Network Project

Project Team

Mohamed Tarek 230102535

Abdelaziz Soliman 230105666

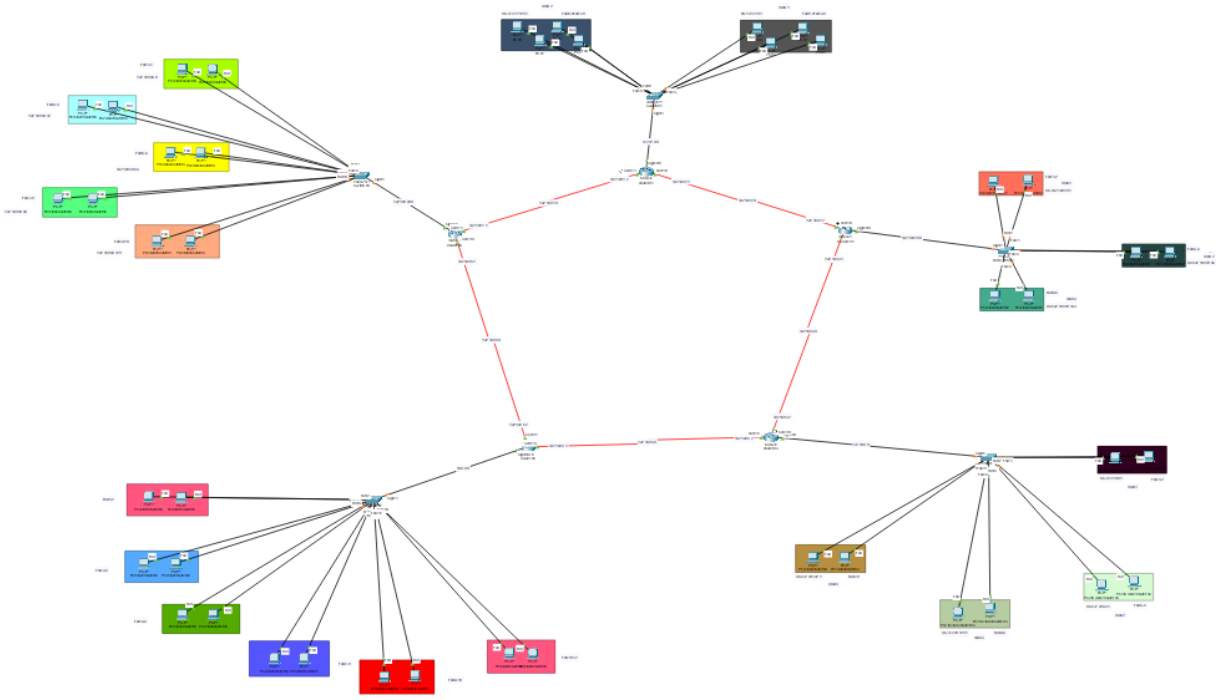
Seif Waheed 230102645

Omar Ahmed 230104579

Asmaa Saied 230101389

1. Network Design :

The first step of the project involved designing the network topology.

