

Micro-Project (Part-1)

For partial fulfillment of Activity Based Learning

for Course

Data Communication & Networking (3028)

Network Design Task-01



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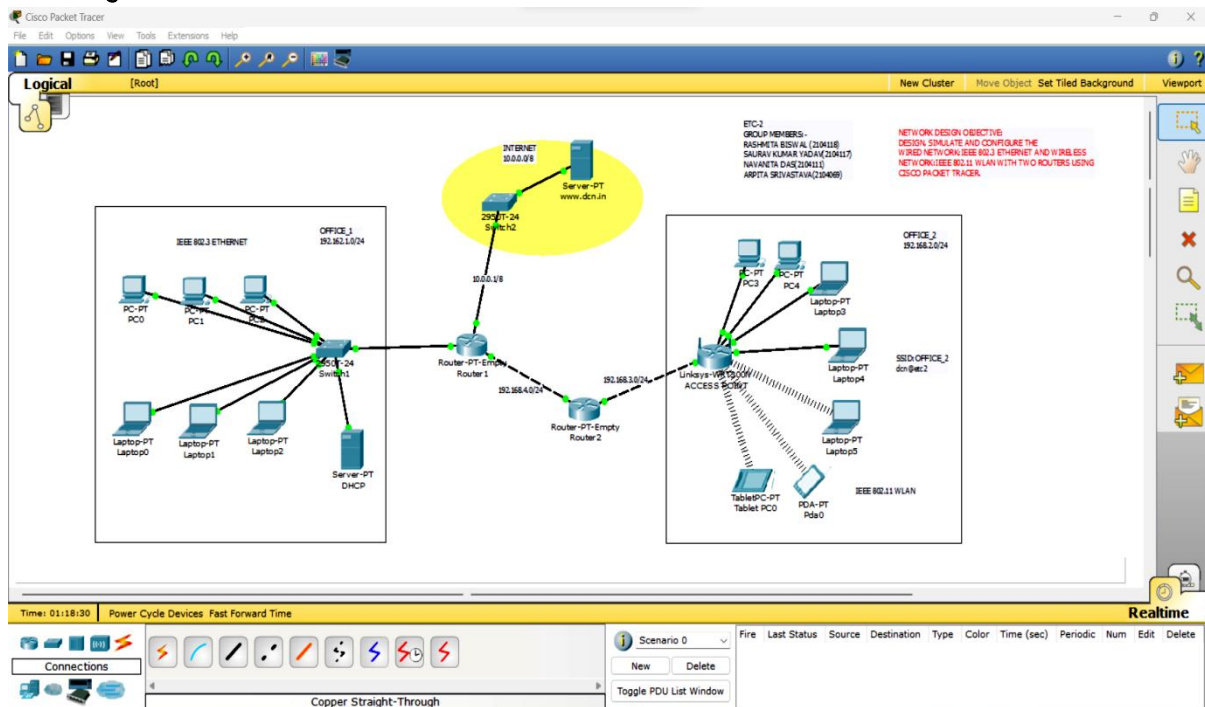
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Aim :

Design, configuration and simulation of heterogeneous network i.e. wired (**IEEE 802.3, ETHERNET**) and wireless (**IEEE 802.11, WLAN**) with two routers 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	192.168.1.1/24
OFFICE_2	192.168.2.0/24	192.168.2.2/24 - 192.168.2.254/24	192.168.2.1/24
INTERNET	10.0.0.0/8	10.0.0.2/8 - 10.255.255.254/8	10.0.0.1/8

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

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

- **Internet (Network Address : 10.0.0.0/8)**
Class-A Networks default subnet mask: 255.0.0.0

HTTP(s) Server hosted on a Generic Server (End Device).
 IP Address of Server machine 10.0.0.2 (e.g www.kiit.ac.in)
 Default Gateway: 10.0.0.1

➤ **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 for respective office location
- Pass Phrase: dcn@etc2
- 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
- 3 NICs for Router 1 (R1)
- 2 NICs for Router 2 (R2)
- Routing Protocol: Routing Information Protocol v.1 (RIP v1)

Intermediate Network Specifications :

Between Routers	Network Address	IP Address of Gateways
AP (OFFICE_2) – R2	192.168.3.0/24	192.168.3.1 & 192.168.3.2
R1- R2	192.168.4.0/24	192.168.4.1 & 192.168.4.2

