



Project Report

Course Title:

Computer network

Submitted to:

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Submitted by:

Name:

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Program:

BSCS-SP24- 3rd Semester

1. Objectives

- Design and implement a full-scale enterprise network using Cisco Packet Tracer.
- Configure multiple routing protocols (RIP, EIGRP, OSPF).
- Enable inter-protocol communication through redistribution.
- Implement DHCP and Email Server communication.
- Demonstrate interconnectivity across routers with varied subnetting.
- ACL configuration
- NAT configuration

2. Network Topology Description

The network comprises 14 routers (R1 to R14), forming three autonomous domains:

- RIP domain: Routers R1–R4, is used for forming RIP network with multiple IP addresses with subnetting.
- EIGRP domain: Routers R9–R12 is used for forming EIGRP network with multiple IP addresses with subnetting.
- OSPF domain: Routers R5–R8 with area 0 is used for forming OSPF network with multiple IP addresses with subnetting.
- Router 13 serves as the redistribution point between RIP, OSPF, and EIGRP.

3. IP Addressing Table

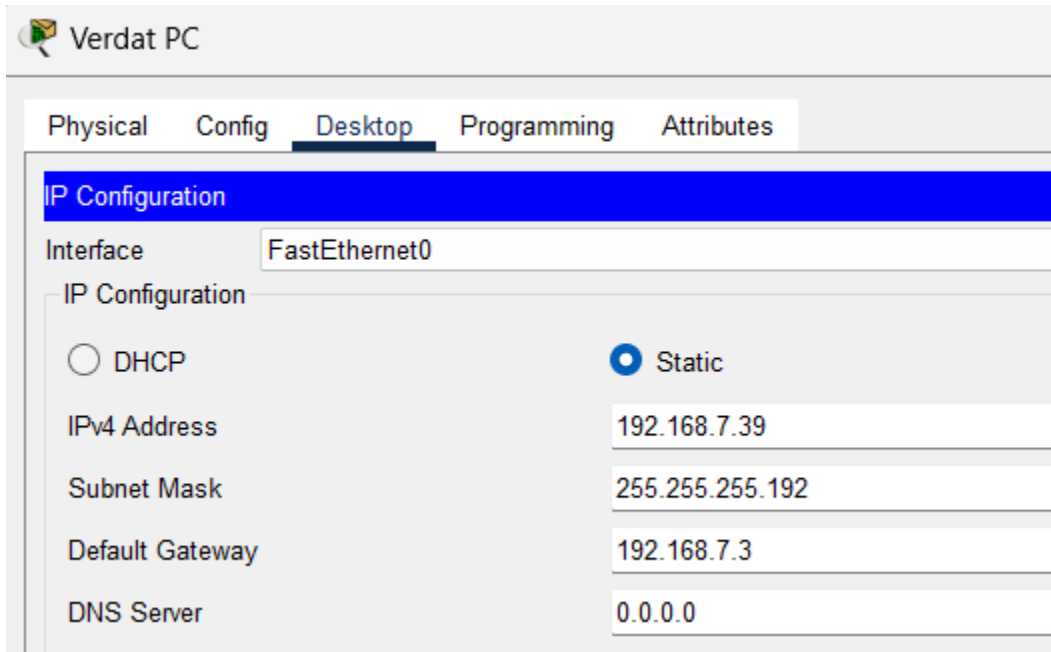
Router	Interface	IP Address	Subnet Mask	Protocol
R2	S0/1/0	192.168.2.39	255.255.255.192	RIP
R2	S0/2/0	30.30.30.1	255.0.0.0	----
R2	S0/1/1	192.168.3.39	255.255.255.240	RIP
R2	G0/0/0	192.168.1.3	255.255.255.128	RIP

R14	S0/2/0	30.30.30.2	255.0.0.0	----
R14	G0/0/0	20.20.20.3	255.0.0.0	----
R3	S0/1/0	192.168.3.40	255.255.255.240	RIP
R3	S0/1/1	192.168.4.39	255.255.255.128	RIP
R4	S0/1/0	192.168.5.39	255.255.255.240	RIP
R4	S0/2/0	192.168.6.39	255.255.255.128	RIP
R1	S0/2/0	192.168.5.40	255.255.255.240	RIP
R1	S0/2/1	192.168.2.40	255.255.255.192	RIP
R9	S0/1/0	192.168.11.39	255.255.255.128	EIGRP
R9	S0/1/1	192.168.9.38	255.255.255.240	EIGRP
R10	S0/1/0	192.168.8.39	255.255.255.192	EIGRP
R10	S0/1/1	192.168.9.39	255.255.255.240	EIGRP
R11	S0/1/0	192.168.10.39	255.255.255.224	EIGRP
R11	S0/1/1	192.168.8.38	255.255.255.192	EIGRP
R12	S0/1/0	192.168.11.38	255.255.255.128	EIGRP
R12	S0/1/1	192.168.10.38	255.255.255.224	EIGRP
R12	S0/2/0	192.168.12.40	255.255.255.240	EIGRP
R12	G0/0/0	192.168.7.3	255.255.255.192	EIGRP
R7	S0/1/0	192.168.17.2	255.255.255.224	OSPF
R7	S0/1/1	192.168.16.1	255.255.255.128	OSPF
R8	S0/1/0	192.168.17.1	255.255.255.224	OSPF
R8	S0/1/1	192.168.15.1	255.255.255.240	OSPF
R8	S0/2/0	192.168.18.2	255.255.255.192	OSPF
R5	G0/0/0	192.168.13.3	255.255.255.192	OSPF
R5	G0/0/1	10.10.10.1	255.0.0.0	-----
R5	S0/1/0	192.168.15.2	255.255.255.240	OSPF
R5	S0/1/1	192.168.14.1	255.255.255.224	OSPF
R6	S0/1/1	192.168.16.2	255.255.255.128	OSPF
R6	S0/1/0	192.168.14.2	255.255.255.224	OSPF
R13	S0/1/0	192.168.6.40	255.255.255.128	RIP
R13	S0/2/0	192.168.12.39	255.255.255.240	EIGRP
R13	S0/1/1	192.168.18.1	255.255.255.192	OSPF

- Router 13 is used for redistribution where it is linked with all protocols

4. Configuration of devices

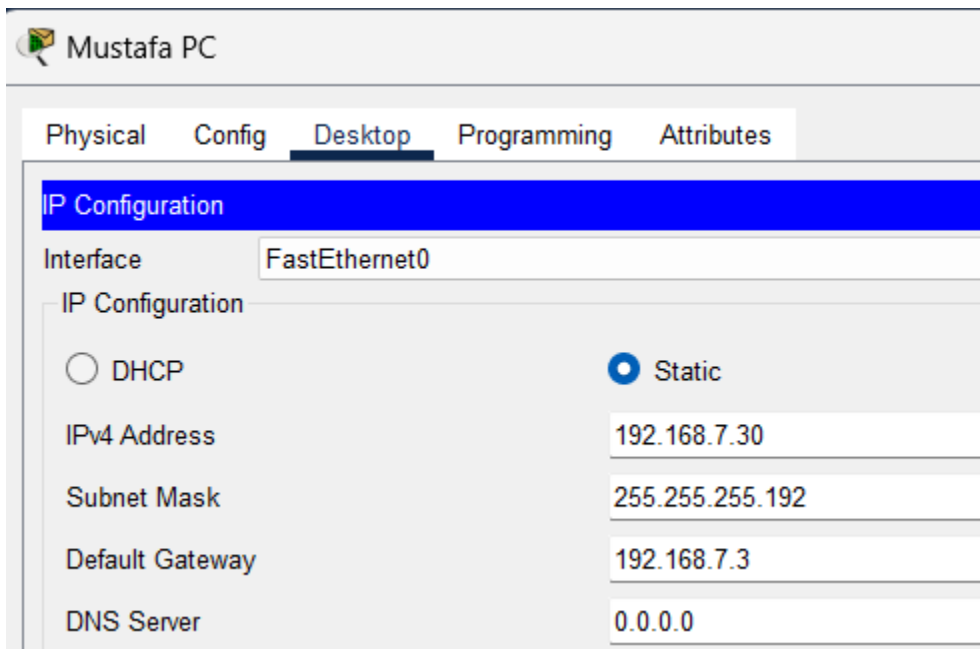
- **Verdat PC**



The screenshot shows the configuration window for 'Verdat PC'. The 'Desktop' tab is selected, and the 'IP Configuration' section is highlighted. The 'Interface' is set to 'FastEthernet0'. Under 'IP Configuration', the 'Static' radio button is selected. The fields for IPv4 Address, Subnet Mask, Default Gateway, and DNS Server are filled with the values 192.168.7.39, 255.255.255.192, 192.168.7.3, and 0.0.0.0 respectively.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	192.168.7.39
Subnet Mask	255.255.255.192
Default Gateway	192.168.7.3
DNS Server	0.0.0.0

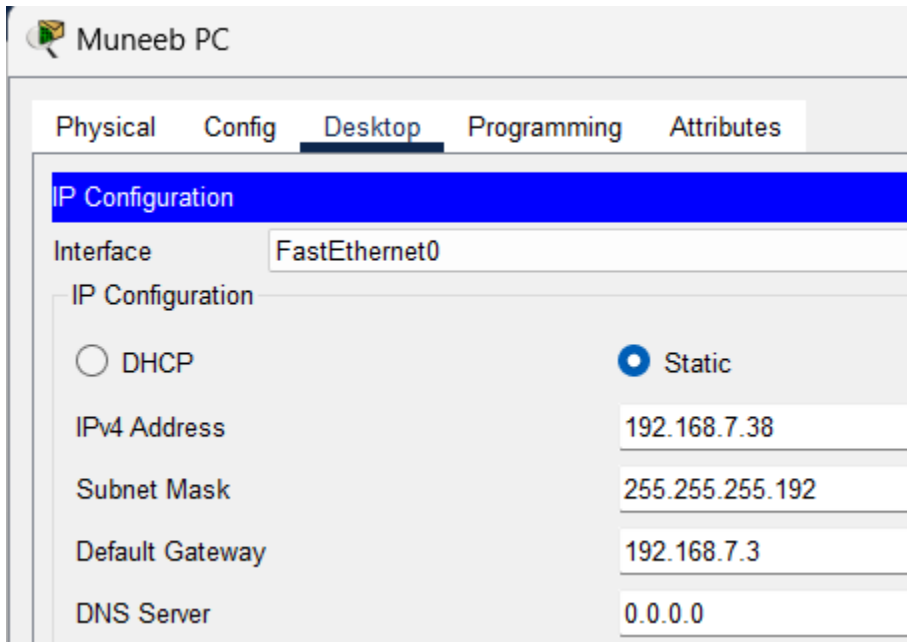
- **Mustafa PC**



The screenshot shows the configuration window for 'Mustafa PC'. The 'Desktop' tab is selected, and the 'IP Configuration' section is highlighted. The 'Interface' is set to 'FastEthernet0'. Under 'IP Configuration', the 'Static' radio button is selected. The fields for IPv4 Address, Subnet Mask, Default Gateway, and DNS Server are filled with the values 192.168.7.30, 255.255.255.192, 192.168.7.3, and 0.0.0.0 respectively.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	192.168.7.30
Subnet Mask	255.255.255.192
Default Gateway	192.168.7.3
DNS Server	0.0.0.0