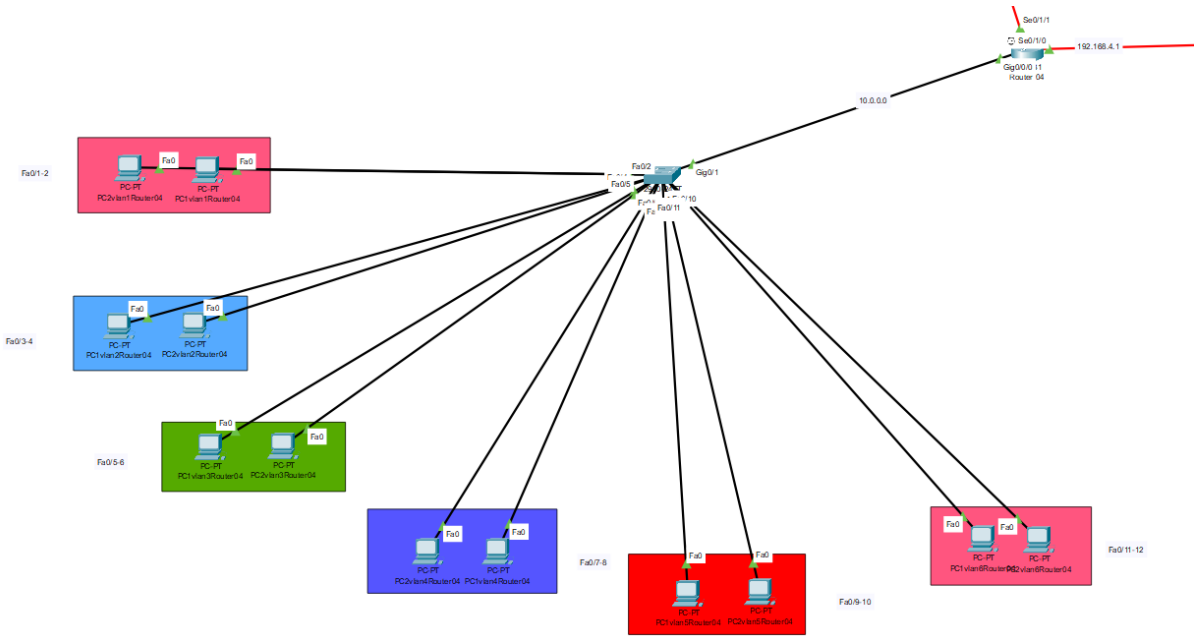


2. Subnetting

Once the network design was finalized, subnetting was performed to allocate IP addresses efficiently. Each branch and department received a specific subnet to:

- Isolate traffic for security and performance.
- Ensure there were enough IP addresses for all devices within each network segment.

Now, let us choose a branch to apply the subnetting



pic. 2

In this branch **(refer to Pic. 2),** the network IP is 10.0.0.0, and there are 6 departments.

To meet the requirements, we need to subnet this IP address to accommodate the 6 departments efficiently. Each subnet will be assigned based on the number of devices per department and future scalability.

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3. Subnet Calculation :

Network IP : 10.0.0.0/8

Network = 2^n

$6 = 2^n$

$n = 3 \longrightarrow$ this is number of borrowed bits

$3 + 8 = 11$

So the new IP : 10.0.0.0/11

Network Address	Usable Host Range	Broadcast Address:
10.0.0.0	10.0.0.1 - 10.31.255.254	10.31.255.255
10.32.0.0	10.32.0.1 - 10.63.255.254	10.63.255.255
10.64.0.0	10.64.0.1 - 10.95.255.254	10.95.255.255
10.96.0.0	10.96.0.1 - 10.127.255.254	10.127.255.255
10.128.0.0	10.128.0.1 - 10.159.255.254	10.159.255.255
10.160.0.0	10.160.0.1 - 10.191.255.254	10.191.255.255
10.192.0.0	10.192.0.1 - 10.223.255.254	10.223.255.255
10.224.0.0	10.224.0.1 - 10.255.255.254	10.255.255.255

pic. 3

And this is for the other networks in the projects :

Network IP = 172.20.0.0/16

$4 = 2^n$

$n = 2$

$2 + 16 = 18$

New IP = 172.20.0.0/18

Network Address	Usable Host Range	Broadcast Address:
172.20.0.0	172.20.0.1 - 172.20.63.254	172.20.63.255
172.20.64.0	172.20.64.1 - 172.20.127.254	172.20.127.255
172.20.128.0	172.20.128.1 - 172.20.191.254	172.20.191.255
172.20.192.0	172.20.192.1 - 172.20.255.254	172.20.255.255

