

Computer Network Lab

Semester Project



Topic:

University Network

Submitted To:

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Degree & Semester:

BSCS (6th Semester)

Department of Computer Science

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Lahore

Introduction: -

This University Network Scenario is about designing the topology of the University LAN network where various computers are set up in different departments so that they can communicate and communicate through data exchange. Designing a university communication environment that connects different departments with each other, prioritizes communication between different departments. CNS is used to design a structured and well-organized topology, satisfying all college needs (e.g. client). The CNS comes with an efficient network.

Objectives: -

The main objective of the proposed network is to update the network and also enhance capabilities and increase the flexibility of the network which will eventually provide good security.

Network Requirements: -

- At least two units will not be able to communicate with each other
- One unit must have two servers' web and email
- Restrict remaining units to access one or two servers
- The new system should be able to reduce internet downtime.
- Download and upload links should be maintained above 5 Mbps speed requirement.
- Network will be scalable.
- Should comprise of data centers with necessary security features and support.

IP Addressing Plan: -

Unit No 1

Computer Lab 1(128.168.0.0)	
PC 0	128.168.0.2
PC 1	128.168.0.3
PC 2	128.168.0.4
PC 3	128.168.0.5
Printer0	128.168.0.6

Unit No 2

SERVER ROOM (1.0.0.0)	
FTP ,HTTP Server	1.0.0.4
Email	1.0.0.6
DNS SERVER	1.0.0.2
HTTP SERVER	1.0.0.3

Unit No 3

Faculty Room (192.168.2.0)	
PC(4)	192.168.2.2
PC(5)	192.168.2.3
PC(6)	192.168.2.4
PC(7)	192.168.2.5
PC(8)	192.168.2.6
DHCP server	192.168.2.8

Unit No 4

IT DEPARTMENT Lab 1(Vlan 10)(192.168.1.0)+IT DEPARTMENT Lab 2 (192.168.1.0) VLAN (Vlan 20)(192.168.5.0)	
HOD vlan10	
PC0(1)	192.168.1.2
PC0(2)	192.168.1.3
PA Office vlan 20	
PC2(2)	192.168.5.2
PC3(2)	192.168.5.3

UNIT No 5

PA Office (192.168.3.0)	
PT PC	192.168.3.2
EXAM CELL	192.168.3.3
Enquiry PC	192.168.3.4
TPO	192.168.3.5
Printer 3	192.168.3.6
Printer 4	192.168.3.7
Printer 5	192.168.3.8

Unit No 6

PRINCIPLE ROOM (192.168.4.0)	
PC 18	192.168.4.2
Printer 6	192.168.4.4
Laptop0	192.168.4.3
DHCP Server	192.168.4.5

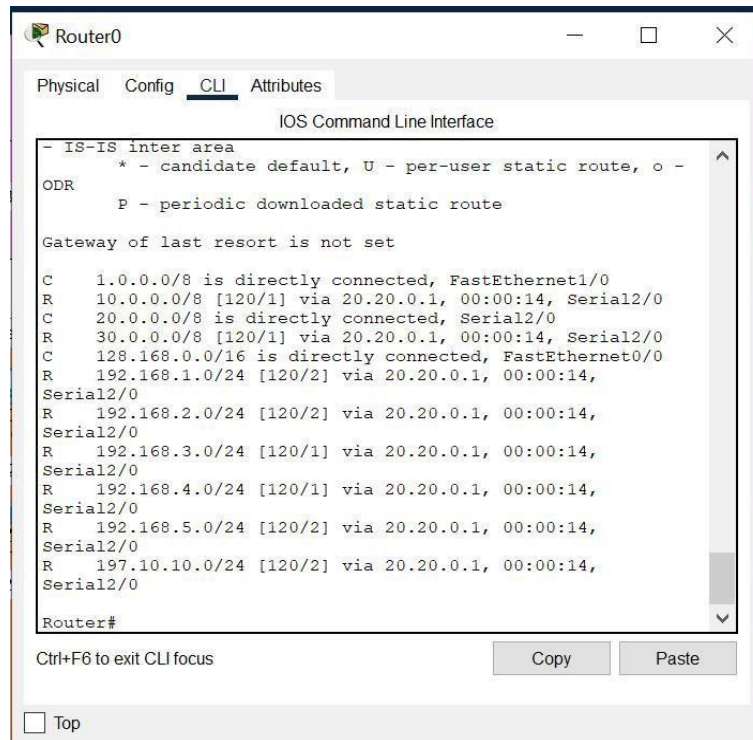
Unit No 7

IP=197.10.10.0

VLSM		Subnets	Starting IP	Broadcast Ip
197.10.10.2	30 hosts	255.255.255.224	197.10.10.0/27	197.10.10.31/27
197.10.10.34	20 hosts	255.255.255.224	197.10.10.32/27	197.10.10.63/27
197.10.10.64	10 hosts	255.255.255.240	197.10.10.64 /28	197.10.10.79 /28

Routing Protocol Plan: -

Routing Information Protocol (RIP) is a flexible route that uses hop counts as a transmission metric to find the best route between a source and a local network. It is a distance navigation protocol with an AD value of 120 and works on the OSI model application platform.



The screenshot shows the CLI of Router0 with the following output:

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

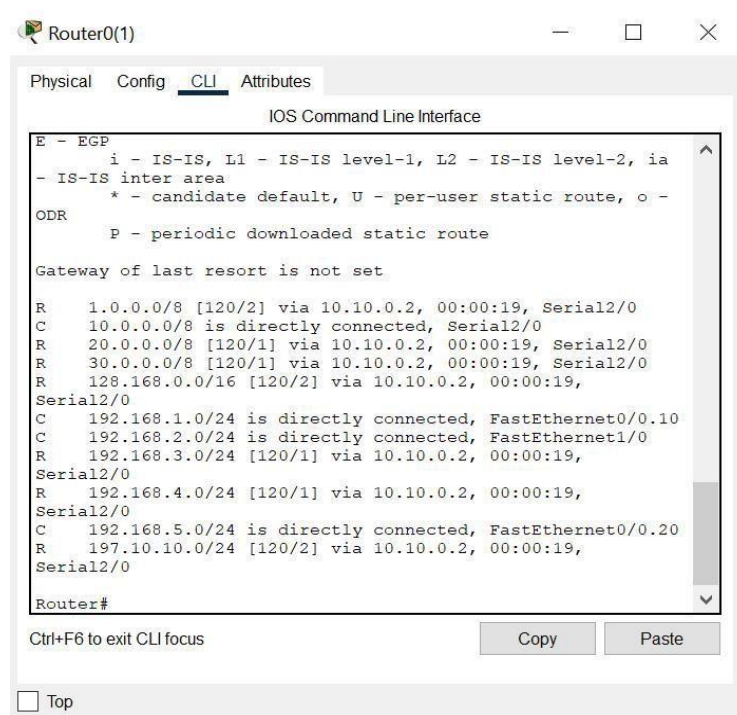
- IS-IS inter area
  * - candidate default, U - per-user static route, o -
ODR
  P - periodic downloaded static route

Gateway of last resort is not set

C 1.0.0.0/8 is directly connected, FastEthernet1/0
R 10.0.0.0/8 [120/1] via 20.20.0.1, 00:00:14, Serial2/0
C 20.0.0.0/8 is directly connected, Serial2/0
R 30.0.0.0/8 [120/1] via 20.20.0.1, 00:00:14, Serial2/0
C 128.168.0.0/16 is directly connected, FastEthernet0/0
R 192.168.1.0/24 [120/2] via 20.20.0.1, 00:00:14,
Serial2/0
R 192.168.2.0/24 [120/2] via 20.20.0.1, 00:00:14,
Serial2/0
R 192.168.3.0/24 [120/1] via 20.20.0.1, 00:00:14,
Serial2/0
R 192.168.4.0/24 [120/1] via 20.20.0.1, 00:00:14,
Serial2/0
R 192.168.5.0/24 [120/2] via 20.20.0.1, 00:00:14,
Serial2/0
R 197.10.10.0/24 [120/2] via 20.20.0.1, 00:00:14,
Serial2/0

Router#
```

Routing Protocol Plan for Router0



The screenshot shows the CLI of Router0(1) with the following output:

```
Router0(1)
Physical Config CLI Attributes
IOS Command Line Interface

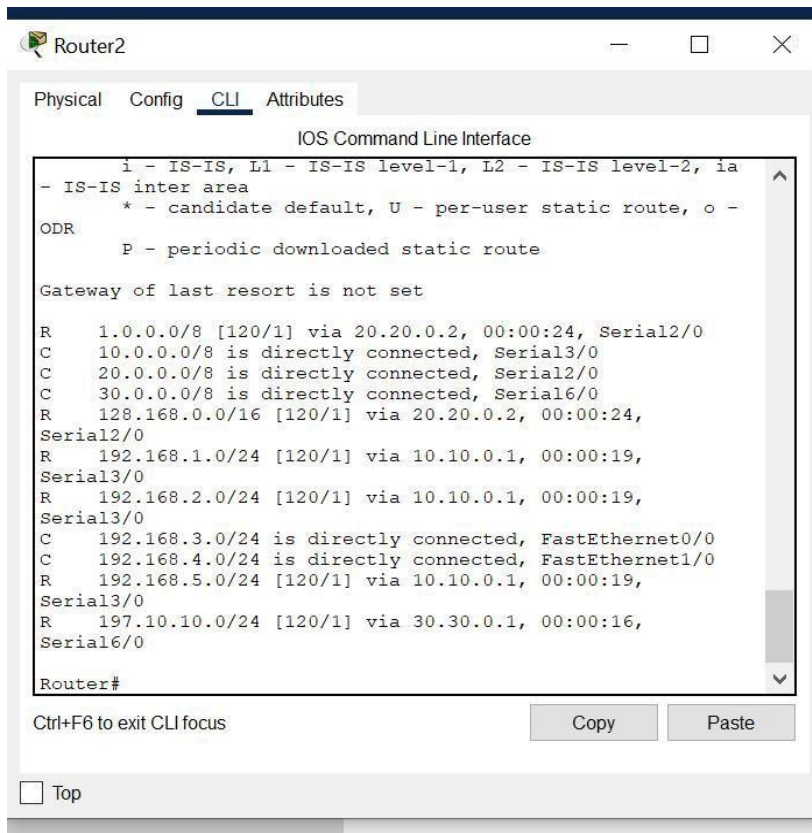
E - EGP
  i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia
- IS-IS inter area
  * - candidate default, U - per-user static route, o -
ODR
  P - periodic downloaded static route

