

Computer Networking (Wireless Networking)

Practical Journal

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DEPARTMENT OF COMPUTER SCIENCE



M.Sc. (Computer Science)

CERTIFICATE

This is to certify that the work entered in this journal was done in the Computer laboratory by the student **Mr. Durgadevi Murugan Tevar** Roll No. **78**
Seat No. _____ Of the Class **M.Sc. computer Science** Second Year Sem-3 during
the year **2022- 2023** in a satisfactory manner.

Lecturer In charge

External Examiner

Head of Dept.

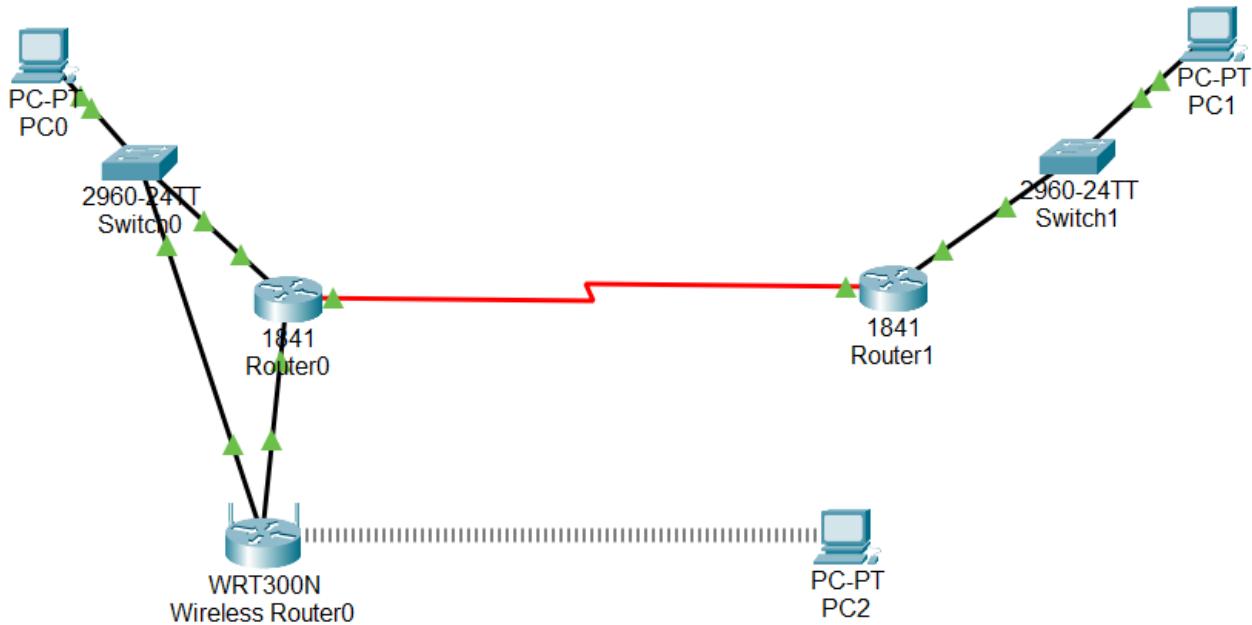
Practical No: 01

Aim: Configuring WEP on a Wireless Router

Components: Wireless Router, Router, Switch, Device (PC)

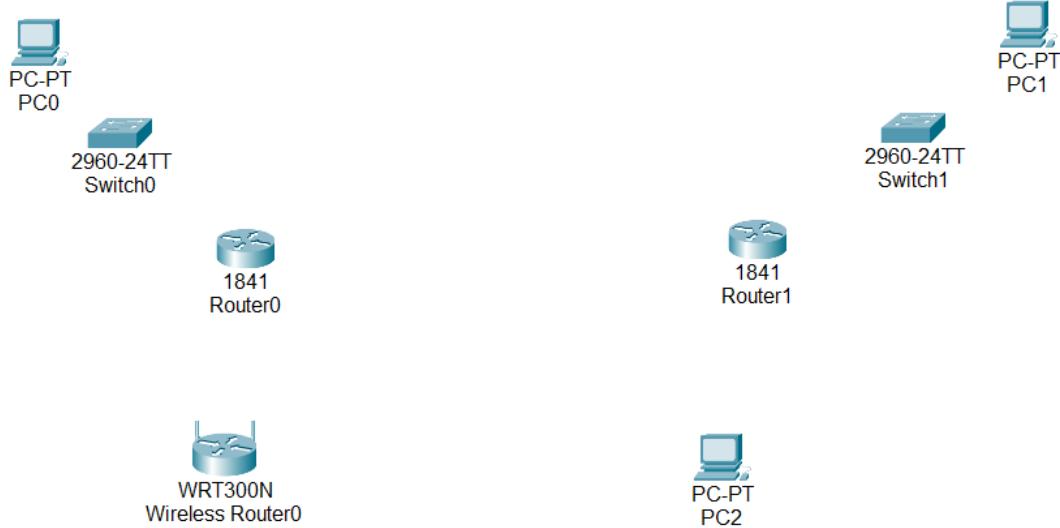
Theory: Wired Equivalent Privacy (WEP) is a security protocol, specified in the IEEE Wireless Fidelity (Wi-Fi) standard, 802.11b. That standard is designed to provide a wireless local area network (WLAN) with a level of security and privacy comparable to what is usually expected of a wired LAN.

Cisco Packet Tracer Setup:-

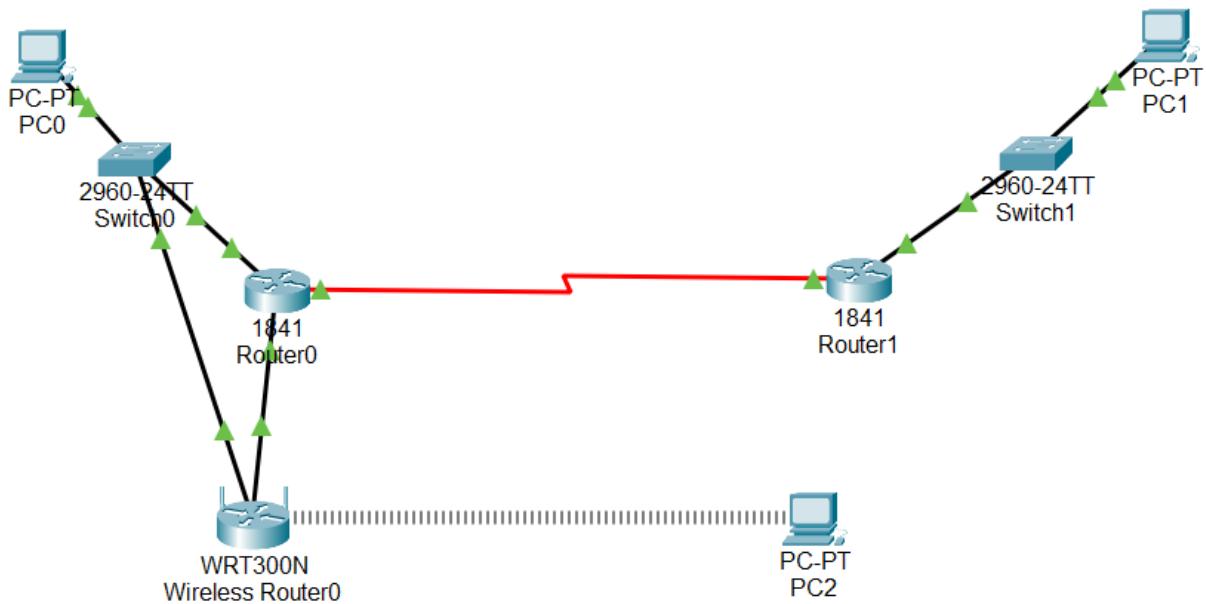


Implementation:

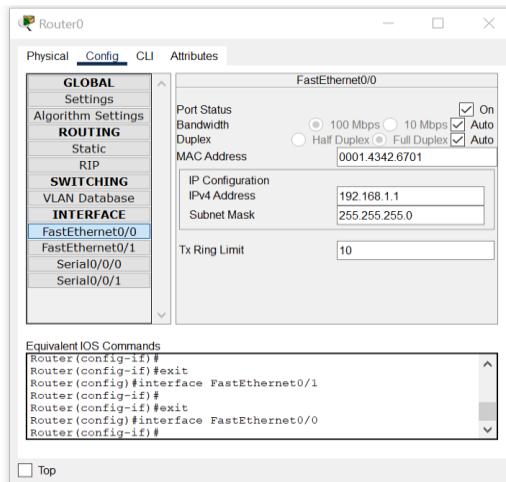
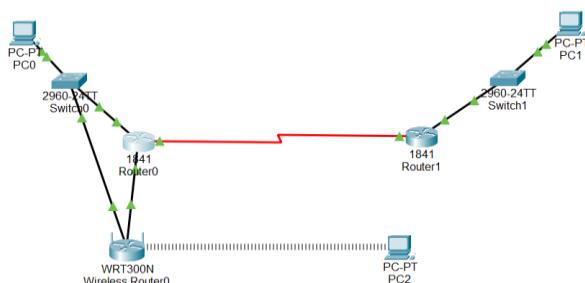
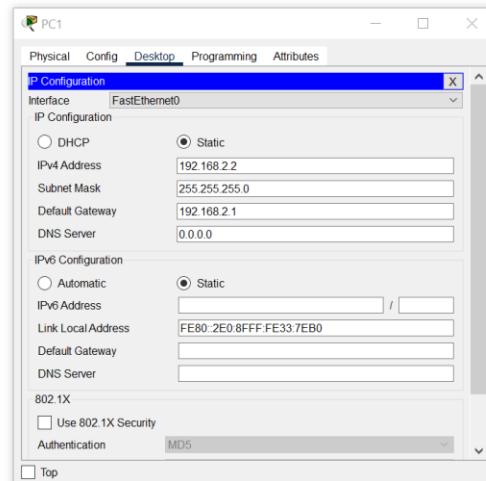
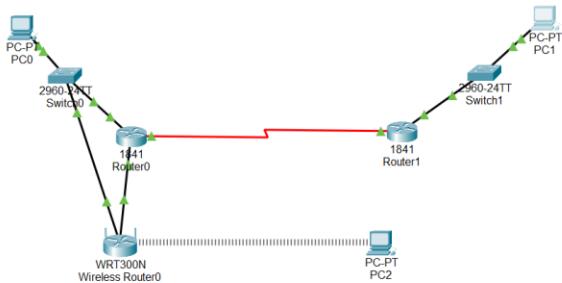
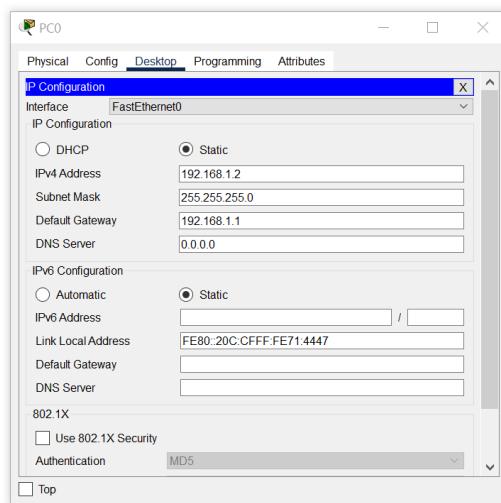
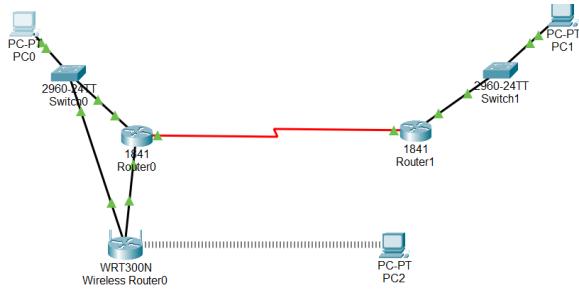
Step 1: Arranging devices

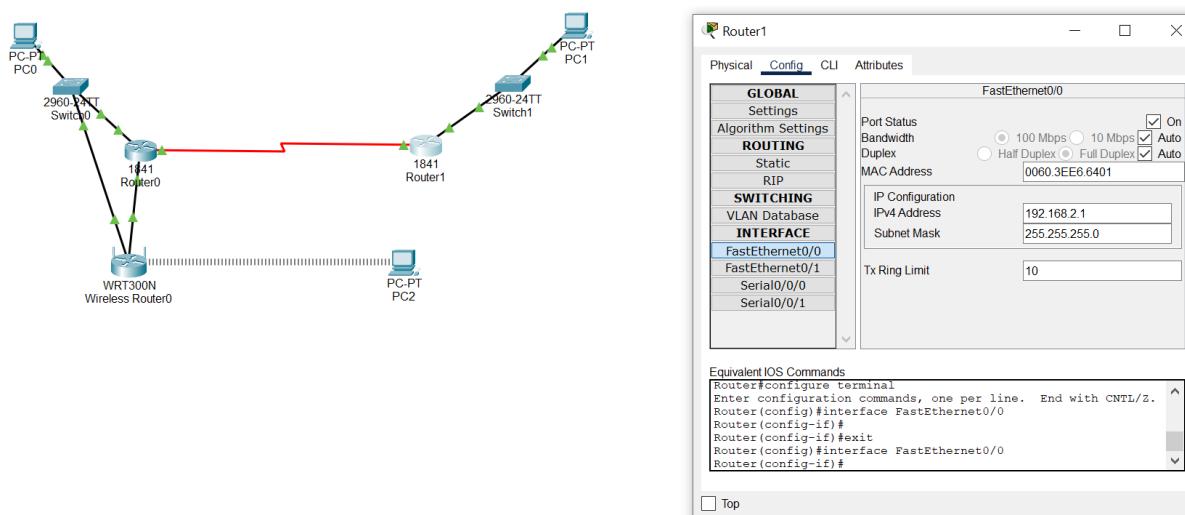
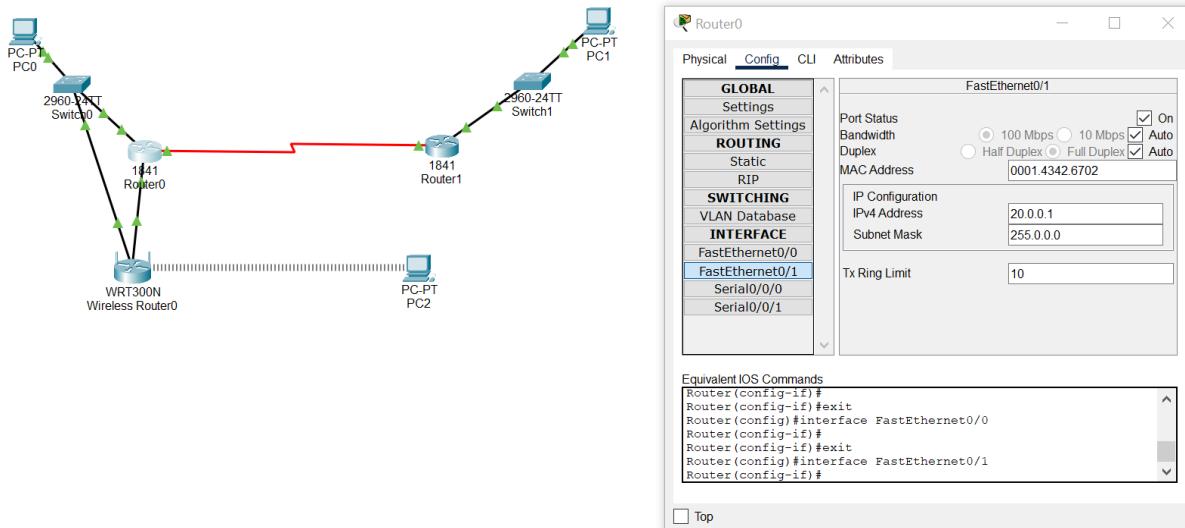


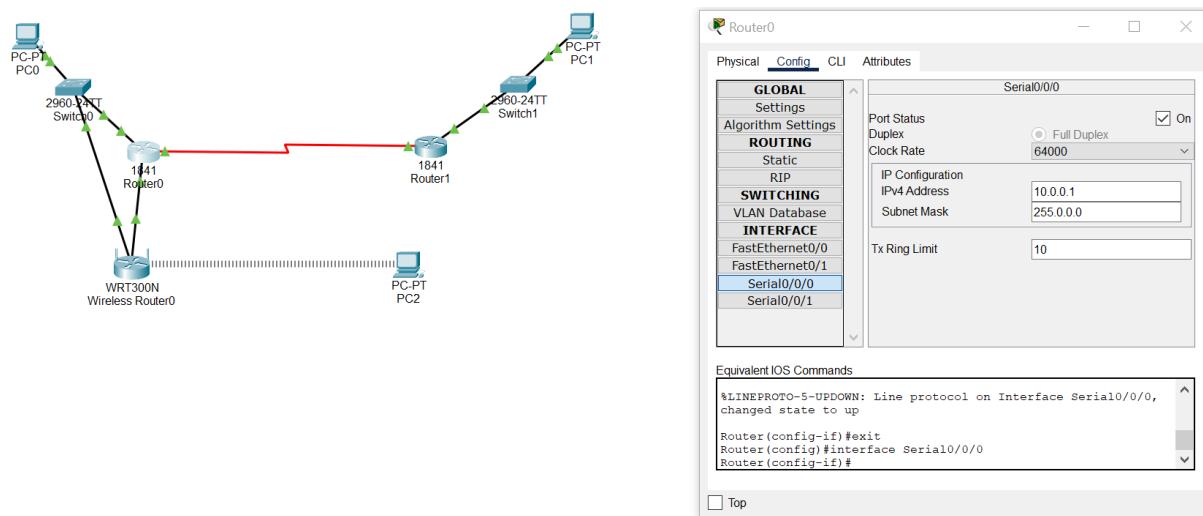
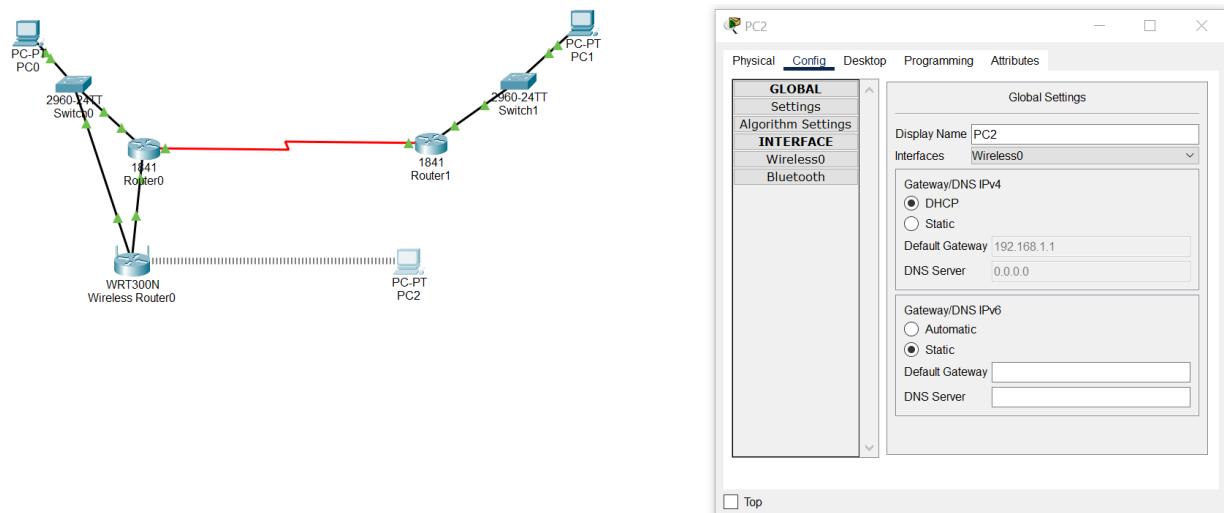
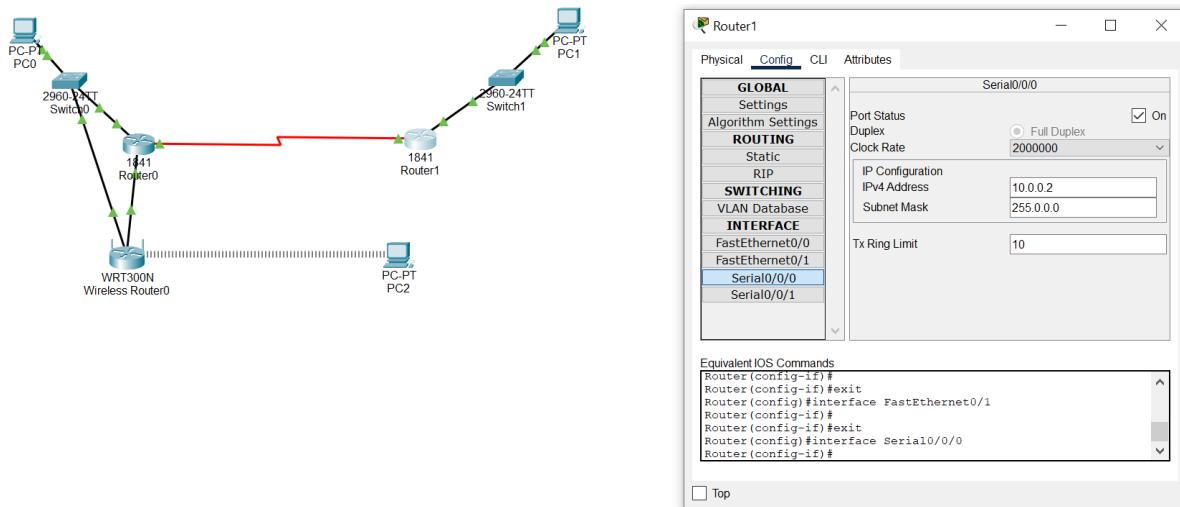
Step 2: Creating connections using Ethernet and serial cable between devices

