.0.0.0/8 is directly connected, Serial2/0

C 128.168.0.0/16 is directly connected, FastEthernet1/0

R 192.168.1.0/24 [120/2] via 20.20.0.1, 00:00:01, Serial2/0

R 192.168.2.0/24 [120/2] via 20.20.0.1, 00:00:01, Serial2/0

R 192.168.4.0/24 [120/1] via 20.20.0.1, 00:00:01, Serial2/0

Router#

Ctrl+F6 to exit CLI focus

Copy Paste

Destination	Type	Color	Time(sec)	Periodic	Num	Edt
IT LAB 3	ICMP		0.000	N	15	(ec
Tablet PC1	ICMP		0.000	N	16	(ec

# 07. SECURING ROUTERS

Routers are also secured with ssh (Secure Shell). Routers and their assigned passwords are mentioned below:

Routers Name	Passwords
Router 0	SSH (admin)
Router 1	SSH (admin)
Router 2	SSH (admin)

## Router 0

```
Router0
Physical Config CLI Attributes
IOS Command Line Interface

% Invalid input detected at '^' marker.

Router(config)#enable
% Incomplete command.
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#end
Translating "end"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find computer address

Router#enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTRL/Z.
Router(config)#ip domain name admin
Router(config)#hostname r0
r0(config)#crypto key generate rsa
The name for the keys will be: r0.admin
Choose the size of the key modulus in the range of 360 to 2048 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.

How many bits in the modulus [512]: 1024
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]

r0(config)#enable password admin
*Mar 1 1:10:40.159: %SSH-5-ENABLED: SSH 1.99 has been enabled
r0(config)#username admin password admin
r0(config)#ip ssh version 2
r0(config)#line vty 0 15
r0(config-line)#transport input ssh
r0(config-line)#login local
r0(config-line)#
```

