

# **Micro-Project (Part-2)**

*For partial fulfillment of Activity Based Learning*

*for Course*

**Data Communication & Networking (3028)**

**Network Design Task-02**



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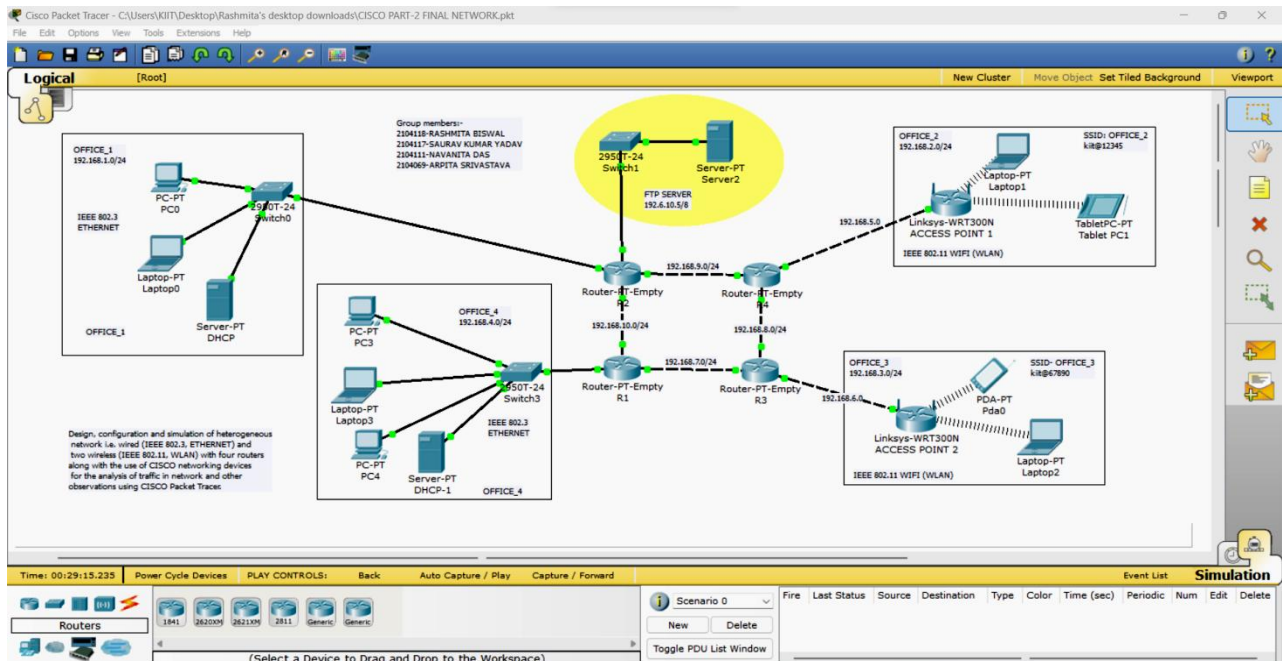
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Deemed to be University, Bhubaneswar -751024**

## Aim :

Design, configuration and simulation of heterogeneous network i.e. wired (IEEE 802.3, ETHERNET) and two wireless (IEEE 802.11, WLAN) with four routers using FTP SERVER along with the use of CISCO networking devices for the analysis of traffic in network and other observations using CISCO Packet Tracer.

## Network Scenario :



## Software used:



CISCO Packet Tracer

## Network Specifications :

### ➤ Heterogeneous Network (Table. 1)

Name	Network Address	IP Configurations	Gateway
OFFICE_1	192.168.1.0/24	192.168.1.2/24 - 192.168.1.254/24	<b>192.168.1.1/24</b>
OFFICE_2	192.168.2.0/24	192.168.2.2/24 - 192.168.2.254/24	<b>192.168.2.1/24</b>
FTP SERVER	192.6.10.0/8	192.6.10.2/8 - 255.255.255.254/8	<b>192.6.10.1/8</b>
OFFICE_3	192.168.3.0/24	192.168.3.2/24 - 192.168.3.254/24	<b>192.168.3.1/24</b>
OFFICE_4	192.168.4.0/24	192.168.4.2 - 192.168.4.254/24	<b>192.168.4.1/24</b>

\* IP Configuration: **Dynamic Host Configuration Protocol (DHCP)**

**Note:** All are Class-C Networks default subnet mask: **255.255.255.0**

- **FTP SERVER (Network Address : 192.6.10.0/8 )**  
Class-C Networks default subnet mask: 255.255.255.0

- **Cable Specifications**

- Connections > Copper Straight -Through  
(Between PC/Laptop/Server to Switch and Switch to Routers)
- Connections > Copper Cross – Over  
(Between same device like Switch to Switch and Routers to Routers)

- **Switch Specifications**

- Type: CISCO 2950T-24 (Switch for Wired LAN)
- IEEE 802.3 Fast Ethernet (FE-Copper)
- Standard: 100-Base\_TX

- **Wireless Access Points / Routers**

- Type: Linksys-WRT300N
- IEEE 802.11 standard - ISM Band 2.4 GHz
- Authentication: WPA2-PSK
- Encryption: AES
- SSID: OFFICE\_2 and OFFICE\_3 for respective office location
- Pass Phrase: kiit@12345 for OFFICE\_2 and kiit@67890 for OFFICE\_3
- LAN: IP Configuration: DHCP as per **Table.1**

- **Router Specifications**

- Type: Generic (Router-PT-Empty)
- Add Hardware interfaces: Fast Ethernet 100 Mbps
- Network Interface Card (NIC) – Network Adaptor : IEEE 802.3 Fast Ethernet (FE-Copper)
- Standard: 100-Base\_TX
- 4 NICs for Router 2 (R2)
- 3 NICs for Router 1 (R1), Router 3 (R3) and Router4 (R4)
- Routing Protocol: Routing Information Protocol v.1 (RIP v1)

### **Intermediate Network Specifications :**

Between Routers	Network Address	IP Address of Gateways
AP (OFFICE 2) – R4	192.168.5.0/24	192.168.5.1 & 192.168.5.2
AP (OFFICE 3) – R3	192.168.6.0/24	192.168.6.1 & 192.168.6.2
R1-R2	192.168.10.0/24	192.168.10.1 & 192.168.10.2
R1-R3	192.168.7.0/24	192.168.7.1 & 192.168.7.2
R2-R4	192.168.9.0/24	192.168.9.1 & 192.168.9.2
R3-R4	192.168.8.0/24	192.168.8.1 & 192.168.8.2

**NB: AP → Access Point (Linksys-WRT300N)**

## *PC/ Laptop/ Server Specifications :*

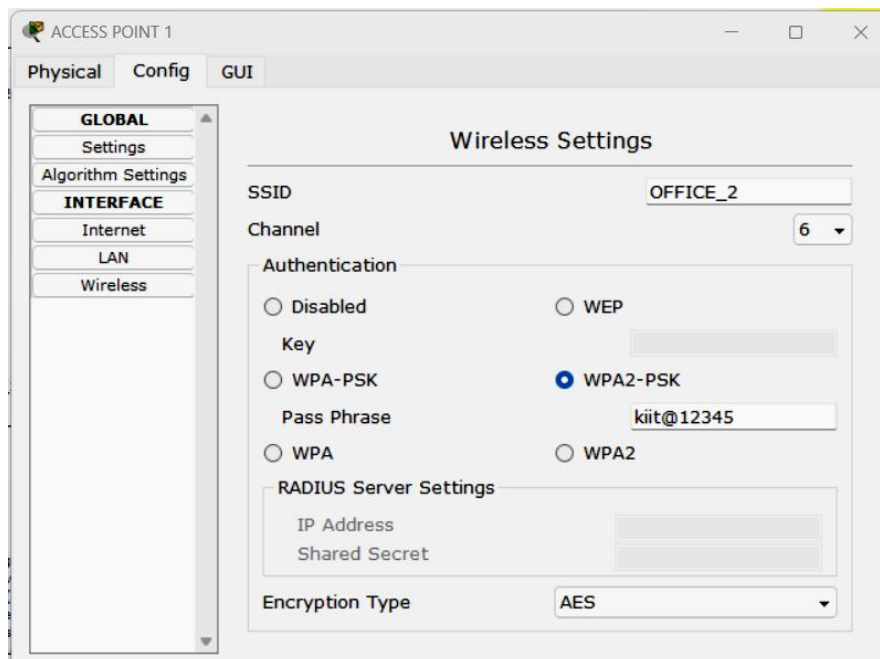
- End Devices > Generic PC/laptop/Server