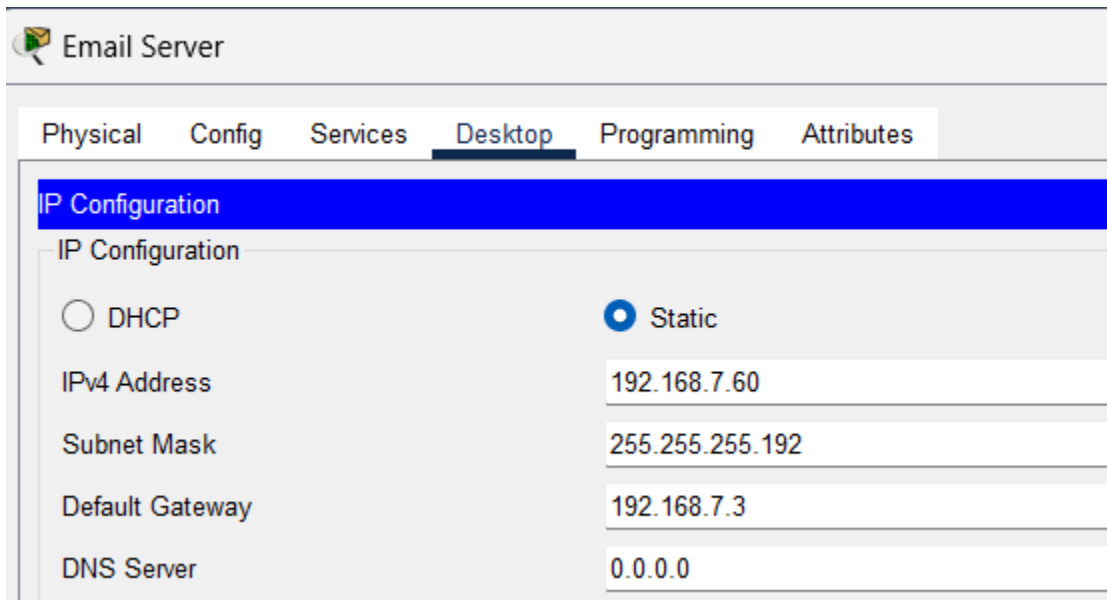
- **Muneeb PC**



The screenshot shows the configuration window for 'Muneeb PC'. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Interface' is 'FastEthernet0'. The configuration is set to 'Static' (selected with a radio button). The following fields are filled:

Field	Value
IPv4 Address	192.168.7.38
Subnet Mask	255.255.255.192
Default Gateway	192.168.7.3
DNS Server	0.0.0.0

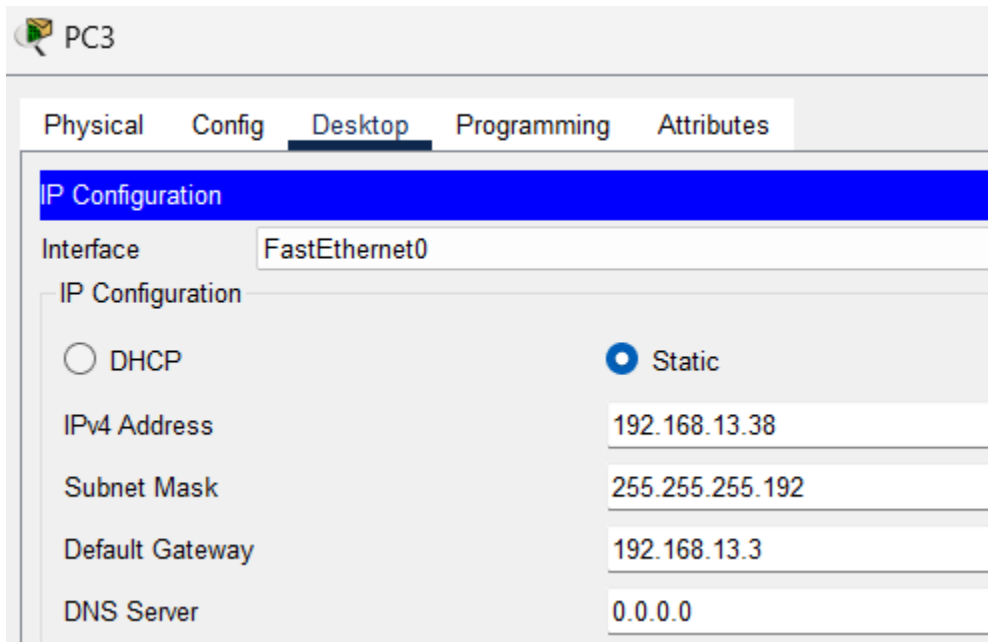
- **Email Server**



The screenshot shows the configuration window for 'Email Server'. The 'Desktop' tab is selected. Under 'IP Configuration', the configuration is set to 'Static' (selected with a radio button). The following fields are filled:

Field	Value
IPv4 Address	192.168.7.60
Subnet Mask	255.255.255.192
Default Gateway	192.168.7.3
DNS Server	0.0.0.0

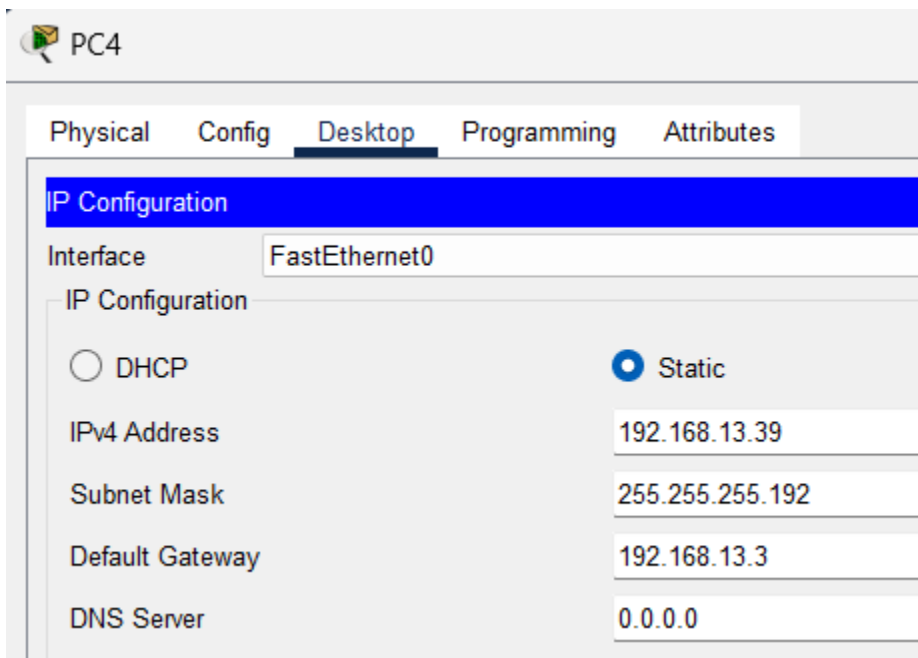
- **PC3**



The screenshot shows the configuration window for PC3. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Interface' is 'FastEthernet0'. The 'Static' radio button is selected. The IPv4 Address is 192.168.13.38, Subnet Mask is 255.255.255.192, Default Gateway is 192.168.13.3, and DNS Server is 0.0.0.0.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	192.168.13.38
Subnet Mask	255.255.255.192
Default Gateway	192.168.13.3
DNS Server	0.0.0.0

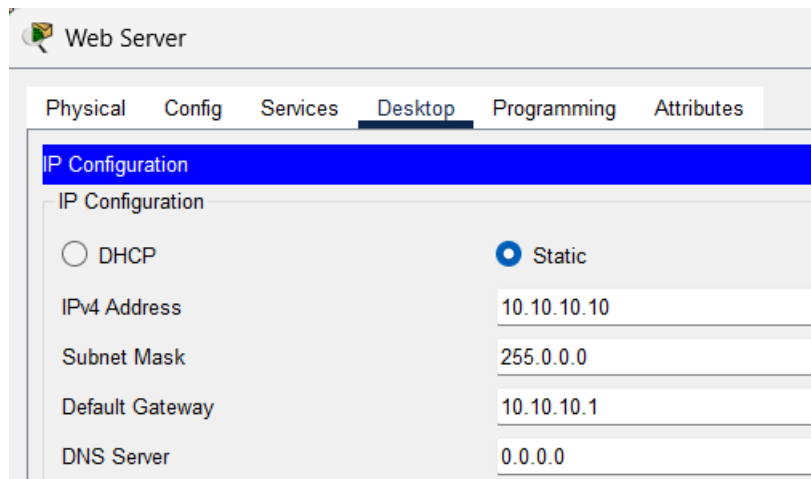
- **PC4**



The screenshot shows the configuration window for PC4. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Interface' is 'FastEthernet0'. The 'Static' radio button is selected. The IPv4 Address is 192.168.13.39, Subnet Mask is 255.255.255.192, Default Gateway is 192.168.13.3, and DNS Server is 0.0.0.0.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	192.168.13.39
Subnet Mask	255.255.255.192
Default Gateway	192.168.13.3
DNS Server	0.0.0.0

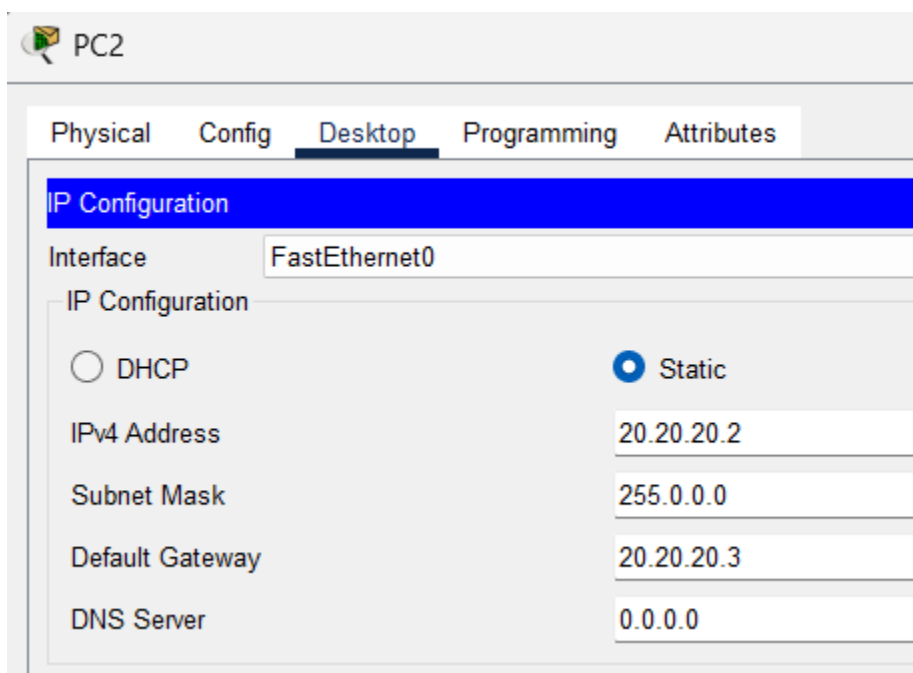
- **Web Server configuration**



The image shows a configuration window for a 'Web Server'. It has a title bar with a green icon and the text 'Web Server'. Below the title bar are five tabs: 'Physical', 'Config', 'Services', 'Desktop', and 'Attributes'. The 'Desktop' tab is selected and highlighted. Under the 'Desktop' tab, there is a section titled 'IP Configuration' which is highlighted in blue. Below this section, there are two radio buttons: 'DHCP' and 'Static'. The 'Static' radio button is selected. Below the radio buttons, there are five text input fields: 'IPv4 Address' with the value '10.10.10.10', 'Subnet Mask' with the value '255.0.0.0', 'Default Gateway' with the value '10.10.10.1', and 'DNS Server' with the value '0.0.0.0'.