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

The screenshot shows the 'ACCESS POINT' configuration window with the 'Config' tab selected. The left sidebar has 'Wireless' selected under the 'INTERFACE' section. The main area is titled 'Wireless Settings'. It includes fields for 'SSID' (OFFICE_2) and 'Channel' (6). Under 'Authentication', 'WPA2-PSK' is selected, with a 'Pass Phrase' of 'dcn@etc2'. The 'Encryption Type' is set to 'AES'. Other options like 'Disabled', 'WEP', 'WPA', and 'WPA2' are unselected. There is also a section for 'RADIUS Server Settings' with fields for 'IP Address' and 'Shared Secret'.

Config > Internet

The screenshot shows the 'ACCESS POINT' configuration window with the 'Config' tab selected. The left sidebar has 'Internet' selected under the 'INTERFACE' section. The main area is titled 'Internet Settings'. It shows 'Connection Type' set to 'Static'. Below this, there are fields for 'Default Gateway' (192.168.3.1), 'IP Address' (192.168.3.2), 'Subnet Mask' (255.255.255.0), 'DNS Server', 'UserName', and 'Password'.

GUI (LAN→DHCP Configuration)

ACCESS POINT

Physical Config GUI

LINKSYS®
A Division of Cisco Systems, Inc.

Firmware Version: v0.93.3 WRT300N

Wireless-N Broadband Router

Setup Wireless Security Access Restrictions Applications & Gaming Administration Status

Basic Setup DDNS MAC Address Clone Advanced Routing

Internet Setup

Internet Connection type: Static IP

Internet IP Address: 192 . 168 . 3 . 2

Subnet Mask: 255 . 255 . 255 . 0

Default Gateway: 192 . 168 . 3 . 1

DNS 1: 0 . 0 . 0 . 0

DNS 2 (Optional): 0 . 0 . 0 . 0

DNS 3 (Optional): 0 . 0 . 0 . 0

Optional Settings (required by some internet service providers)

Host Name:

Domain Name:

MTU: Size: 1500

Network Setup

Router IP: IP Address: 192 . 168 . 2 . 1

Subnet Mask: 255.255.255.0

DHCP Server

Help...