## *Procedure:*

As per the Network scenario diagram given above, the required networking devices like Wireless Access Points, Routers, Switches, PCs, Laptops, Wireless Tablets and Smart devices (PDA) were placed. The required cable connections were made. All devices were configured as per the specifications given above. Some of the device configuration methods (Screenshots) are given below:

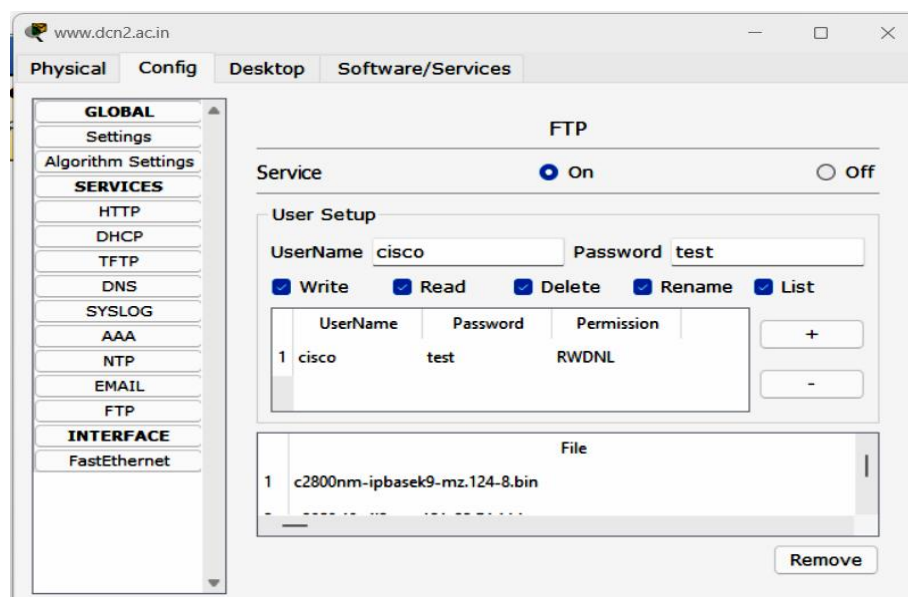
### *Basic Configuration*

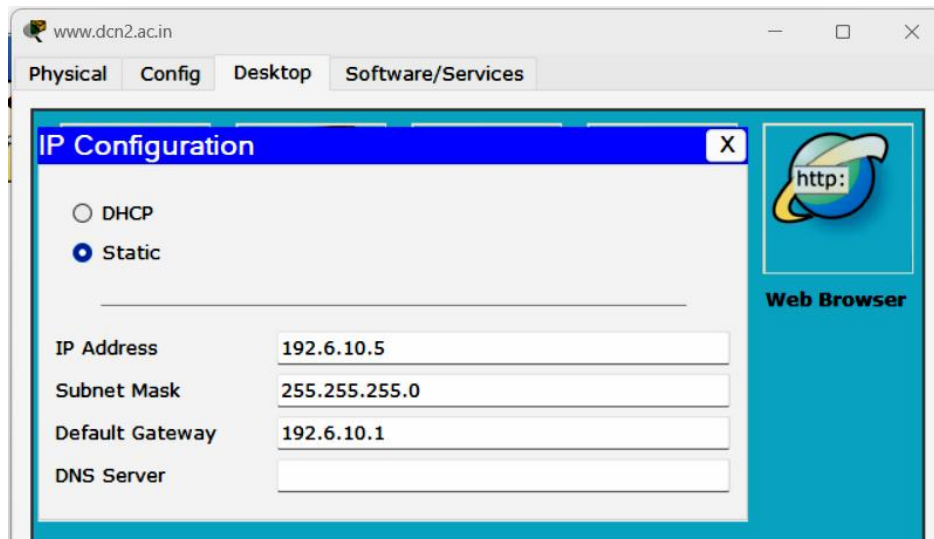
#### *1. Wireless Access Point Configuration (Linksys-WRT300N)*