Network IP = 192.168.20.0/24

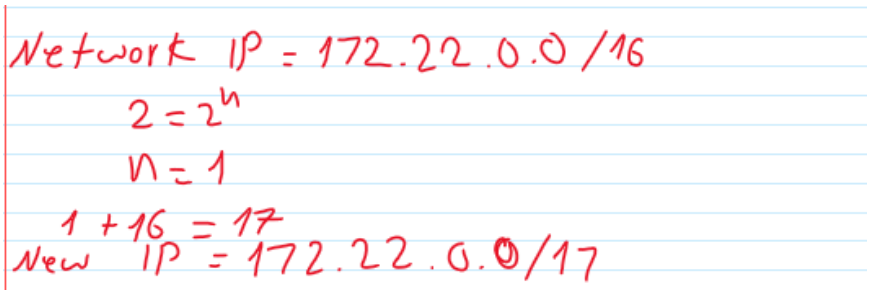
$3 = 2^n$

$n = 2$

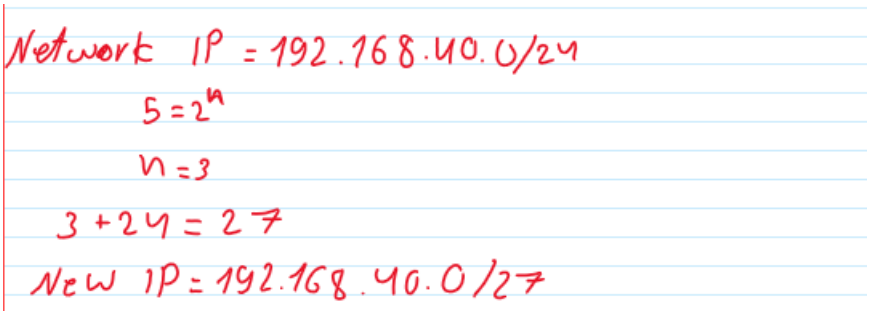
$2 + 2n = 26$

New IP = 192.168.20.0/26

Network Address	Usable Host Range	Broadcast Address:
192.168.20.0	192.168.20.1 - 192.168.20.62	192.168.20.63
192.168.20.64	192.168.20.65 - 192.168.20.126	192.168.20.127
192.168.20.128	192.168.20.129 - 192.168.20.190	192.168.20.191
192.168.20.192	192.168.20.193 - 192.168.20.254	192.168.20.255



Network Address	Usable Host Range	Broadcast Address:
172.22.0.0	172.22.0.1 - 172.22.127.254	172.22.127.255
172.22.128.0	172.22.128.1 - 172.22.255.254	172.22.255.255

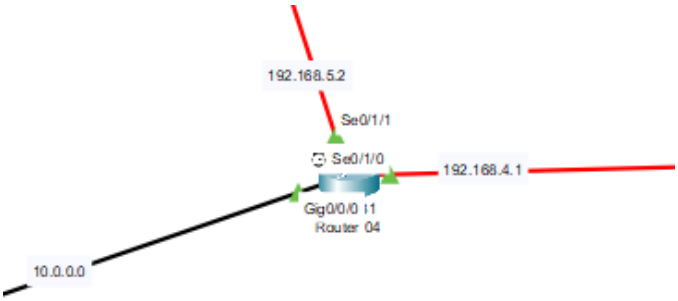


Network Address	Usable Host Range	Broadcast Address:
192.168.40.0	192.168.40.1 - 192.168.40.30	192.168.40.31
192.168.40.32	192.168.40.33 - 192.168.40.62	192.168.40.63
192.168.40.64	192.168.40.65 - 192.168.40.94	192.168.40.95
192.168.40.96	192.168.40.97 - 192.168.40.126	192.168.40.127
192.168.40.128	192.168.40.129 - 192.168.40.158	192.168.40.159
192.168.40.160	192.168.40.161 - 192.168.40.190	192.168.40.191
192.168.40.192	192.168.40.193 - 192.168.40.222	192.168.40.223
192.168.40.224	192.168.40.225 - 192.168.40.254	192.168.40.255