Field	Value
IPv4 Address	10.10.10.10
Subnet Mask	255.0.0.0
Default Gateway	10.10.10.1
DNS Server	0.0.0.0

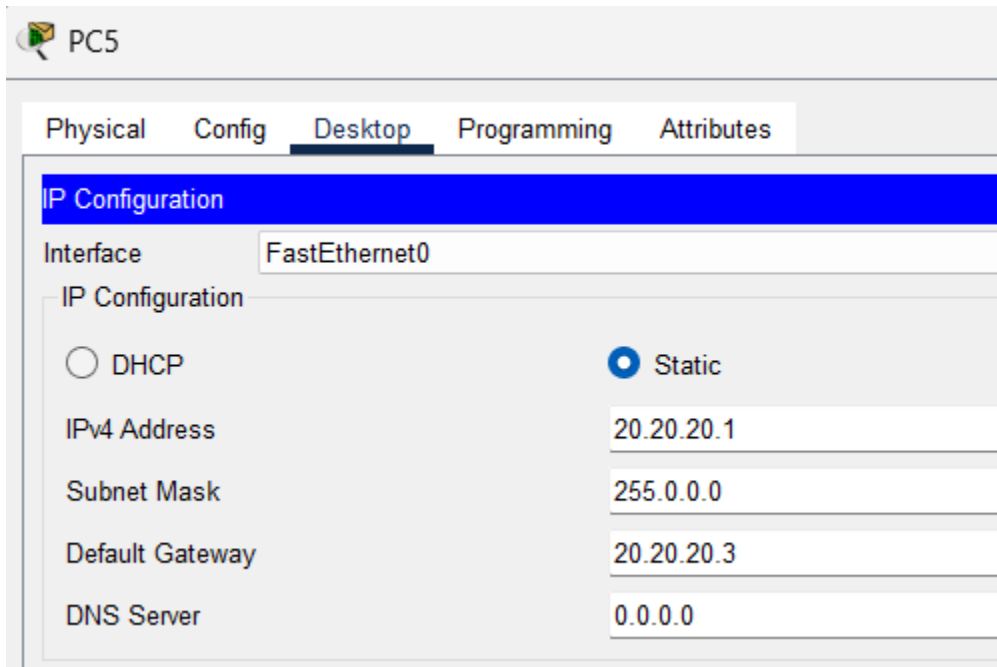
- **PC2**



The image shows a configuration window for 'PC2'. It has a title bar with a green icon and the text 'PC2'. Below the title bar are five tabs: 'Physical', 'Config', 'Desktop', 'Programming', and 'Attributes'. The 'Desktop' tab is selected and highlighted. Under the 'Desktop' tab, there is a section titled 'IP Configuration' which is highlighted in blue. Below this section, there is a dropdown menu labeled 'Interface' with the value 'FastEthernet0'. Below the dropdown menu, there are two radio buttons: 'DHCP' and 'Static'. The 'Static' radio button is selected. Below the radio buttons, there are five text input fields: 'IPv4 Address' with the value '20.20.20.2', 'Subnet Mask' with the value '255.0.0.0', 'Default Gateway' with the value '20.20.20.3', and 'DNS Server' with the value '0.0.0.0'.

Field	Value
Interface	FastEthernet0
IPv4 Address	20.20.20.2
Subnet Mask	255.0.0.0
Default Gateway	20.20.20.3
DNS Server	0.0.0.0

- **PC5**

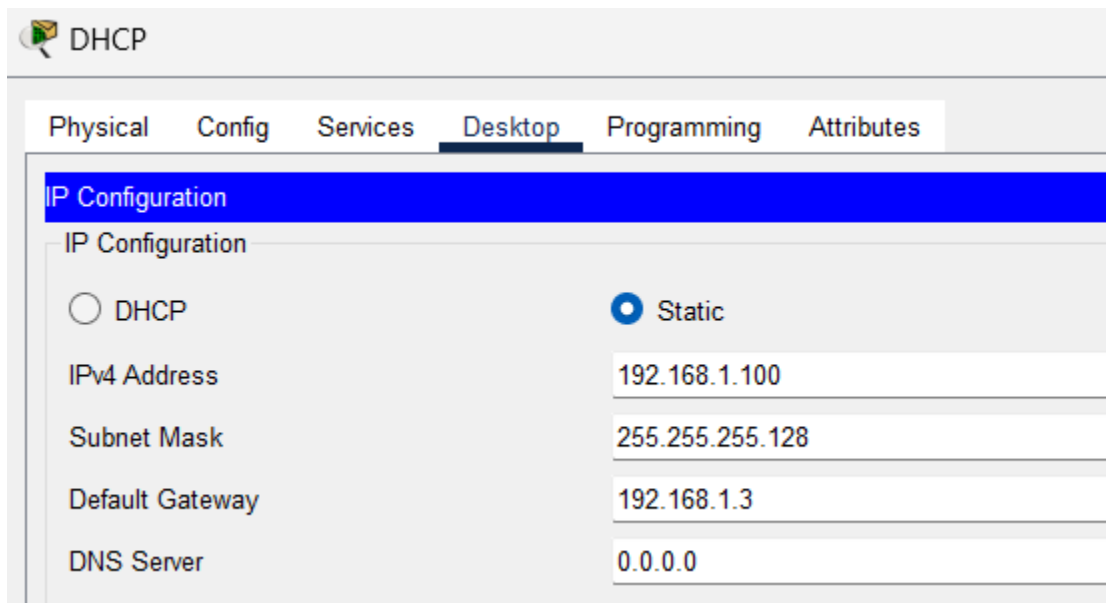


The screenshot shows the configuration window for PC5. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Static' radio button is chosen. The interface is 'FastEthernet0'. The IPv4 Address is 20.20.20.1, Subnet Mask is 255.0.0.0, Default Gateway is 20.20.20.3, and DNS Server is 0.0.0.0.

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	20.20.20.1
Subnet Mask	255.0.0.0
Default Gateway	20.20.20.3
DNS Server	0.0.0.0

DHCP configuration

- **DHCP server**



The screenshot shows the configuration window for the DHCP server. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Static' radio button is chosen. The IPv4 Address is 192.168.1.100, Subnet Mask is 255.255.255.128, Default Gateway is 192.168.1.3, and DNS Server is 0.0.0.0.

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	192.168.1.100
Subnet Mask	255.255.255.128
Default Gateway	192.168.1.3
DNS Server	0.0.0.0

- **Services -> DHCP**

Physical Config **Services** Desktop Programming Attributes

SERVICES

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

DHCP

Interface: FastEthernet0 Service: ☒ On ☐ Off

Pool Name: serverPool

Default Gateway: 192.168.1.3

DNS Server: 0.0.0.0

Start IP Address: 192.168.1.38

Subnet Mask: 255.255.255.128

Maximum Number of Users: 26

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	192.168.1.3	0.0.0.0	192.168.1.38	255.255.255.128	26	0.0.0.0	0.0.0.0

- **PC0 -> DHCP assigned**

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration

☒ DHCP ☐ Static

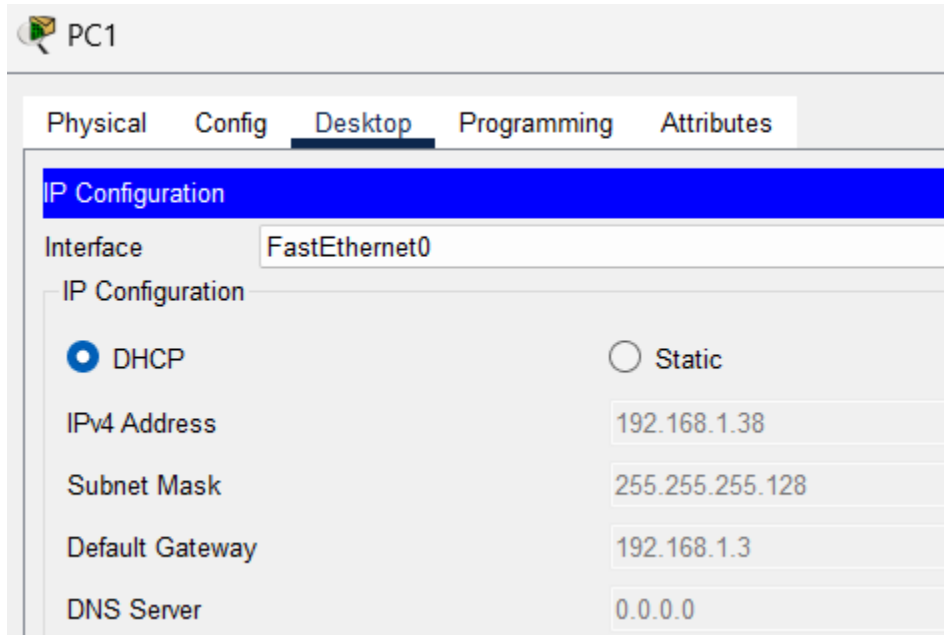
IPv4 Address: 192.168.1.39

Subnet Mask: 255.255.255.128

Default Gateway: 192.168.1.3

DNS Server: 0.0.0.0

- **PC1 -> DHCP assigned**



5. Configuration of Routers

Router 2

```
interface GigabitEthernet0/0/0
 ip address 192.168.1.3 255.255.255.128
 no shutdown

interface Serial0/1/0
 ip address 192.168.2.39 255.255.255.192
 no shutdown

interface Serial0/2/0
 ip address 30.30.30.1 255.0.0.0
 no shutdown

interface Serial0/1/1
 ip address 192.168.3.39 255.255.255.240
 no shutdown
```

Router 14

```
interface Serial0/2/0
 ip address 30.30.30.2 255.0.0.0
 no shutdown

interface GigabitEthernet0/0/0
```

```
ip address 20.20.20.3 255.0.0.0
no shutdown
```

Router 1

```
interface Serial0/2/0
  ip address 192.168.5.38 255.255.255.240
no shutdown
```

```
interface Serial0/2/1
  ip address 192.168.2.38 255.255.255.192
no shutdown
```

Router 3

```
interface Serial0/1/0
  ip address 192.168.3.38 255.255.255.240
no shutdown
```

```
interface Serial0/1/1
  ip address 192.168.4.39 255.255.255.128
no shutdown
```

Router 4

```
interface Serial0/1/0
  ip address 192.168.5.39 255.255.255.240
no shutdown
```

```
interface Serial0/1/1
  ip address 192.168.4.38 255.255.255.128
no shutdown
```

```
interface Serial0/2/0
  ip address 192.168.6.39 255.255.255.128
no shutdown
```

Router 13

```
interface Serial0/1/0
  ip address 192.168.6.38 255.255.255.128
no shutdown
```

```
interface Serial0/1/1
  ip address 192.168.18.1 255.255.255.192
no shutdown
```

```
interface Serial0/2/0
  ip address 192.168.12.39 255.255.255.240
no shutdown
```

Router 9

```
interface Serial0/1/0
  ip address 192.168.11.39 255.255.255.128
no shutdown
```

```
interface Serial0/1/1
  ip address 192.168.9.38 255.255.255.240
no shutdown
```

Router 10

```
interface Serial0/1/0
  ip address 192.168.8.39 255.255.255.192
no shutdown
```

```
interface Serial0/1/1
  ip address 192.168.9.39 255.255.255.240
no shutdown
```

Router 11

```
interface GigabitEthernet0/0/0
  ip address 192.168.7.3 255.255.255.192
no shutdown
```

```
interface Serial0/1/0
  ip address 192.168.10.39 255.255.255.224
no shutdown
```

```
interface Serial0/1/1
  ip address 192.168.8.38 255.255.255.192
no shutdown
```

Router 12

```
interface Serial0/1/0
  ip address 192.168.11.38 255.255.255.128
no shutdown
```

```
interface Serial0/1/1
  ip address 192.168.10.38 255.255.255.224
no shutdown
```

```
interface Serial0/2/0
  ip address 192.168.12.38 255.255.255.240
no shutdown
```

Router 8

```
interface Serial0/1/0
  ip address 192.168.17.1 255.255.255.224
no shutdown
```

```
interface Serial0/1/1
 ip address 192.168.15.1 255.255.255.240
 no shutdown
```

```
interface Serial0/2/0
 ip address 192.168.18.2 255.255.255.192
 no shutdown
```

Router 7

```
interface Serial0/1/0
 ip address 192.168.17.2 255.255.255.224
 no shutdown
```

```
interface Serial0/1/1
 ip address 192.168.16.1 255.255.255.128
 no shutdown
```

Router 6

```
interface Serial0/1/0
 ip address 192.168.14.2 255.255.255.224
 no shutdown
```

```
interface Serial0/1/1
 ip address 192.168.16.2 255.255.255.128
 no shutdown
```