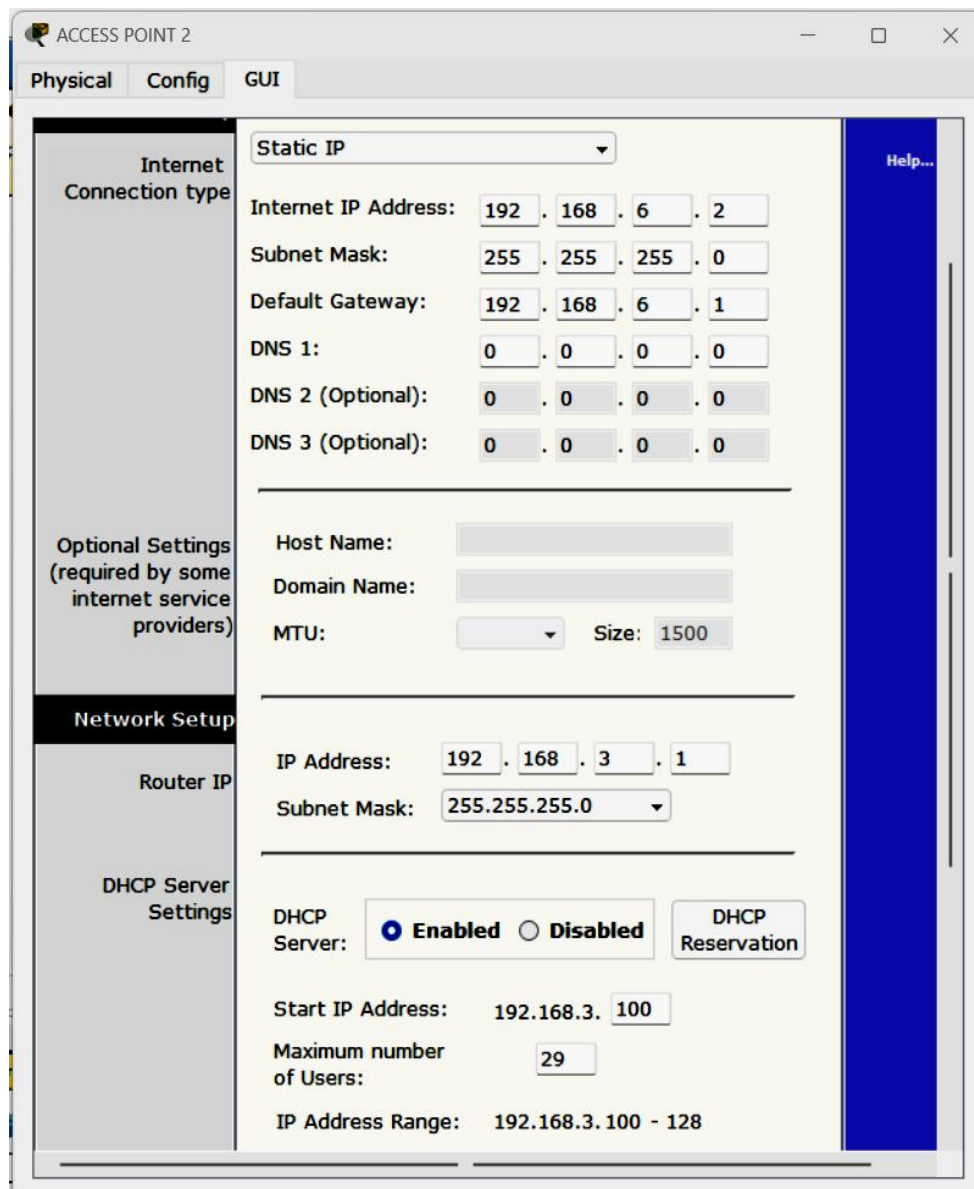
*Config > Wireless*

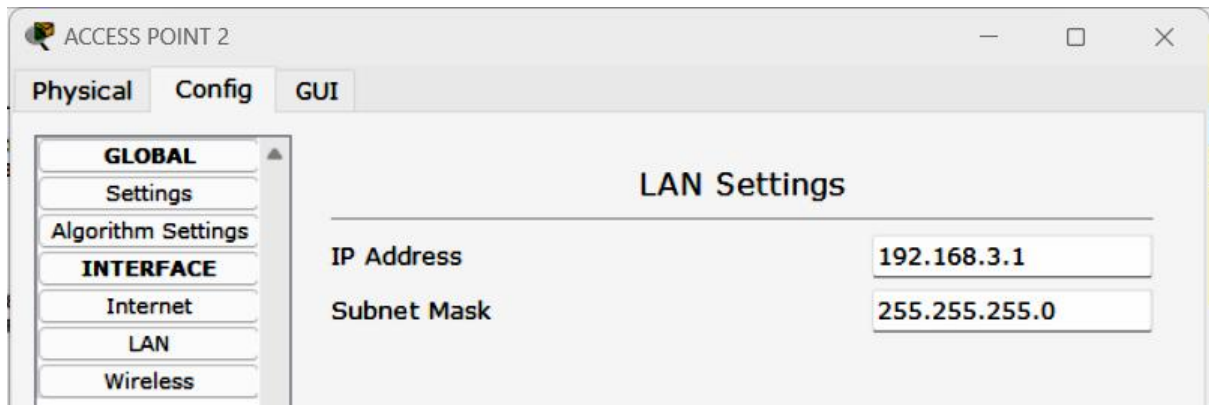
*Config > FTP SERVER*





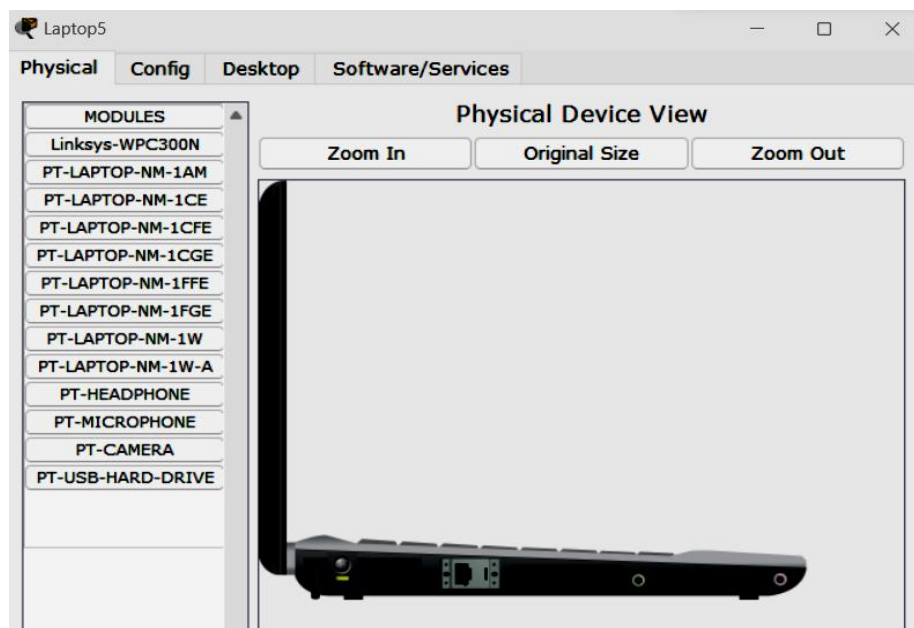
### *GUI (LAN DHCP Configuration)*



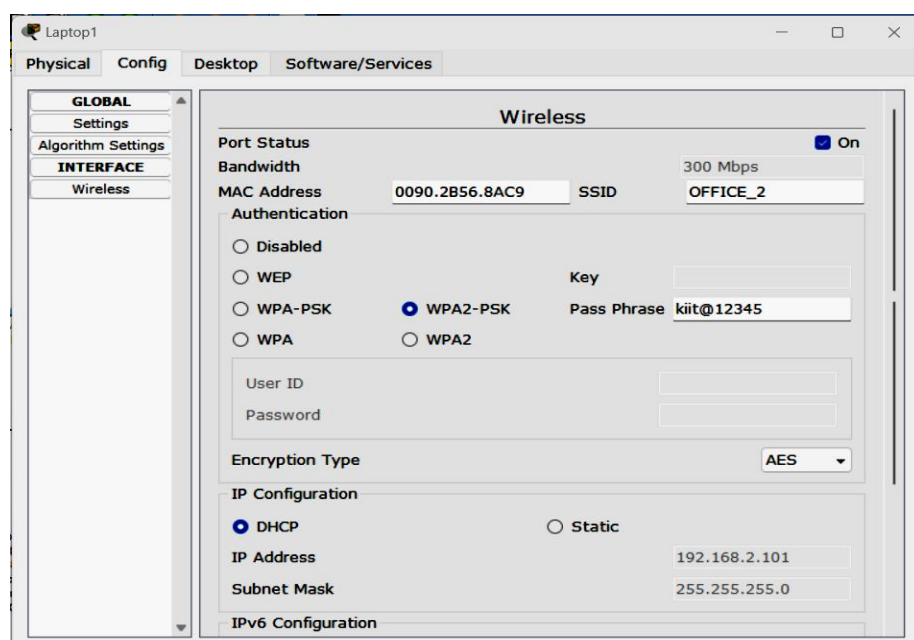


*Then, Save Settings.*

## 2. Laptop

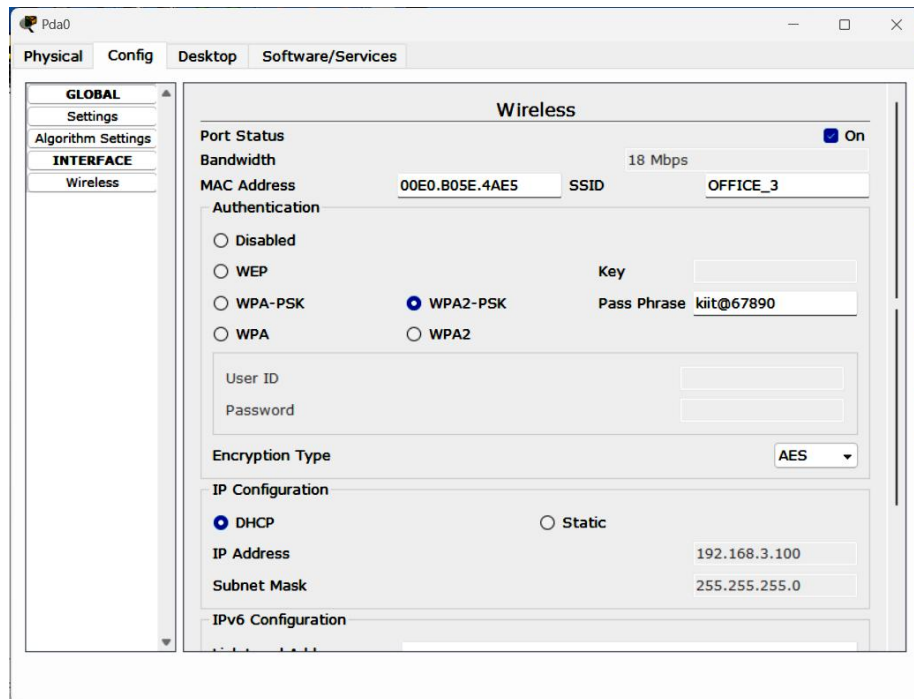