ACCESS POINT

Physical Config GUI

GLOBAL

Settings

Algorithm Settings

INTERFACE

Internet

LAN

Wireless

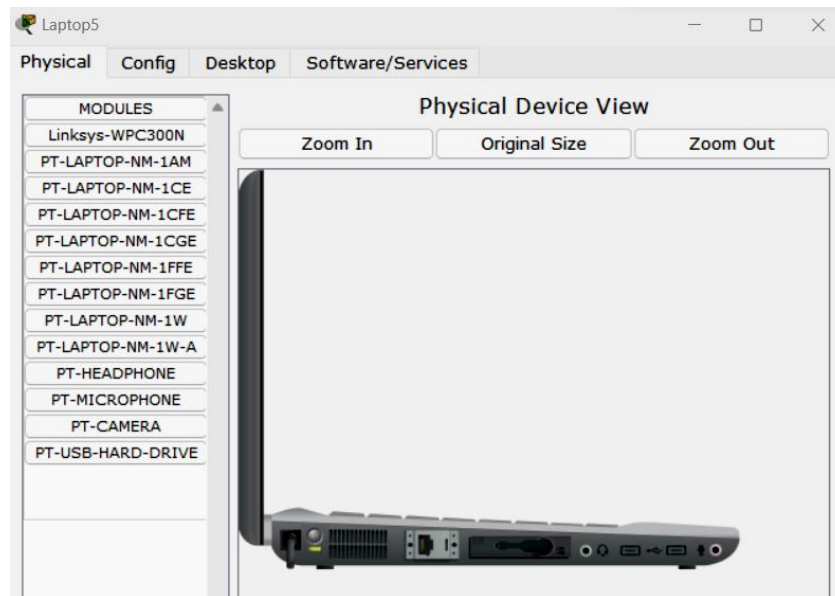
LAN Settings

IP Address: 192.168.2.1

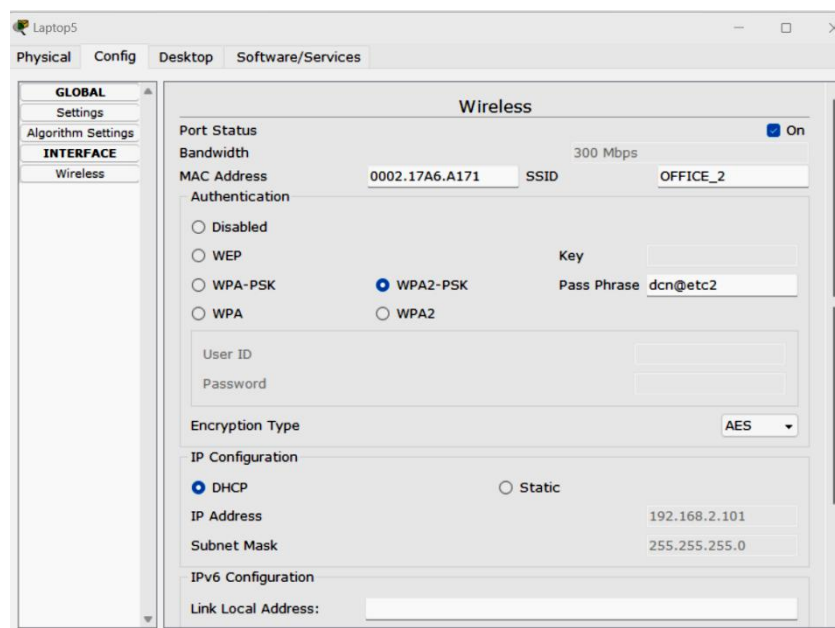
Subnet Mask: 255.255.255.0

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)