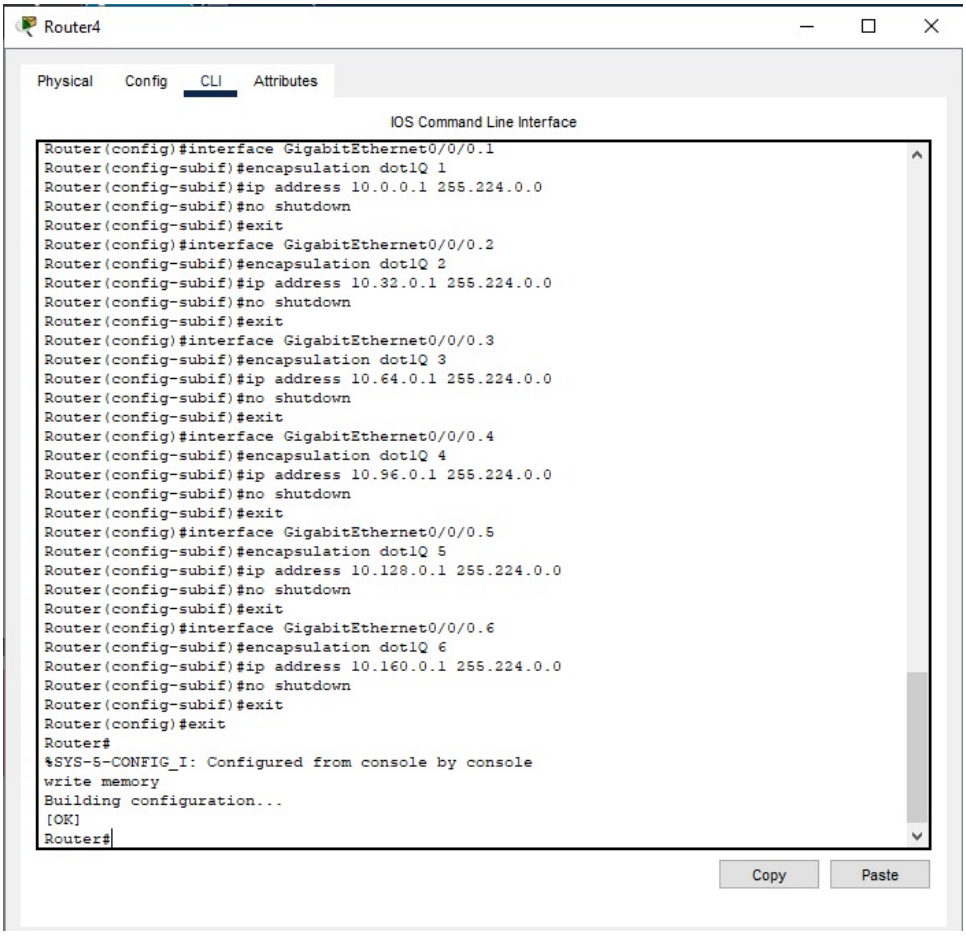
4. Configuration:

After subnetting, the configuration phase began.

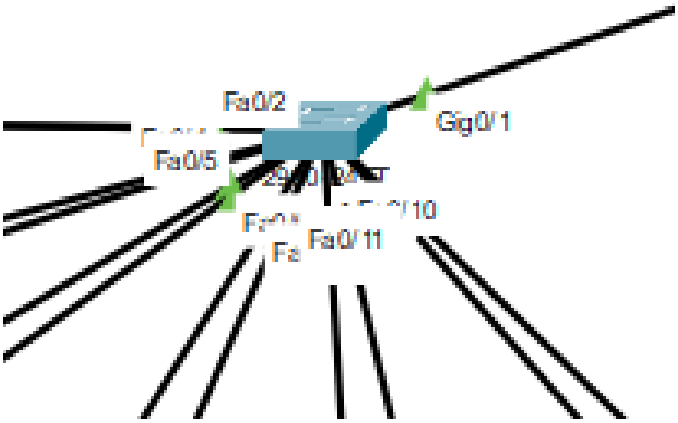
1 - **Router Configuration :**



Configured sub interfaces for inter-VLAN routing :