*"Linksys-WPC300N" module is inserted into laptop and then it is switched on.*

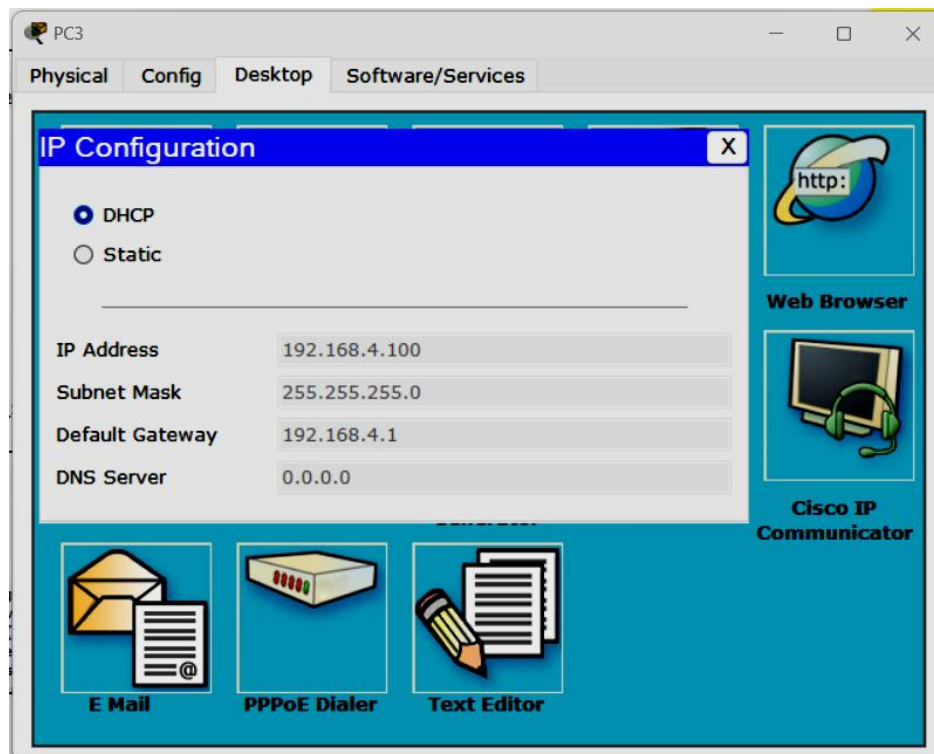


*Config > laptop*

### 3. Wireless Tablet/ Smart device (PDA)



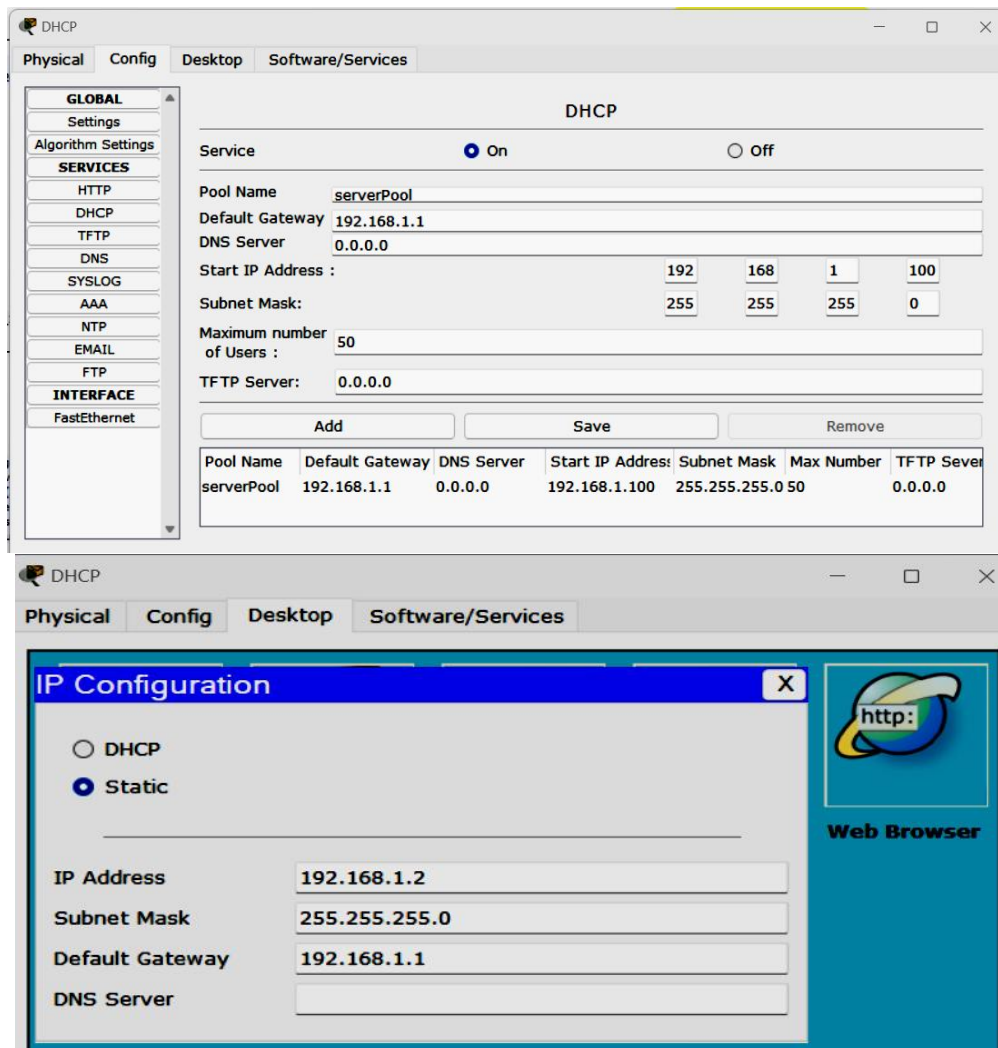
### 4. Other wired end devices



*All PC connected to wired Ethernet Network must be configured as  
Desktop > IP Configuration > DHCP.*