Tablet PC0

Physical Config Desktop Software/Services

GLOBAL

Settings

Algorithm Settings

INTERFACE

Wireless

Wireless

Port Status ☒ On

Bandwidth 54 Mbps

MAC Address 00D0.5861.E86C SSID OFFICE_2

Authentication

☐ Disabled

☐ WEP

☐ WPA-PSK ☒ WPA2-PSK

☐ WPA ☐ WPA2

Key

Pass Phrase dcn@etc2

User ID

Password

Encryption Type AES

IP Configuration

☒ DHCP ☐ Static

IP Address 192.168.2.102

Subnet Mask 255.255.255.0

IPv6 Configuration

Pda0

Physical Config Desktop Software/Services

GLOBAL

Settings

Algorithm Settings

INTERFACE

Wireless

Wireless

Port Status ☒ On

Bandwidth 54 Mbps

MAC Address 0060.4712.890E SSID OFFICE_2

Authentication

☐ Disabled

☐ WEP

☐ WPA-PSK ☒ WPA2-PSK

☐ WPA ☐ WPA2

Key

Pass Phrase dcn@etc2

User ID

Password

Encryption Type AES

IP Configuration

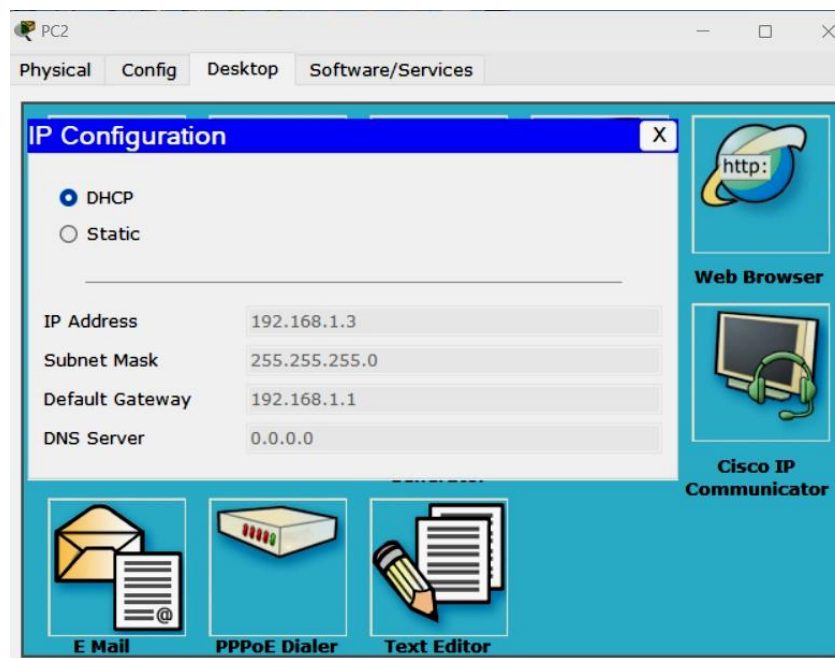
☒ DHCP ☐ Static

IP Address 192.168.2.100

Subnet Mask 255.255.255.0

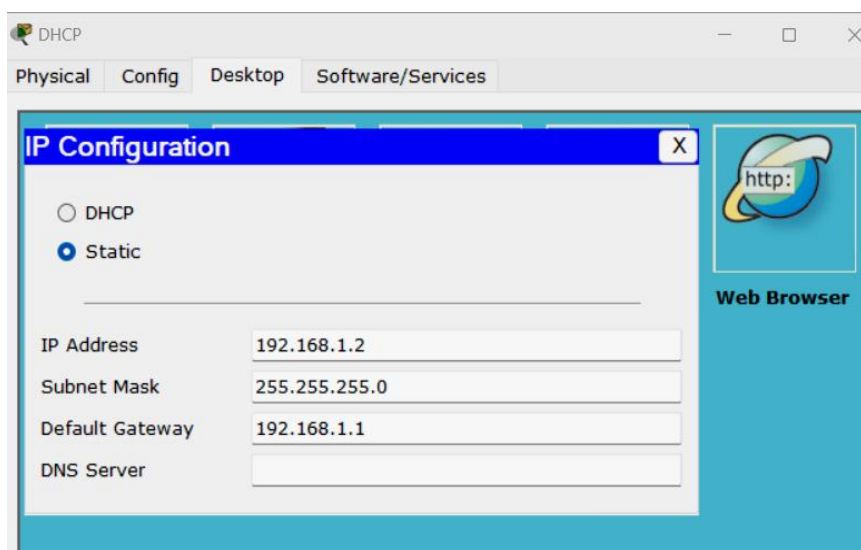
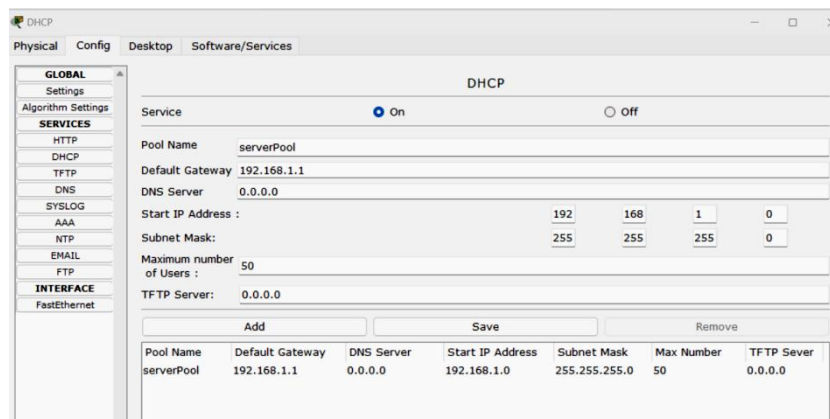
IPv6 Configuration