Router 5

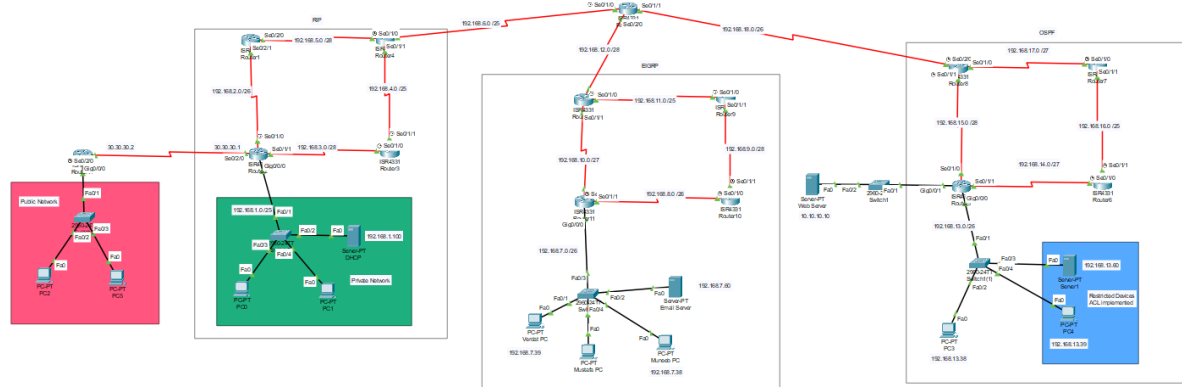
```
interface GigabitEthernet0/0/0
 ip address 192.168.13.3 255.255.255.192
 no shutdown
```

```
interface GigabitEthernet0/0/1
 ip address 10.10.10.1 255.0.0.0
 no shutdown
```

```
interface Serial0/1/0
 ip address 192.168.15.2 255.255.255.240
 no shutdown
```

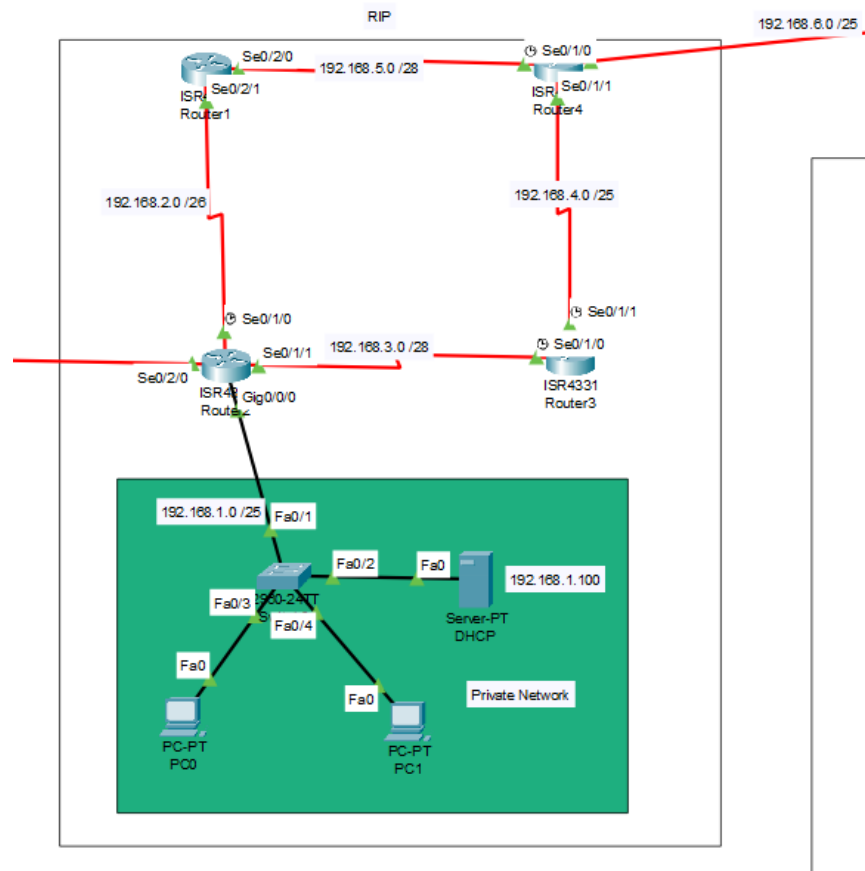
```
interface Serial0/1/1
 ip address 192.168.14.1 255.255.255.224
 no shutdown
```

Screenshot of Topology



RIP Configuration

RIP Network



Router 1

```
router rip
network 192.168.2.0
network 192.168.5.0
```

Router 2

```
router rip
  network 192.168.1.0
  network 192.168.2.0
  network 192.168.3.0
```

Router 3

```
router rip
  network 192.168.3.0
  network 192.168.4.0
```

Router 4

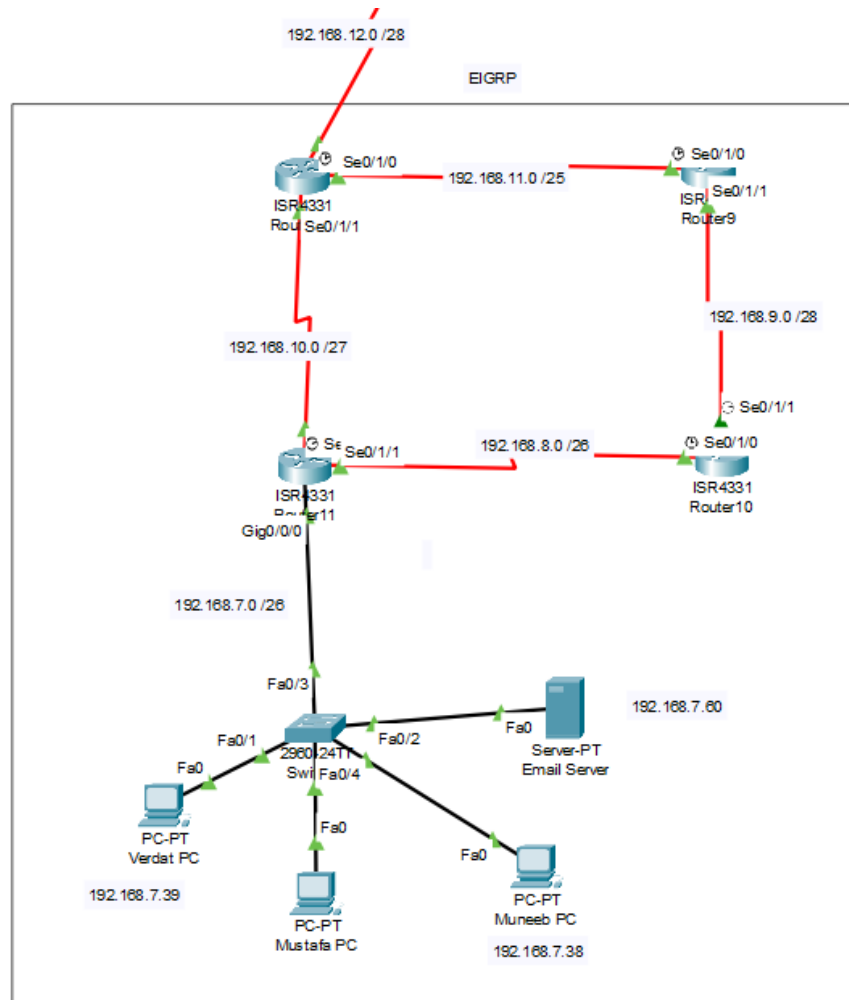
```
router rip
  network 192.168.4.0
  network 192.168.5.0
  network 192.168.6.0
```

Router 13

```
router rip
  network 192.168.6.0
```

EIGRP Configuration

EIGRP Network



Router 9

```
router eigrp 10
 network 192.168.11.0
 network 192.168.9.0
```

Router 10

```
router eigrp 10
 network 192.168.8.0
 network 192.168.9.0
```

Router 11


```

router eigrp 10
 network 192.168.7.0
 network 192.168.10.0
 network 192.168.8.0

```

Router 12

```

router eigrp 10
 network 192.168.10.0
 network 192.168.11.0
 network 192.168.12.0

```

Router 13

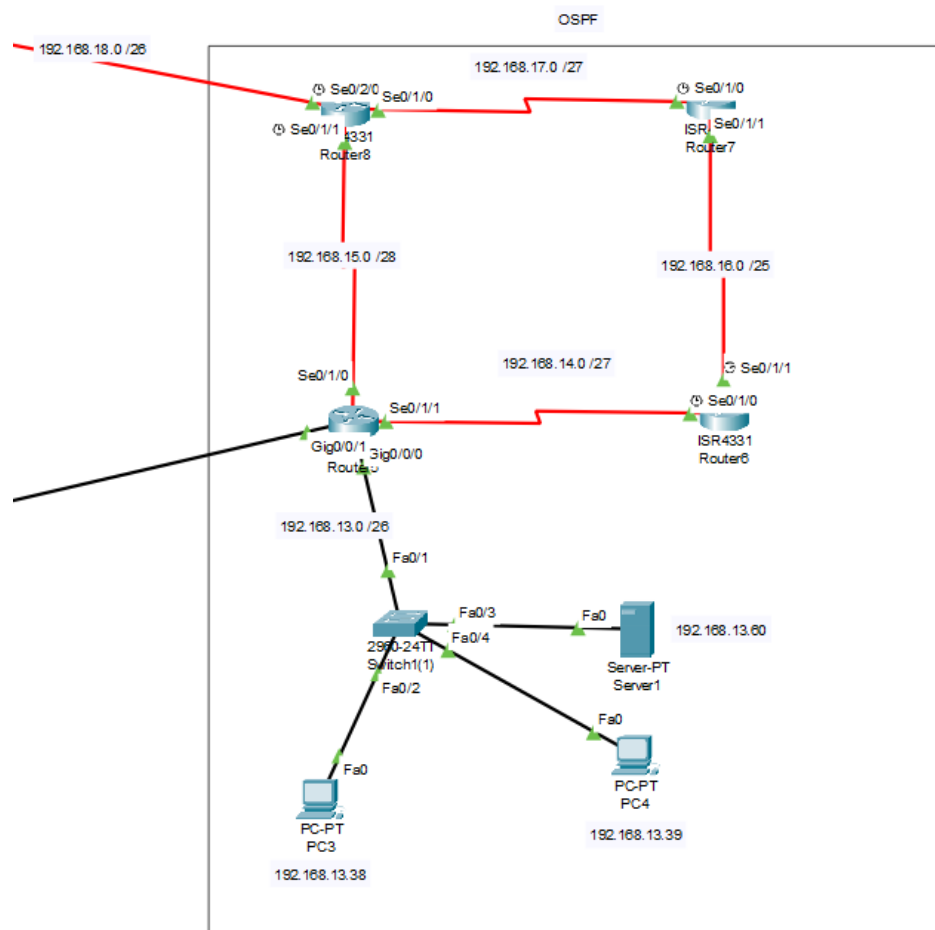
```

router eigrp 10
 network 192.168.12.0

```

OSPF Configuration

OSPF Network



Router 5

```
router ospf 1
 network 192.168.14.0 0.0.0.31 area 0
 network 192.168.15.0 0.0.0.15 area 0
 network 192.168.13.0 0.0.0.63 area 0
```

Router 6

```
router ospf 1
 network 192.168.16.0 0.0.0.127 area 0
 network 192.168.14.0 0.0.0.31 area 0
```

Router 7

```
router ospf 1
 network 192.168.16.0 0.0.0.127 area 0
 network 192.168.17.0 0.0.0.31 area 0
```

Router 8

```
router ospf 1
 network 192.168.18.0 0.0.0.63 area 0
 network 192.168.17.0 0.0.0.31 area 0
 network 192.168.15.0 0.0.0.15 area 0
```