## 5. DHCP Server

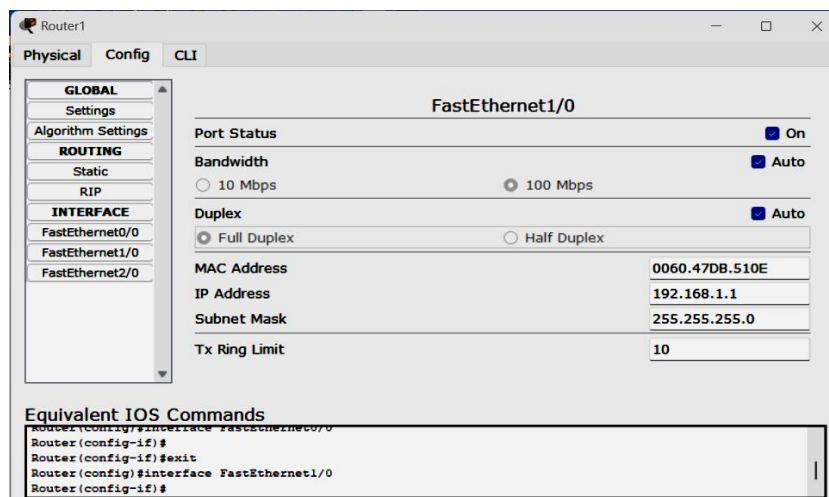
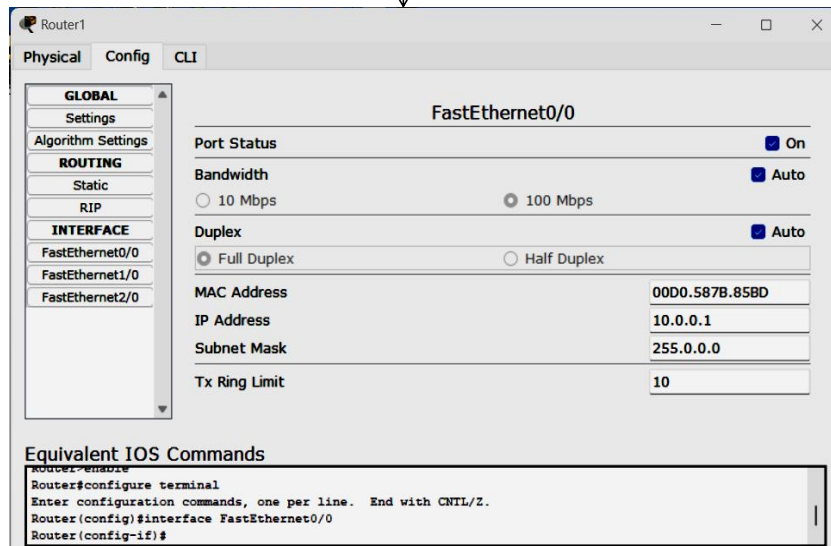
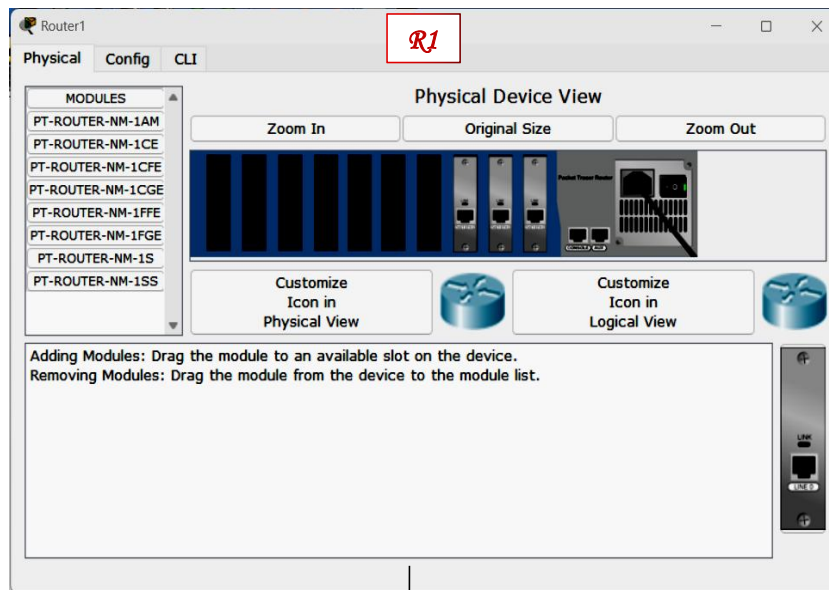


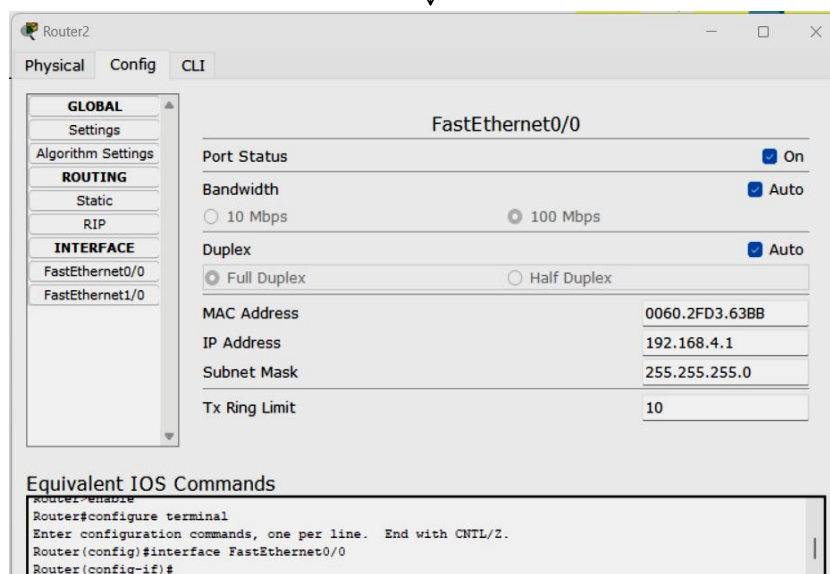
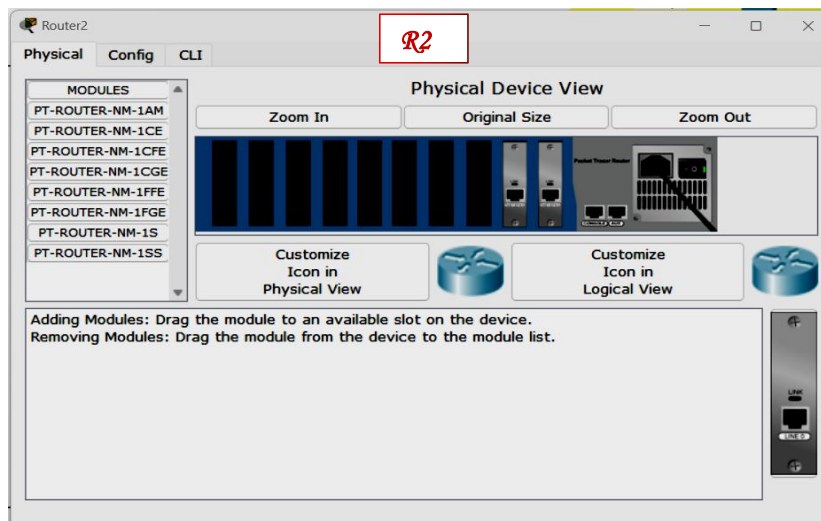
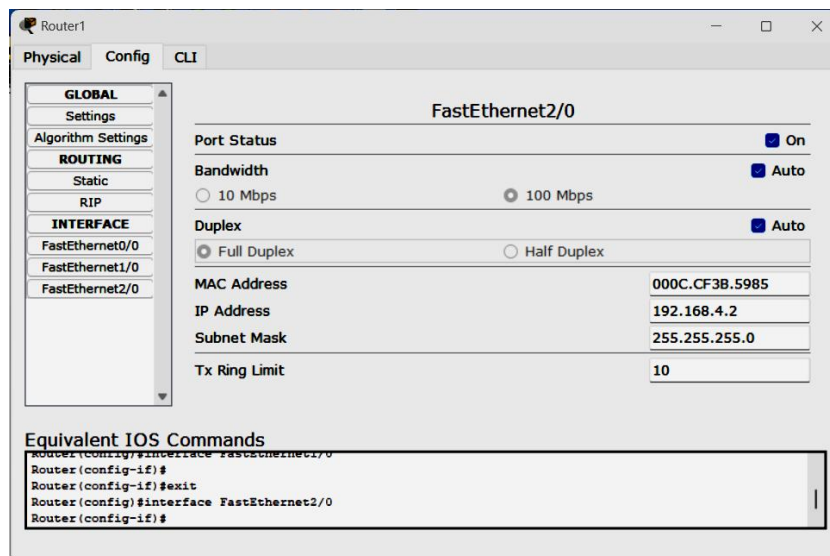
## 6. Router