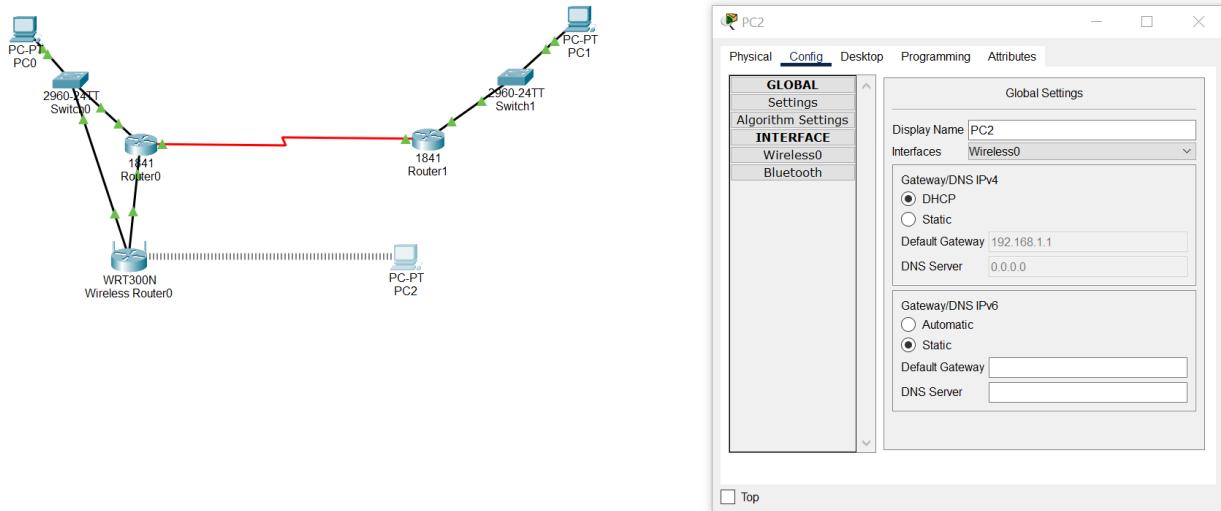


Step 3: Configuring all devices





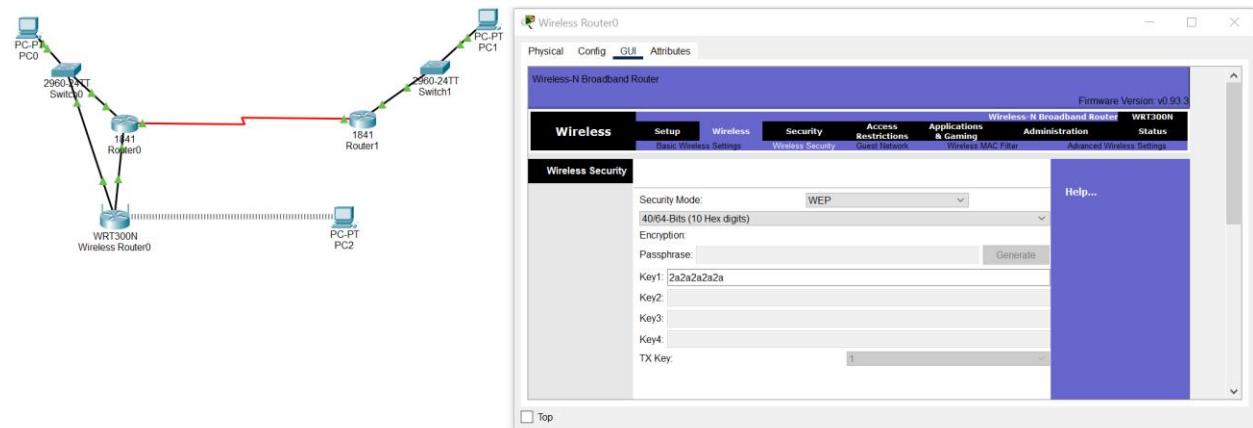




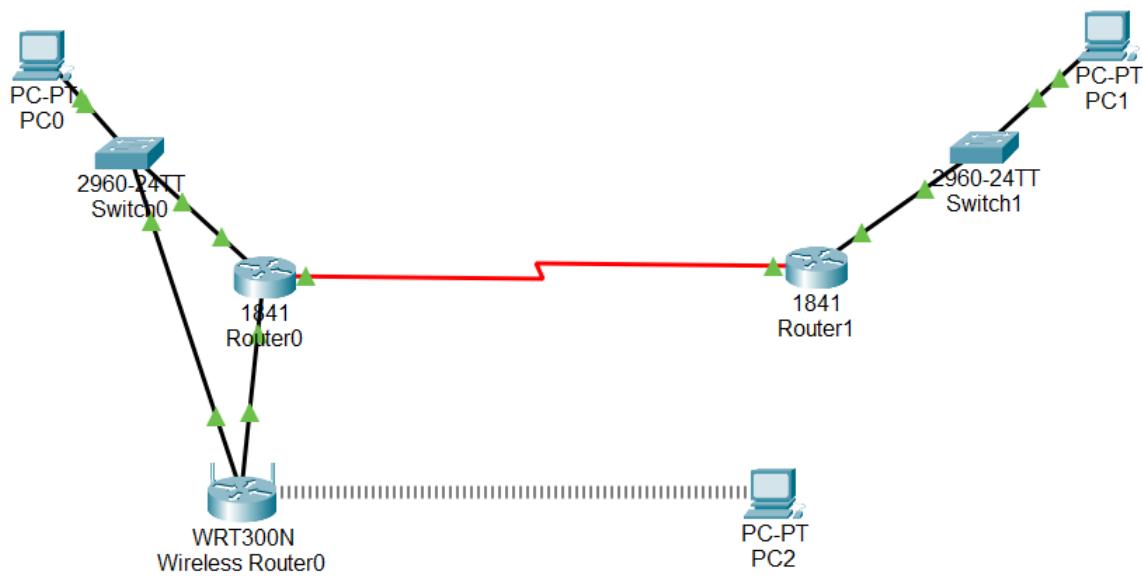
Step 4: Configuring wireless router



Step 5: Adding security mode as WEP and setting up key as 2a2a2a2a2a



Checking connection:



DU List Window										
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
●	Successful	PC0	PC1	ICMP	■	0.000	N	0	(edit)	
●	Successful	PC1	PC0	ICMP	■	0.000	N	1	(edit)	
●	Successful	PC0	PC2	ICMP	■	0.000	N	2	(edit)	
●	Successful	PC1	PC2	ICMP	■	0.000	N	3	(edit)	
●	Successful	PC2	PC1	ICMP	■	0.000	N	4	(edit)	

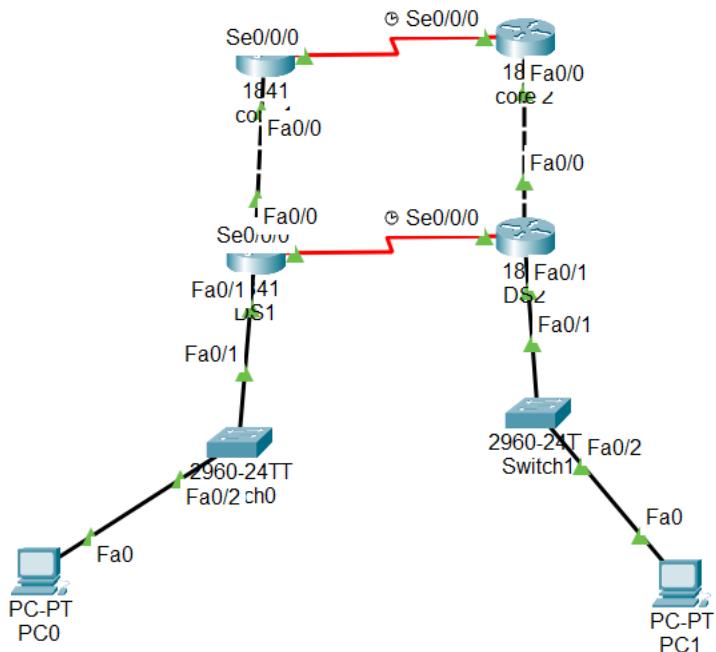
Practical No: 02

Aim: Demonstrating Distribution Layer Functions

Components: Router, Switch, Device (PC)

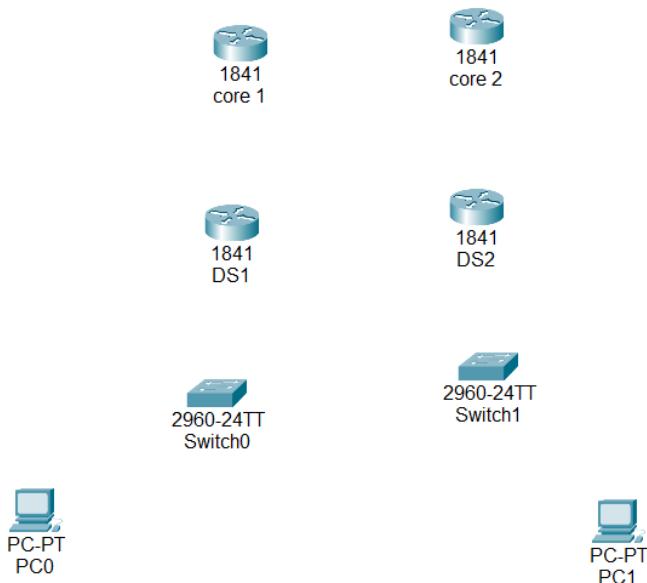
Theory: The distribution layer is the smart layer in the three-layer model. Routing, filtering, and QoS policies are managed at the distribution layer. Distribution layer devices also often manage individual branch-office WAN connections. This layer is also called the Workgroup layer.

Cisco Packet Tracer Setup:-

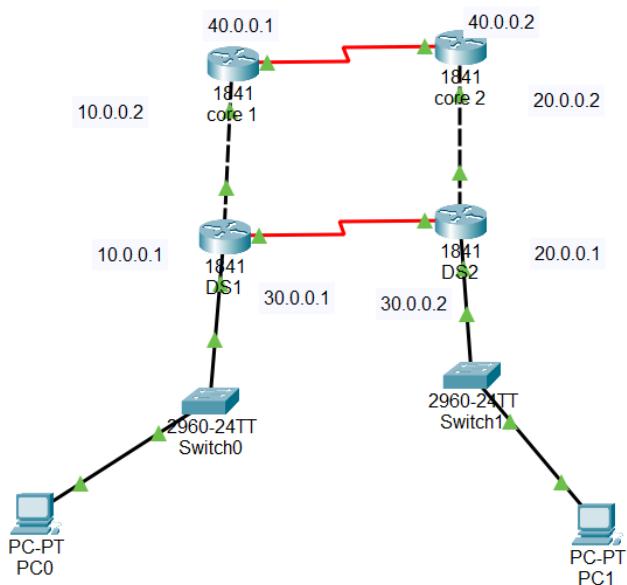


Implementation:

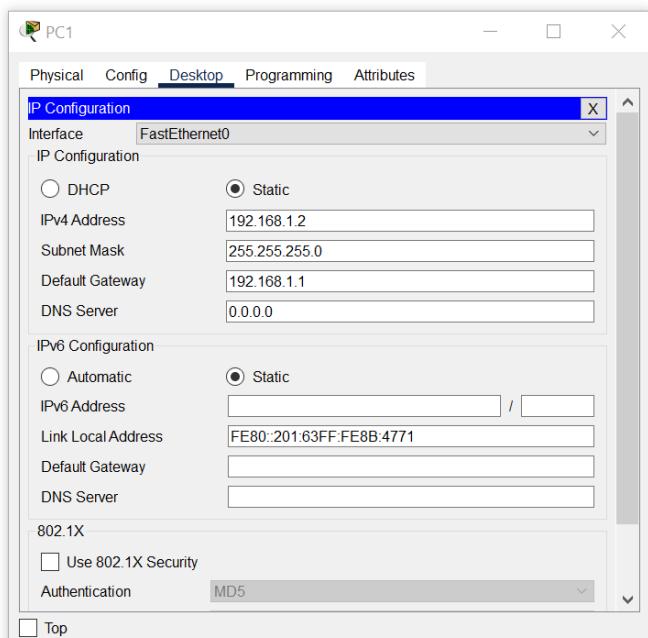
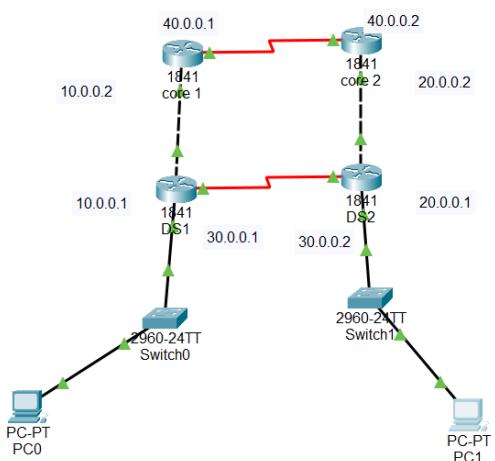
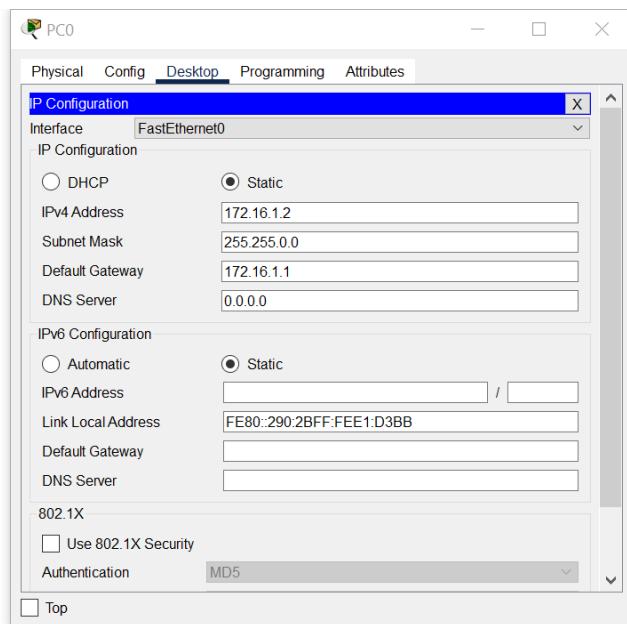
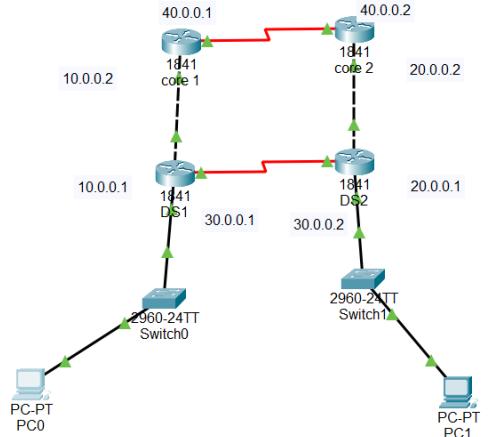
Step 1: Arranging devices