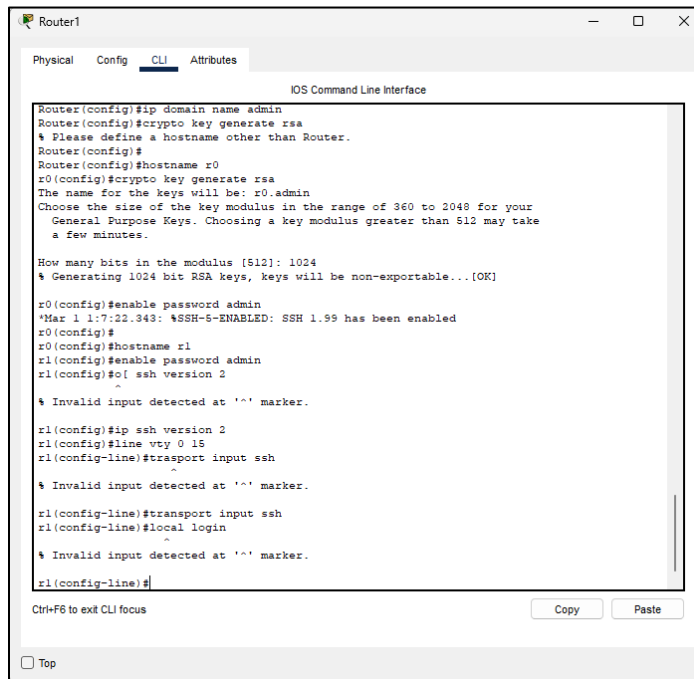
Ctrl+F6 to exit CLI focus

Copy Paste

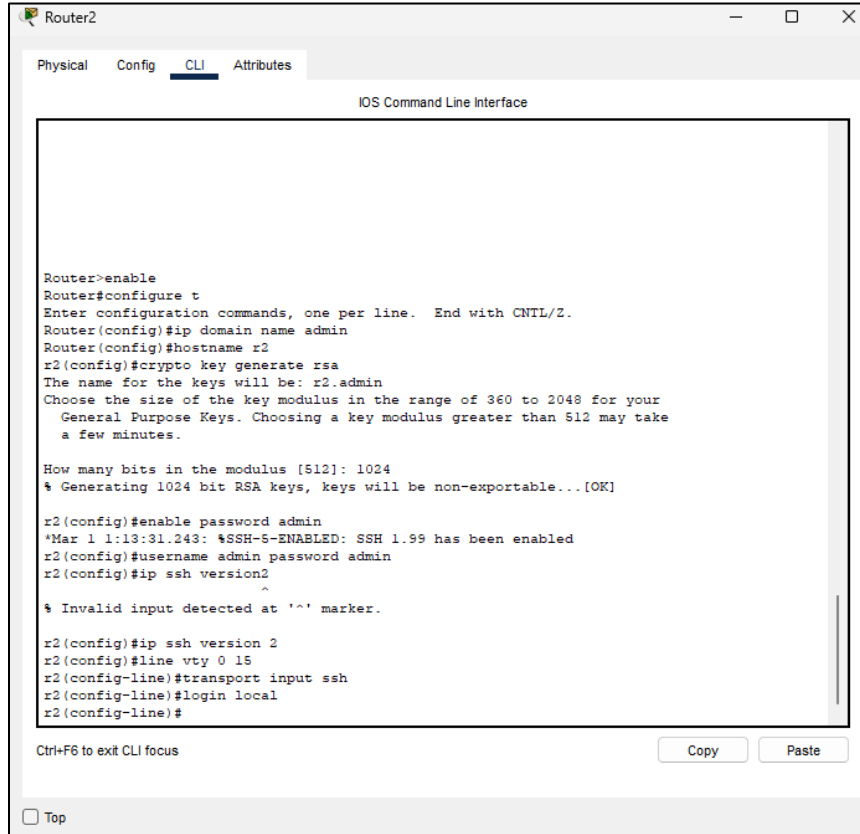
Top



# Router 1

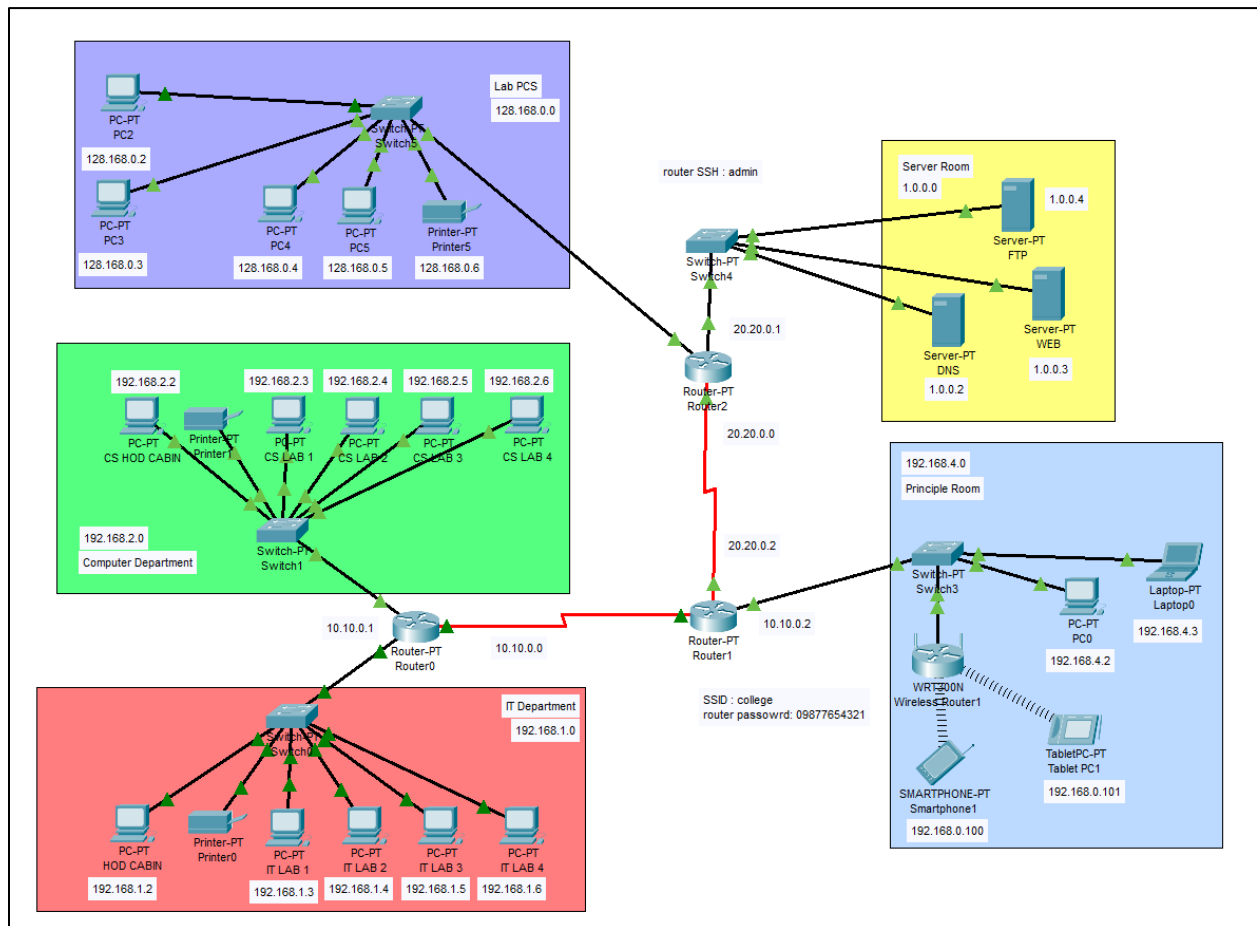


# Router 2

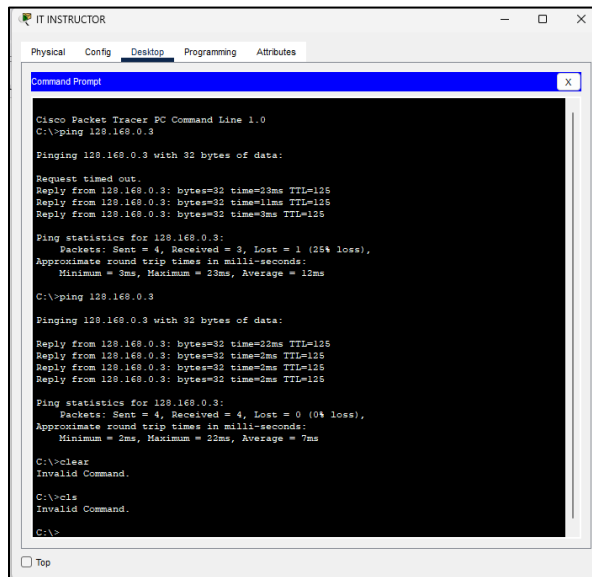


# 08. DESIGN, PING TEST, SIMMULATION

## Network Design



# Ping test



```
IT INSTRUCTOR
Physical Config Desktop Programming Attributes
Command Prompt X
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 128.169.0.3

Pinging 128.169.0.3 with 32 bytes of data:

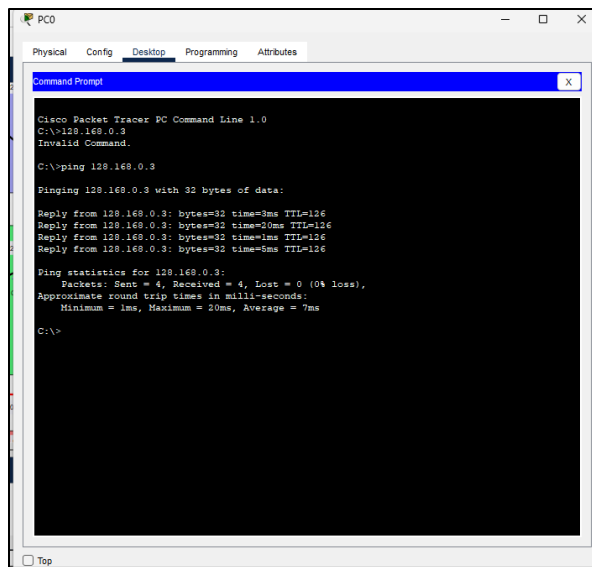
Request timed out.
Reply from 128.169.0.3: bytes=32 time=23ms TTL=125
Reply from 128.169.0.3: bytes=32 time=11ms TTL=125
Reply from 128.169.0.3: bytes=32 time=3ms TTL=125

Ping statistics for 128.169.0.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 3ms, Maximum = 23ms, Average = 12ms
C:\>ping 128.169.0.3

Pinging 128.169.0.3 with 32 bytes of data:

Reply from 128.169.0.3: bytes=32 time=22ms TTL=125
Reply from 128.169.0.3: bytes=32 time=2ms TTL=125
Reply from 128.169.0.3: bytes=32 time=2ms TTL=125
Reply from 128.169.0.3: bytes=32 time=2ms TTL=125