2 - **Switch Configuration :**



Set up VLANs for each department :

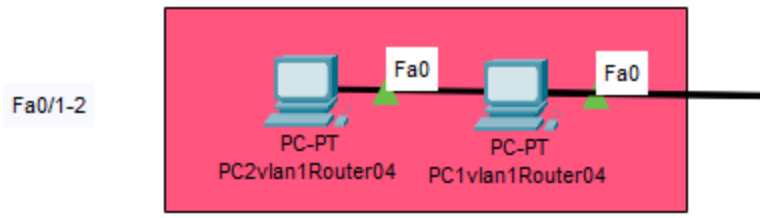
```
Switch>en
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#vlan 1
Switch(config-vlan)#exit
Switch(config)#vlan 2
Switch(config-vlan)#exit
Switch(config)#vlan 3
Switch(config-vlan)#exit
Switch(config)#vlan 4
Switch(config-vlan)#exit
Switch(config)#vlan 5
Switch(config-vlan)#exit
Switch(config)#vlan 6
Switch(config-vlan)#exit
Switch(config)#
```

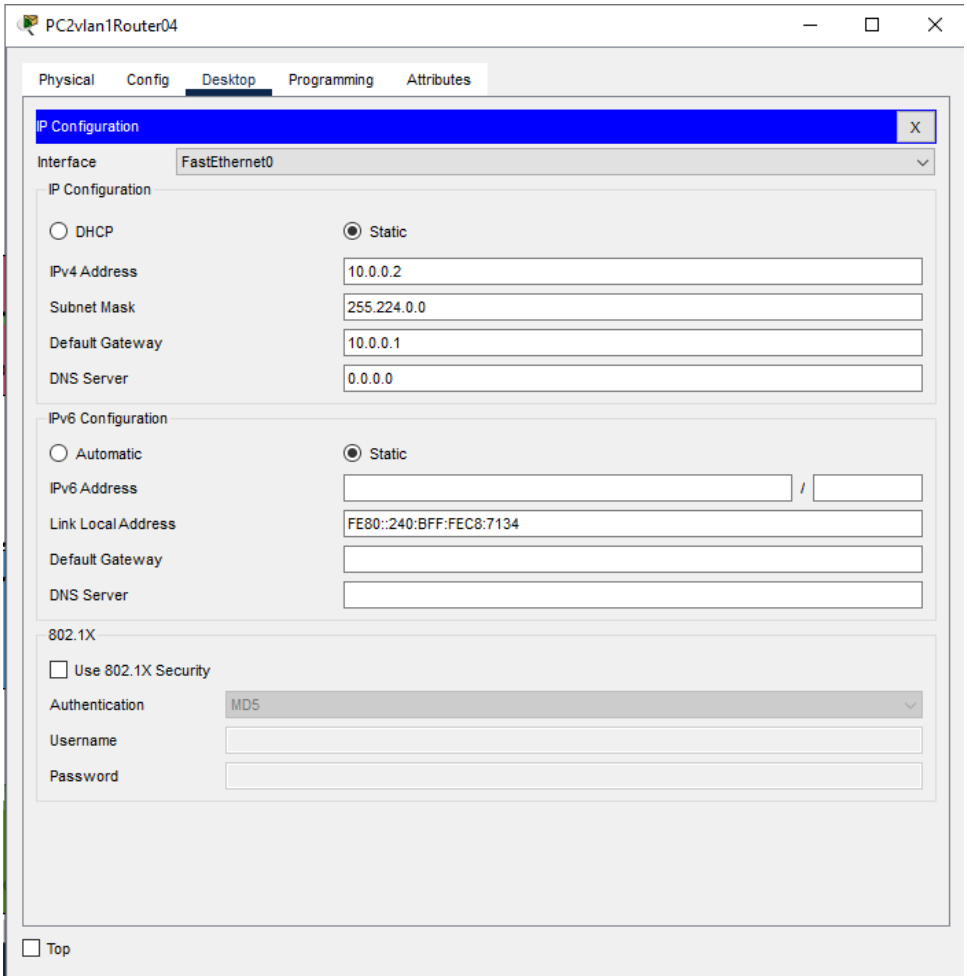
Assign Ports to VLANs and configure **Trunking** on the Switch-Router Link :

```
Switch(config)#interface FastEthernet0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 1
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 1
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 2
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/4
Switch(config-if)#switchport mode access
Switch(config-if)#
Switch(config-if)#switchport access vlan 2
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/5
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 3
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/6
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 3
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/7
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 4
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/8
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 4
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/9
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 5
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/10
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 5
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/11
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 6
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/12
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 6
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#interface GigabitEthernet0/1
Switch(config-if)#switchport mode trunk
Switch(config-if)#exit
Switch(config)#
```