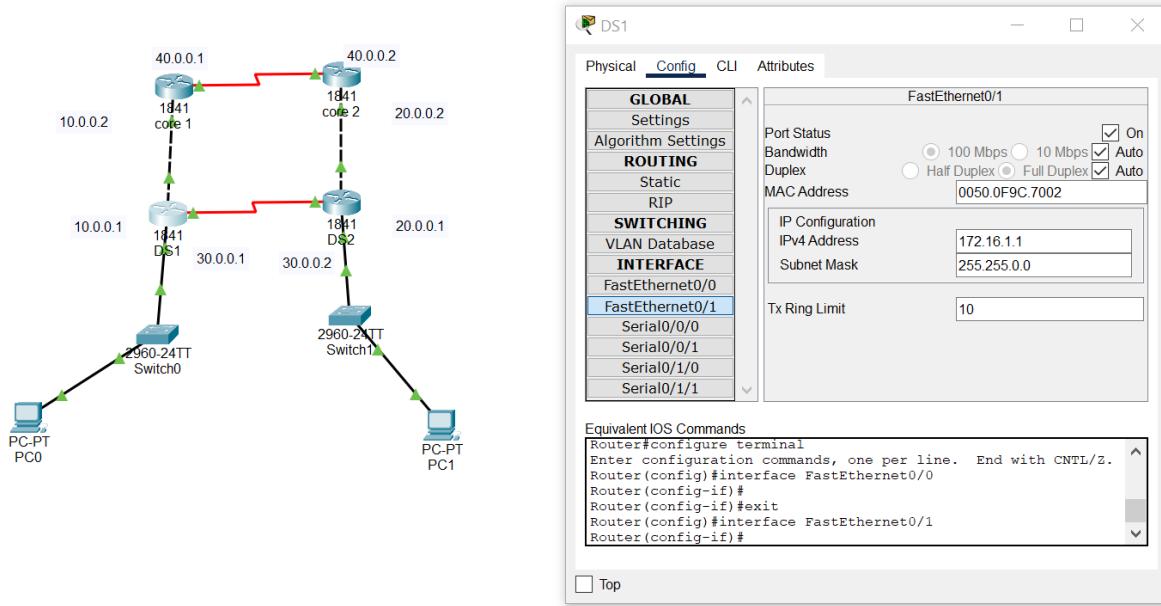
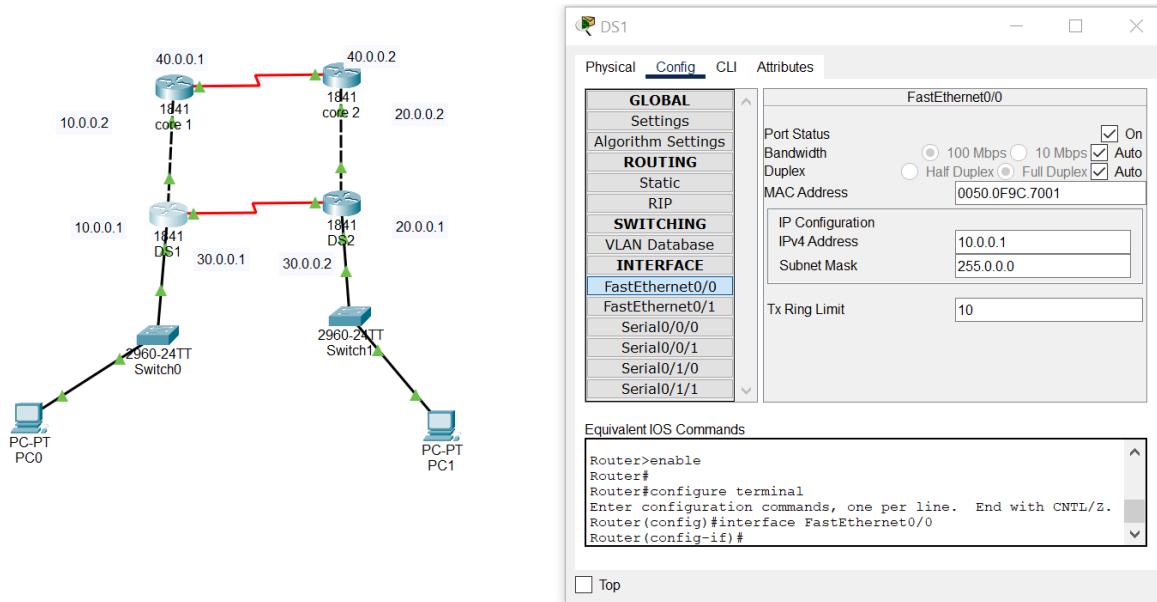
Step 2: Creating connections using Ethernet and serial cable between devices

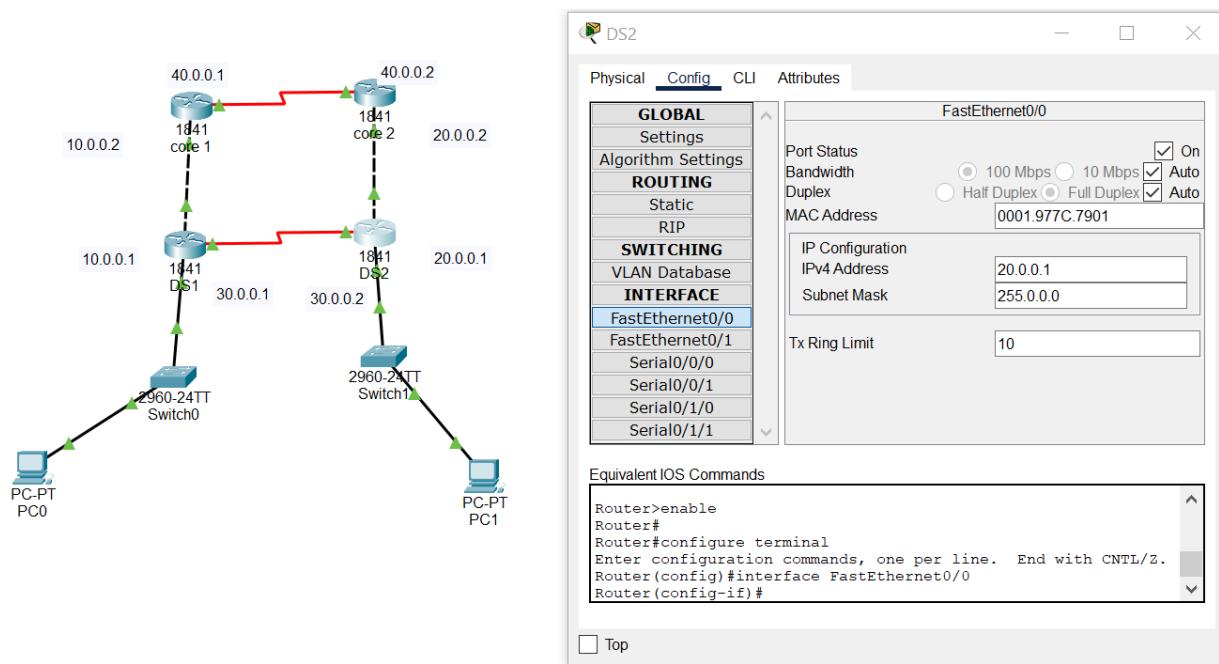
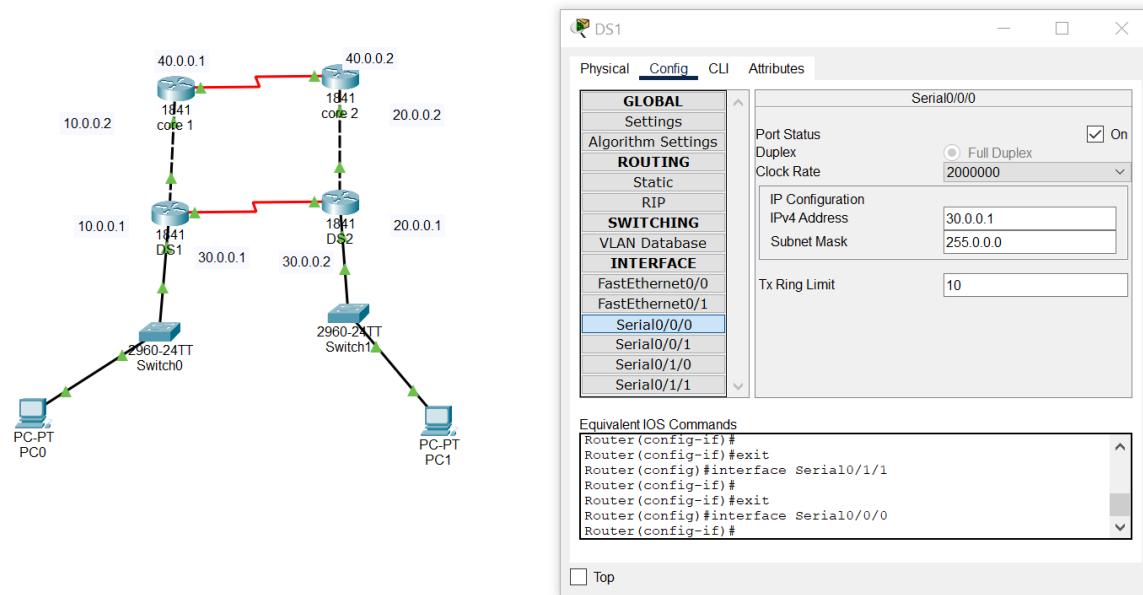


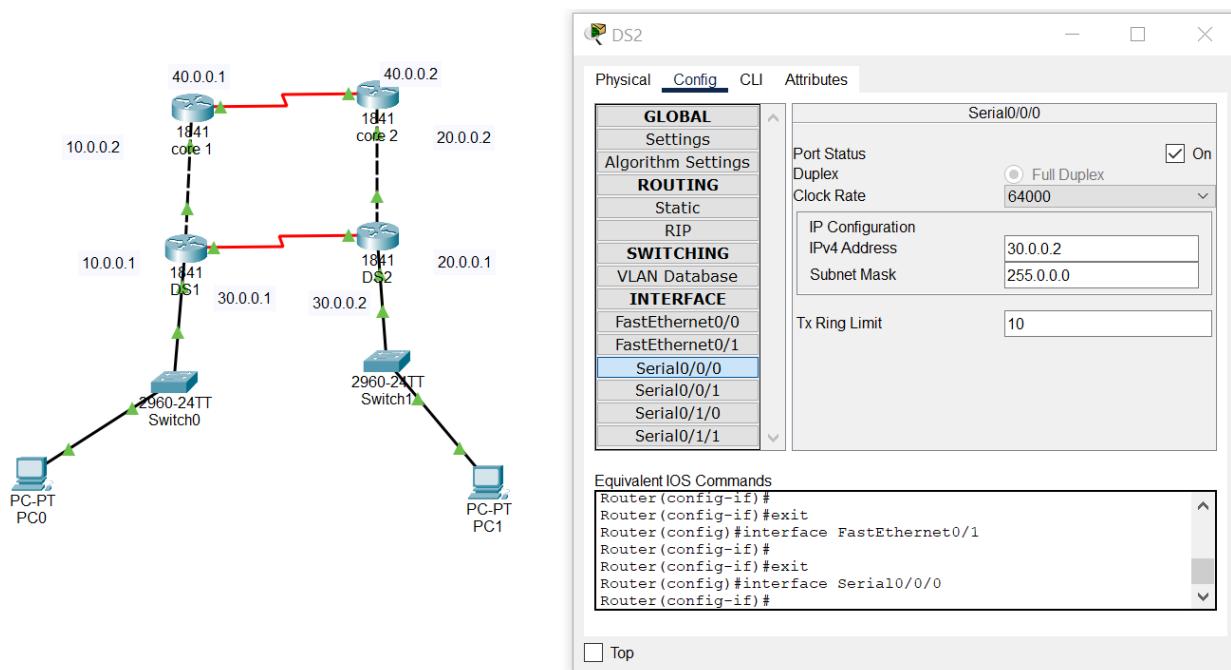
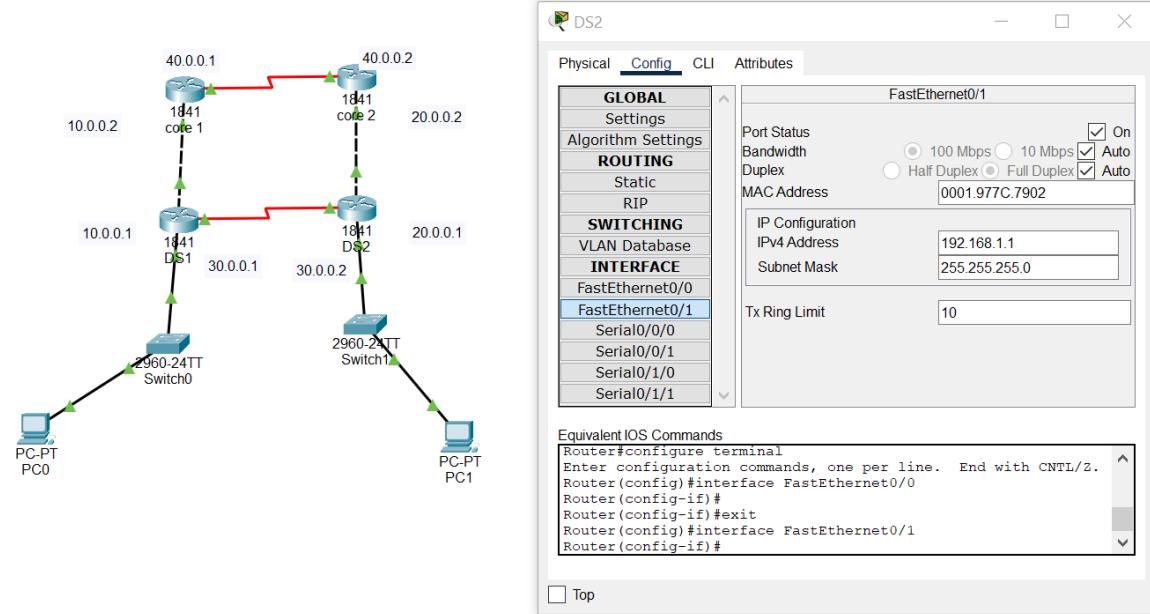
Step 3: Configuring all devices



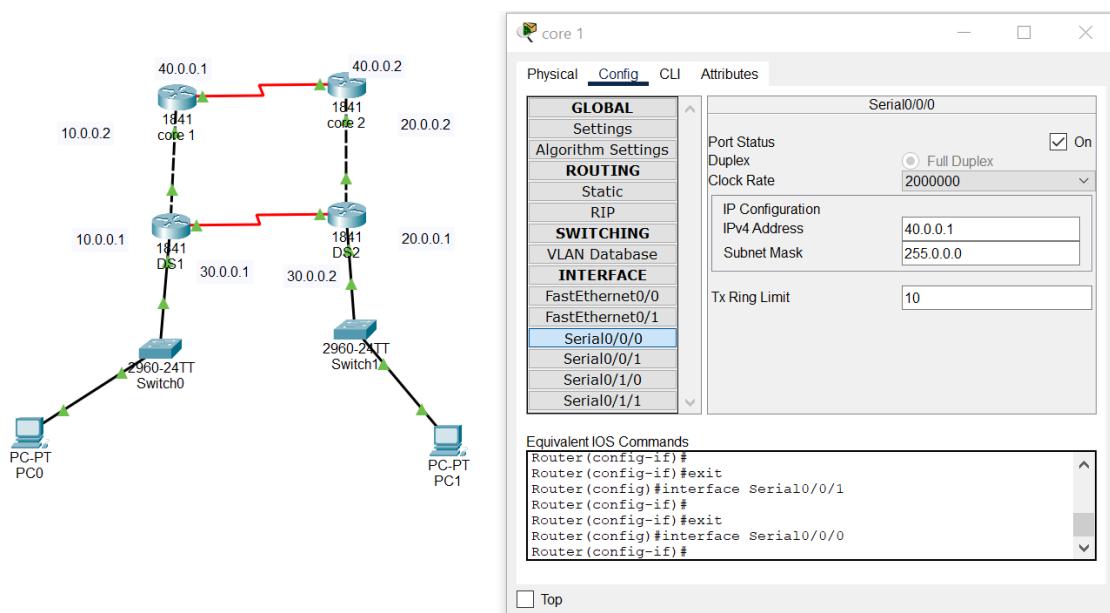
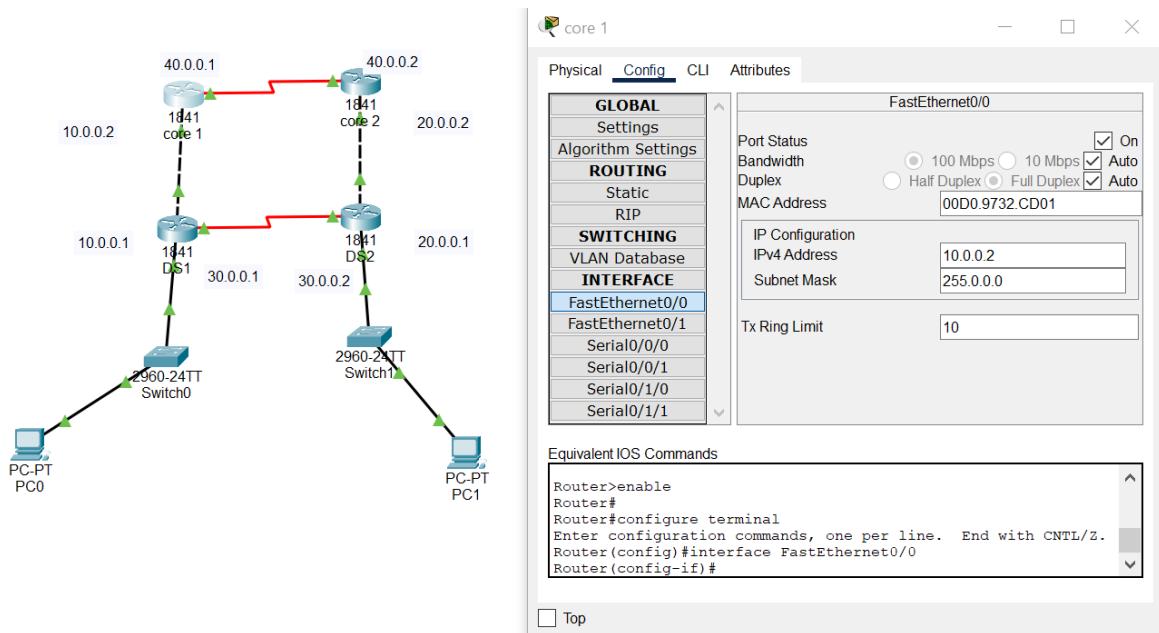
Step 4: Setting up distribution layer using router

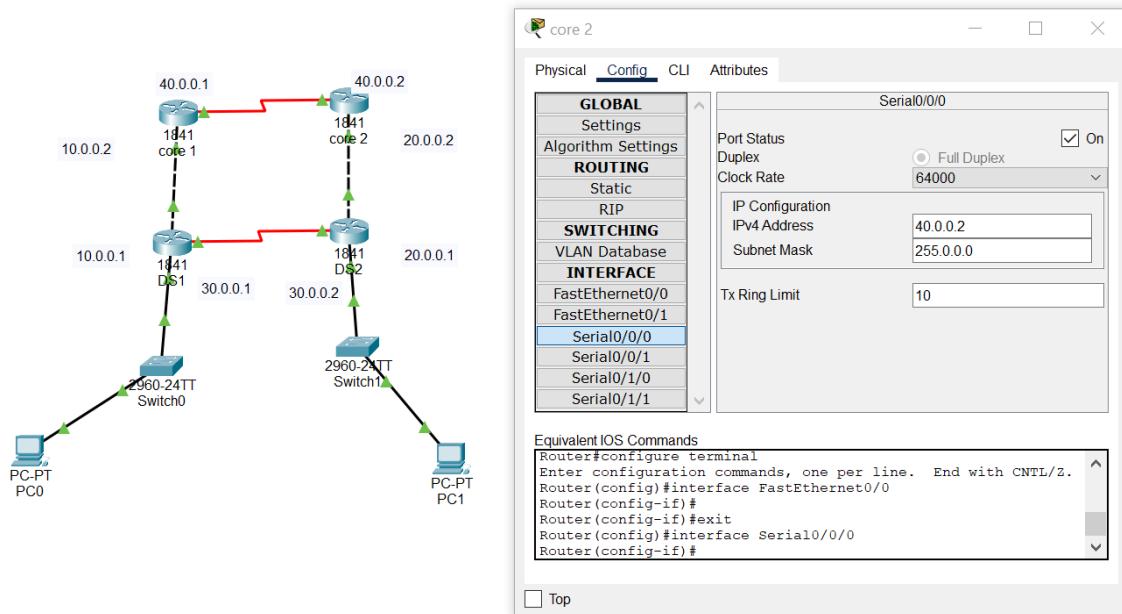
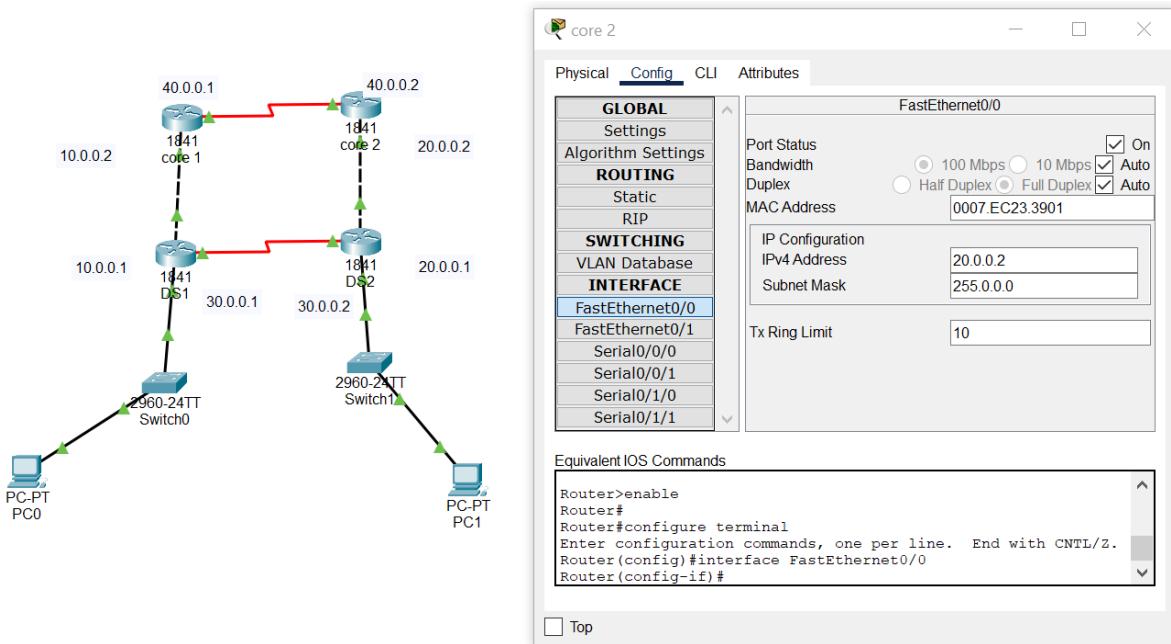