4. Other wired end devices



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

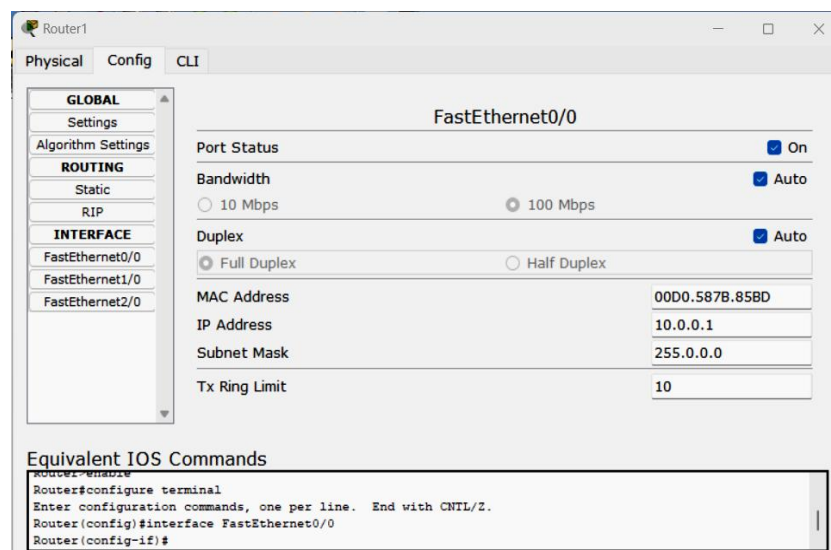
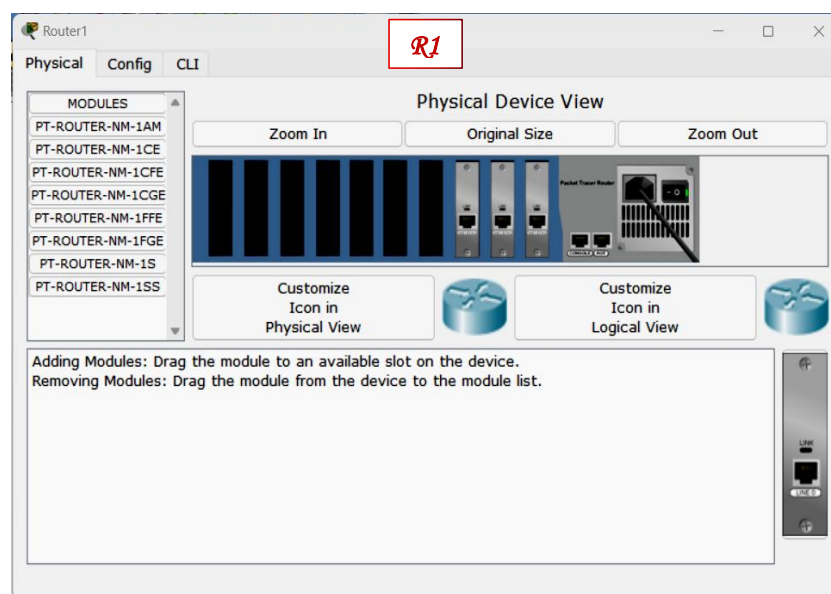
5. DHCP Server



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:





Router1

Physical Config CLI

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

INTERFACE

FastEthernet0/0

FastEthernet1/0

FastEthernet2/0

FastEthernet1/0

Port Status ☒ On

Bandwidth ☒ Auto

☐ 10 Mbps ☒ 100 Mbps

Duplex ☒ Auto

☒ Full Duplex ☐ Half Duplex

MAC Address 0060.47DB.510E

IP Address 192.168.1.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Equivalent IOS Commands

```
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
```



Router1

Physical Config CLI

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

INTERFACE

FastEthernet0/0

FastEthernet1/0

FastEthernet2/0

FastEthernet2/0

Port Status ☒ On

Bandwidth ☒ Auto

☐ 10 Mbps ☒ 100 Mbps

Duplex ☒ Auto

☒ Full Duplex ☐ Half Duplex

MAC Address 000C.CF3B.5985

IP Address 192.168.4.2

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Equivalent IOS Commands

```
Router(config)#interface FastEthernet2/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet2/0
Router(config-if)#
```



Router2

Physical Config CLI

R2

Physical Device View

Zoom In Original Size Zoom Out

Customize Icon in Physical View

Customize Icon in Logical View

Adding Modules: Drag the module to an available slot on the device.
Removing Modules: Drag the module from the device to the module list.

MODULES

PT-ROUTER-NM-1AM

PT-ROUTER-NM-1CE

PT-ROUTER-NM-1CFE

PT-ROUTER-NM-1CGE

PT-ROUTER-NM-1FFE

PT-ROUTER-NM-1FGE

PT-ROUTER-NM-1S

PT-ROUTER-NM-1SS

↓

Router2

Physical Config CLI

GLOBAL

- Settings
- Algorithm Settings
- ROUTING**
 - Static
 - RIP
- INTERFACE**
 - FastEthernet0/0
 - FastEthernet1/0

FastEthernet0/0

Port Status ☒ On

Bandwidth ☒ Auto

☐ 10 Mbps ☒ 100 Mbps

Duplex ☒ Auto

☒ Full Duplex ☐ Half Duplex

MAC Address 0060.2FD3.63BB

IP Address 192.168.4.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Equivalent IOS Commands