Router 13

```
router ospf 1
 network 192.168.18.0 0.0.0.63 area 0
```

Redistribution Configuration (On Router 13)**Router 13**

```
router rip
 redistribute eigrp 10 metric 2
 redistribute ospf 1 metric 2
 exit

router eigrp 10
 redistribute rip metric 1 1 255 1 1
 redistribute ospf 1 metric 1 1 255 1 1
 exit

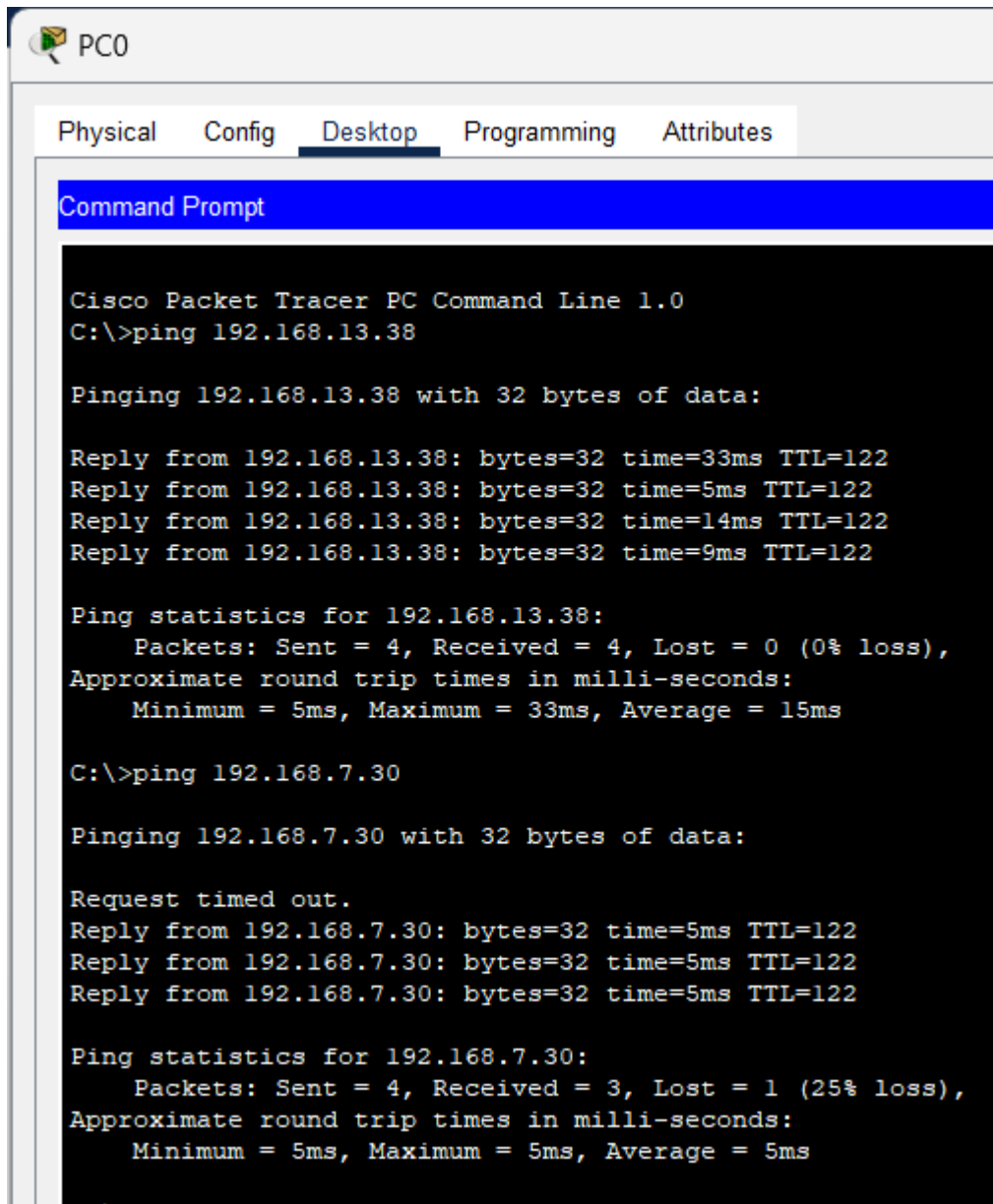
router ospf 1
```

```
redistribute rip subnets
redistribute eigrp 10 subnets
exit
```

These command of redistribution on router 13 will help to communicate each protocol with each other

Test Network Connectivity Using Ping

- PC0 with PC3 and Mustafa PC



The screenshot shows the PC0 interface in Cisco Packet Tracer. The 'Desktop' tab is selected, displaying a 'Command Prompt' window. The window shows the output of two ping commands. The first command is 'ping 192.168.13.38', which results in four successful replies with varying times (33ms, 5ms, 14ms, 9ms) and a 0% loss. The second command is 'ping 192.168.7.30', which results in a 'Request timed out' followed by three successful replies (all 5ms) and a 25% loss.

```
PC0
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.13.38

Pinging 192.168.13.38 with 32 bytes of data:

Reply from 192.168.13.38: bytes=32 time=33ms TTL=122
Reply from 192.168.13.38: bytes=32 time=5ms TTL=122
Reply from 192.168.13.38: bytes=32 time=14ms TTL=122
Reply from 192.168.13.38: bytes=32 time=9ms TTL=122

Ping statistics for 192.168.13.38:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 5ms, Maximum = 33ms, Average = 15ms

C:\>ping 192.168.7.30

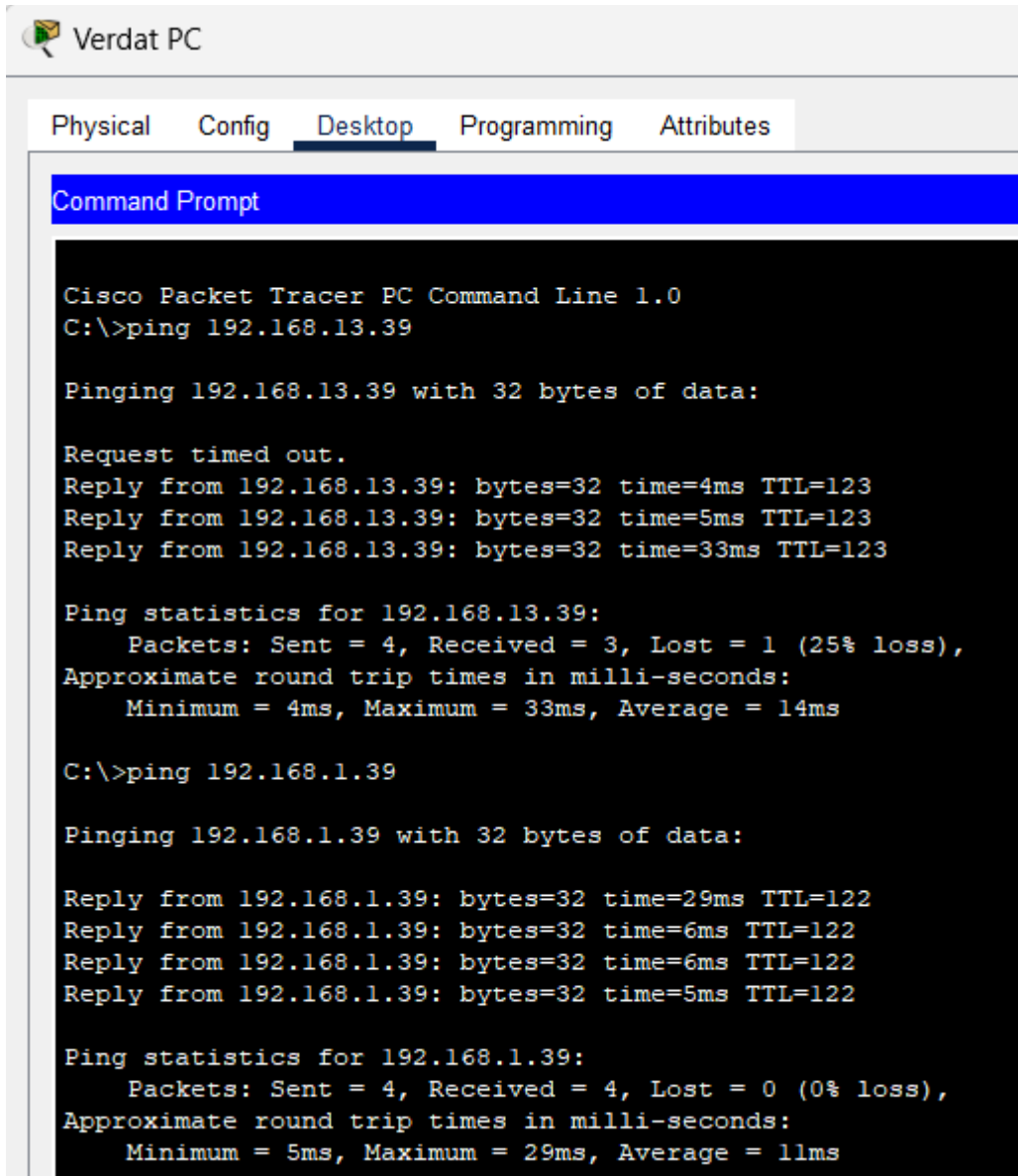
Pinging 192.168.7.30 with 32 bytes of data:

Request timed out.
Reply from 192.168.7.30: bytes=32 time=5ms TTL=122
Reply from 192.168.7.30: bytes=32 time=5ms TTL=122
Reply from 192.168.7.30: bytes=32 time=5ms TTL=122

Ping statistics for 192.168.7.30:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 5ms, Maximum = 5ms, Average = 5ms
```

This shows that RIP protocol is successfully communicating with OSPF protocol and EIGRP protocol

- **Verdat PC with PC1 and PC4**



The screenshot shows the Verdat PC interface with the 'Desktop' tab selected. A Command Prompt window is open, displaying the output of two ping commands. The first command is 'ping 192.168.13.39', which shows a 25% loss of packets. The second command is 'ping 192.168.1.39', which shows 0% loss of packets.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.13.39

Pinging 192.168.13.39 with 32 bytes of data:

Request timed out.
Reply from 192.168.13.39: bytes=32 time=4ms TTL=123
Reply from 192.168.13.39: bytes=32 time=5ms TTL=123
Reply from 192.168.13.39: bytes=32 time=33ms TTL=123

Ping statistics for 192.168.13.39:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 4ms, Maximum = 33ms, Average = 14ms

C:\>ping 192.168.1.39

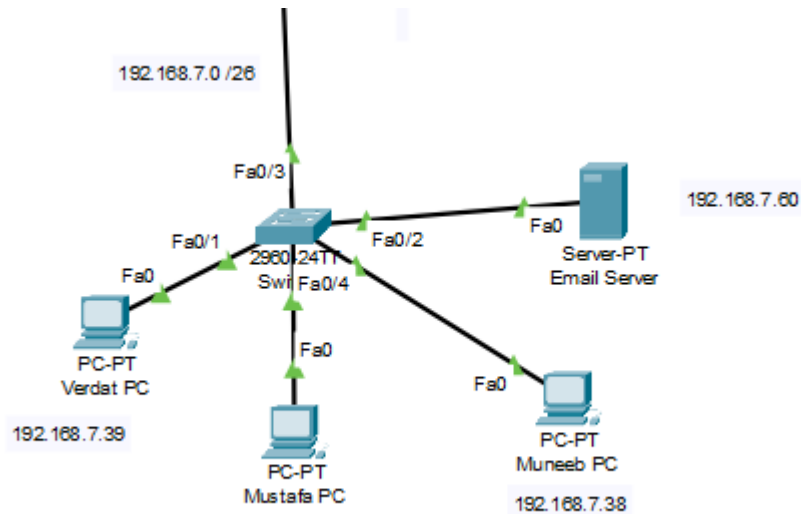
Pinging 192.168.1.39 with 32 bytes of data:

Reply from 192.168.1.39: bytes=32 time=29ms TTL=122
Reply from 192.168.1.39: bytes=32 time=6ms TTL=122
Reply from 192.168.1.39: bytes=32 time=6ms TTL=122
Reply from 192.168.1.39: bytes=32 time=5ms TTL=122