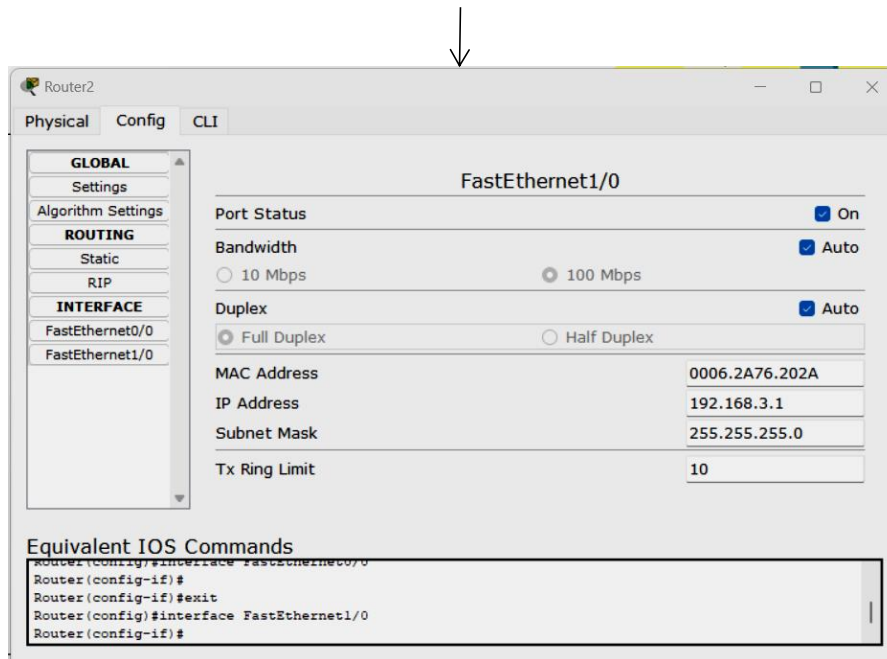
- ✓ Place **Generic Routers** from the **Router Menu** from the **Lower left corner of the window**.
- ✓ **Double-Click** on **Router** to open **Menu**. In **PHYSICAL TAB**. Add a extra **PT-ROUTER NM-1CFE interface** by dragging and dropping at the back panel of the Router.
- ✓ Similar to placement of Router, place **CISCO Catalyst 2950T-24 Switches** and End devices like PC and Server as required.
- ✓ Connect **Copper Straight Cable** between **PC-SWITCH, SWITCH-ROUTER**.
- ✓ Connect Copper Cross Cable between **ROUTER-ROUTER** and **SWITCH-SWITCH** interfaces. Give the suitable IP Address in Router interface by refer by double clicking on **ROUTER > COFIG > Select the suitable interface> Give the IP Address** in the Space given.



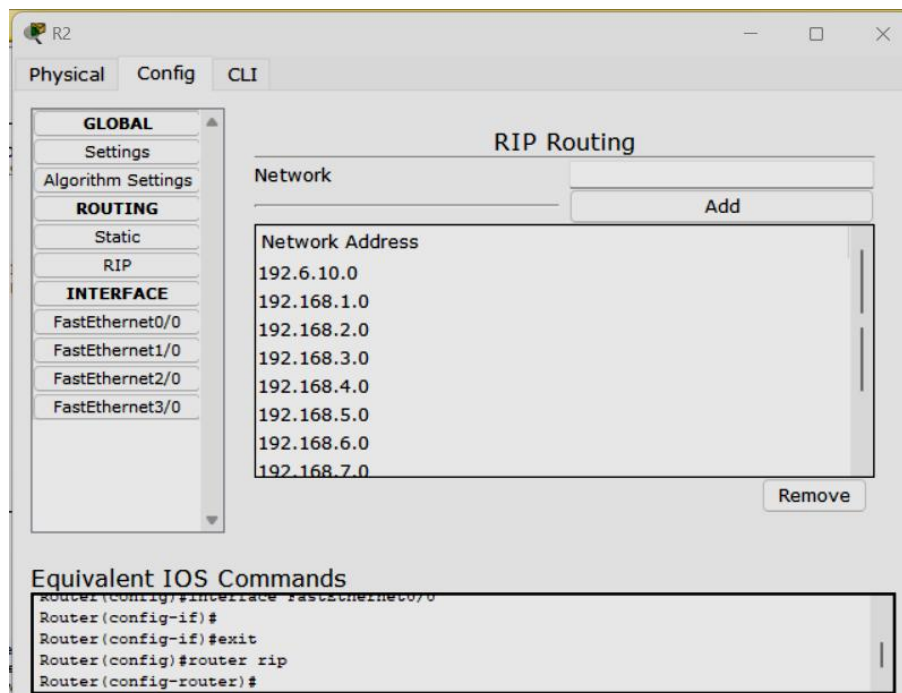
*The above mentioned steps are shown in the figures below:*