Gateway of last resort is not set

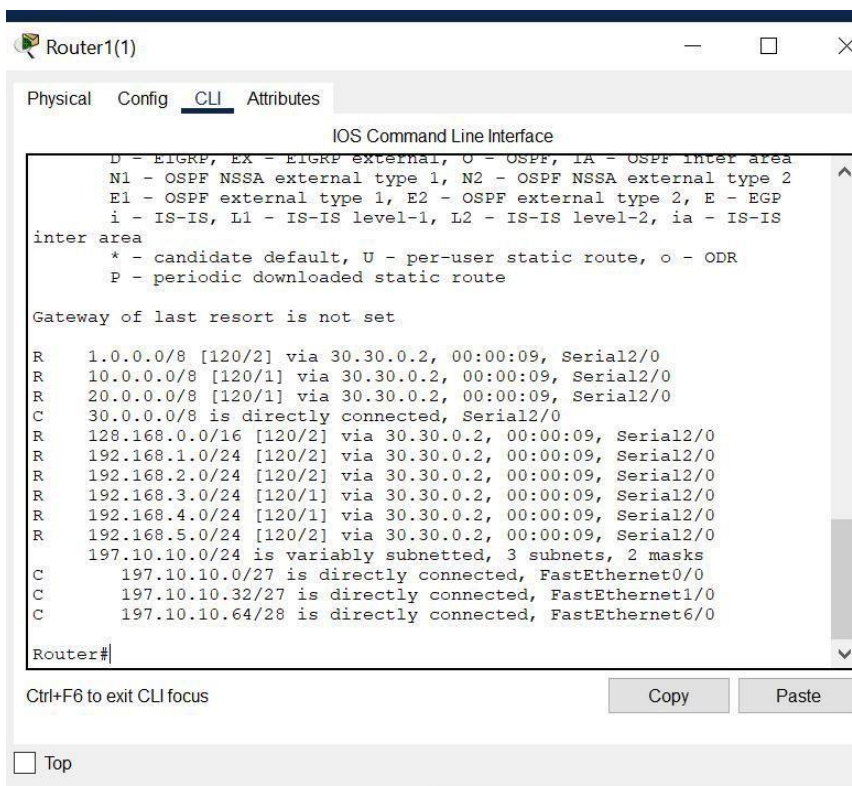
R 1.0.0.0/8 [120/2] via 10.10.0.2, 00:00:19, Serial2/0
C 10.0.0.0/8 is directly connected, Serial2/0
R 20.0.0.0/8 [120/1] via 10.10.0.2, 00:00:19, Serial2/0
R 30.0.0.0/8 [120/1] via 10.10.0.2, 00:00:19, Serial2/0
R 128.168.0.0/16 [120/2] via 10.10.0.2, 00:00:19,
Serial2/0
C 192.168.1.0/24 is directly connected, FastEthernet0/0.10
C 192.168.2.0/24 is directly connected, FastEthernet1/0
R 192.168.3.0/24 [120/1] via 10.10.0.2, 00:00:19,
Serial2/0
R 192.168.4.0/24 [120/1] via 10.10.0.2, 00:00:19,
Serial2/0
C 192.168.5.0/24 is directly connected, FastEthernet0/0.20
R 197.10.10.0/24 [120/2] via 10.10.0.2, 00:00:19,
Serial2/0

Router#
```

Routing Protocol Plan for Router0(1)



Routing Protocol Plan for Router2



Routing Protocol Plan for Router1(1)

Switch Configuration for VLAN: -