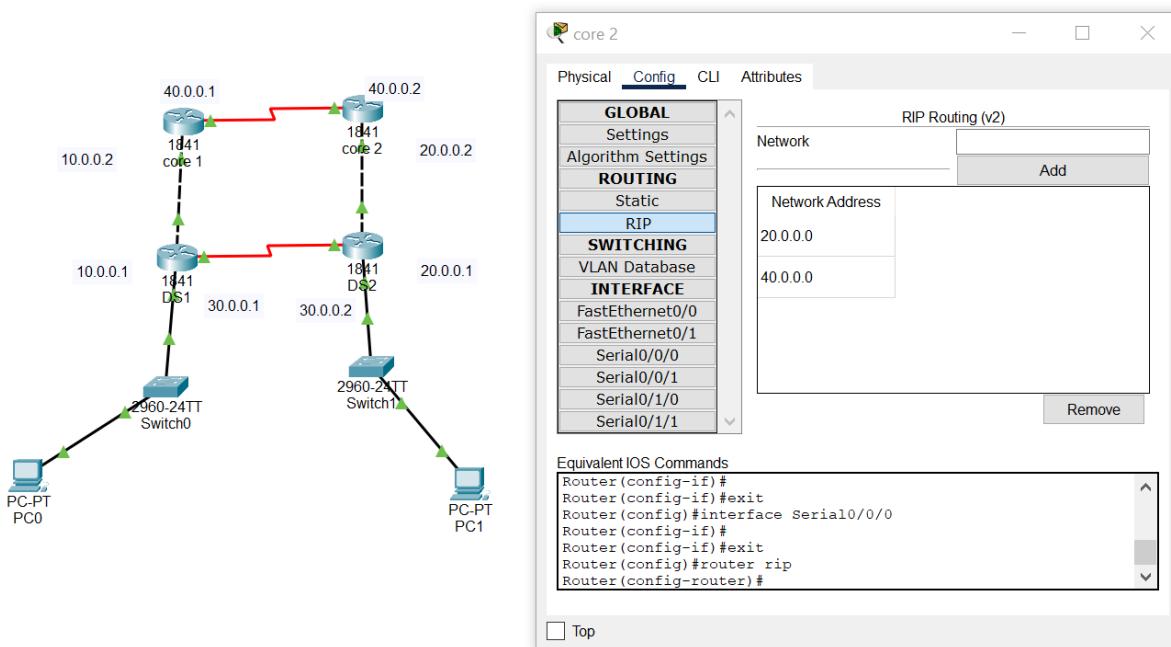
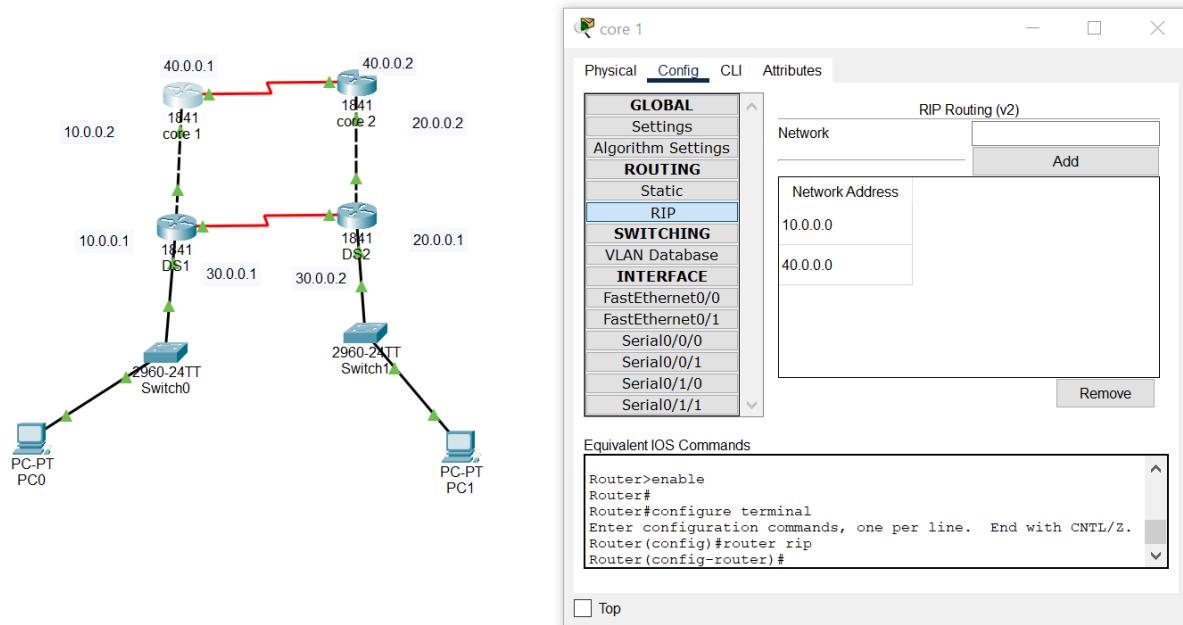


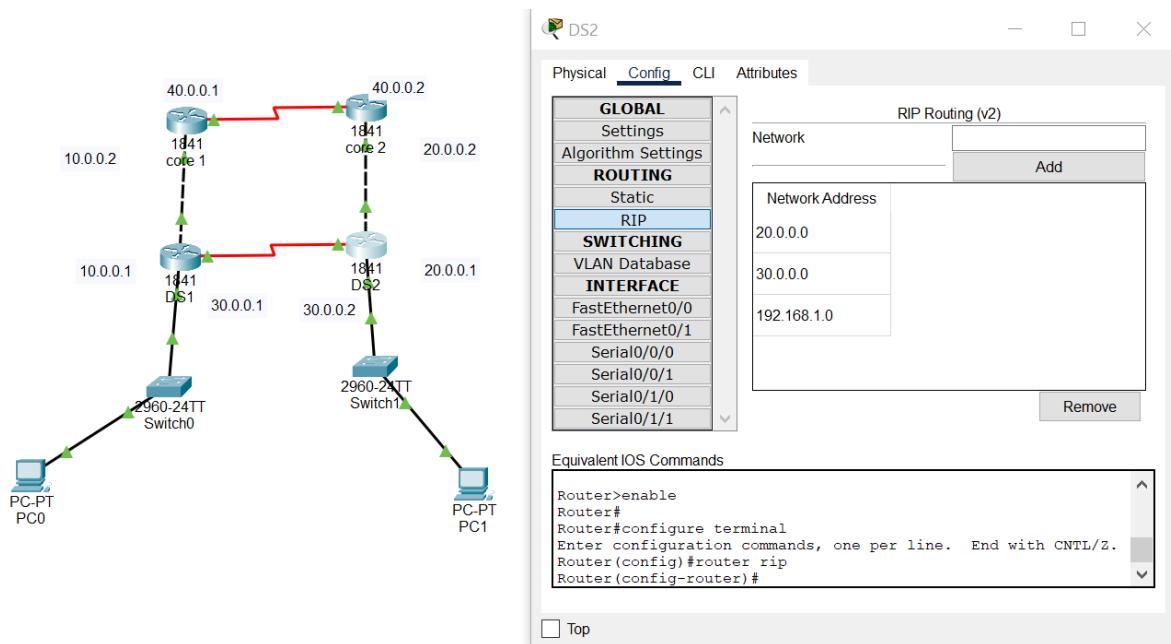
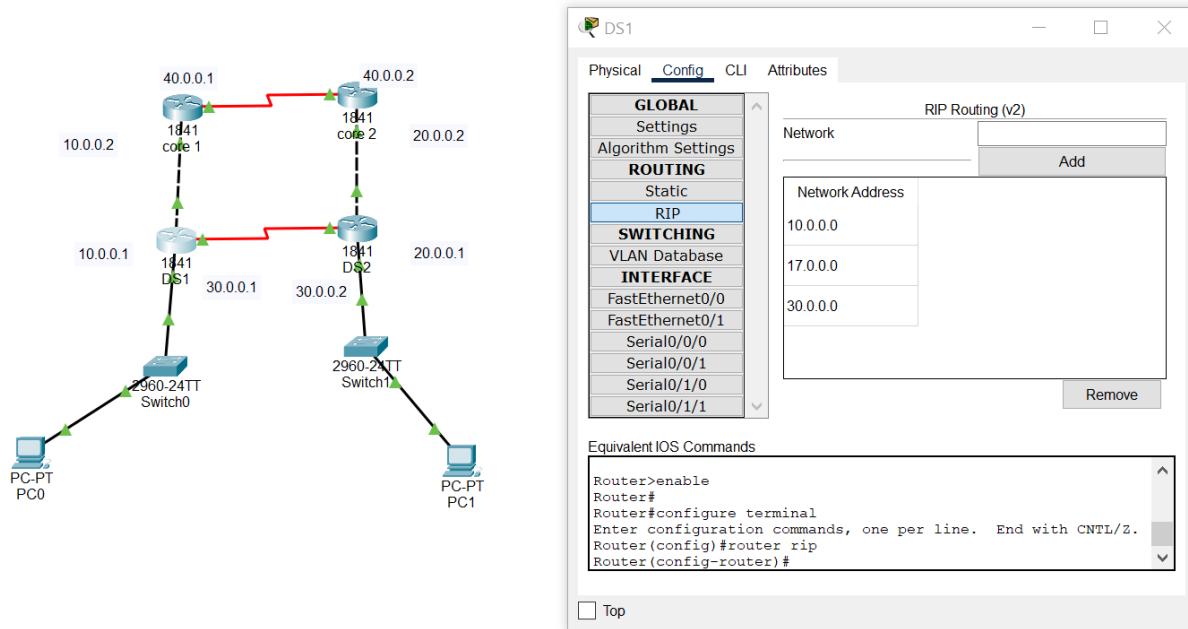
Step 5: Setting up core routers



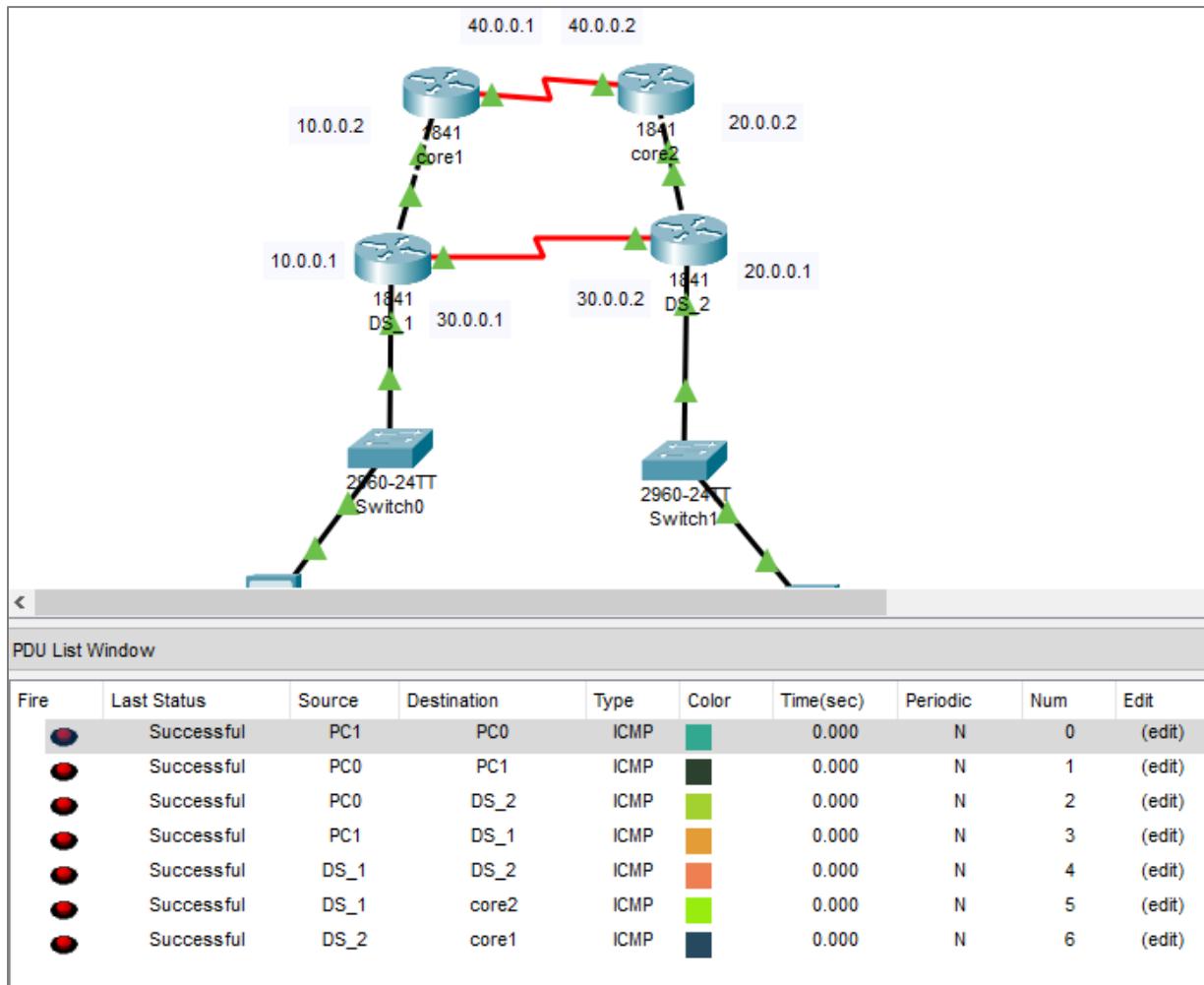


Step 6: Setting up RIP routing protocol





Checking connection:



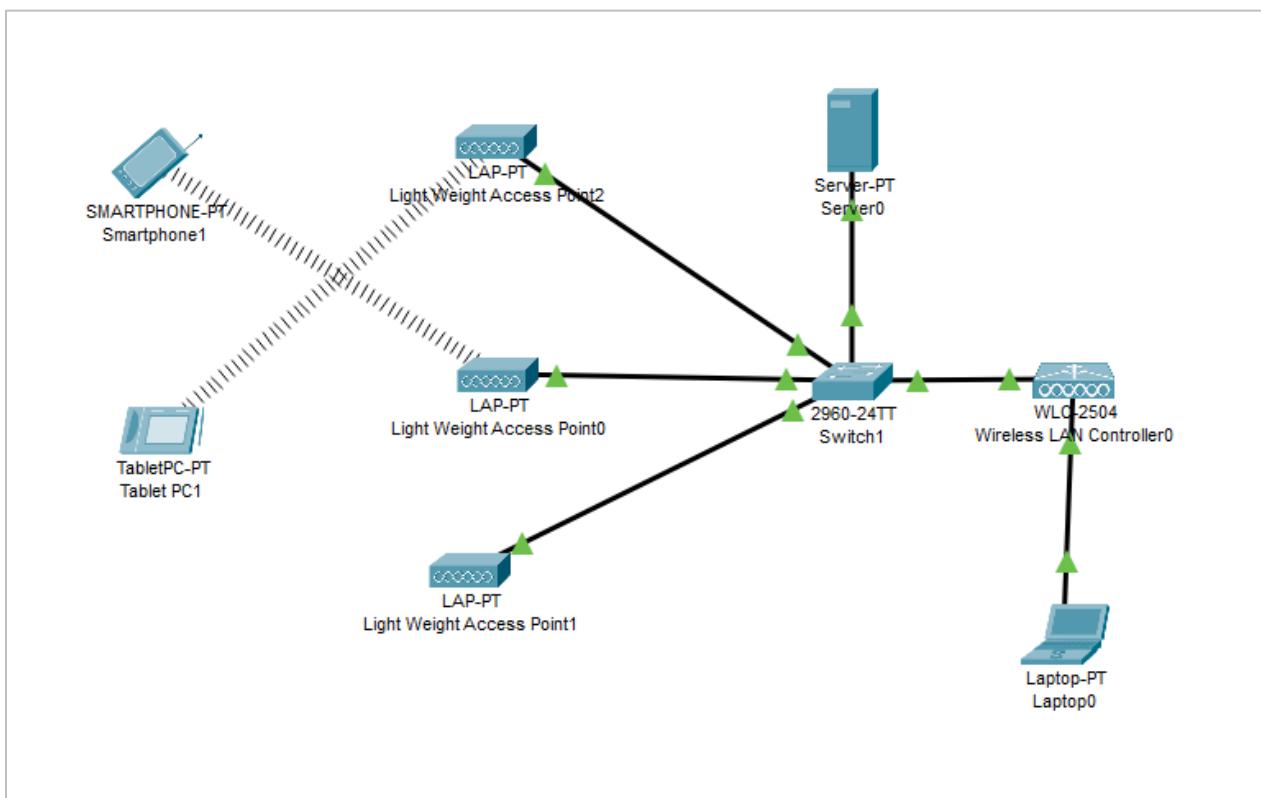
Practical No: 05

Aim: Configure Auto Profiles ACU Utilities

Components: WLC (Wireless LAN Controller), AP (Access point), Switch, Server, Laptop, Smartphone, Tablet

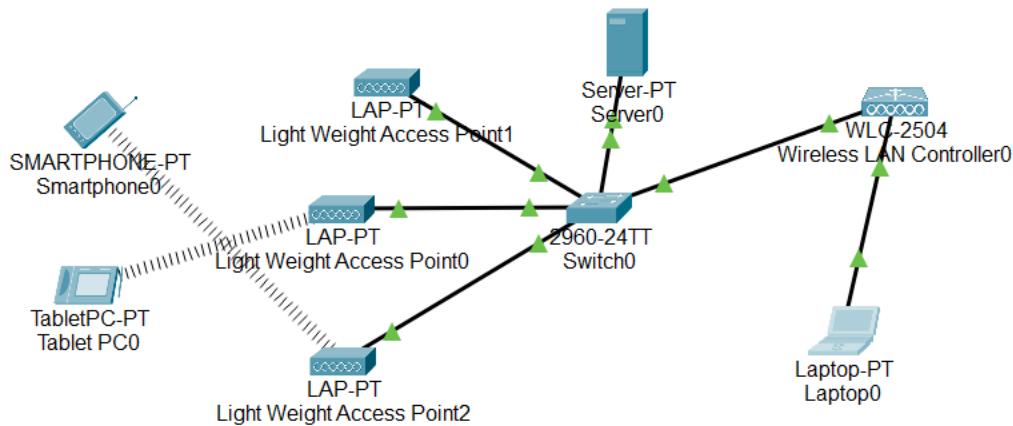
Theory: The Use Auto Profile Selection option causes the driver for the client adapter to automatically select a profile from the list of profiles that were set up to be included in auto profile selection. The name of the profile that is being used appears in the box to the right of the Use Auto Profile Selection option. If the client adapter loses association for more than 10 seconds, the driver switches automatically to another profile that is included in Auto Profile Selection. The adapter will not switch profiles as long as it remains associated or reassociates within 10 seconds (or within the time specified by the LEAP authentication timeout value). To force the client adapter to associate to a different AP (AP), Auto Profile Selection must be disabled and a new profile must be selected.