3 – Set up each devices :

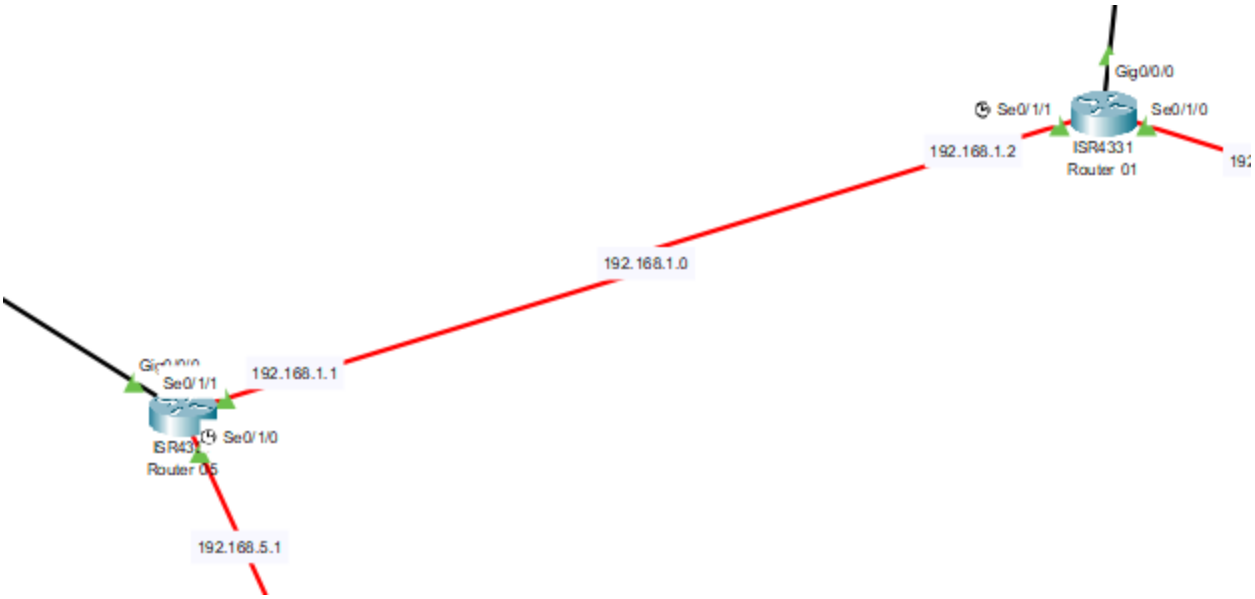
By assigning the IP address and the default gateway.





Now the network is complete, we repeated the process for the other networks.