```
% Invalid input detected at '^' marker.
Switch#show vlan brief

VLAN Name                Status    Ports
-----
1    default                active    Fa0/6, Fa0/7,
Fa0/8, Fa0/9
Fa0/11, Fa0/12, Fa0/13
Fa0/15, Fa0/16, Fa0/17
Fa0/19, Fa0/20, Fa0/21
Fa0/23, Fa0/24, Gig0/1
10   HOD                    active    Gig0/2
Fa0/1, Fa0/2
20   Faculty                active    Fa0/3, Fa0/4
1002 fddi-default          active
1003 token-ring-default    active
1004 fddinet-default        active
1005 trnet-default          active
Switch#
```

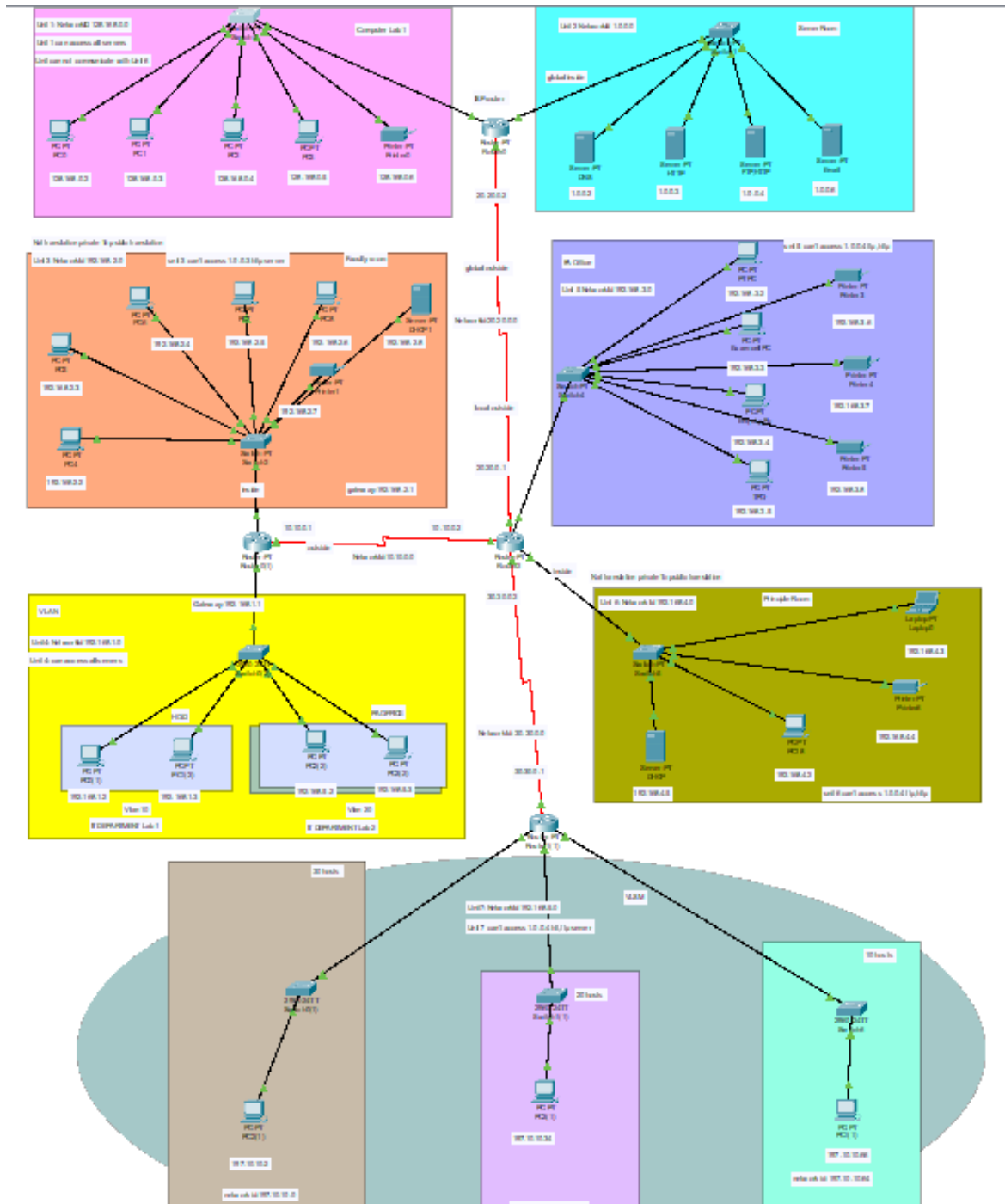
Ctrl+F6 to exit CLI focus

Copy Paste

☐ Top

Switch configuration for virtual LAN UNIT 4

Topology: -

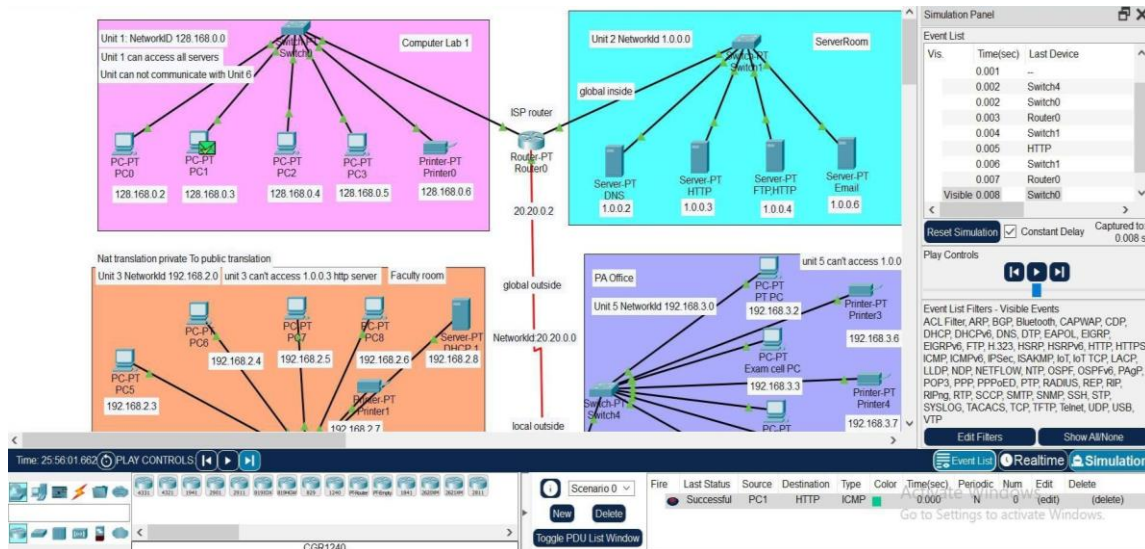


The prototype of the proposed network is implemented on cisco packet tracer

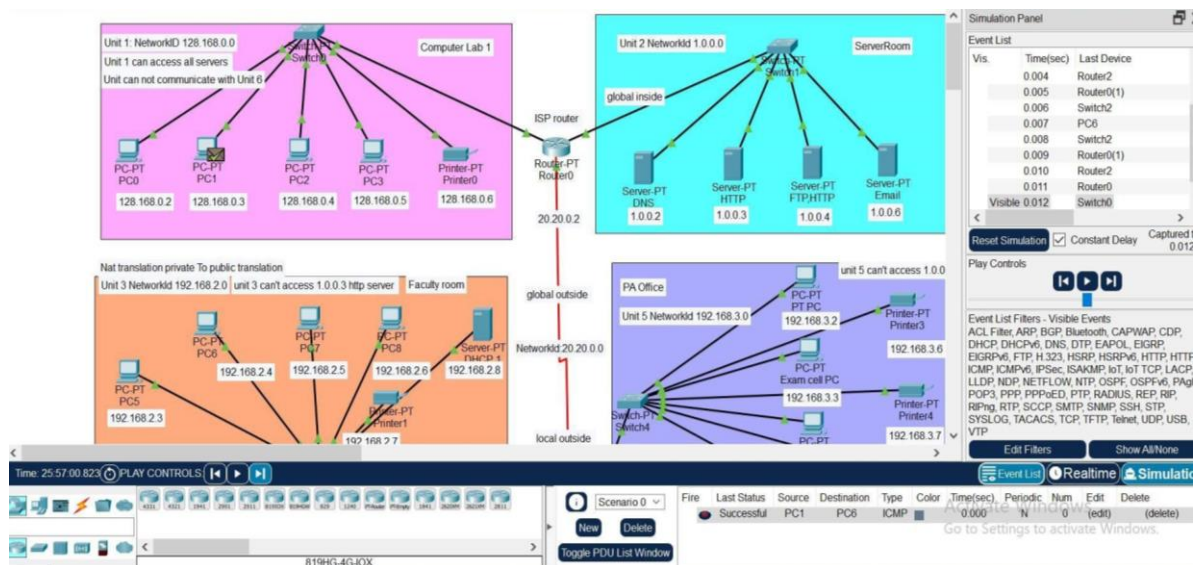
Testing Network: -

Test 1: Communication b/w Units.

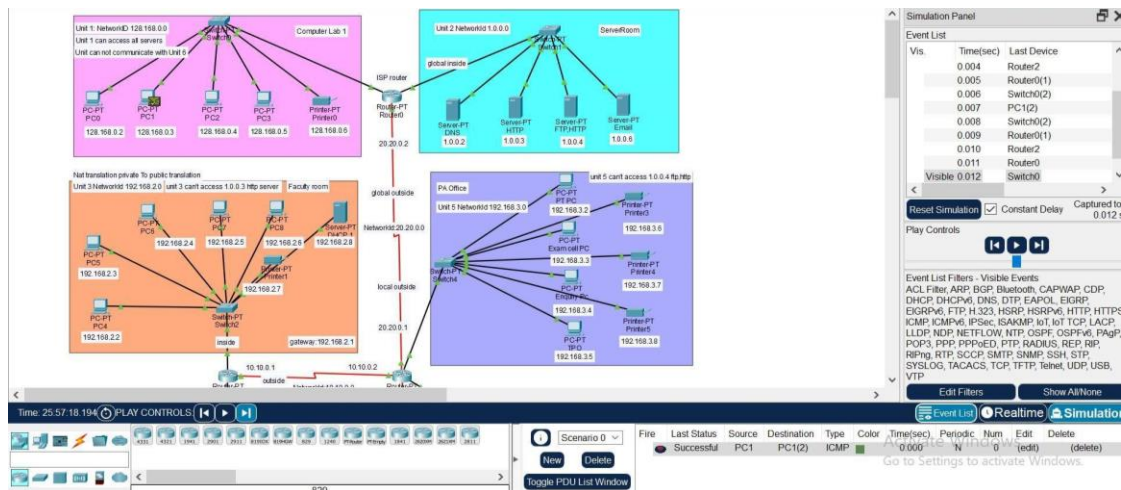
Unit No 1 communication with Unit 2



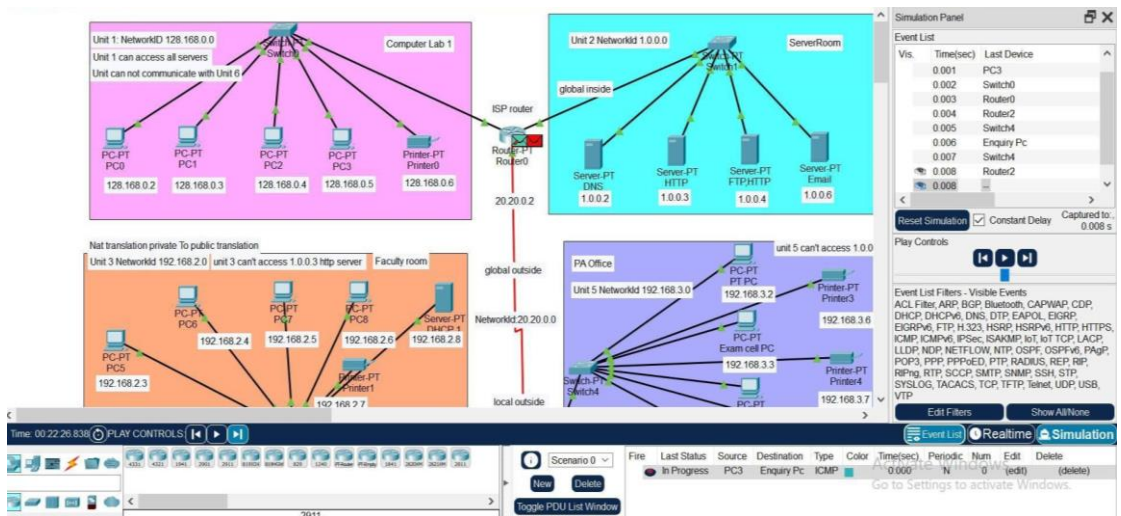
Unit No 1 communication with unit 3



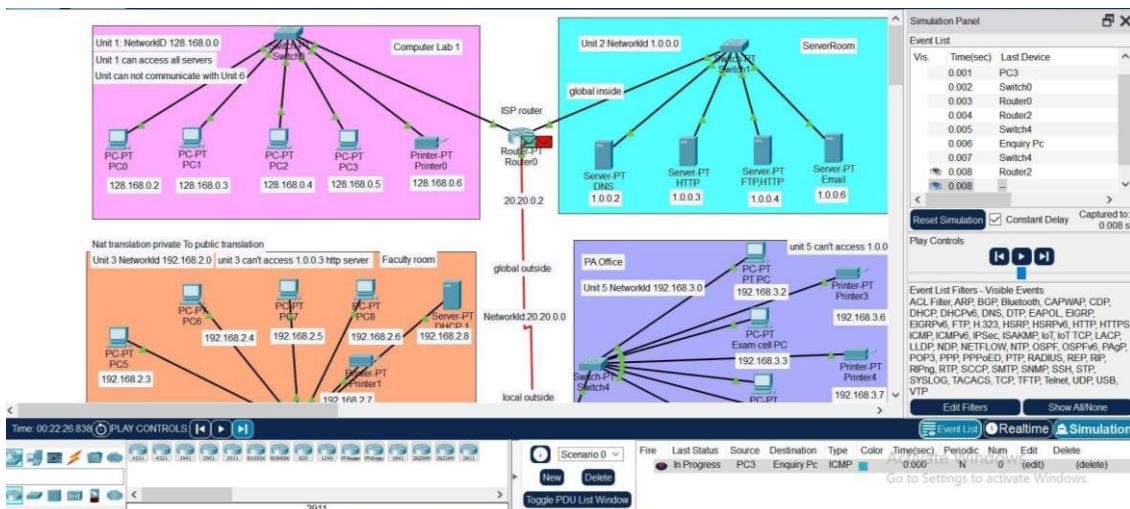
Unit No 1 communication with unit 4 HOD



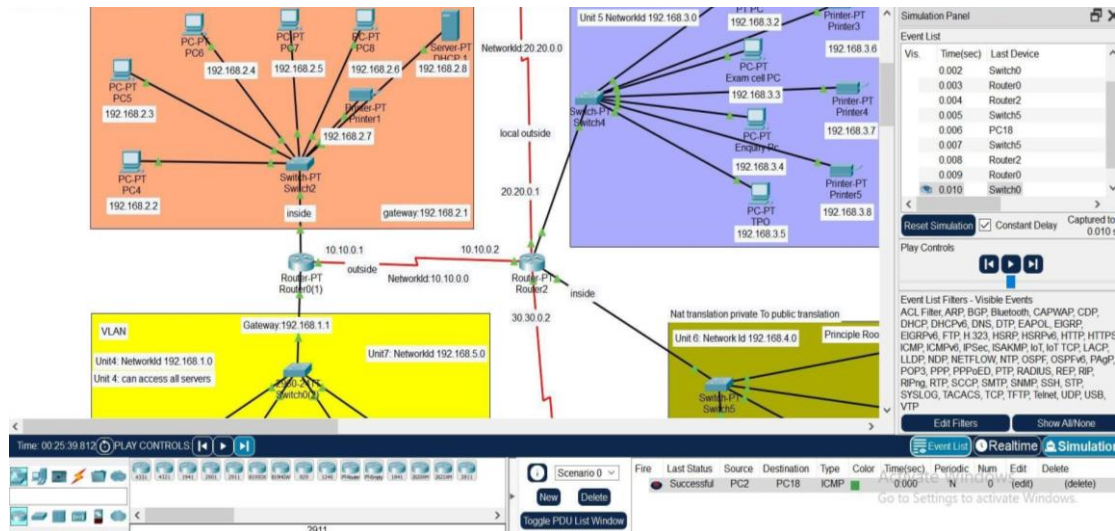
Unit No 1 communication with unit 4 PA office



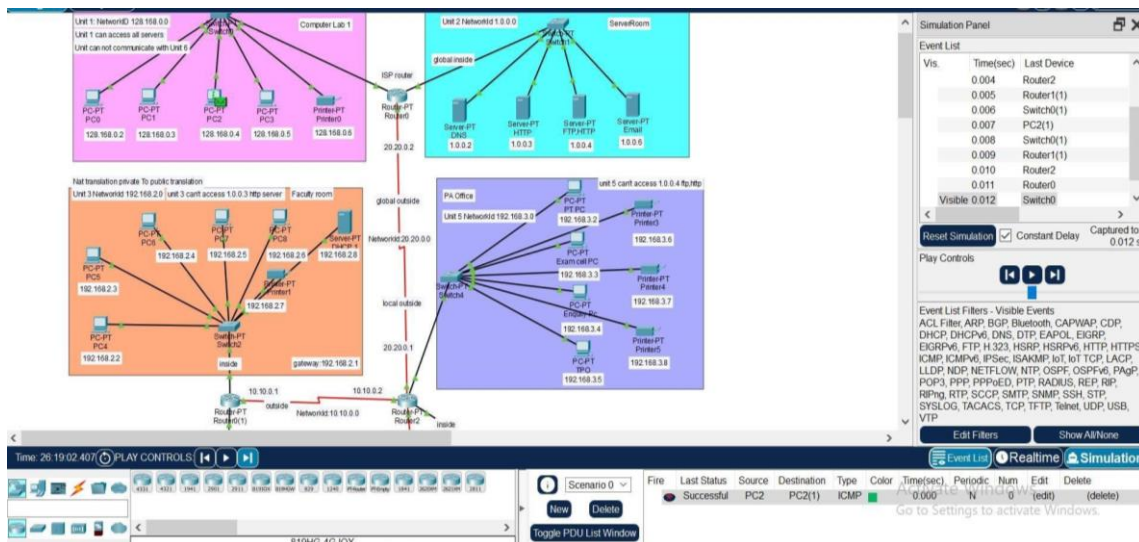