Cisco Packet Tracer Setup:-

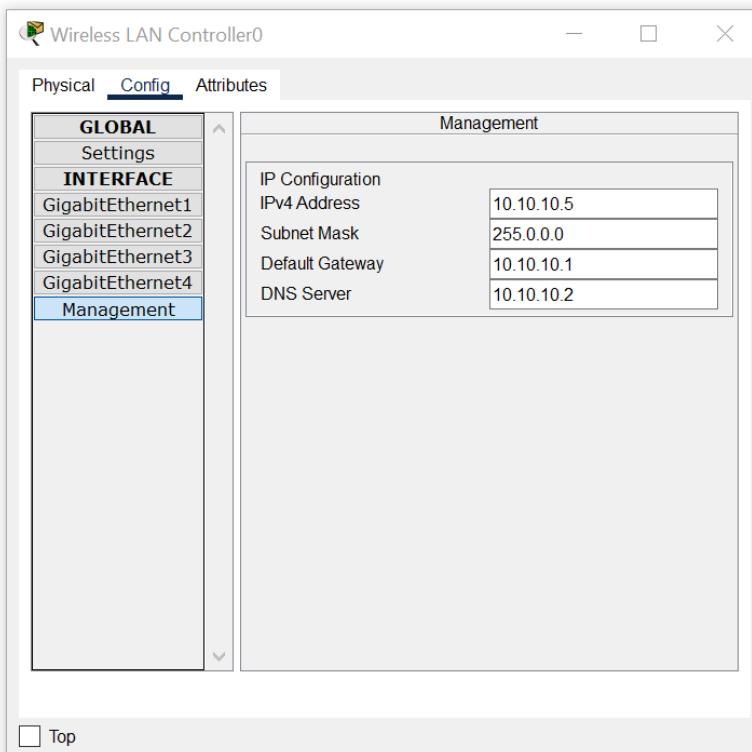


Implementation:

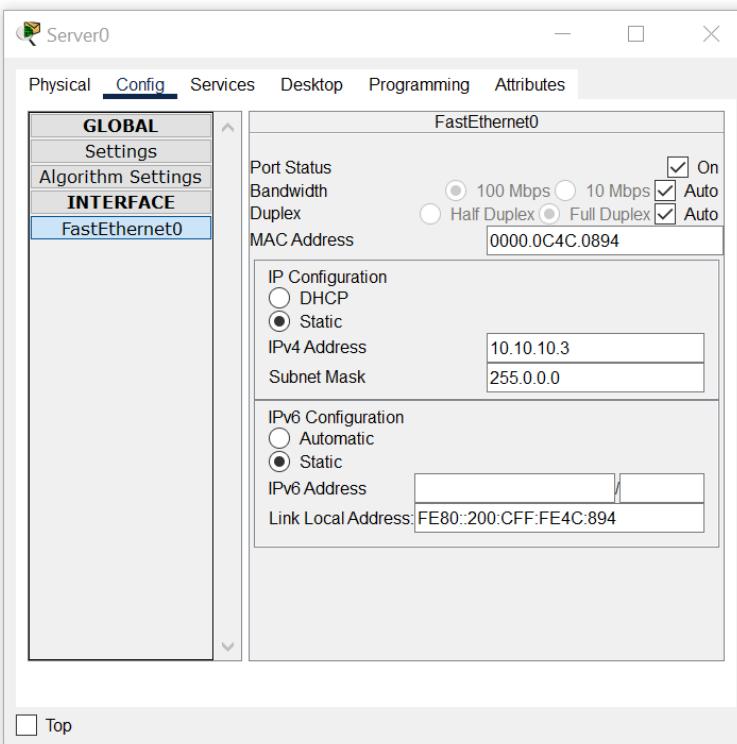
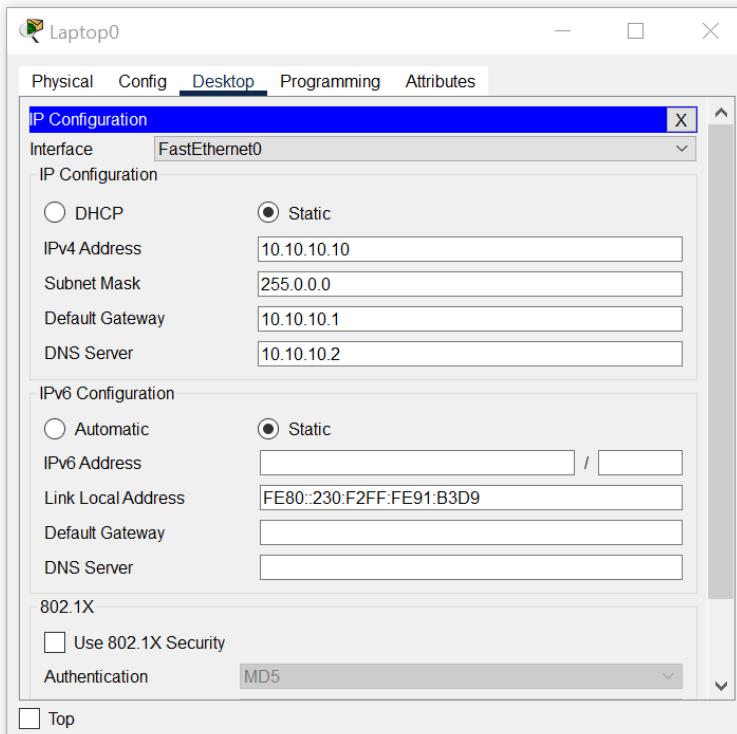
Step 1: Arranging devices and creating connections

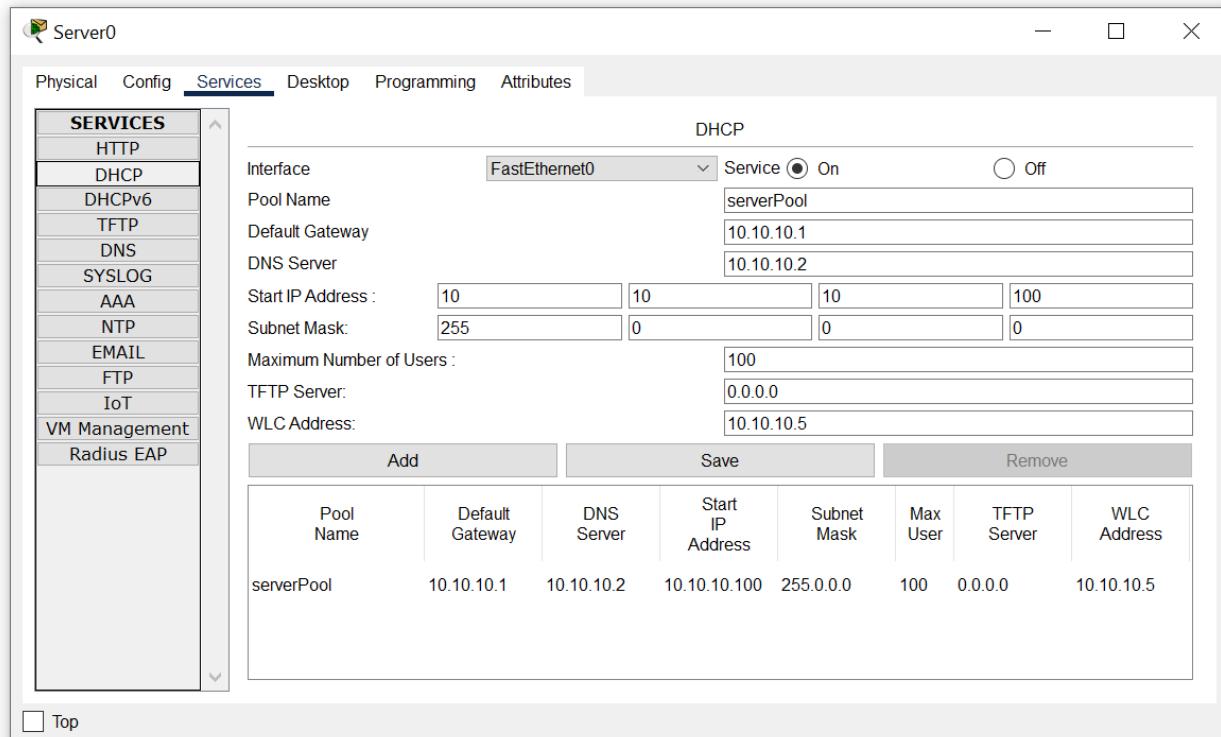


Step 2: WLC (Wireless LAN Controller)

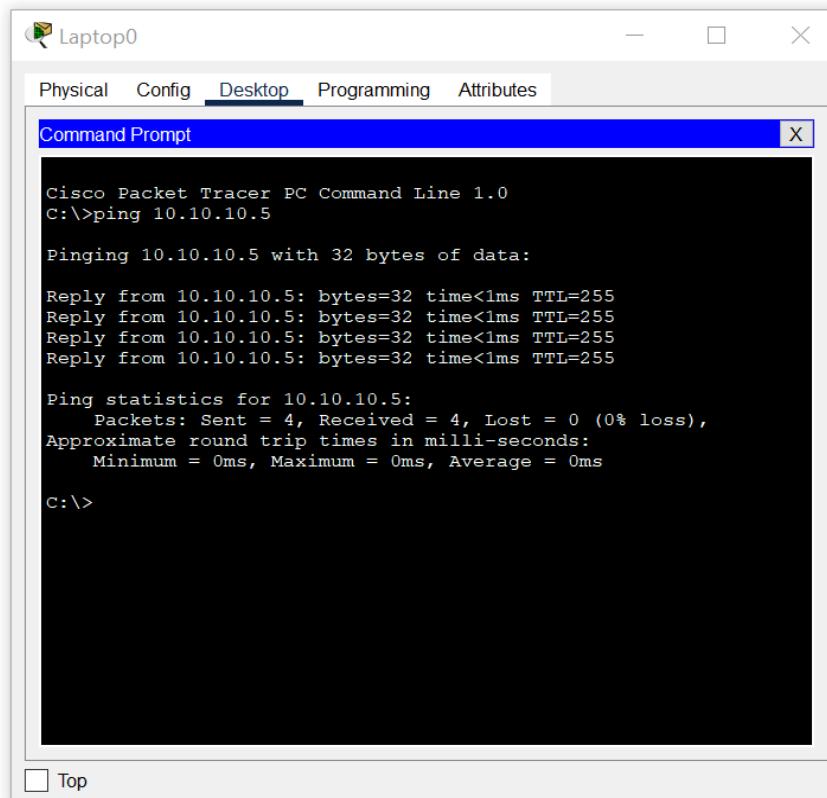


Step 3: Configuring Laptop and server and checking connection





Check the connection



Step 4: Configuring Admin settings using address (<http://10.10.10.5>)

The screenshot shows a web browser window titled "Laptop2" with the URL "http://10.10.10.5". The browser tabs include Physical, Config, Desktop (which is selected), Programming, and Attributes. The main content area displays the Cisco 2500 Series Wireless LAN Controller setup interface. It features a blue background with a white globe icon at the top. Below it, the text "Cisco 2500 Series Wireless LAN Controller" is centered. A message "Welcome! Please start by creating an admin account." is displayed above three input fields: "Create admin username", "Create admin password", and "Confirm admin password". A "Start" button is located below these fields. At the bottom of the screen, there is another window titled "Set Up Your Controller" with various configuration parameters.

Set Up Your Controller

Parameter	Value
System Name	GJCCS
Country	India (IN)
Date & Time	07/14/2022 15:16:06
Timezone	Colombo, Kolkata, Mumbai, New Delhi
NTP Server	(optional)
Management IP Address	10.10.10.5
Subnet Mask	255.0.0.0
Default Gateway	10.10.10.1
Management VLAN ID	0

Employee Network

Network Name: STUDENT

Security: WPA2 Personal

Passphrase:|

Confirm Passphrase:|

VLAN: Management VLAN

DHCP Server Address: 0.0.0.0 (optional)

Guest Network

This screenshot shows a configuration page for a wireless network. It includes fields for the network name (STUDENT), security (WPA2 Personal), passphrase, VLAN selection (Management VLAN), and DHCP server address. A 'Guest Network' section is also present. At the bottom are 'Back' and 'Next' buttons.

1 Set Up Your Controller

2 Create Your Wireless Networks

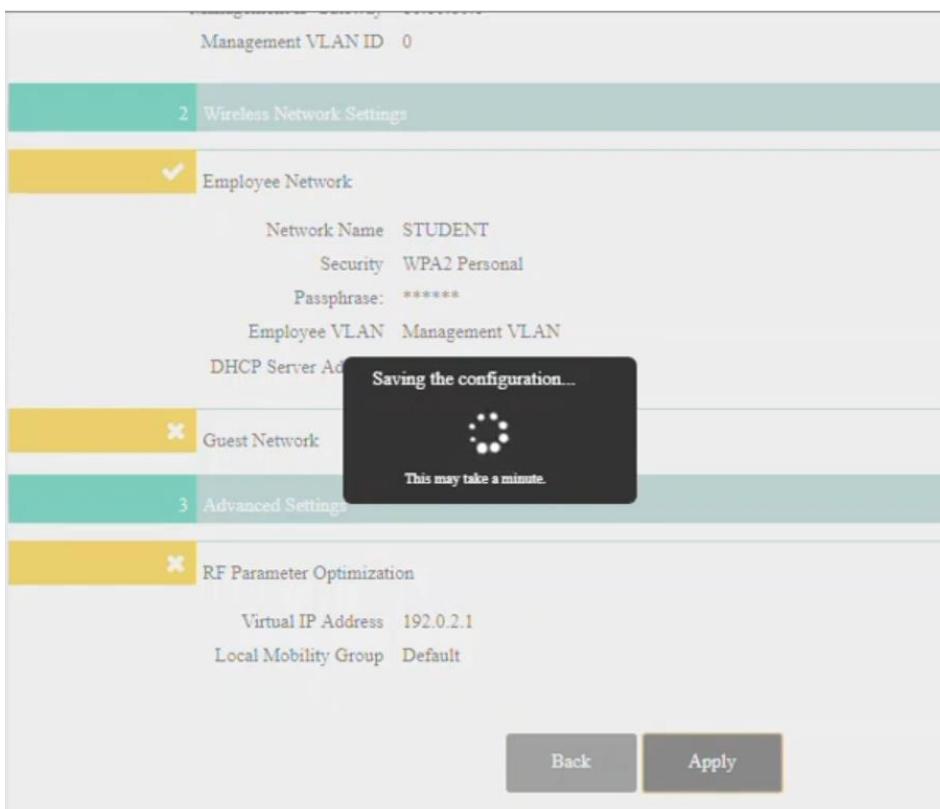
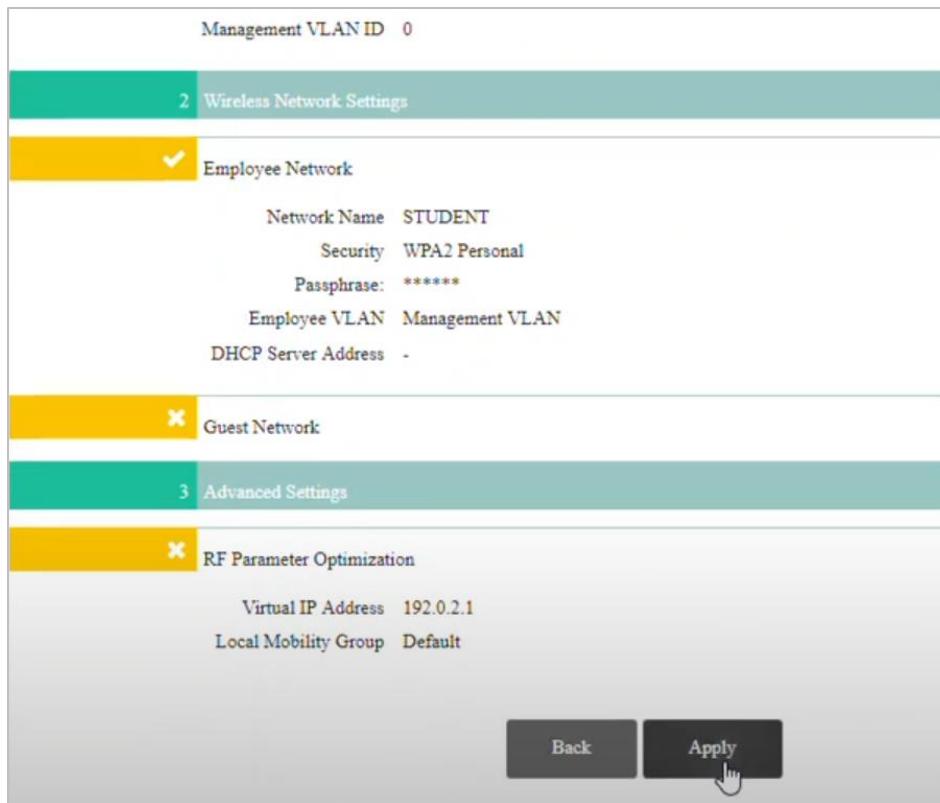
3 Advanced Setting

RF Parameter Optimization

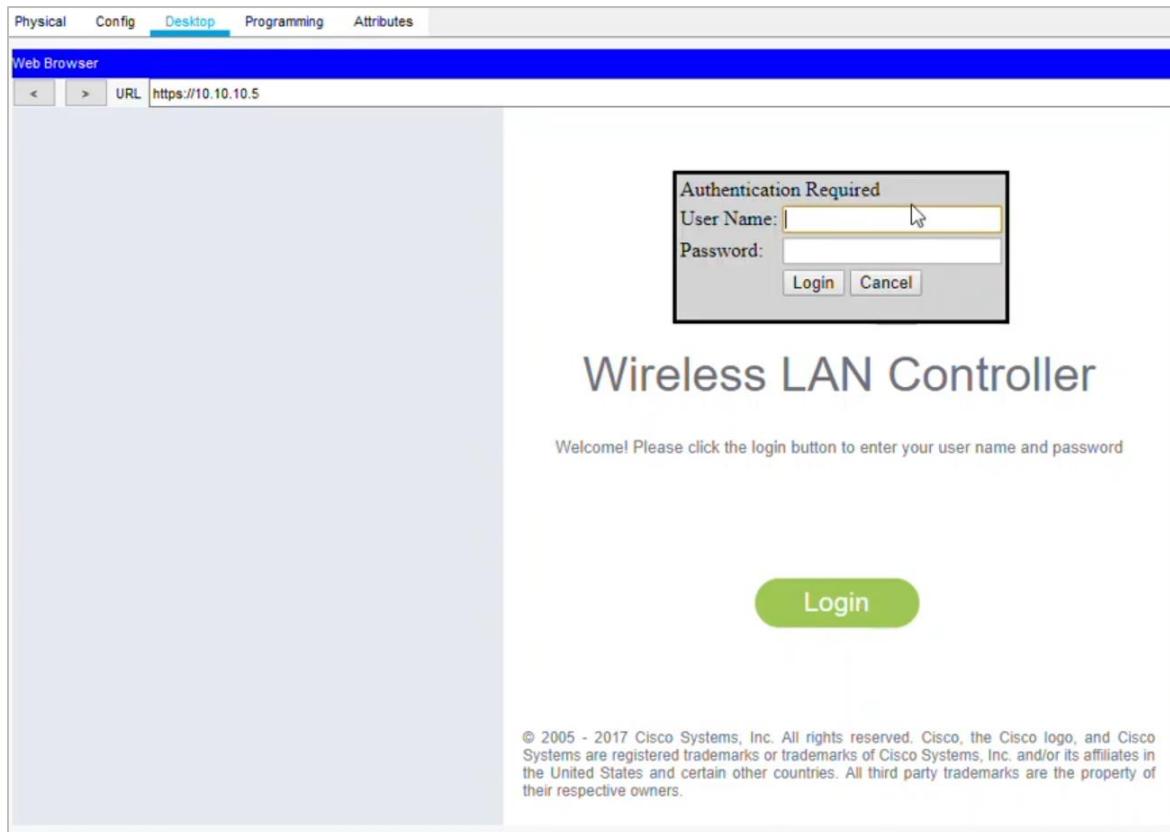
Virtual IP Address: 192.0.2.1

Local Mobility Group: Default

This screenshot shows a setup wizard with three completed steps: 'Set Up Your Controller', 'Create Your Wireless Networks', and 'Advanced Setting'. It also includes sections for 'RF Parameter Optimization', 'Virtual IP Address' (192.0.2.1), and 'Local Mobility Group' (Default). At the bottom are 'Back' and 'Next' buttons.