Ping statistics for 192.168.1.39:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 5ms, Maximum = 29ms, Average = 11ms
```

This shows that EIGRP protocol is successfully communicating with OSPF protocol and RIP protocol and vice versa. Hence all networks are successfully communicating with each other.

Email Configuration



- Email Server**

🔍 Email Server

Physical
Config
Services
Desktop
Programming
Attributes

IP Configuration

IP Configuration

☐ DHCP

IPv4 Address

Subnet Mask

Default Gateway

DNS Server

☒ Static

192.168.7.60

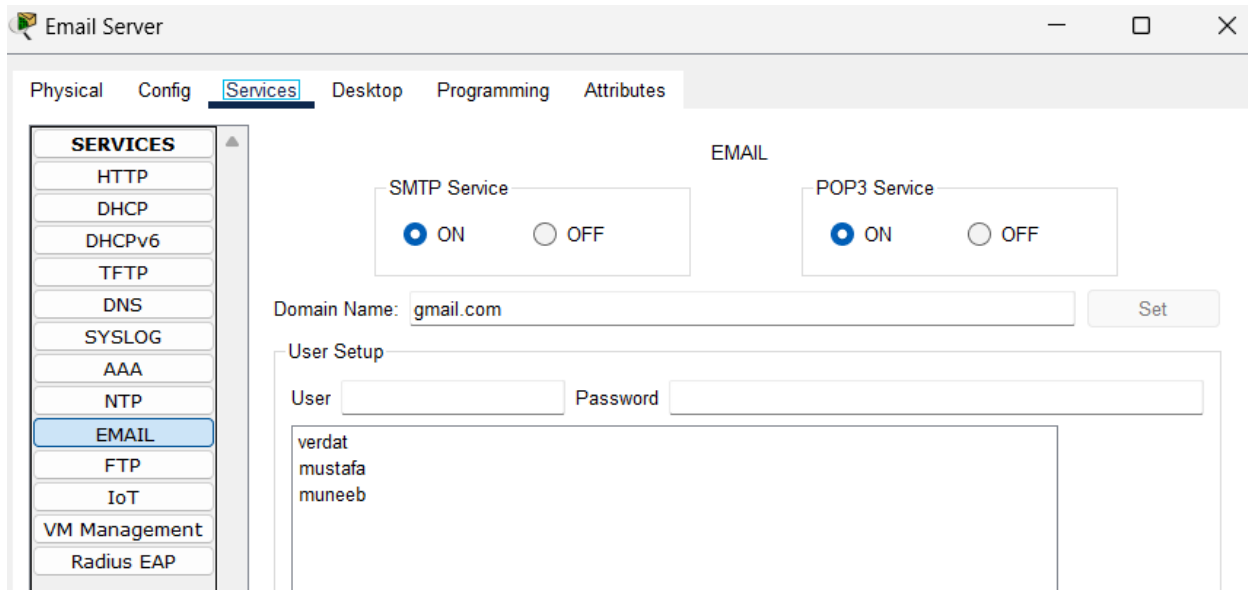
255.255.255.192

192.168.7.3

0.0.0.0

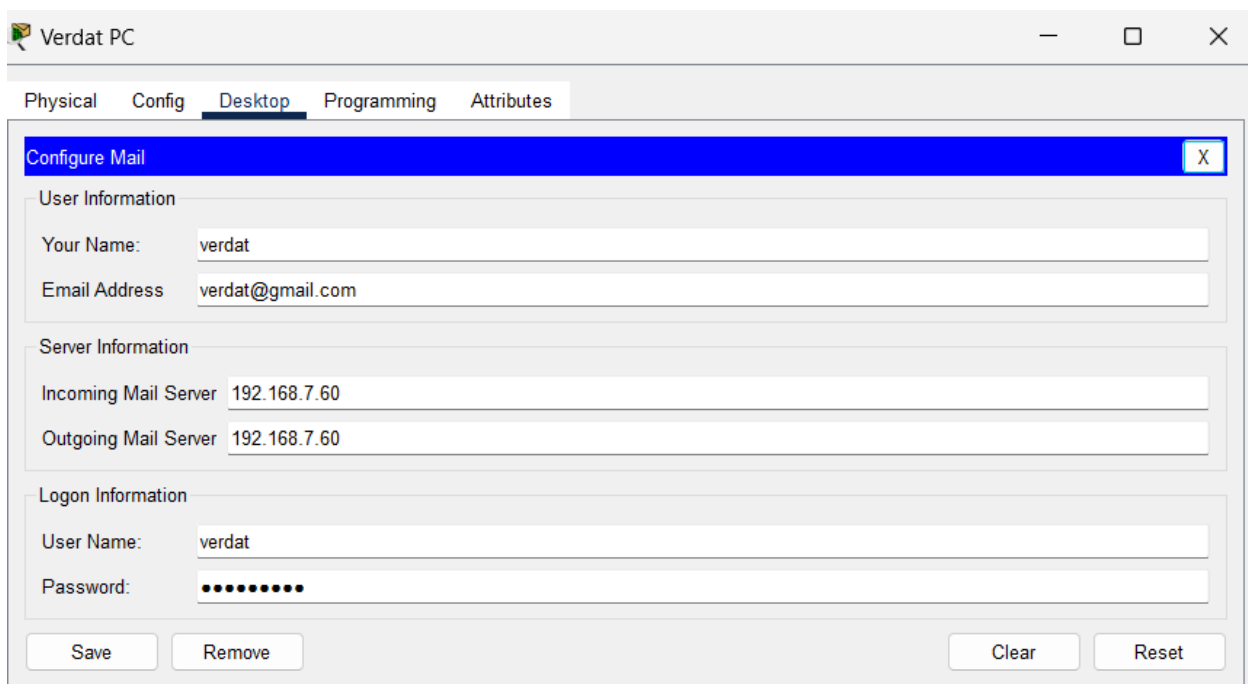
- **Services -> Email**

First add the domain name then enter users name with relevant password

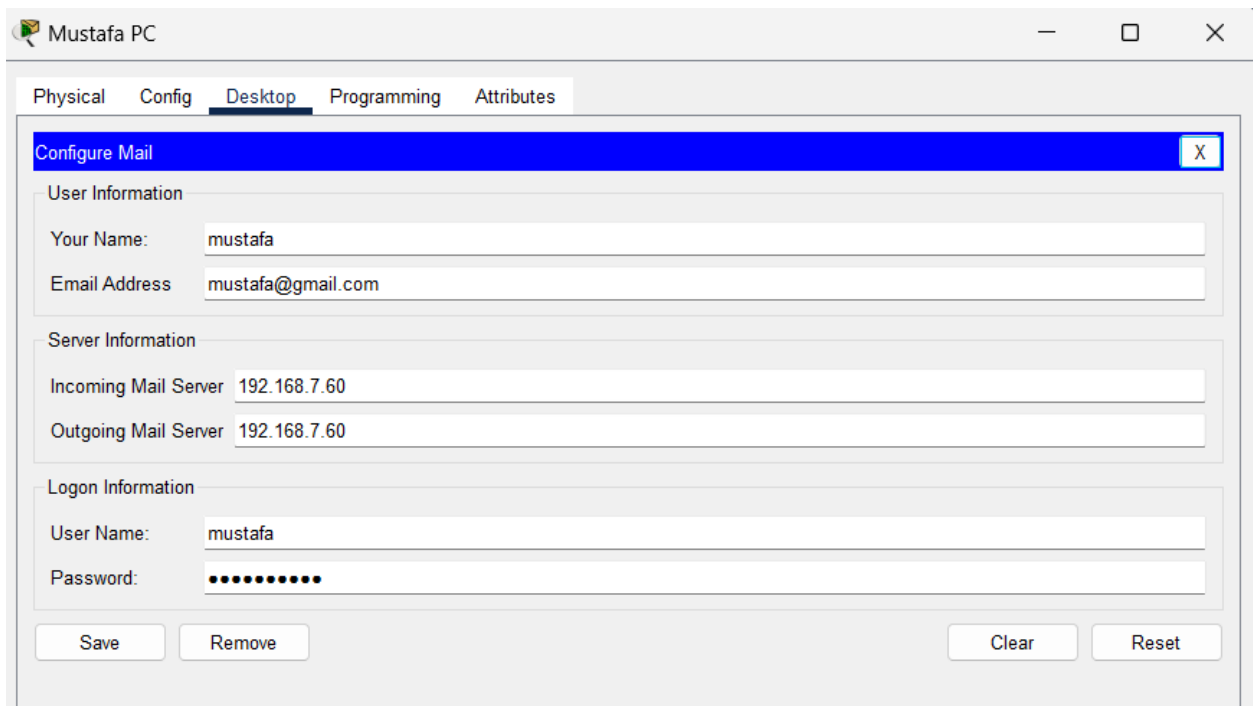


Now Configure Email on Each User PCS which was defined in server and save it on each PCs

- **Verdat PC**



- **Mustafa PC**



The screenshot shows a window titled "Mustafa PC" with a tabbed interface. The "Desktop" tab is selected, displaying a "Configure Mail" dialog box. The dialog has a blue title bar with a close button (X). It contains three sections: "User Information", "Server Information", and "Logon Information".

User Information:

- Your Name: mustafa
- Email Address: mustafa@gmail.com

Server Information:

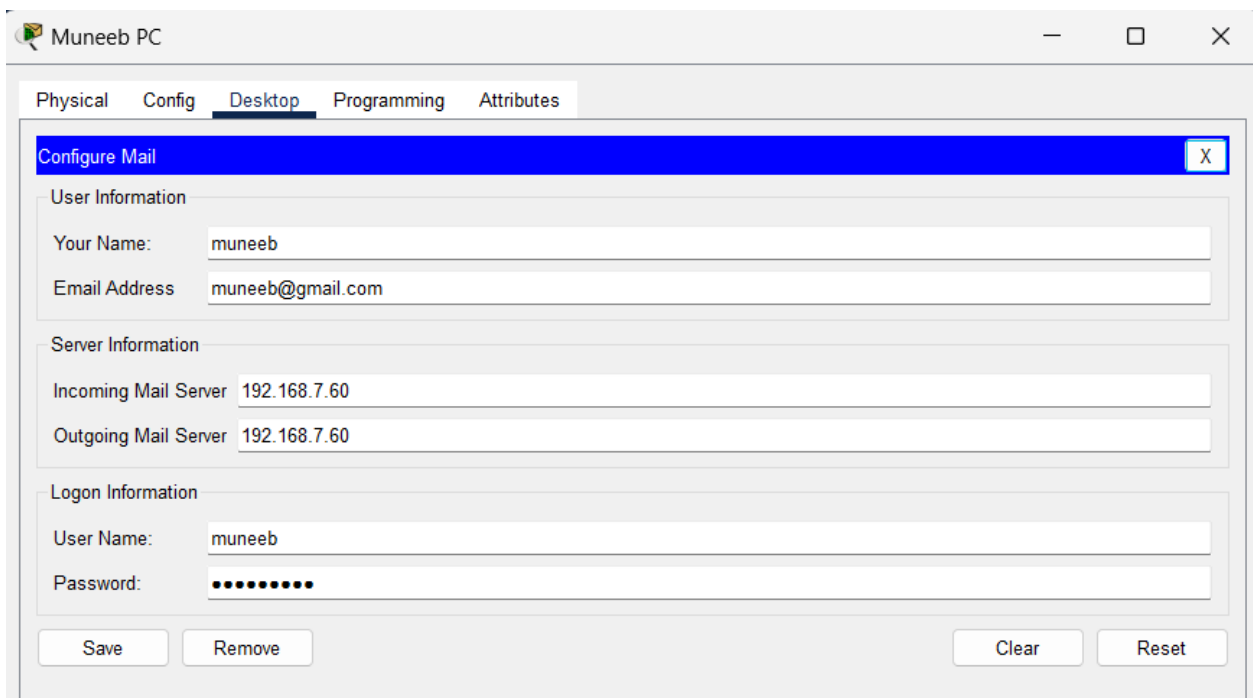
- Incoming Mail Server: 192.168.7.60
- Outgoing Mail Server: 192.168.7.60

Logon Information:

- User Name: mustafa
- Password: (masked with dots)

At the bottom of the dialog are four buttons: "Save", "Remove", "Clear", and "Reset".

- **Muneeb PC**



The screenshot shows a window titled "Muneeb PC" with a tabbed interface. The "Desktop" tab is selected, displaying a "Configure Mail" dialog box. The dialog has a blue title bar with a close button (X). It contains three sections: "User Information", "Server Information", and "Logon Information".

User Information:

- Your Name: muneeb
- Email Address: muneeb@gmail.com

Server Information:

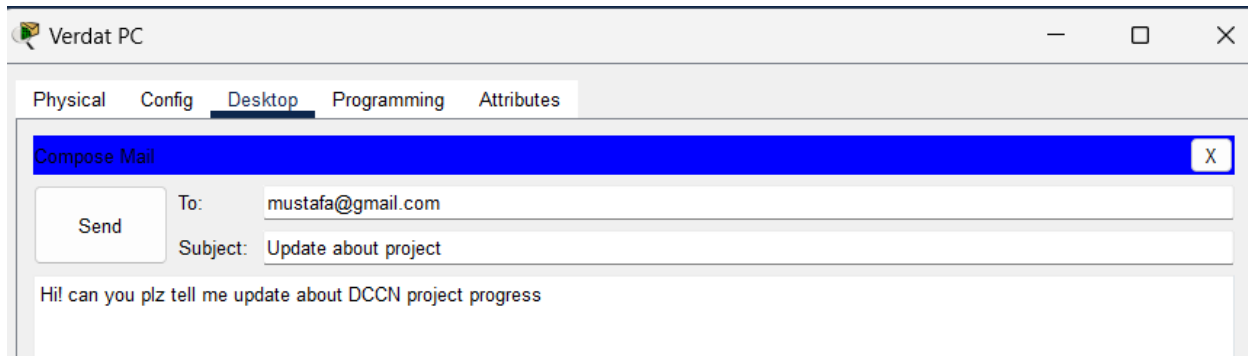
- Incoming Mail Server: 192.168.7.60
- Outgoing Mail Server: 192.168.7.60

Logon Information:

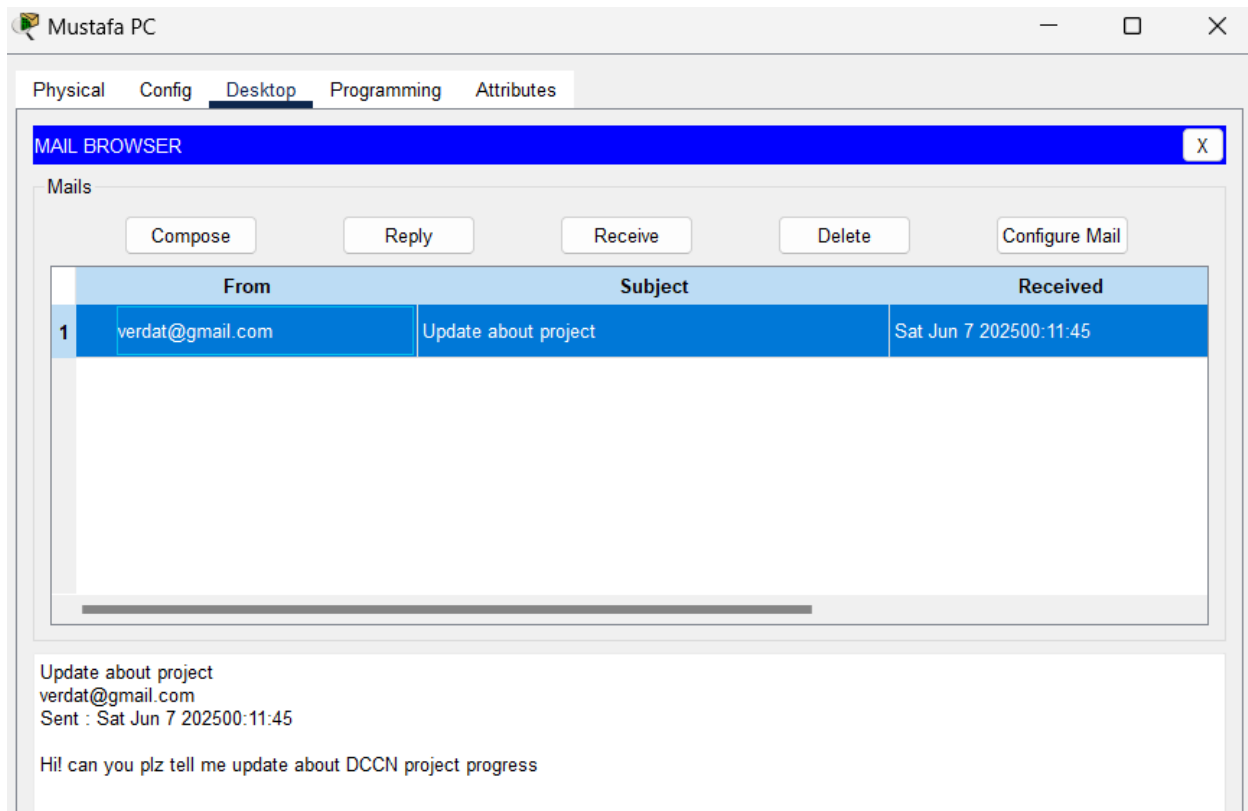
- User Name: muneeb
- Password: (masked with dots)

At the bottom of the dialog are four buttons: "Save", "Remove", "Clear", and "Reset".

Now check if email is sending and receiving from on PC to another

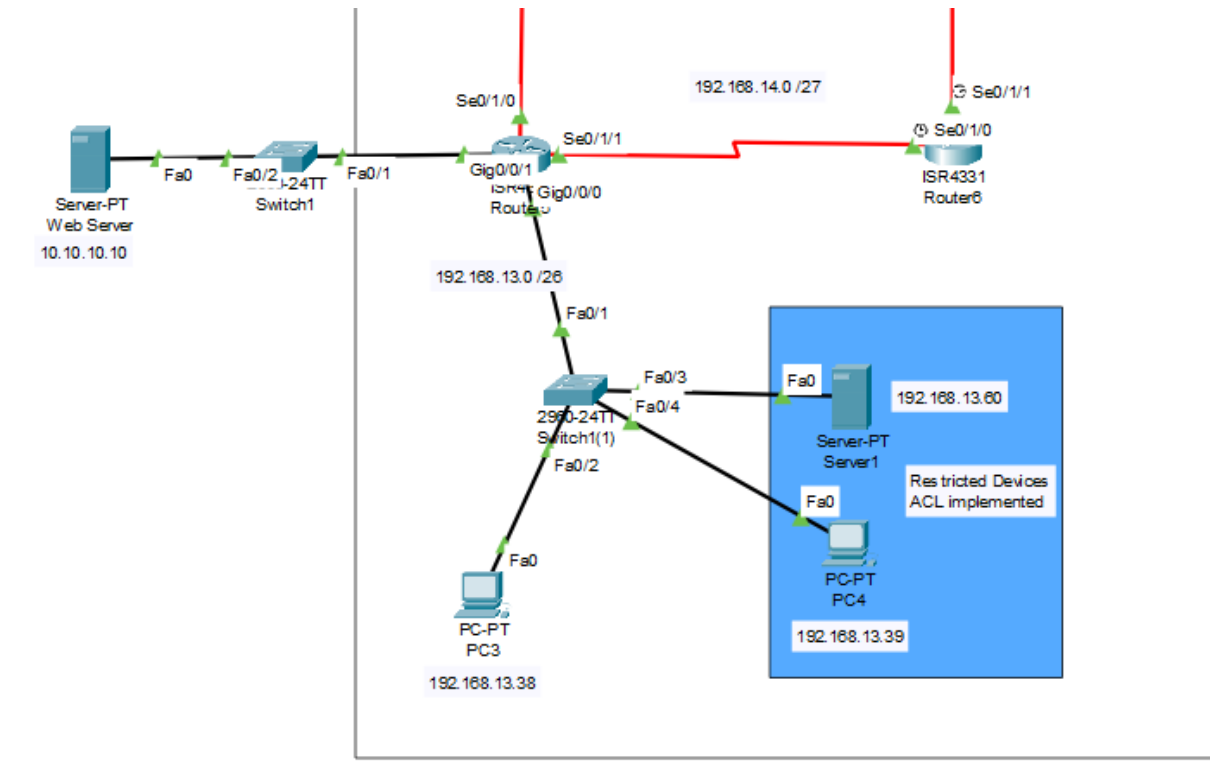


Verdat PC has sent an email to Mustafa PC now, let's check if Mustafa PC received it successfully



Mustafa's PC successfully receives the email

Standard ACL Configuration



Web Server configuration

Web Server

Physical Config Services **Desktop** Programming Attributes

IP Configuration

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 10.10.10.10

Subnet Mask: 255.0.0.0

Default Gateway: 10.10.10.1

DNS Server: 0.0.0.0

ACL configuration on Router 5

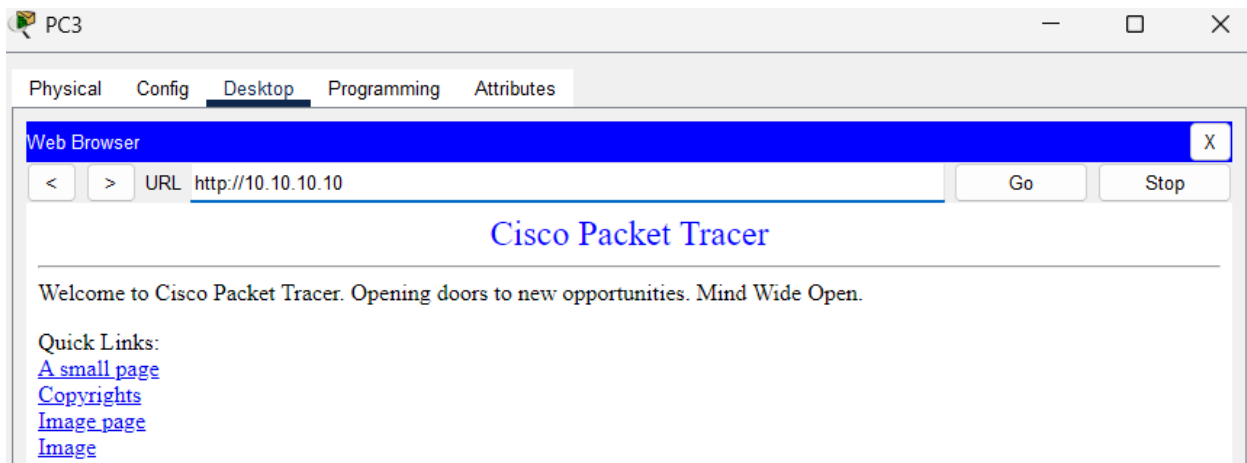
Type command