Unit No 1 Access control deny to communication with unit 5



Unit No 1 communication with Unit 6



Unit No 1 communication with unit 7

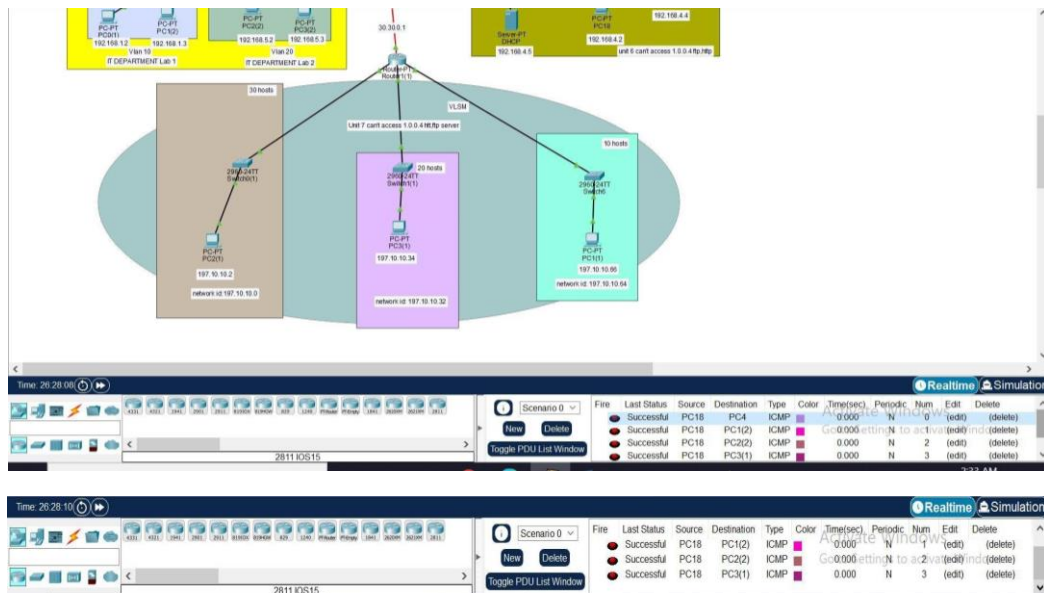


Unit 2 Communication with all units Ping

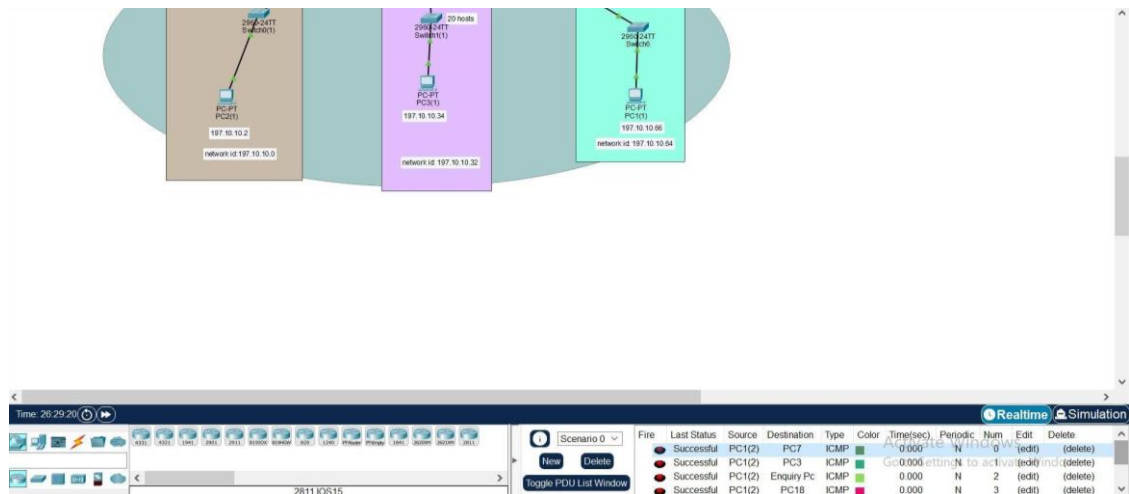
```
PC7
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 128.168.0.2
Pinging 128.168.0.2 with 32 bytes of data:
Reply from 128.168.0.2: bytes=32 time=2ms TTL=125
Reply from 128.168.0.2: bytes=32 time=3ms TTL=125
Reply from 128.168.0.2: bytes=32 time=2ms TTL=125
Reply from 128.168.0.2: bytes=32 time=2ms TTL=125
Ping statistics for 128.168.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 3ms, Average = 1ms
C:\>ping 192.168.3.3
Pinging 192.168.3.3 with 32 bytes of data:
Reply from 192.168.3.3: bytes=32 time=1ms TTL=126
Reply from 192.168.3.3: bytes=32 time=2ms TTL=126
Reply from 192.168.3.3: bytes=32 time=2ms TTL=126
Reply from 192.168.3.3: bytes=32 time=2ms TTL=126
Ping statistics for 192.168.3.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 2ms, Average = 1ms
C:\>ping 192.168.4.2
Pinging 192.168.4.2 with 32 bytes of data:
Request timed out.
Reply from 192.168.4.2: bytes=32 time=1ms TTL=126
Reply from 192.168.4.2: bytes=32 time=1ms TTL=126
Reply from 192.168.4.2: bytes=32 time=1ms TTL=126