Step 5: Login back to Admin Panel using address (<https://10.10.10.5>)



Check the Access points AP's

AP Name	IP Address(Ipv4/Ipv6)	AP Model
Light Weight Access Point0	10.10.10.100	PT-AIR-CAP1000I-A-K9
Light Weight Access Point1	0.0.0.0	PT-AIR-CAP1000I-A-K9
Light Weight Access Point2	10.10.10.102	PT-AIR-CAP1000I-A-K9

Go to WLAN's make SSID for STUDENT to Student

WLAN ID	Type	Profile Name	WLAN SSID	Admin Status	Security Policies
1	WLAN	STUDENT	STUDENT	Enabled	[WPA2][Auth(PSK)]

General	Security	QoS	Policy-Mapping	Advanced
Profile Name: STUDENT	Type: WLAN	SSID: Student	Status: Enabled	
Security Policies: [WPA2][Auth(PSK)] (Modifications done under security tab will appear after applying the changes.)				
Radio Policy: All				
Interface/Interface Groups(G): management				

Step 6: Add new wireless LAN as TEACHER with SSID Teacher

The screenshot shows the Cisco Wireless LAN Controller (WLC) Web User Interface. The top navigation bar includes tabs for Physical, Config, Desktop, Programming, and Attributes. The URL in the browser is https://10.10.10.5/frameAPGroupList.html. The main menu has options like MONITOR, WLANs, CONTROLLER, WIRELESS, SECURITY, MANAGEMENT, COMMANDS, HELP, FEEDBACK, and Home.

Top Window (AP Groups):

- Left sidebar: WLANS, Advanced (selected).
- Table header: AP Group Name, AP Group Description.
- Data row: STUDENT, Student_AP.
- Action buttons: Entries 1 - 3 of 3, Add Group (highlighted with a red arrow).

Middle Window (WLANs > New):

- Left sidebar: WLANS, Advanced (selected).
- Form fields:
 - Type: WLAN.
 - Profile Name: TEACHER.
 - SSID: Teacher.
 - ID: 2.
- Action buttons: < BACK, Apply.

Bottom Window (WLANs > Edit 'TEACHER'): Advanced tab

- Left sidebar: WLANS, Advanced (selected).
- Form fields:
 - Profile Name: TEACHER.
 - Type: WLAN.
 - SSID: Teacher.
 - Status: Enabled (checkbox checked).

Final Top Window (AP Groups):

- Left sidebar: WLANS, Advanced (selected).
- Table header: AP Group Name, AP Group Description.
- Data rows: STUDENT, Student_AP and TEACHER, Teacher_AP.
- Action buttons: Entries 1 - 3 of 3, Remove (for each row).

Step 7: Create AP Groups for TEACHER and STUDENT

The screenshot shows the Cisco WLC Web User Interface. The top navigation bar includes tabs for Physical, Config, Desktop, Programming, and Attributes. The URL in the browser is https://10.10.10.5/frameAPGroupList.html. The main menu has options like MONITOR, WLANs, CONTROLLER, WIRELESS, SECURITY, MANAGEMENT, COMMANDS, HELP, FEEDBACK, and Home.

Top Window (AP Groups):

- Left sidebar: WLANS, Advanced (selected).
- Table header: AP Group Name, AP Group Description.
- Data row: default-group.
- Action buttons: Entries 1 - 1 of 1, Add Group (highlighted with a red arrow).

Middle Window (AP Groups):

- Left sidebar: WLANS, Advanced (selected).
- Form fields:
 - Add New AP Group:
 - AP Group Name: STUDENT.
 - Description: Student AP.
- Action buttons: Add (highlighted with a red arrow), Cancel.

Assign wireless LAN to AP

Add AP Group TEACHER

Assign wireless LAN

Ap Groups > Edit 'TEACHER'

General **WLANS** **RF Profile** **APs** **802.11u** **Location** **Ports/Module**

Add New

WLAN SSID: Teacher(2)

Interface /Interface Group(G): GigabitEthernet0

SNMP NAC State: Enabled

Add **Cancel**

Assign AP

Ap Groups > Edit 'TEACHER'

General **WLANS** **RF Profile** **APs** **802.11u** **Location** **Ports/Module**

APs currently in the Group

Remove APs **Add APs to the Group**

AP Name	Ethernet MAC	Group Name
Light Weight Access Point7	STUDENT	
Light Weight Access Point8	STUDENT	
Light Weight Access Point6	default-group	

Logout from admin panel

Laptop0

Physical Config Desktop Programming Attributes

Web Browser URL: https://10.10.10.5/frameAPGroupList.html

CISCO MONITOR WLANS CONTROLLER WIRELESS SECURITY MANAGEMENT COMMANDS HELP FEEDBACK Home

WLANS AP Groups

Entries 1 - 3 of 3 Add Group

AP Group Name	AP Group Description
STUDENT	Student_AP
TEACHER	Teacher_AP
default-group	