```
Router(config)#access-list 10 permit host 192.168.13.38
Router(config)#
Router(config)#access-list 10 deny any
Router(config-if)#int gig0/0/0
Router(config-if)#
Router(config-if)#ip access-group 10 in
Router(config-if)#
Router(config-if)#exit
Router(config)#
Router(config)#do wr
Building configuration...
[OK]
```

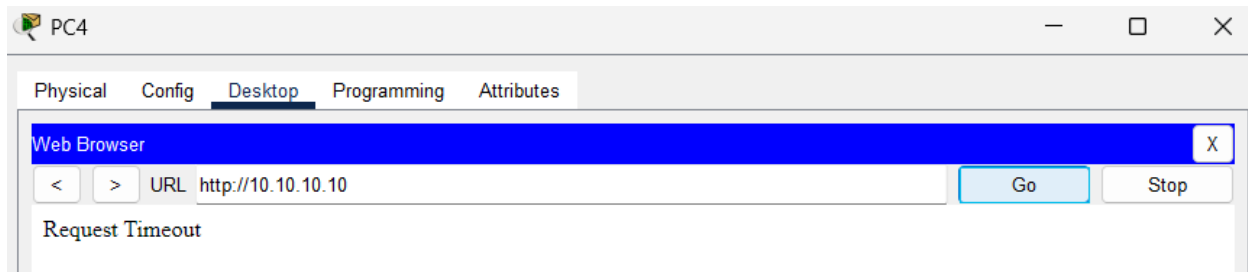
Type command Show access-list