Ping statistics for 128.169.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 22ms, Average = 7ms
C:\>clear
Invalid Command.
C:\>cls
Invalid Command.
C:\>
```



```
PC0
Physical Config Desktop Programming Attributes
Command Prompt X
Cisco Packet Tracer PC Command Line 1.0
C:\>128.169.0.3
Invalid Command.
C:\>ping 128.169.0.3

Pinging 128.169.0.3 with 32 bytes of data:

Reply from 128.169.0.3: bytes=32 time=3ms TTL=126
Reply from 128.169.0.3: bytes=32 time=20ms TTL=126
Reply from 128.169.0.3: bytes=32 time=1ms TTL=126
Reply from 128.169.0.3: bytes=32 time=5ms TTL=126

Ping statistics for 128.169.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 20ms, Average = 7ms
C:\>
```

# Simulation

File Edit Options View Tools Extensions Window Help

Logical Physical x: 1195, y: 302

Root 01:08:30

Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device
	0.902	Switch1	CS LAB 2
	0.902	Switch5	PC4
	0.903	PC4	Switch5
	0.904	--	Switch5
	0.904	Switch5	PC2
	0.904	--	Switch5

Reset Simulation ☒ Constant Delay Captured to: 0.904 s

Play Controls

Event List Filters - Visible Events

ACL Filter, ARP, BGP, Bluetooth, CAPWAP, CDP, DHCP, DHCPv6, DNS, DTP, EAPOL, EIGRP, EIGRPv6, FTP, H.323, HSRP, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPsec, ISAKMP, IoT, IoT TCP, LACP, LLDP, NDP, NETFLOW, NTP, OSPF, OSPFv6, PAgP, POP3, PPP, PPPoE, PTP, RADIUS, REP, RIP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP, SYSLOG, TACACS, TCP, TFTP, Telnet, UDP, USB, VTP

Edit Filters Show All/None

Time: 00:00:48.521 PLAY CONTROLS

Scenario 0

New Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC2	PC4	ICMP		0.000	N	0	(edit)
	Successful	PC2	PC4	ICMP		0.900	N	1	(edit)

## 09. SUMMARY

The outcome of the proposed system will be a fail-safe backbone network infrastructure which meets the requirements for readily available access to information and security of the private network and ensures optimized productivity when telecommunication services are accessed. The installed equipment allowed to organize high-speed wired and wireless Internet access throughout the whole complex of hospital buildings as well as providing transfer of all types of data throughout the single optimized network.

# 10. REFERENCES

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