Check the assigned AP's

```

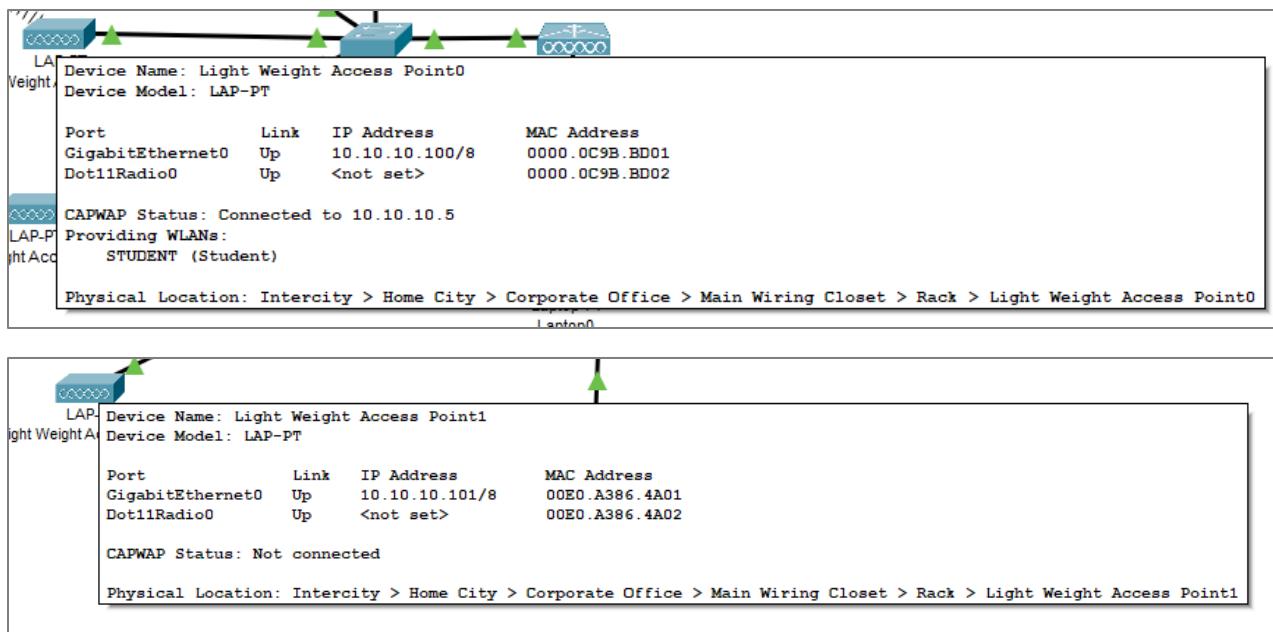
Device Name: Light Weight Access Point2
Device Model: LAP-PT

Port Link IP Address MAC Address
GigabitEthernet0 Up 10.10.10.102/8 00D0.D3B9.7701
Dot11Radio0 Up <not set> 00D0.D3B9.7702

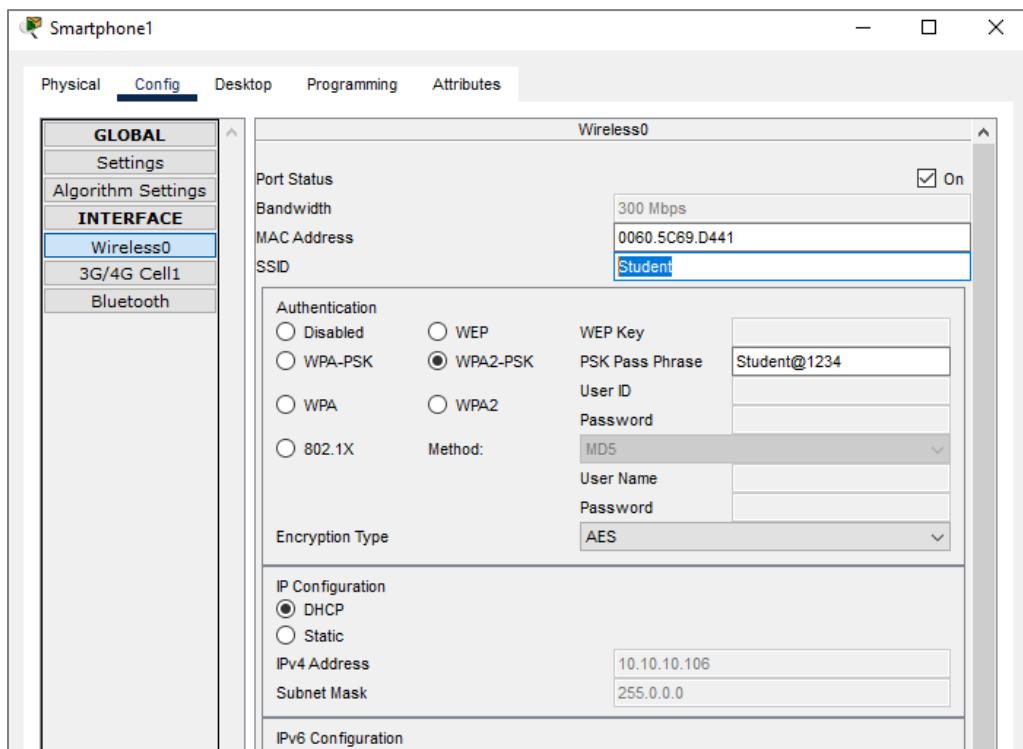
CAPWAP Status: Connected to 10.10.10.5
Providing WLANS:
    TEACHER (Teacher)

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Light Weight Access Point2

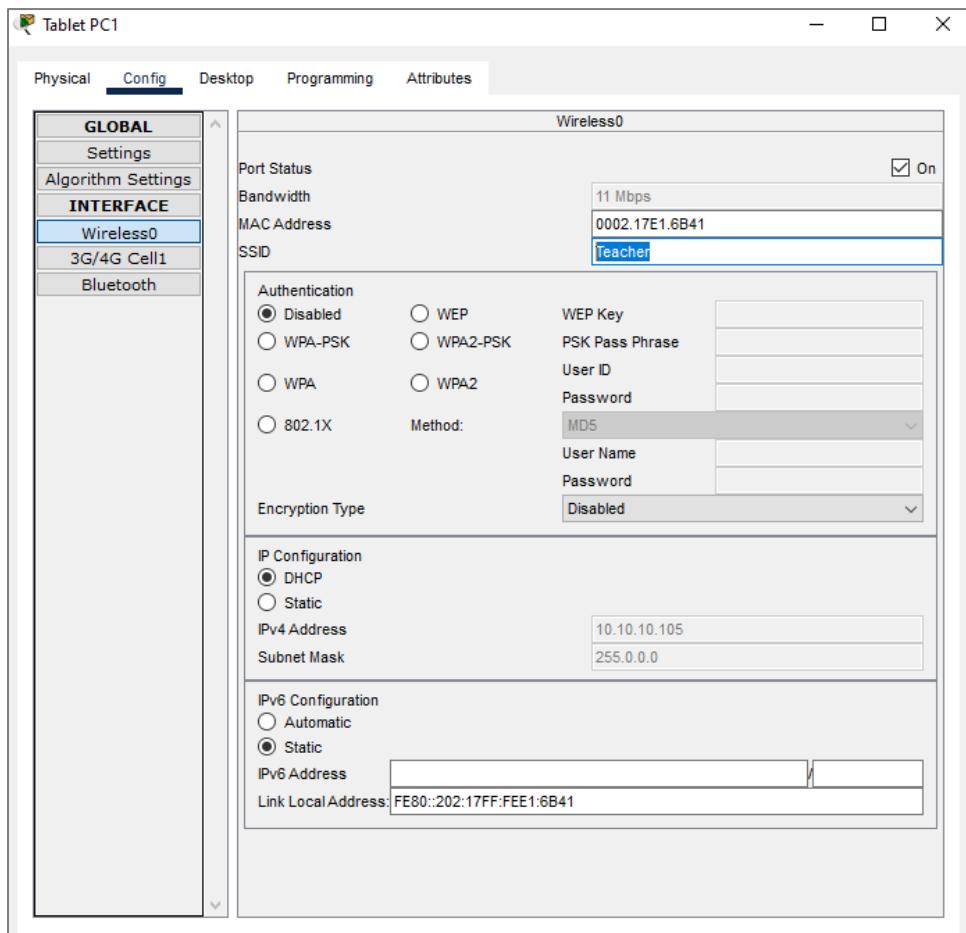
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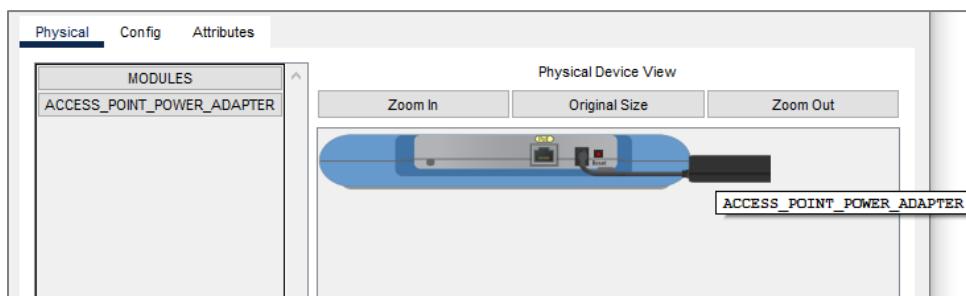
Step 8: Take Smartphone to connect Student AP group with wireless connection using SSID



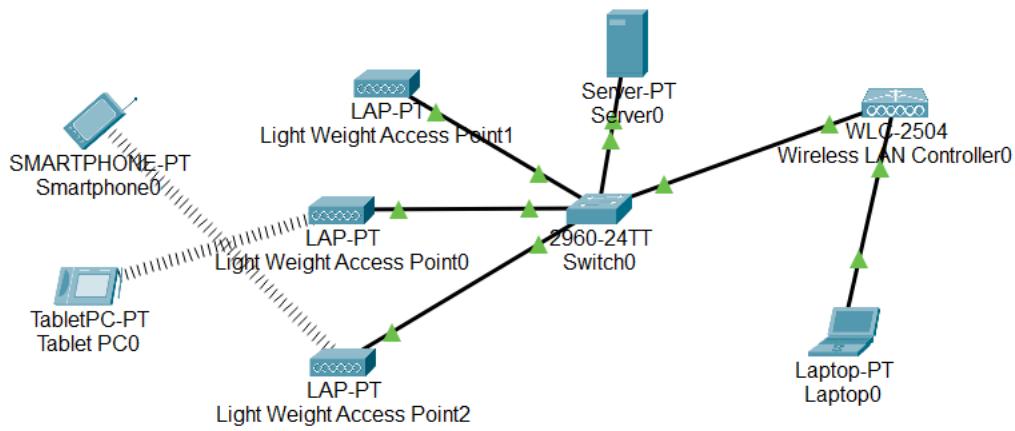
Step 8: Take Tablet to connect Teachers AP group with wireless connection using SSID



Wait for some time (min 30sec to 1min) after that re-plug the adapters of all Access points



Final Output/Connection:



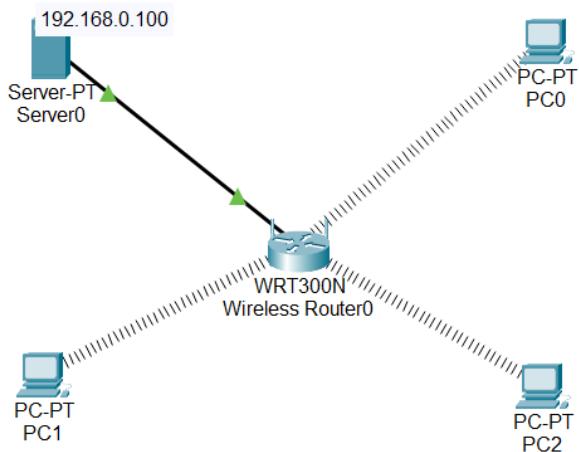
Practical No: 04

Aim: Planning Network-based Firewalls

Components: Wireless Router, Server, PC

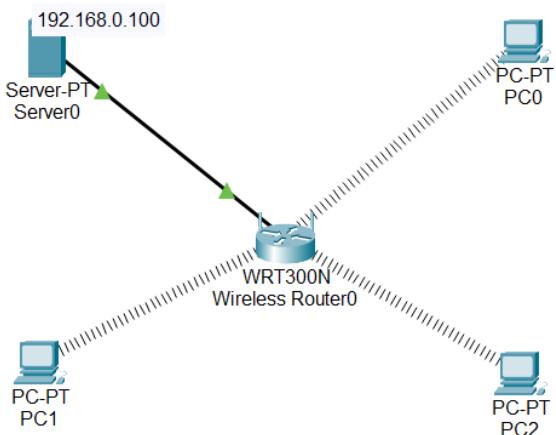
Theory: Network firewalls are security devices used to stop or mitigate unauthorized access to private networks connected to the Internet, especially intranets. The only traffic allowed on the network is defined via firewall policies – any other traffic attempting to access the network is blocked.

Cisco Packet Tracer Setup:-

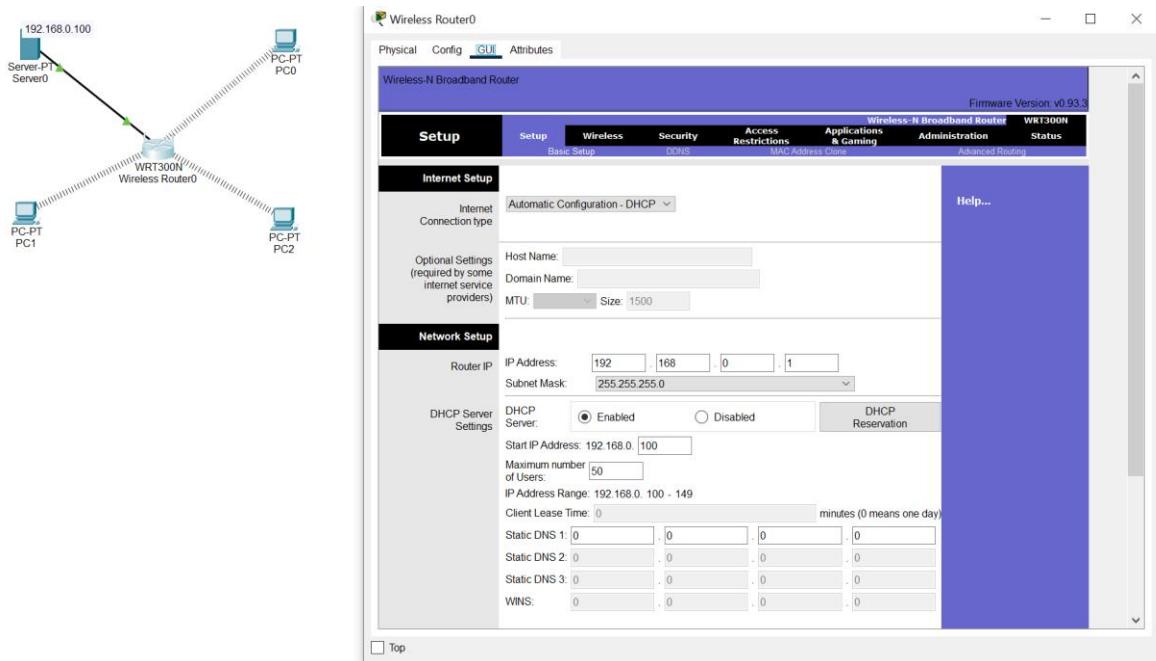


Implementation:

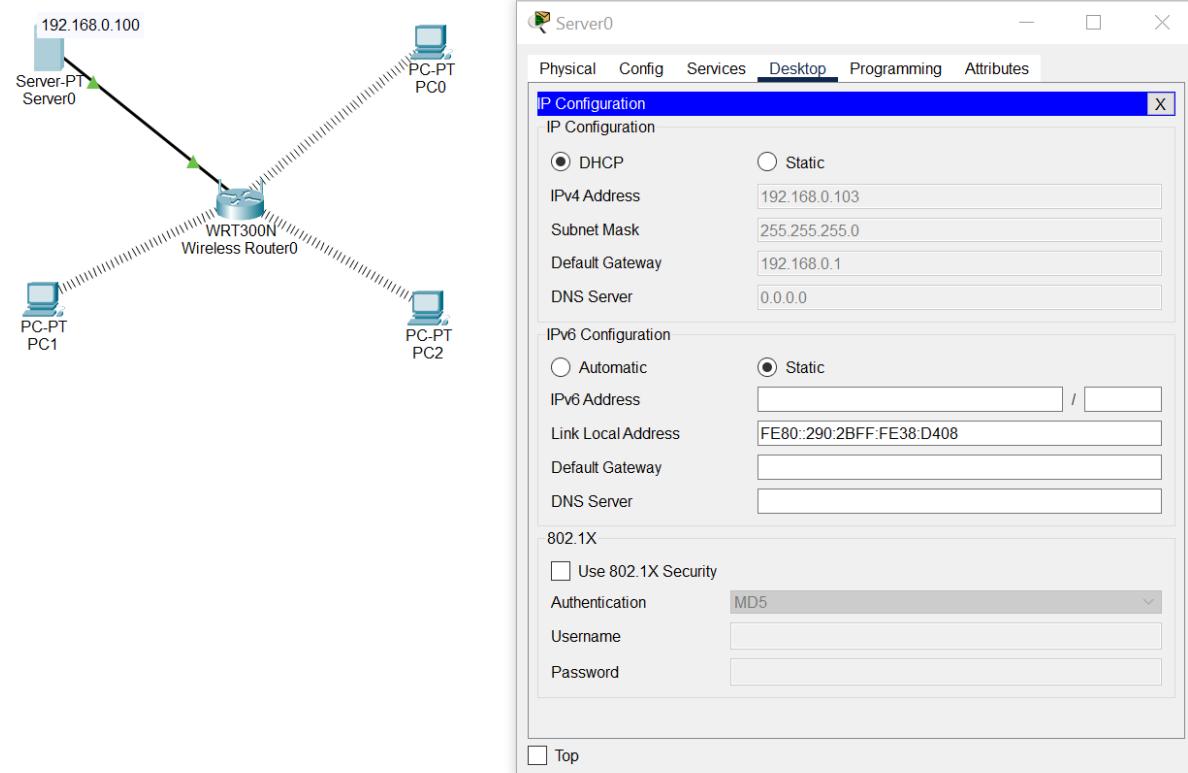
Step 1: Arranging devices and creating connections



Step 2: Configure wireless router and connect server to wireless router using Ethernet cable



Step 3: Configure Server

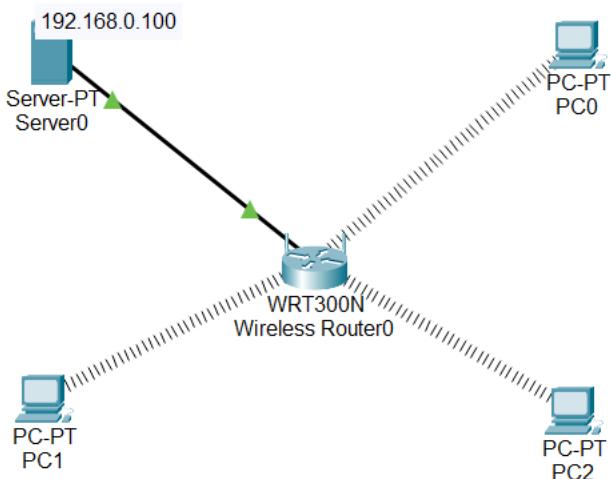


Step 4: Configure and connect all PC's to wireless router

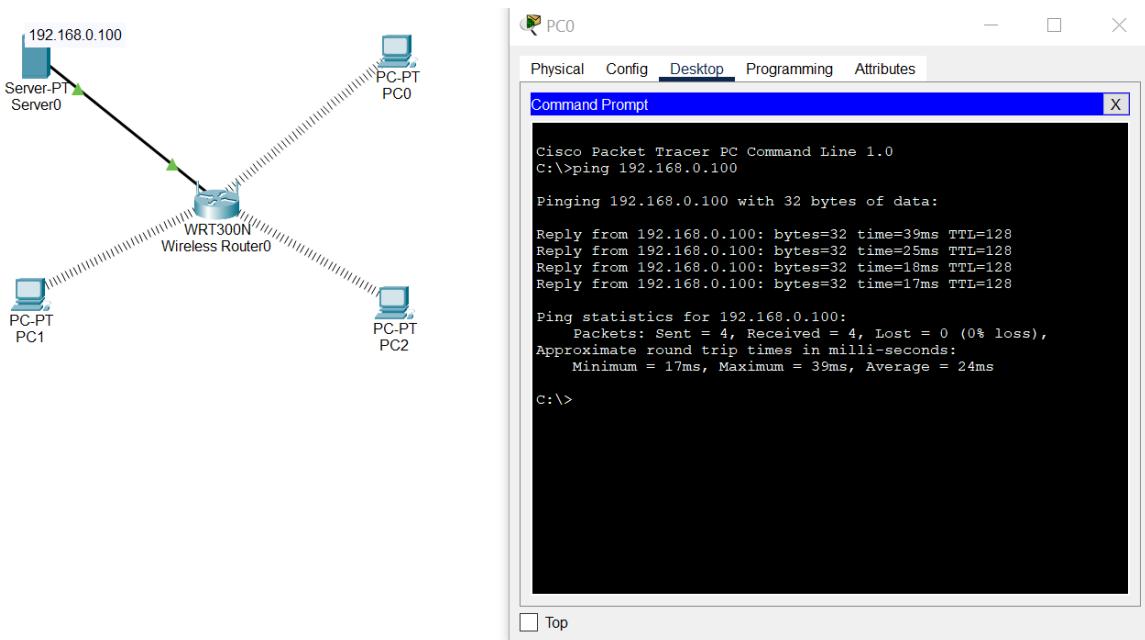
Changing port to wireless adapter of all PC's



After adding wireless adapter of all PC's they will automatically get connected with wireless outer because of DHCP



Step 5: Checking connection of pc's with server



The "Desktop" tab is selected in the navigation bar. A "Web Browser" window is open, displaying the URL "http://192.168.0.100". The page content includes:

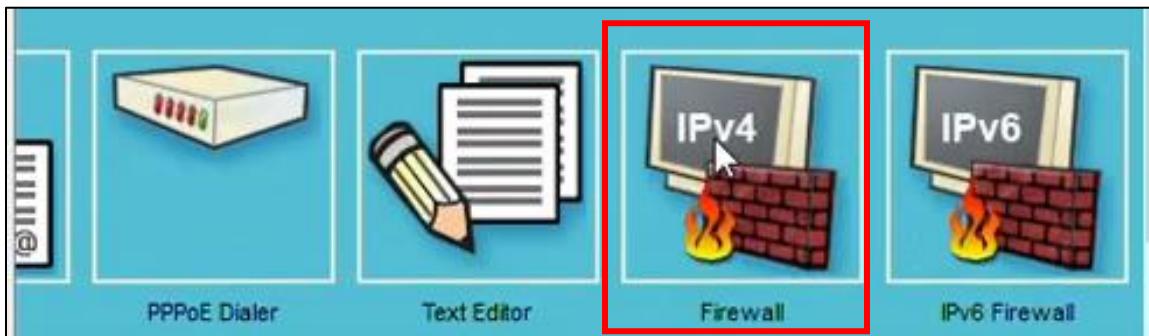
Welcome to Cisco Packet Tracer. Opening doors to new opportunities. Mind Wide Open.

Quick Links:

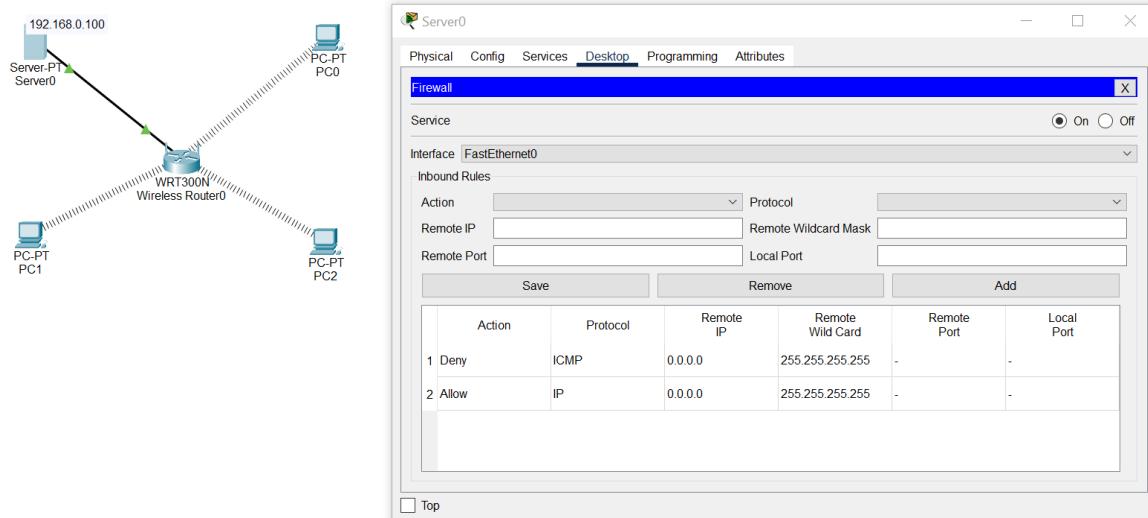
- [A small page](#)
- [Copyrights](#)
- [Image page](#)
- [Image](#)

If receiving response from server our connection is done successfully

Step 6: Configure IPv4 firewall to setup networks based firewall



Add conditions



After the configuration is done for firewall we are unable to ping to server

```
Approximate round trip times in milli-seconds:
    Minimum = 26ms, Maximum = 41ms, Average = 32ms

C:\>ping 192.168.0.100

Pinging 192.168.0.100 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.0.100:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

But we can access the server data (view)



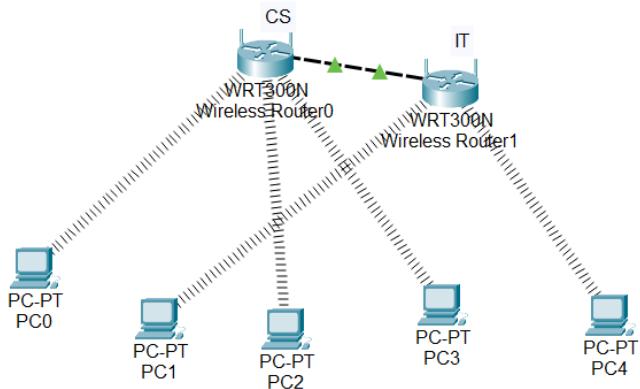
Practical No: 06

Aim: Creating an Adhoc Network

Components: Wireless Router, PC

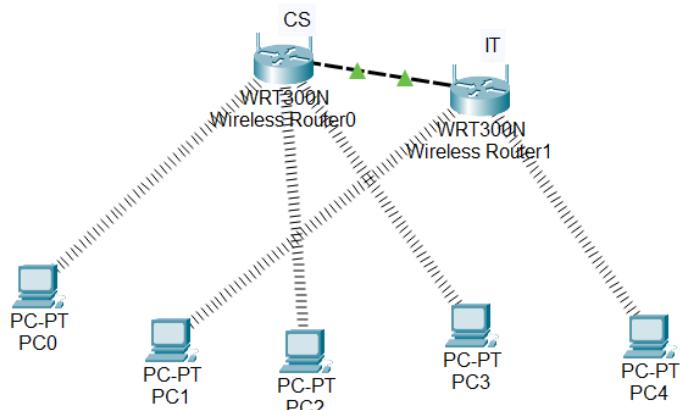
Theory: Ad hoc networks are mostly wireless local area networks (LANs). The devices communicate with each other directly instead of relying on a base station or access points as in wireless LANs for data transfer co-ordination. Each device participates in routing activity, by determining the route using the routing algorithm and forwarding data to other devices via this route.

Cisco Packet Tracer Setup:-

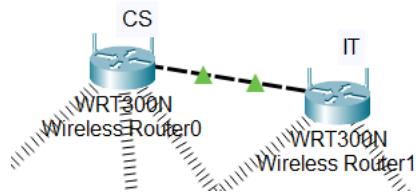


Implementation:-

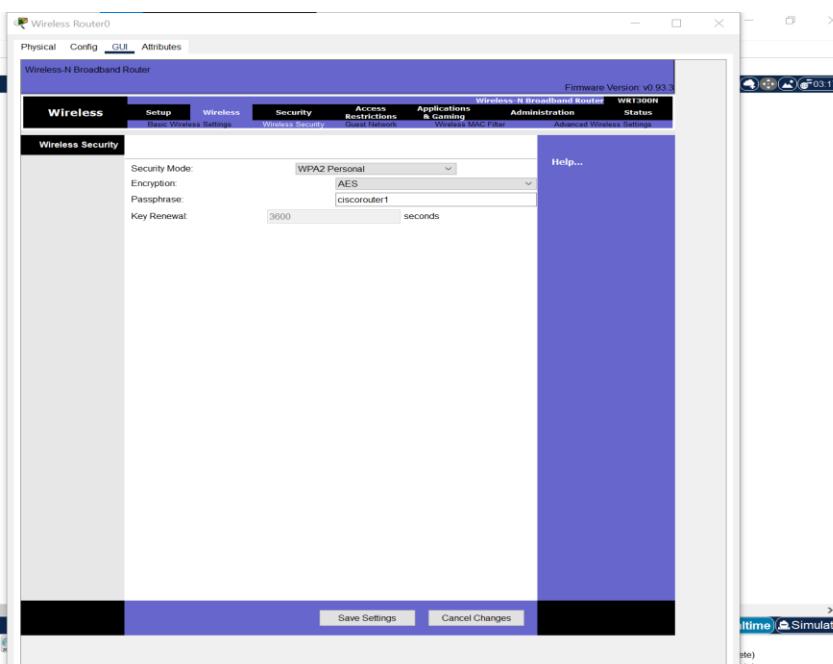
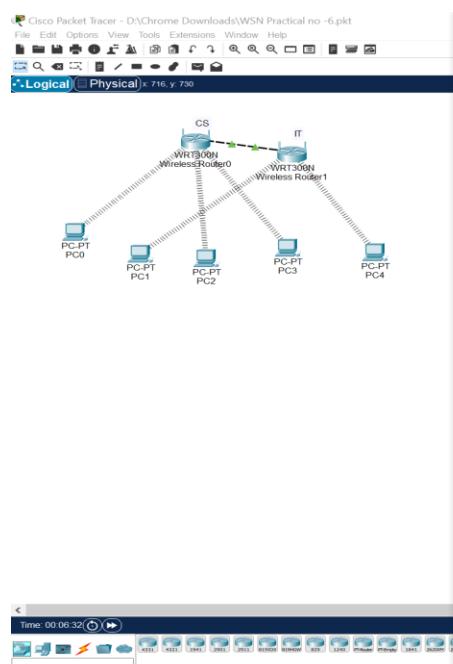
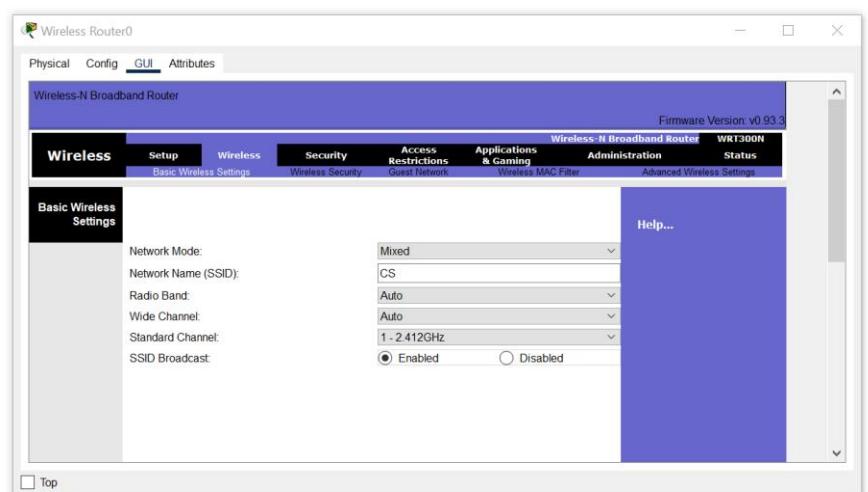
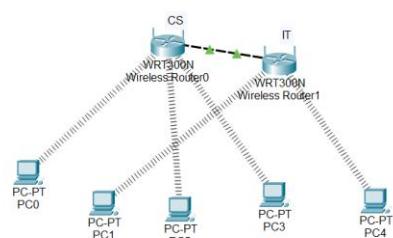
Step1: Arrange all components i.e. Wireless Router and PC's