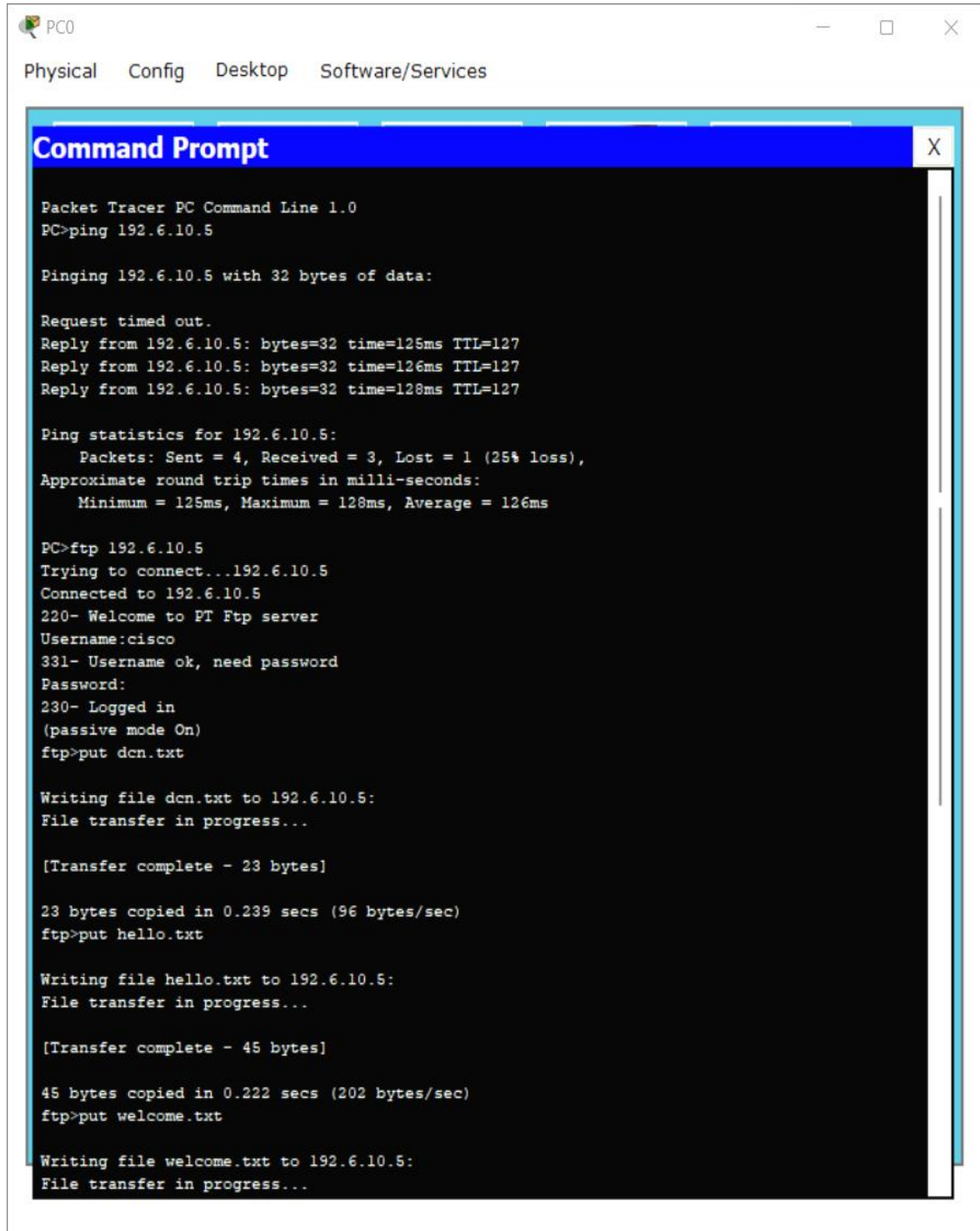
## 6. Routing Protocol: RIPv1



## Observations:

After designing and configuring the complete network, followings can be verified and observed:

- **FTP application server configuration. (put and get)**



The screenshot shows a Packet Tracer PC Command Line window for PC0. The window has tabs for Physical, Config, Desktop, and Software/Services. The Command Prompt window is open, displaying the following text:

```
Packet Tracer PC Command Line 1.0
PC>ping 192.6.10.5

Pinging 192.6.10.5 with 32 bytes of data:

Request timed out.
Reply from 192.6.10.5: bytes=32 time=125ms TTL=127
Reply from 192.6.10.5: bytes=32 time=126ms TTL=127
Reply from 192.6.10.5: bytes=32 time=128ms TTL=127

Ping statistics for 192.6.10.5:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 125ms, Maximum = 128ms, Average = 126ms

PC>ftp 192.6.10.5
Trying to connect...192.6.10.5
Connected to 192.6.10.5
220- Welcome to PT Ftp server
Username:cisco
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>put dcn.txt

Writing file dcn.txt to 192.6.10.5:
File transfer in progress...

[Transfer complete - 23 bytes]

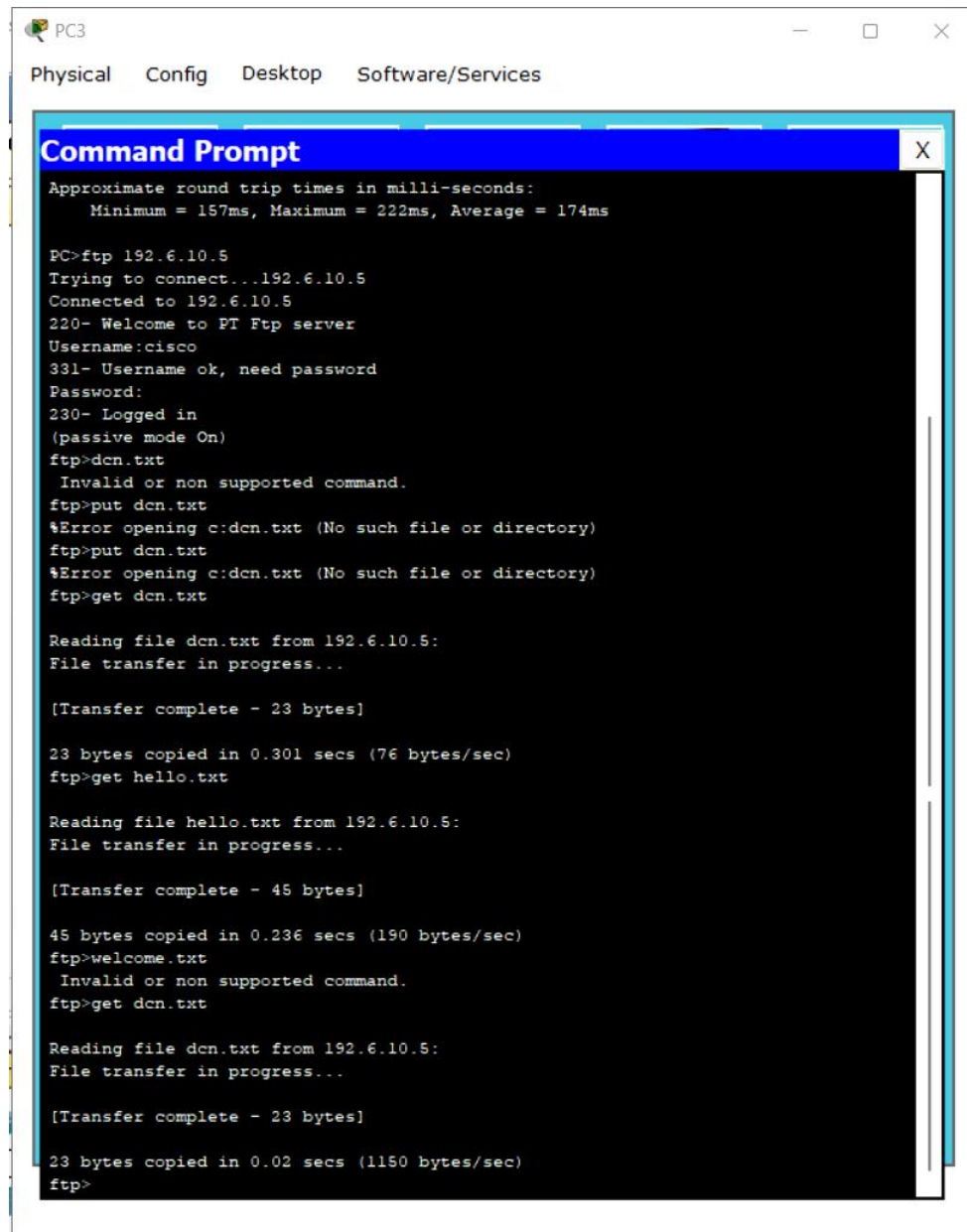
23 bytes copied in 0.239 secs (96 bytes/sec)
ftp>put hello.txt

Writing file hello.txt to 192.6.10.5:
File transfer in progress...

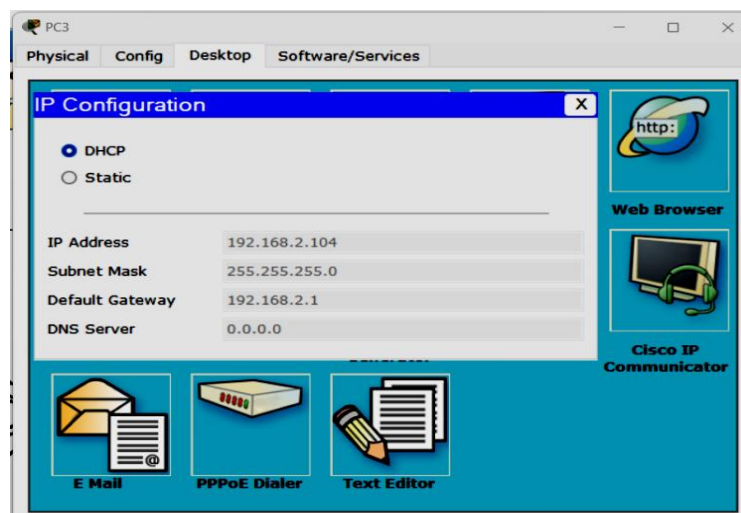
[Transfer complete - 45 bytes]

45 bytes copied in 0.222 secs (202 bytes/sec)
ftp>put welcome.txt

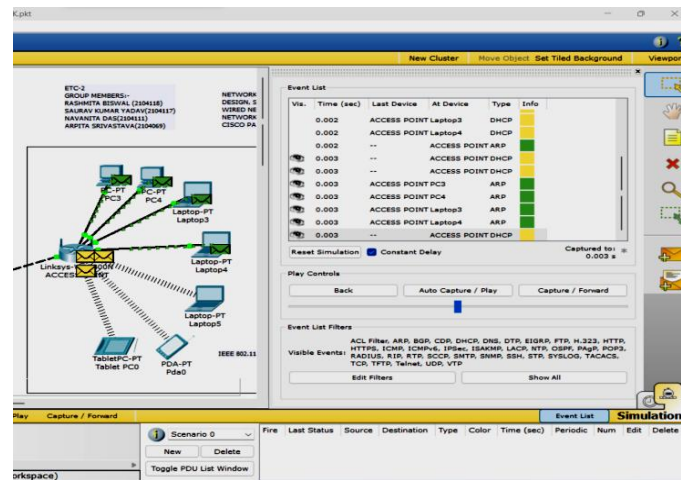
Writing file welcome.txt to 192.6.10.5:
File transfer in progress...
```