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
```

↓

Router2

Physical Config CLI

GLOBAL

- Settings
- Algorithm Settings
- ROUTING**
 - Static
 - RIP
- INTERFACE**
 - FastEthernet0/0
 - FastEthernet1/0

FastEthernet1/0

Port Status ☒ On

Bandwidth ☒ Auto

☐ 10 Mbps ☒ 100 Mbps

Duplex ☒ Auto

☒ Full Duplex ☐ Half Duplex

MAC Address 0006.2A76.202A

IP Address 192.168.3.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Equivalent IOS Commands

```
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
```

7. Routing Protocol: RIPv1

Router1

Physical Config CLI

GLOBAL

- Settings
- Algorithm Settings
- ROUTING**
 - Static
 - RIP
- INTERFACE**
 - FastEthernet0/0
 - FastEthernet1/0
 - FastEthernet2/0

RIP Routing

Network 192.168.4.0

Network Address

10.0.0.0

192.168.1.0

192.168.2.0

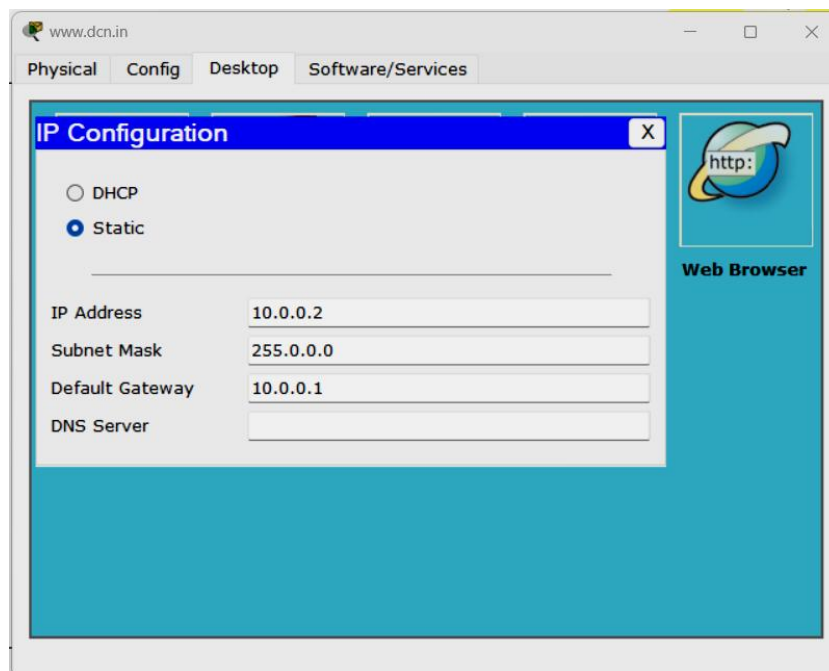
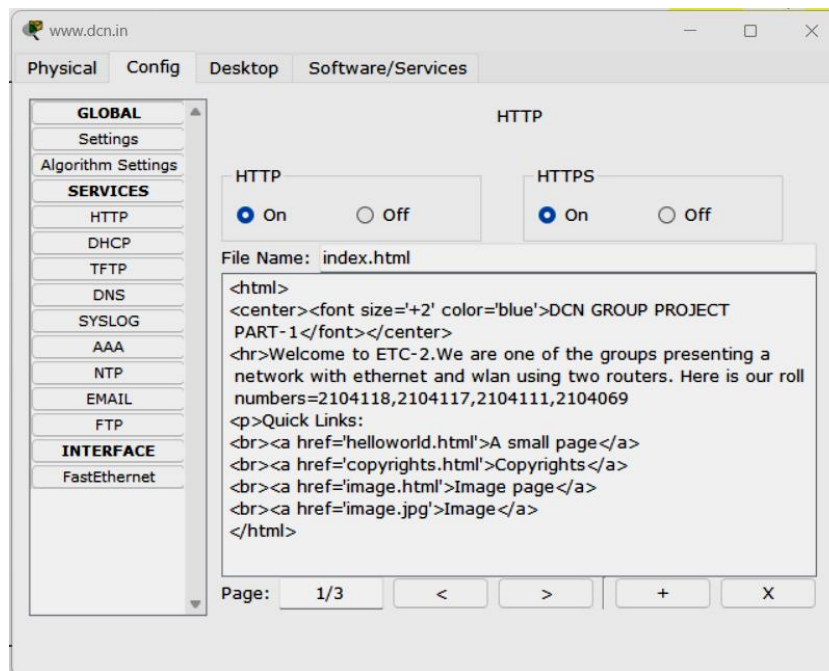
192.168.3.0

192.168.4.0

Equivalent IOS Commands