5. Router OSPF implementation



now we will choose one of these routers

Steps to Implement OSPF:

Router Configuration CLI:

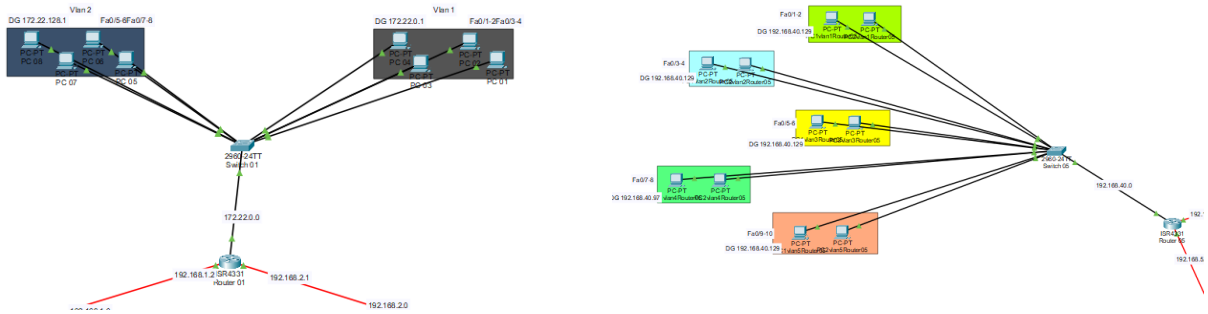
```
Router>enable
Router#onf
Router#onf
Router#conf
Router#configure t
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#inter
Router(config)#interface se
Router(config)#interface serial0/1/0
Router(config-if)#ip
Router(config-if)#ip add
Router(config-if)#ip address 192.168.5.1 255.255.255.0
Router(config-if)#no sh
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
Router(config-if)#exit
Router(config)#interface serial0/1/1
Router(config-if)#ip address 192.168.1.2 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to up

Router(config-if)#ex
Router(config-if)#exit
Router(config)#
```

OSPF Protocol Configuration CLI:

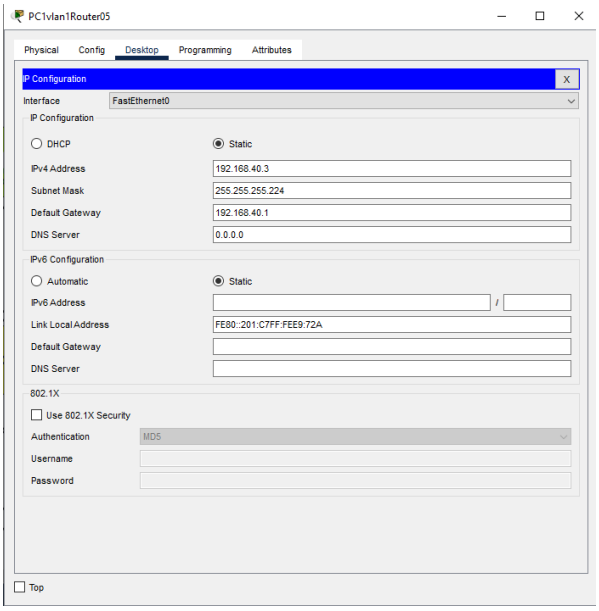
```
Router>ena
Router>enable
Router#conf
Router#configure t
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#rout
Router(config)#router ospf 1
Router(config-router)#rout
Router(config-router)#router-id 2.2.2.2
Router(config-router)#net
Router(config-router)#network 1922.168.1.2 0.0.0.255 area 0
                              ^
% Invalid input detected at '^' marker.

Router(config-router)#network 192.168.1.2 0.0.0.255 area 0
Router(config-router)#network 192.168.1.2 0.0.0.255 area 0
01:03:31: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial0/1/1network 192.168.5.1
0.0.0.255 area 0
Router(config-router)#network 192.168.40.1 0.0.0.255 area 0
Router(config-router)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
write memory
Building configuration...
[OK]
Router#
```