Ping statistics for 192.168.4.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 0ms
C:\>ping 192.168.1.2
Pinging 192.168.1.2 with 32 bytes of data:
Reply from 192.168.1.2: bytes=32 time=1ms TTL=127
Reply from 192.168.1.2: bytes=32 time=1ms TTL=127
Reply from 192.168.1.2: bytes=32 time=1ms TTL=127
Reply from 192.168.1.2: bytes=32 time=1ms TTL=127
Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 192.168.5.2
Pinging 192.168.5.2 with 32 bytes of data:
Reply from 192.168.5.2: bytes=32 time=1ms TTL=127
Reply from 192.168.5.2: bytes=32 time=1ms TTL=127
Reply from 192.168.5.2: bytes=32 time=1ms TTL=127
Reply from 192.168.5.2: bytes=32 time=1ms TTL=127
Ping statistics for 192.168.5.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

```
PC7
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.2
Pinging 192.168.1.2 with 32 bytes of data:
Reply from 192.168.1.2: bytes=32 time=1ms TTL=127
Reply from 192.168.1.2: bytes=32 time=1ms TTL=127
Reply from 192.168.1.2: bytes=32 time=1ms TTL=127
Reply from 192.168.1.2: bytes=32 time=1ms TTL=127
Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 192.168.5.2
Pinging 192.168.5.2 with 32 bytes of data:
Reply from 192.168.5.2: bytes=32 time=1ms TTL=127
Reply from 192.168.5.2: bytes=32 time=1ms TTL=127