➤ *DHCP messages for automatic assignment of IP Configuration.*







### ➤ *PING Command*

*PC > Desktop > Command Prompt:*

*Ping 192.168.2.101*

```

Packet Tracer PC Command Line 1.0
PC>ping 192.168.2.101

Pinging 192.168.2.101 with 32 bytes of data:

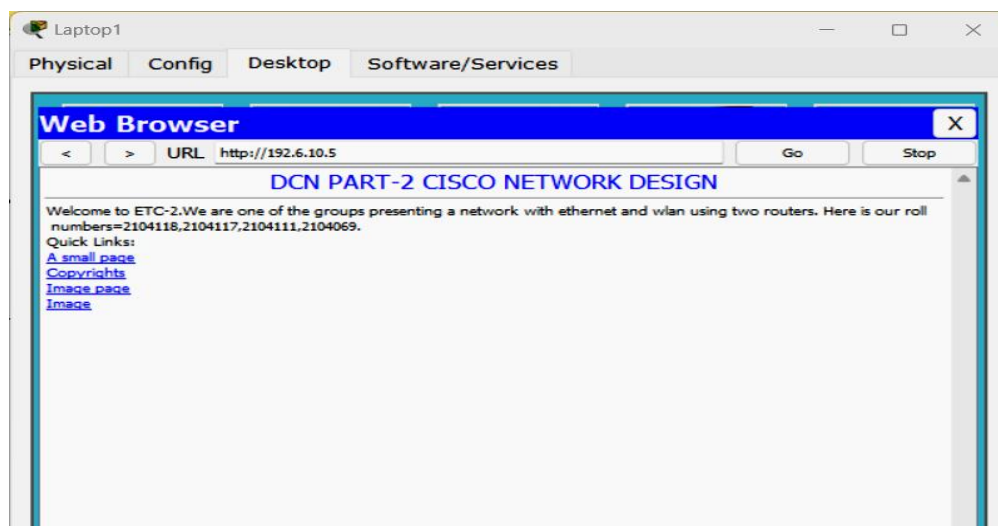
Reply from 192.168.2.101: bytes=32 time=151ms TTL=128
Reply from 192.168.2.101: bytes=32 time=10ms TTL=128
Reply from 192.168.2.101: bytes=32 time=6ms TTL=128
Reply from 192.168.2.101: bytes=32 time=11ms TTL=128

Ping statistics for 192.168.2.101:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 6ms, Maximum = 151ms, Average = 44ms

PC>
  
```

### ➤ *HTTP over TCP Traffic in the Network in Simulation mode*

*PC > Desktop > Web Browser :*



## ➤ Packet transfer

The screenshot shows a Cisco Packet Tracer workspace with a network topology. The topology includes several routers (R1, R2, R3), switches (Switch1, Switch2, Switch3), and various end devices like PCs, laptops, and servers. The network is divided into three offices: Office 1, Office 2, and Office 3. The Event List window on the right shows a series of network events, including ARP requests and ICMP Echo (ping) operations. The Simulation window at the bottom shows the current status of the simulation, including the time (00:25:47.110) and the current scenario (Scenario 0).

Vis.	Time (sec)	Last Device	At Device	Type	Info
	0.003	Switch3	Laptop3	ARP	
	0.005	Switch3	PC4	ARP	
	0.005	Switch3	DHCP-1	ARP	
	0.006	Server2	Switch1	ICMP	
	0.006	Laptop3	Switch3	ARP	
	0.007	Switch1	R2	ICMP	
	0.007	Switch3	R1	ARP	
	0.008	R2	R1	ICMP	
	0.009	R1	Switch3	ICMP	
	0.010	Switch3	PC3	ICMP	

## ➤ Complex PDU

The screenshot shows the same Cisco Packet Tracer workspace as the previous one, but with a different network topology and a more complex PDU (Protocol Data Unit) being captured. The Event List window on the right shows a series of network events, including ARP requests and ICMP Echo (ping) operations. The Simulation window at the bottom shows the current status of the simulation, including the time (00:26:20.129) and the current scenario (Scenario 0).

Vis.	Time (sec)	Last Device	At Device	Type	Info
	0.000	--	PC4	ICMP	
	0.000	--	PC4	ARP	
	0.001	PC4	Switch3	ARP	
	0.002	Switch3	R1	ARP	
	0.002	Switch3	PC3	ARP	
	0.002	Switch3	Laptop3	ARP	
	0.002	Switch3	DHCP-1	ARP	
	0.003	R1	Switch3	ARP	
	0.004	Switch3	PC4	ARP	
	0.004	--	PC4	ICMP	



Create Complex PDU

Source Settings

Source Device: PC4

Outgoing Port:

FastEthernet ☒ Auto Select Port

PDU Settings

Select Application: PING

Destination IP Address: 192.168.2.100

Source IP Address: 192.168.4.101

TTL: 32

TOS: 0

Sequence Number: 10

Size: 0

Simulation Settings

☐ One Shot Time: Seconds

☒ Periodic Interval: 10 Seconds

Create PDU

\*\*\* END OF REPORT \*\*\*