```
Router(config)#interface FastEthernet2/0
Router(config-if)#
Router(config-if)#exit
Router(config)#router rip
Router(config-router)#
```

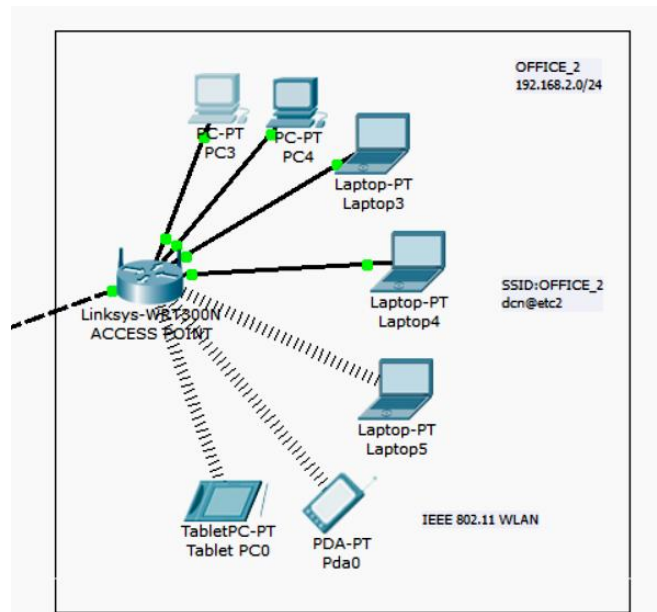
8. HTTP Server



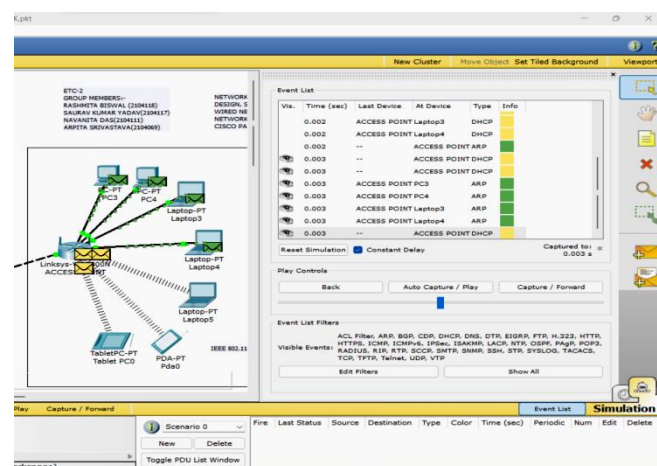
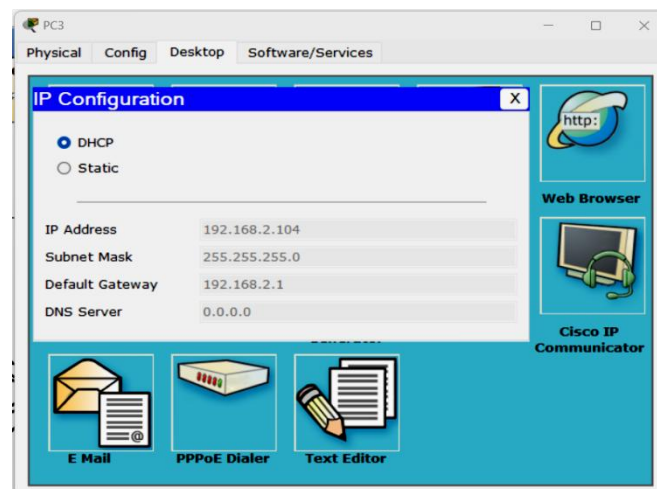
Observations:

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

- *Wireless devices getting associated with the Access Point using Radio Links.*



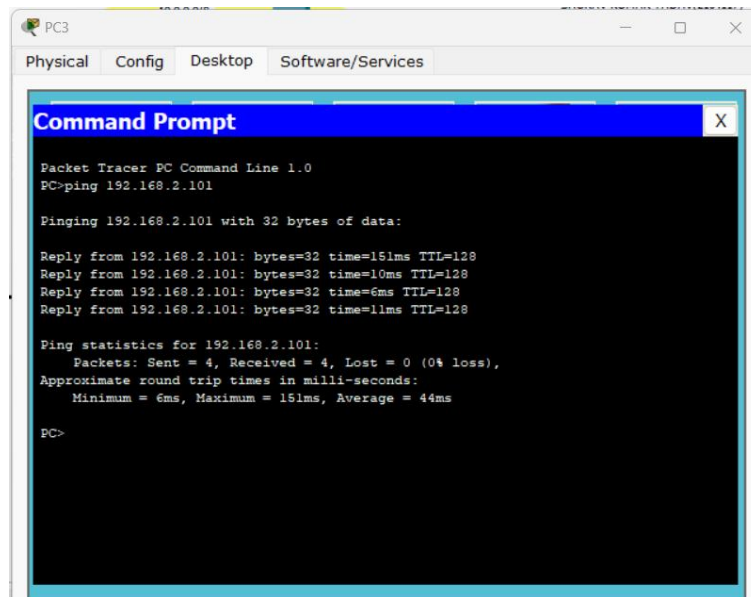
- *DHCP messages for automatic assignment of IP Configuration.*



➤ **PING Command**

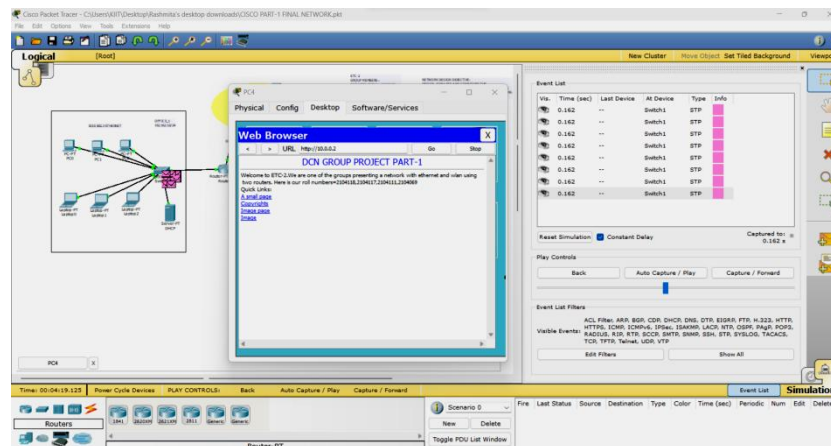