We do the same with all router’s

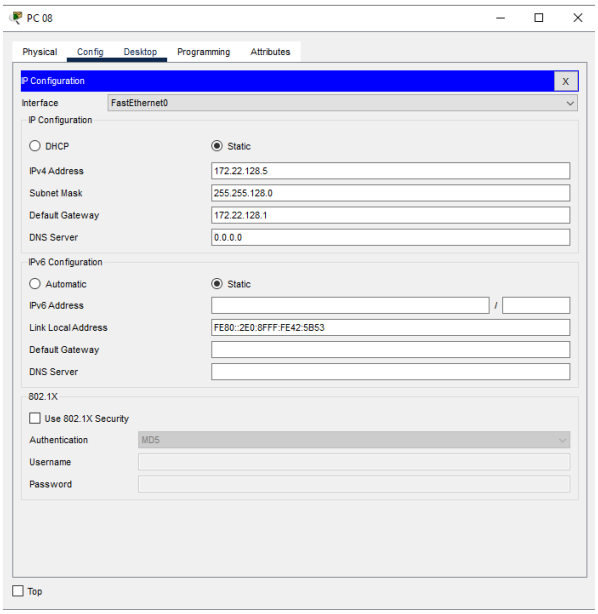
6. Ping:



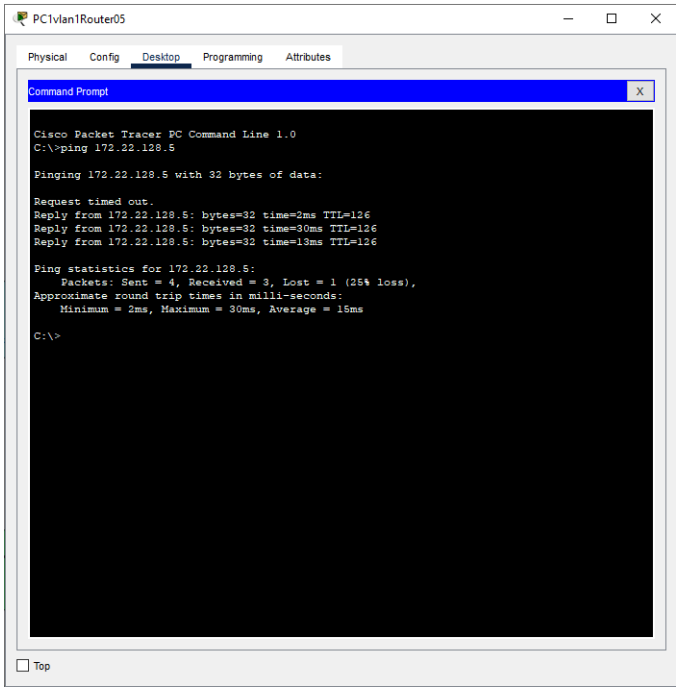
To verify connectivity between the two networks, we will perform a ping test.


PC1vlan1Router05
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.40.3
Subnet Mask
255.255.255.224
Default Gateway
192.168.40.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::201:C7FF:FEE9:72A
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

1


PC 08
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
172.22.128.5
Subnet Mask
255.255.128.0
Default Gateway
172.22.128.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::2E0:8FFF:FE42:5B53
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

2


PC1vlan1Router05
Physical
Config
Desktop
Programming
Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.22.128.5
Pinging 172.22.128.5 with 32 bytes of data:
Request timed out.
Reply from 172.22.128.5: bytes=32 time=2ms TTL=126
Reply from 172.22.128.5: bytes=32 time=30ms TTL=126
Reply from 172.22.128.5: bytes=32 time=13ms TTL=126
Ping statistics for 172.22.128.5:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 2ms, Maximum = 30ms, Average = 15ms
C:\>
Top

3