Reply from 192.168.5.2: bytes=32 time=1ms TTL=127
Reply from 192.168.5.2: bytes=32 time=1ms TTL=127
Ping statistics for 192.168.5.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

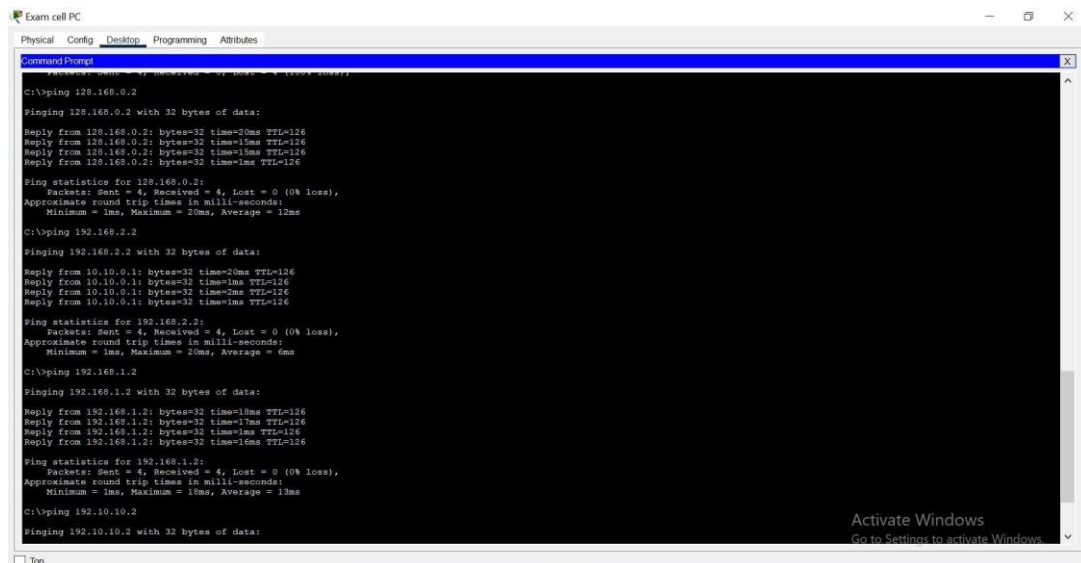
Unit 3 Communication with all units



Unit 4 Commuication with all units



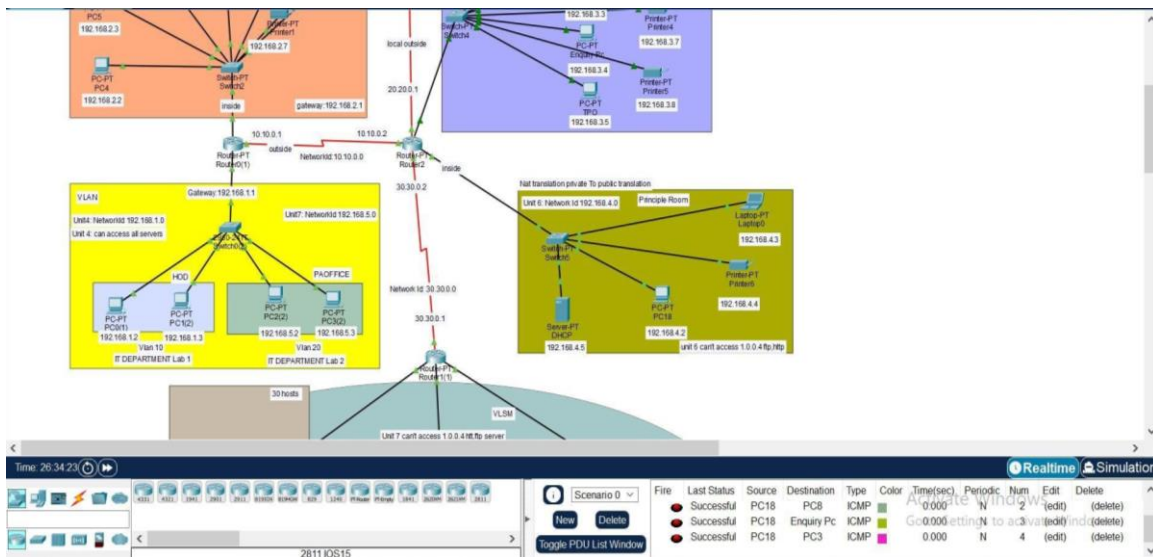
Unit 5 Commuication with all units



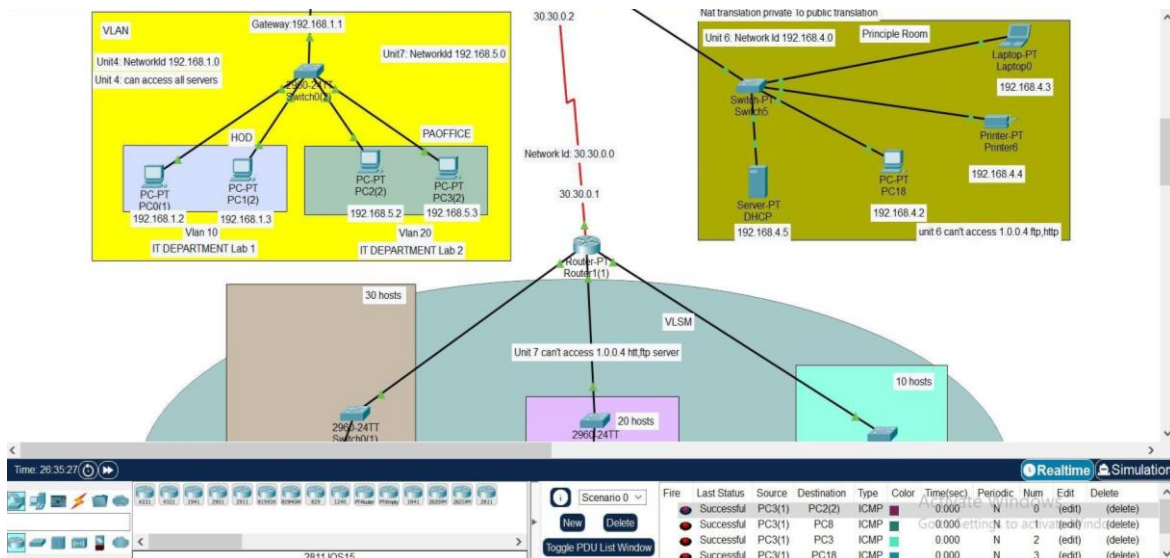
But with Unit no 2 communication not possible due to access control list provided at Unit 1



Unit 6 Communication with all units



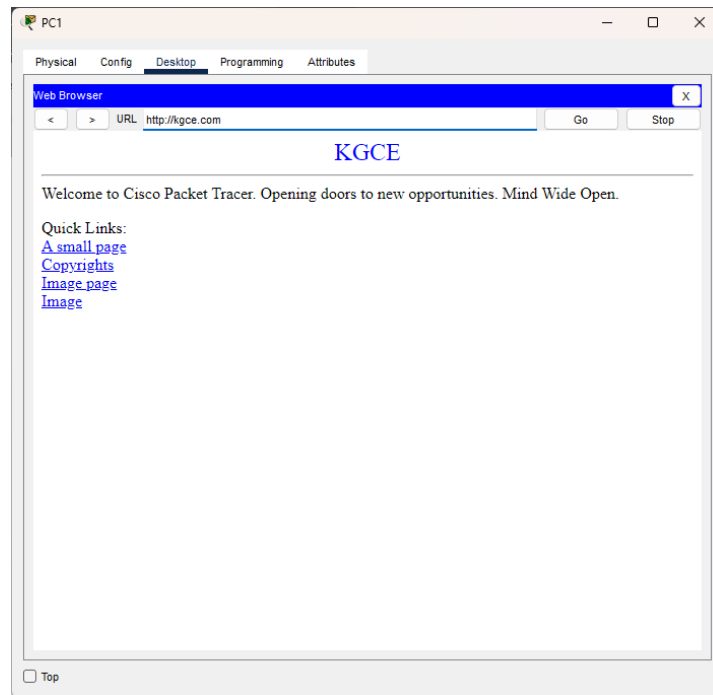
Unit 7 Communication with all units



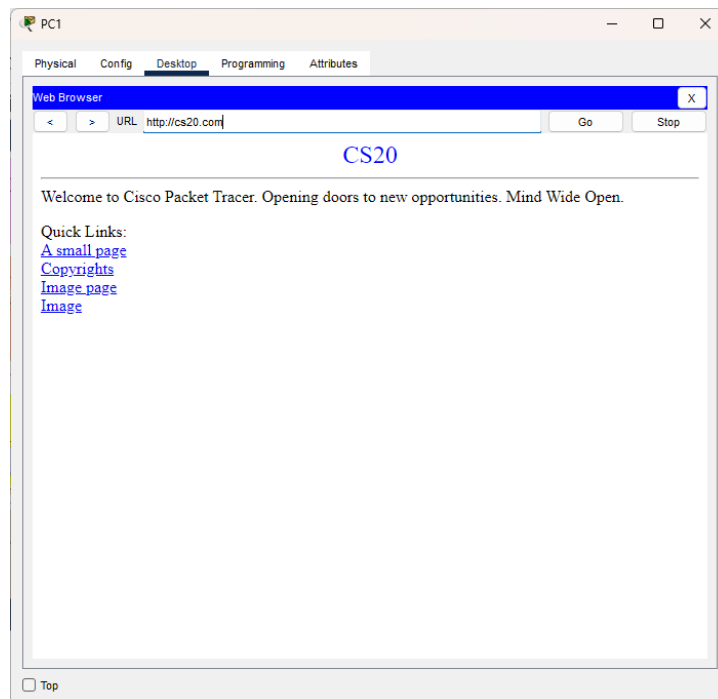
Test 2: Access to Servers

Unit 1 can access all servers

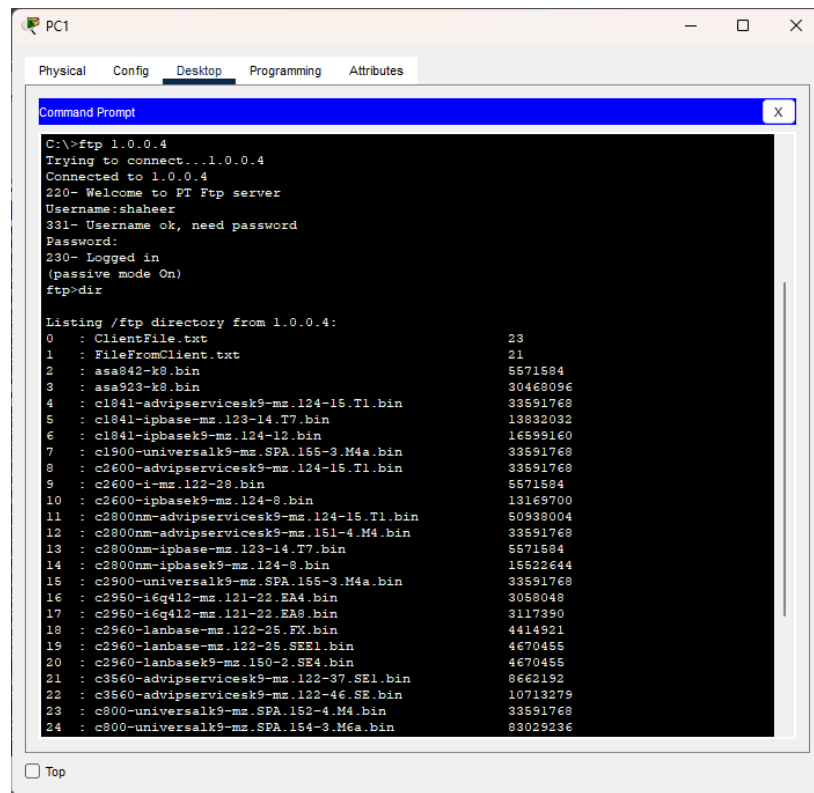
HTTP 1.0.0.4



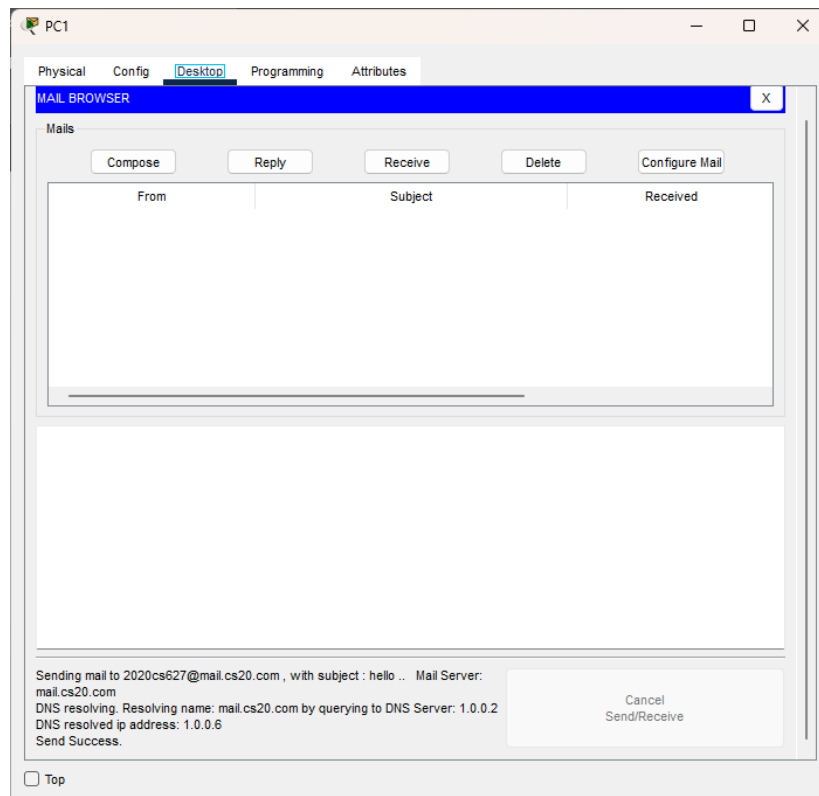
HTTP ,FTP Server 1.0.0.3



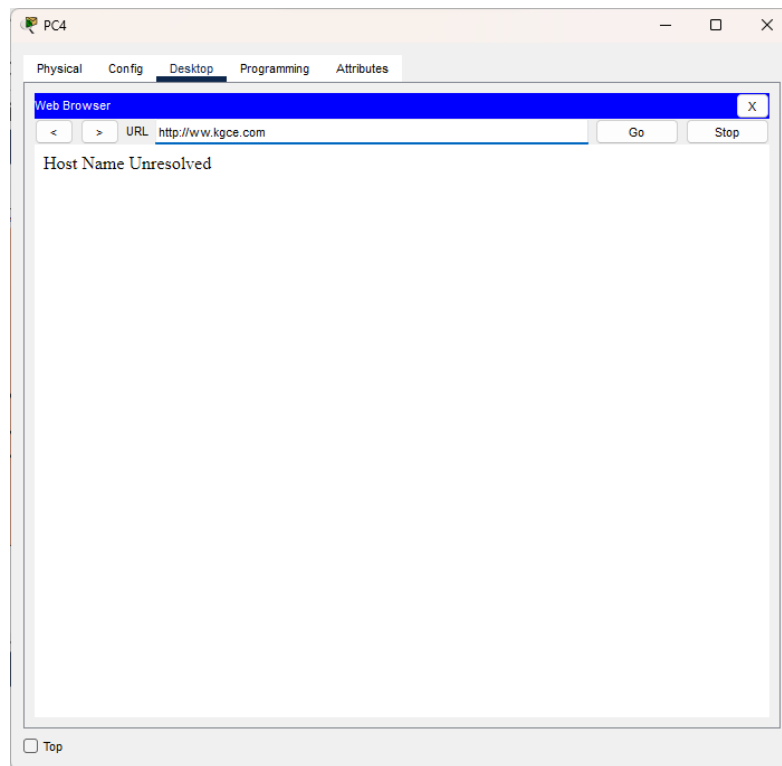
HTTP ,FTP Server 1.0.0.4



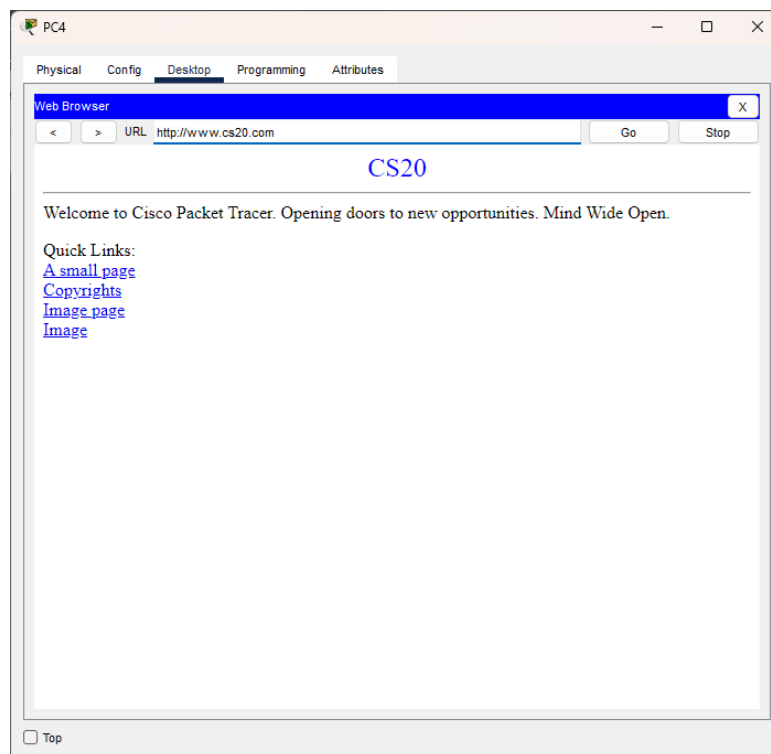
Email 1.0.0.6



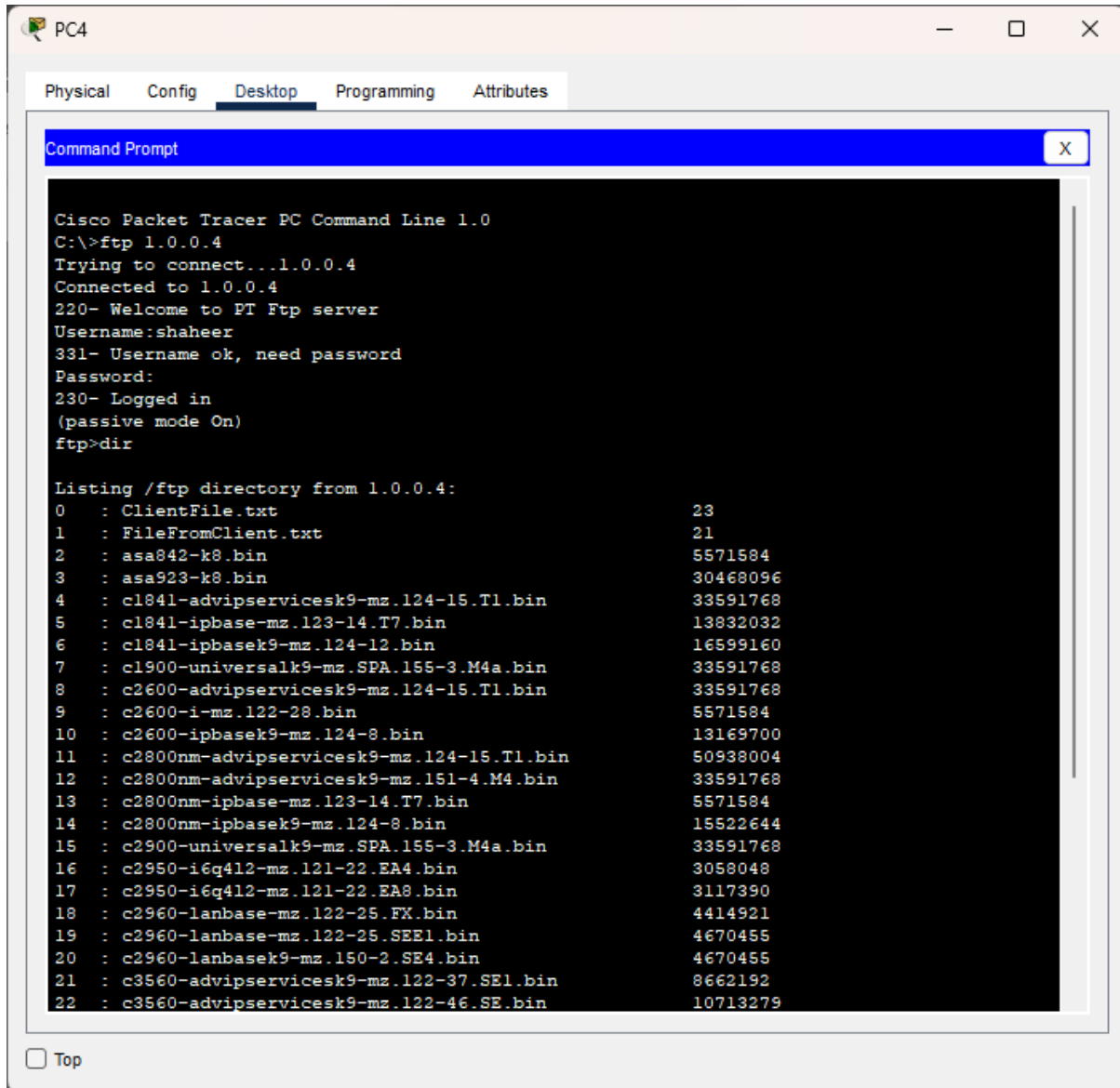
Unit 3 can Access all server except 1.0.0.3 HTTP Access control for server 1.0.0.3



HTTP ,FTP Sever 1.0.0.4



FTP Server 1.0.0.4



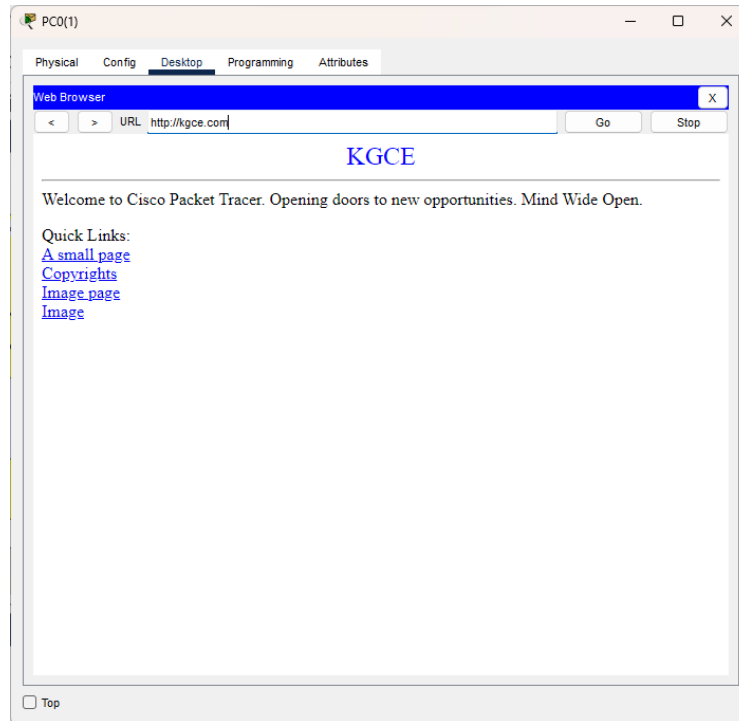
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ftp 1.0.0.4
Trying to connect...1.0.0.4