PC > Desktop > Command Prompt:

Ping 192.168.2.101

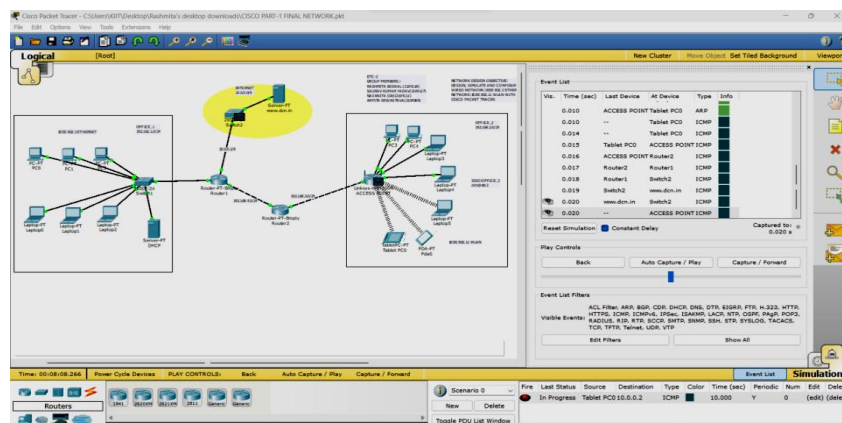


➤ **HTTP over TCP Traffic in the Network in Simulation mode**

PC > Desktop > Web Browser :



➤ **Complex PDU**



Create Complex PDU

Source Settings

Source Device: Tablet PC0

Outgoing Port:

Wireless

☒ Auto Select Port

PDU Settings

Select Application: PING

Destination IP Address: 10.0.0.2

Source IP Address: 192.168.2.102

TTL: 32

TOS: 0

Sequence Number: 100

Size: 5

Simulation Settings

☐ One Shot Time: Seconds

☒ Periodic Interval: 10 Seconds

Create PDU

*** END OF REPORT ***