```
Router#sh access-list
Standard IP access list 10
 10 permit host 192.168.13.38
 20 deny any
```

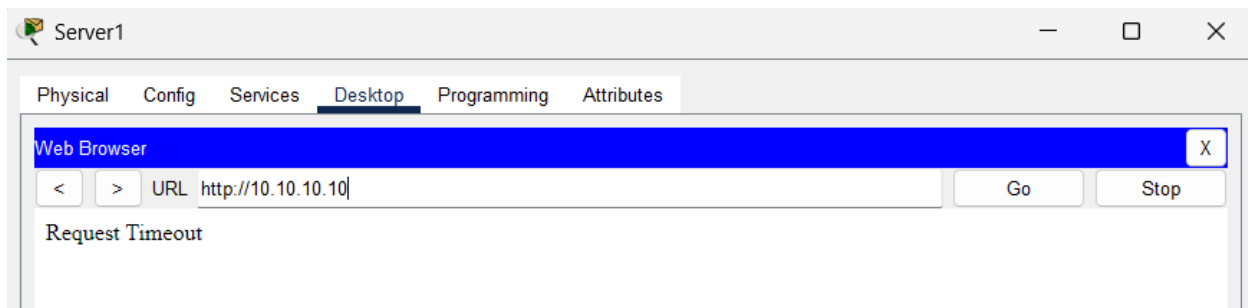
For confirmation check from PC3 (192.168.13.38) to WebServer



This shows that PC3 is able to communicate with web server which we have defined in ACL configuration

From PC4 (192.168.13.38) to Web server

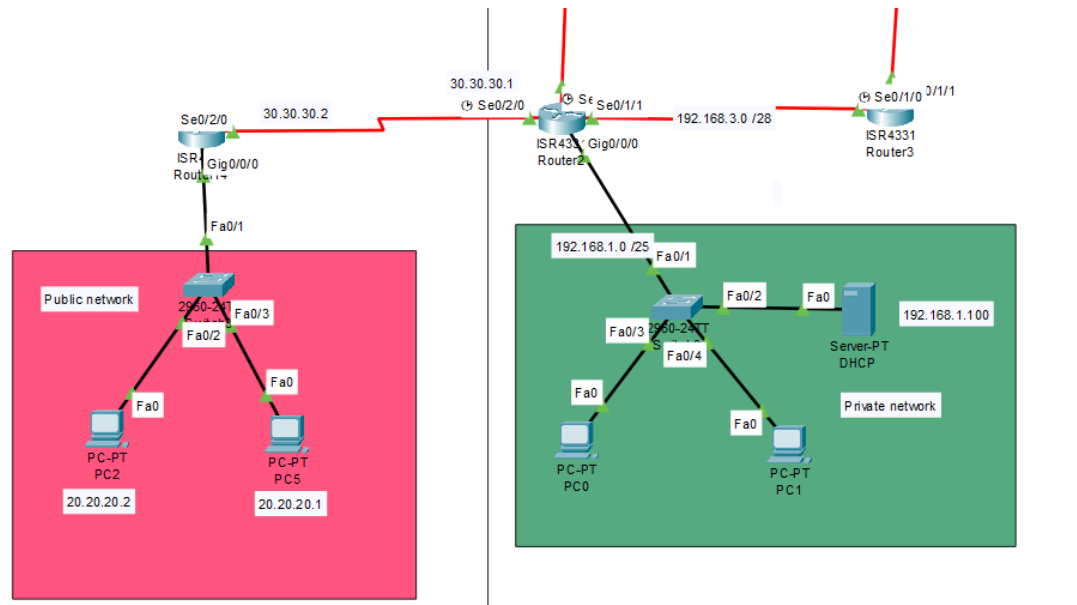
This shows that PC4 was unable to communicate with Web server which we have defined in ACL configuration

From Server 1 (192.168.13.60) to Web server

This shows that Server1 was unable to communicate with Web server which we have defined in ACL configuration

Static NAT configuration

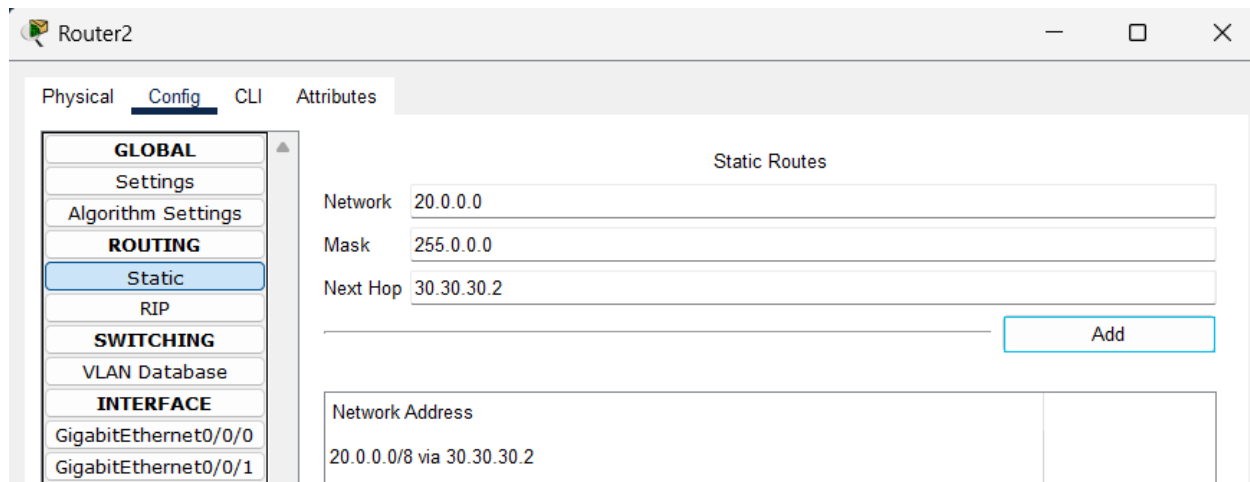
NAT Network



NAT configuration on Router 2

Type command

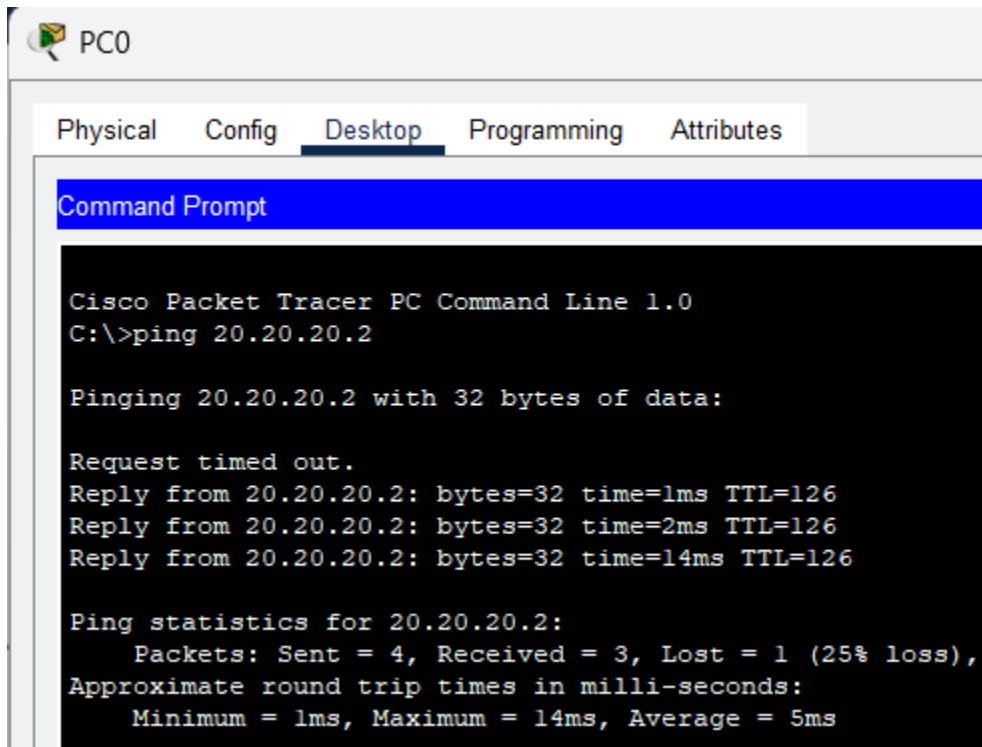
```
Router(config-if)#ip nat inside source static 192.168.1.38 30.30.30.1
Router(config)#ip nat inside source static 192.168.1.39 30.30.30.1
Router(config)#ip nat inside source static 192.168.1.100 30.30.30.1
Router(config)#
Router(config)#int gig0/0/0
Router(config-if)#ip nat inside
Router(config-if)#int se0/2/0
Router(config-if)#ip nat outside
Router(config-if)#
Router(config-if)#exit
Router(config)#
```



This will allow private network to access with public network, but public network cannot access private network this is how NAT works

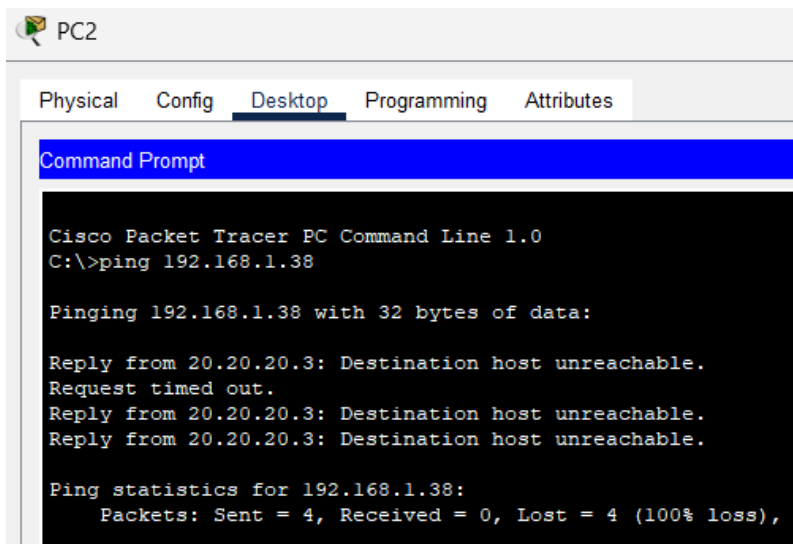
Test connectivity using ping

- From PC0 to PC2



This shows that private network PC can communicate with public network PC

- **From PC2 to PC0**



The screenshot shows the 'PC2' configuration window in Cisco Packet Tracer. The 'Desktop' tab is selected, displaying a 'Command Prompt' window. The text in the command prompt is as follows:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.38

Pinging 192.168.1.38 with 32 bytes of data:

Reply from 20.20.20.3: Destination host unreachable.
Request timed out.
Reply from 20.20.20.3: Destination host unreachable.
Reply from 20.20.20.3: Destination host unreachable.

Ping statistics for 192.168.1.38:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

This shows that public network PC cannot communicate with private network PC. This shows that NAT is working properly.

Conclusion

In this project, we successfully designed and implemented a complete enterprise-level computer network using Cisco Packet Tracer. The network was divided into three autonomous systems operating with RIP, OSPF, and EIGRP, and Router 13 was configured as the central redistribution point to enable seamless communication between all protocols. Subnetting were applied to ensure efficient utilization of IP addresses, while DHCP was implemented to automate IP assignment across hosts. Additional services such as an Email Server and a Web Server were configured to simulate real-world enterprise communication. Network Address Translation (NAT) was applied to allow controlled communication between private and public networks, and Access Control Lists (ACL) were used to enforce security policies by restricting access to specific devices. Connectivity tests through ping and email exchange confirmed successful end-to-end communication across domains, demonstrating that the design met all functional requirements. Overall, this project provided practical exposure to advanced networking concepts including routing, redistribution, subnetting, and

network services, thereby reinforcing our understanding of enterprise network design and implementation.