Connected to 1.0.0.4
220- Welcome to PT Ftp server
Username:shaheer
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>dir

Listing /ftp directory from 1.0.0.4:
0  : ClientFile.txt                23
1  : FileFromClient.txt           21
2  : asa842-k8.bin                 5571584
3  : asa923-k8.bin                 30468096
4  : cl841-advipservicesk9-mz.124-15.T1.bin  33591768
5  : cl841-ipbase-mz.123-14.T7.bin  13832032
6  : cl841-ipbasek9-mz.124-12.bin  16599160
7  : cl900-universalk9-mz.SPA.155-3.M4a.bin  33591768
8  : c2600-advipservicesk9-mz.124-15.T1.bin  33591768
9  : c2600-i-mz.122-28.bin         5571584
10 : c2600-ipbasek9-mz.124-8.bin    13169700
11 : c2800nm-advipservicesk9-mz.124-15.T1.bin  50938004
12 : c2800nm-advipservicesk9-mz.151-4.M4.bin  33591768
13 : c2800nm-ipbase-mz.123-14.T7.bin  5571584
14 : c2800nm-ipbasek9-mz.124-8.bin  15522644
15 : c2900-universalk9-mz.SPA.155-3.M4a.bin  33591768
16 : c2950-i6q412-mz.121-22.EA4.bin  3058048
17 : c2950-i6q412-mz.121-22.EA8.bin  3117390
18 : c2960-lanbase-mz.122-25.FX.bin  4414921
19 : c2960-lanbase-mz.122-25.SEE1.bin  4670455
20 : c2960-lanbasek9-mz.150-2.SE4.bin  4670455
21 : c3560-advipservicesk9-mz.122-37.SE1.bin  8662192
22 : c3560-advipservicesk9-mz.122-46.SE.bin  10713279
```

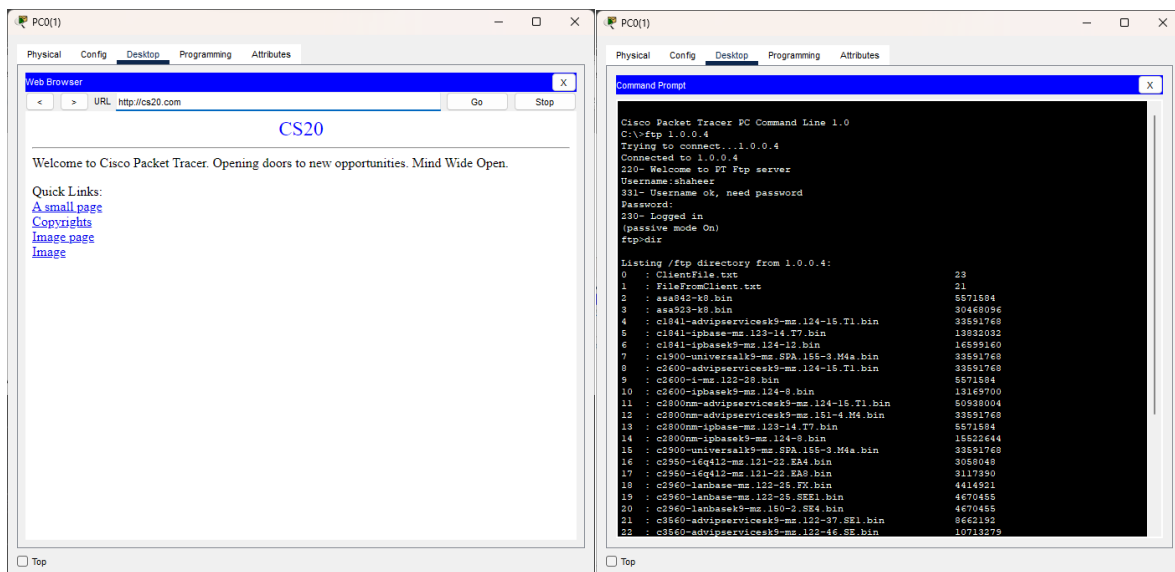
☐ Top

Unit 4 can access all servers

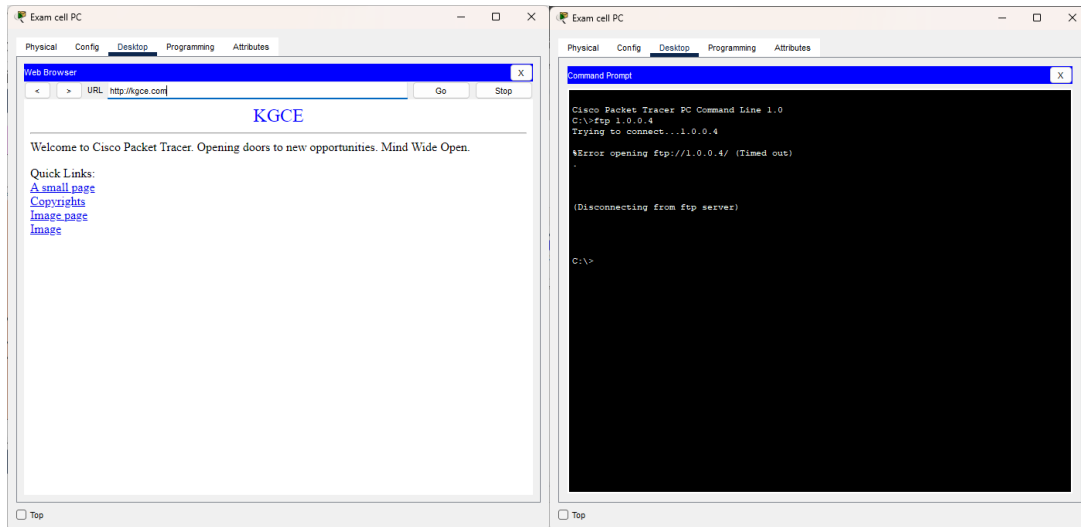
HTTP Server 1.0.0.3



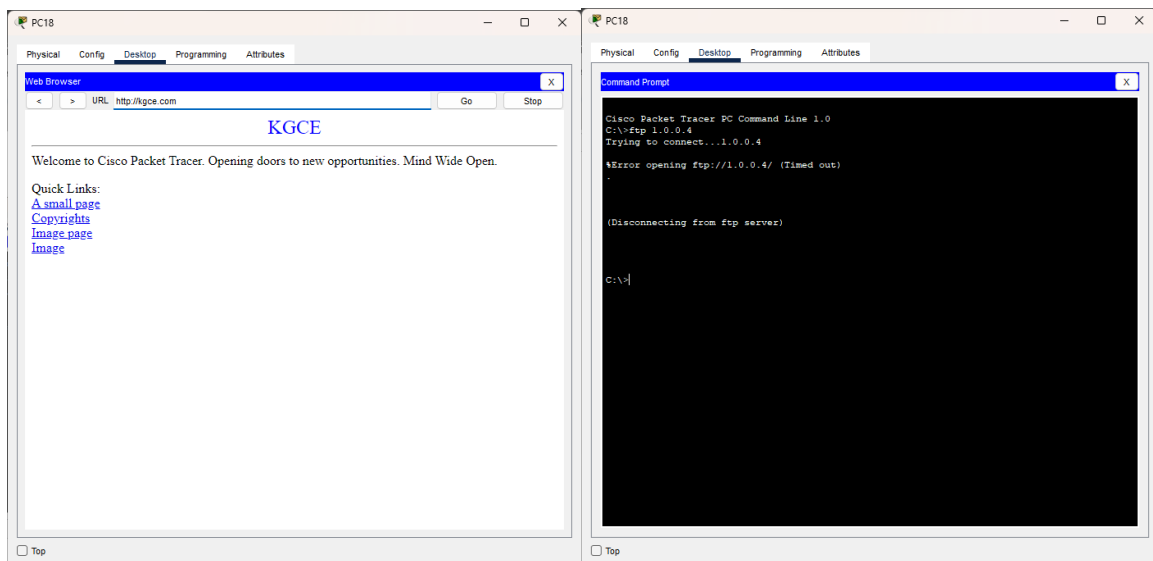
HTTP, FTP Server 1.0.0.4



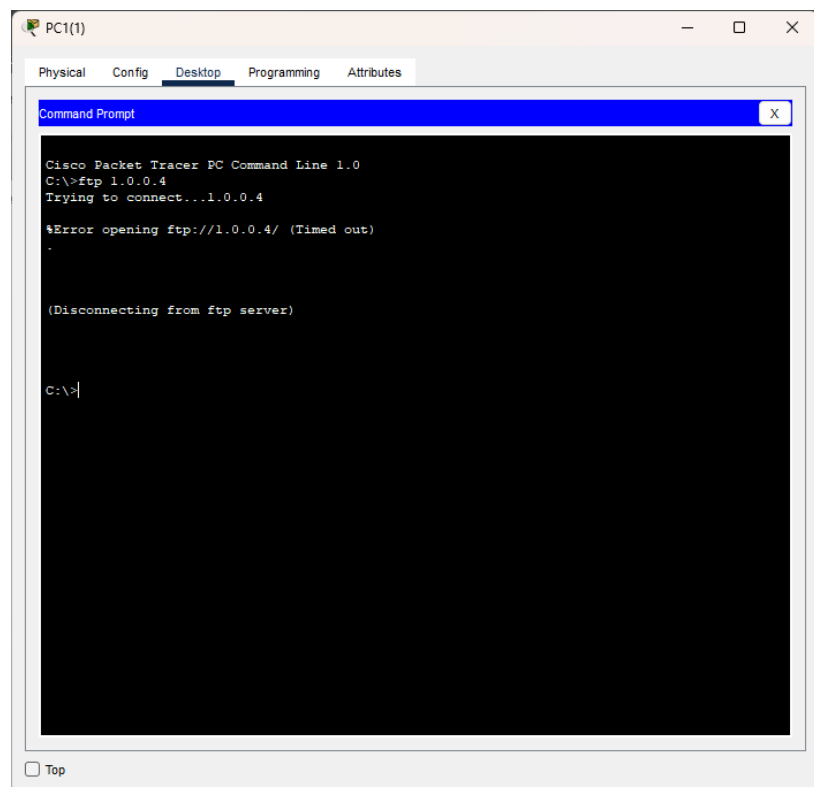
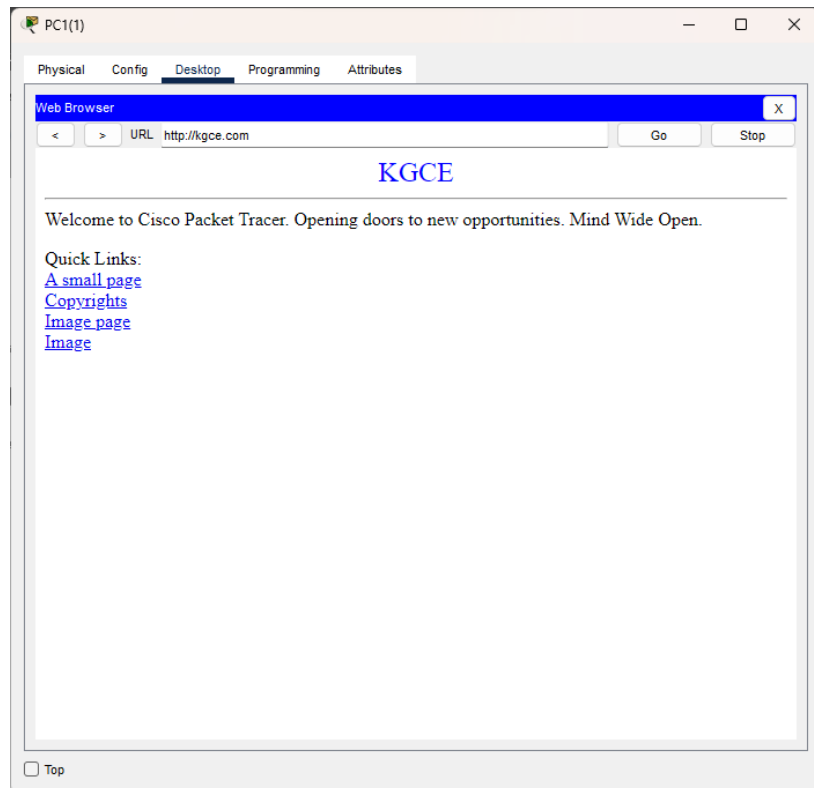
Unit 5 can Access all server except 1.0.0.4 ftp, http



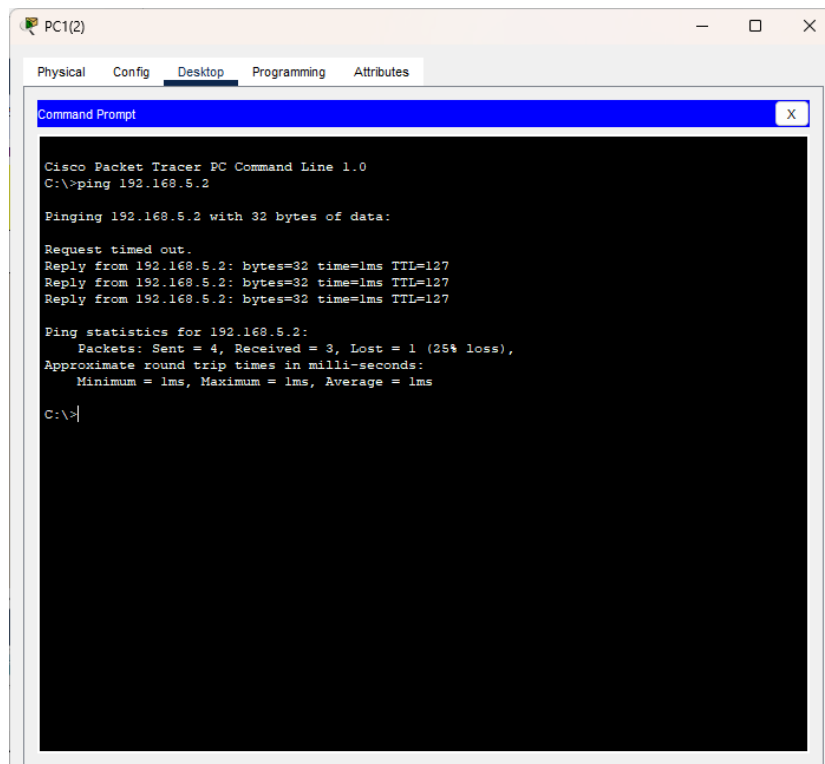
Unit 6 can Access all server except 1.0.0.4 ftp, http



Unit 7 can access all servers except 1.0.0.4 ftp, http



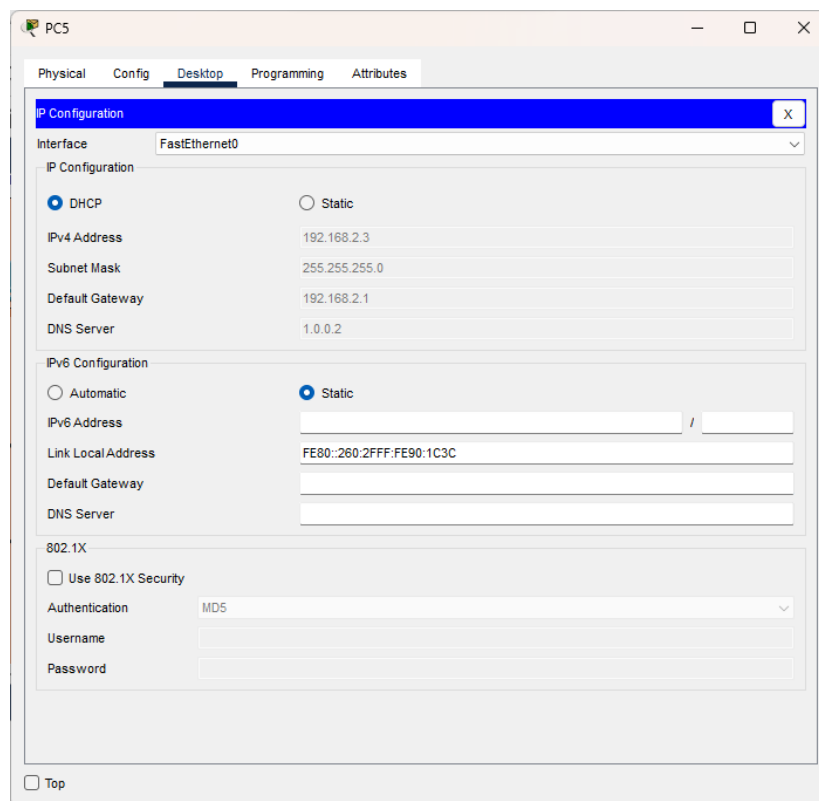
Testing VLAN communications from HOD to PA office



Test 3: Testing VLAN

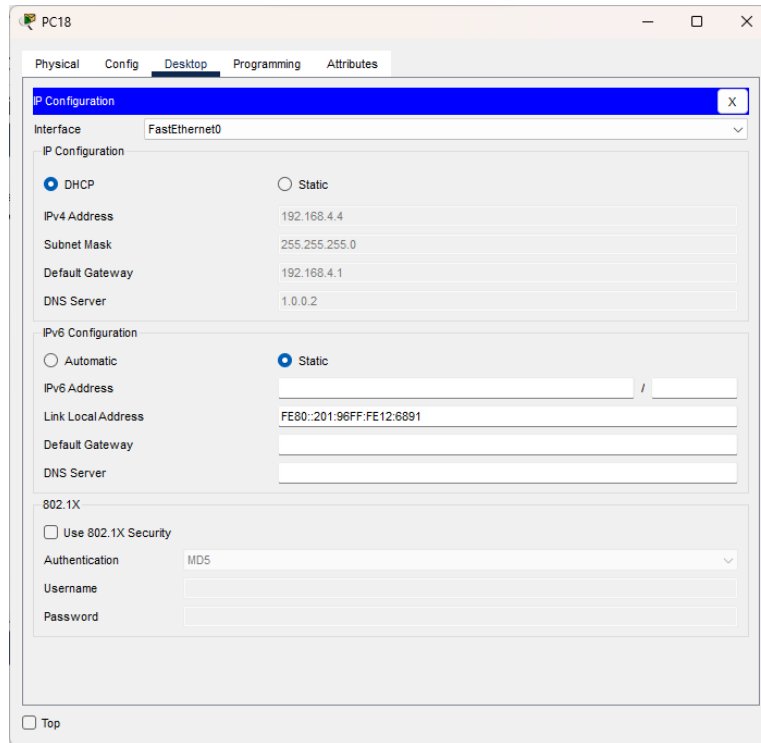
Unit 3 Allocated address By DHCP

Private IP 192.168/



Unit 6 Allocated address By DHCP

Private IP 192.168/



Test 4: NAT (Private addresses allocated translated to public when accessing the Internet)

NAT TRANSLATION(reply from public IP 10.10.0.1)when pingng from HTTP,FTP server

```
C:\>ping 192.168.2.3

Pinging 192.168.2.3 with 32 bytes of data:

Request timed out.
Reply from 10.10.0.1: bytes=32 time=10ms TTL=125
Reply from 10.10.0.1: bytes=32 time=12ms TTL=125
Reply from 10.10.0.1: bytes=32 time=12ms TTL=125

Ping statistics for 192.168.2.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 10ms, Maximum = 12ms, Average = 11ms
```

NAT TRANSLATION(reply from public IP 20.20.0.1)when pingng from HTTP server

```
C:\>ping 192.168.4.2

Pinging 192.168.4.2 with 32 bytes of data:

Request timed out.
Reply from 20.20.0.1: bytes=32 time=2ms TTL=126
Reply from 20.20.0.1: bytes=32 time=21ms TTL=126
Reply from 20.20.0.1: bytes=32 time=11ms TTL=126

Ping statistics for 192.168.4.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 21ms, Average = 11ms
```