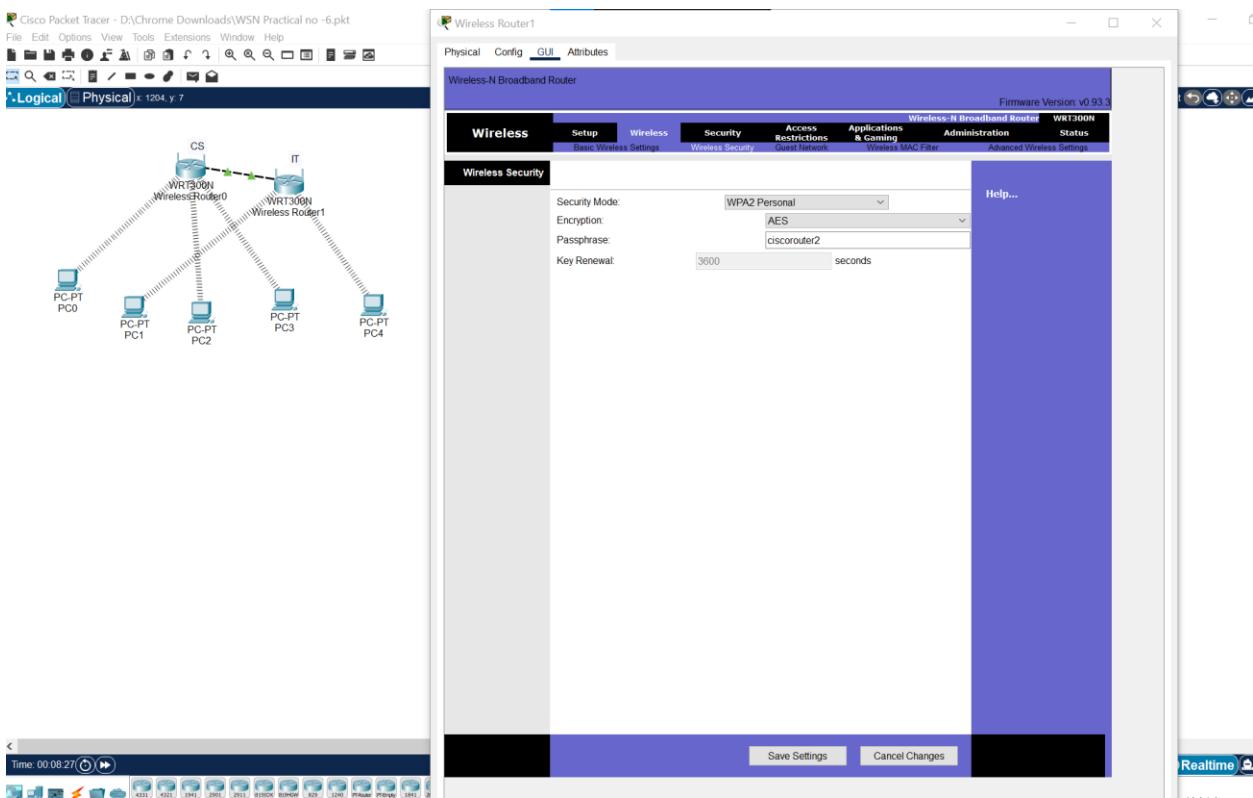
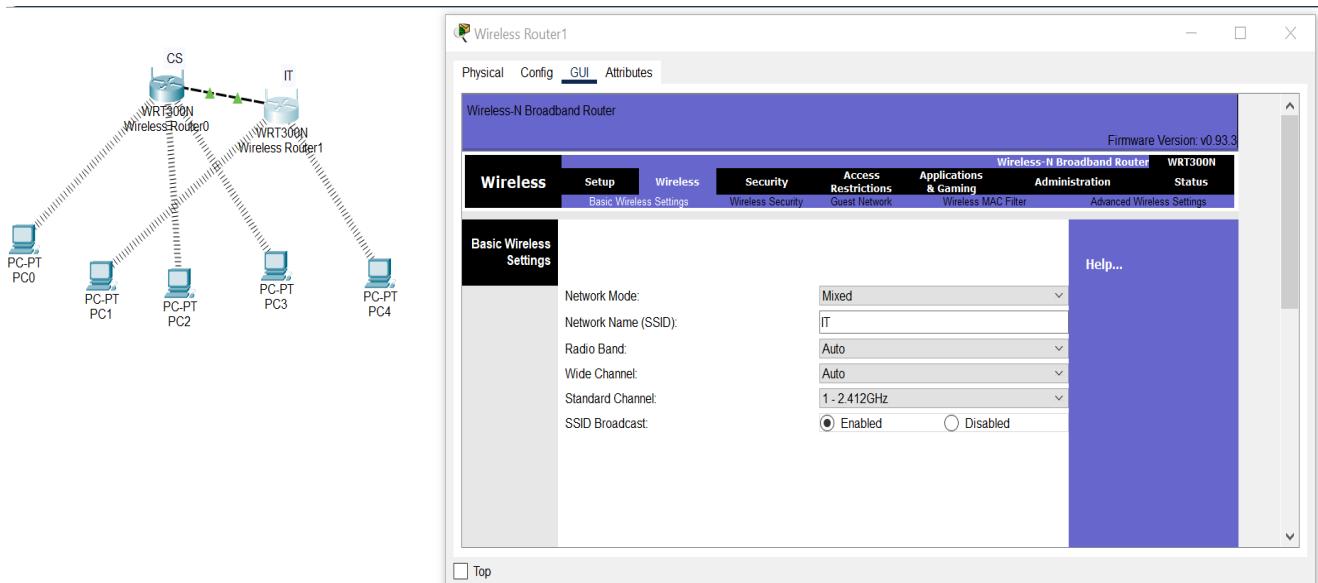
Step2: Configure wireless routers and connect both of them to each other using Ethernet ports



Router 1:

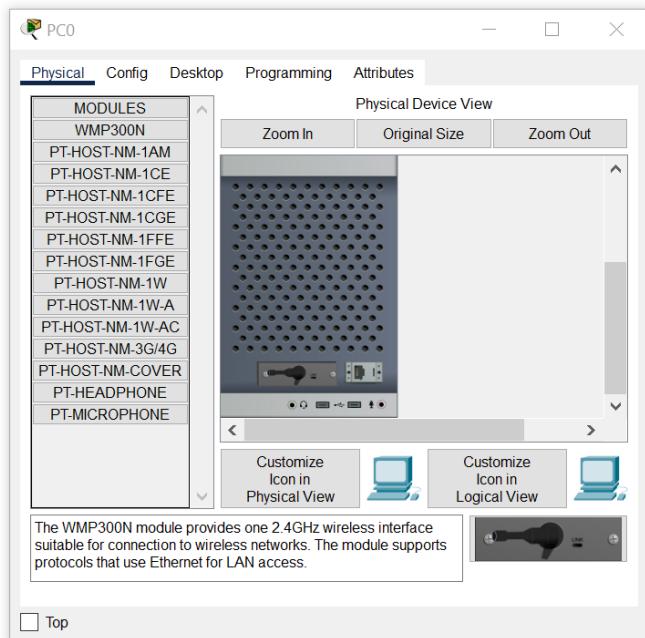


Router 2:

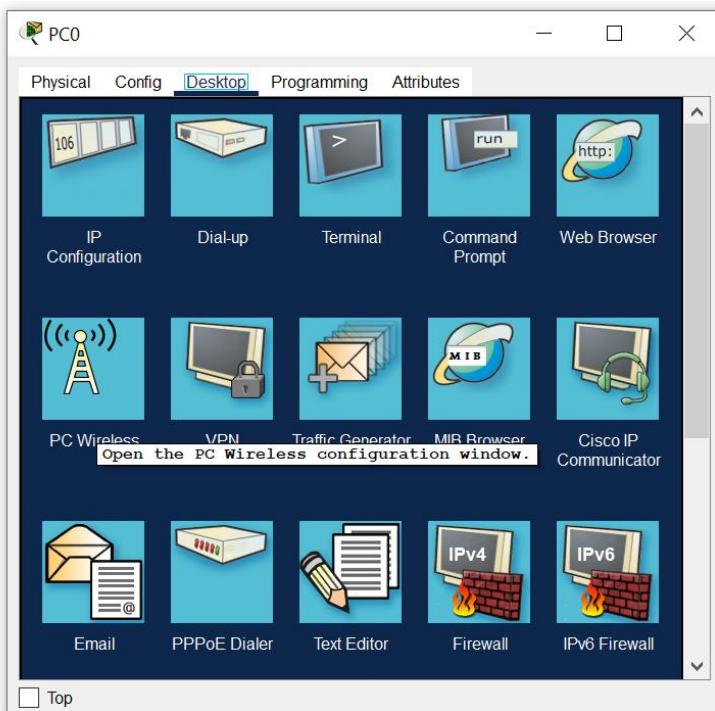


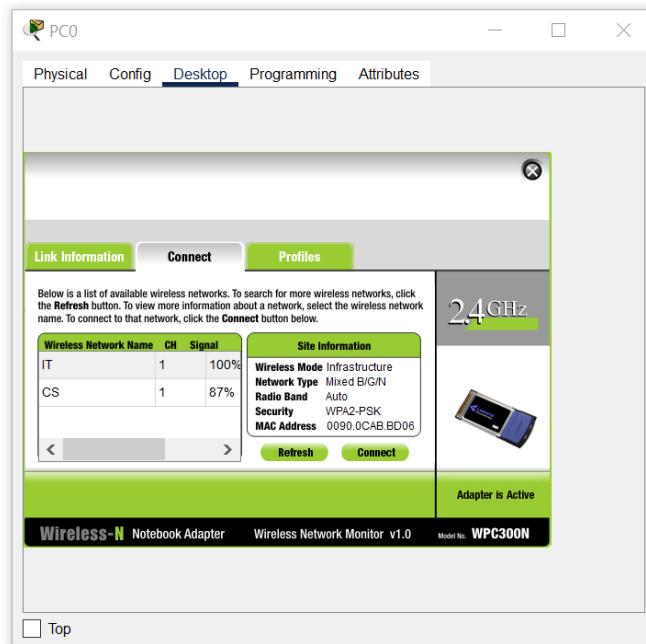
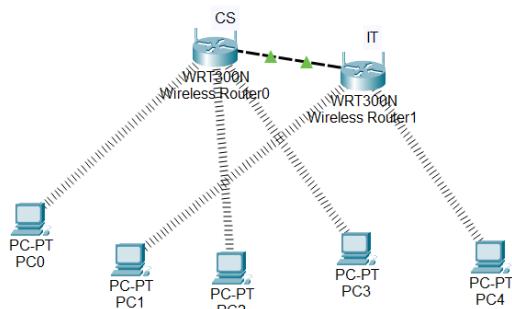
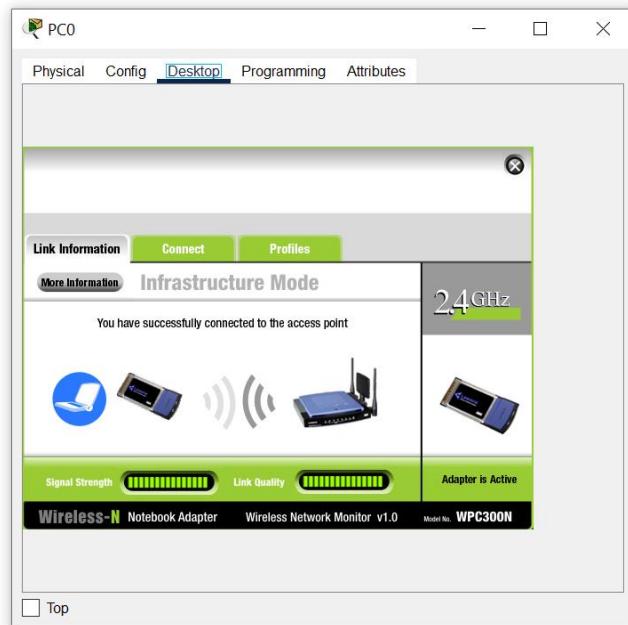
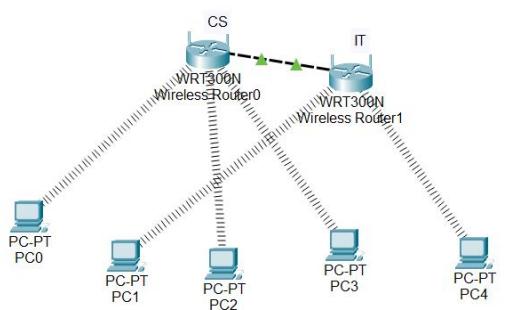
Step3: Connect all machines/devices (PC's) to respective router as per our requirements.

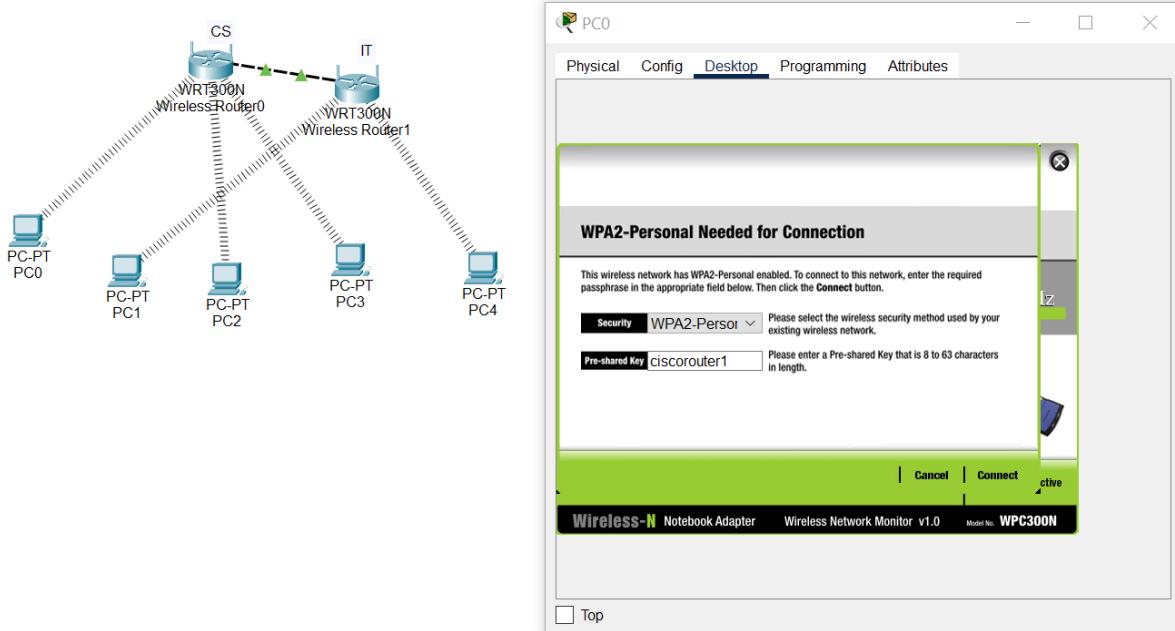
Change the Port of all pc's with wireless adapter



Configure Wireless connection

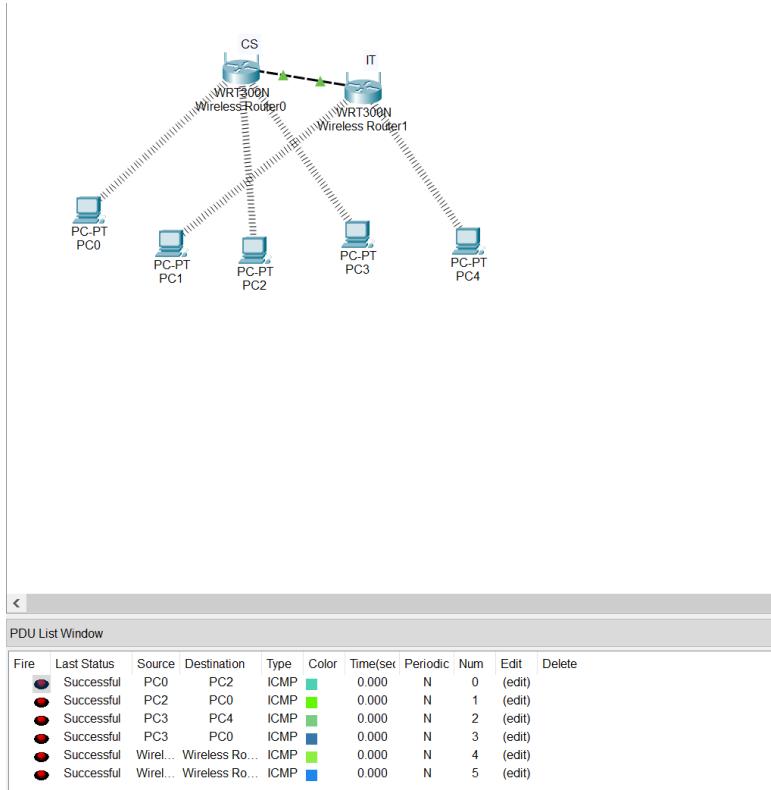






Do similar configuration to all respective PC's

Step4: Check the Connection



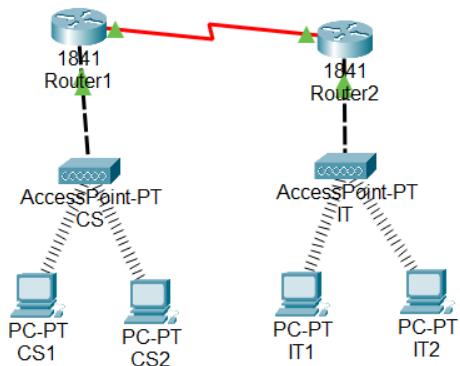
Practical No: 07

Aim: Configuring Basic AP Settings

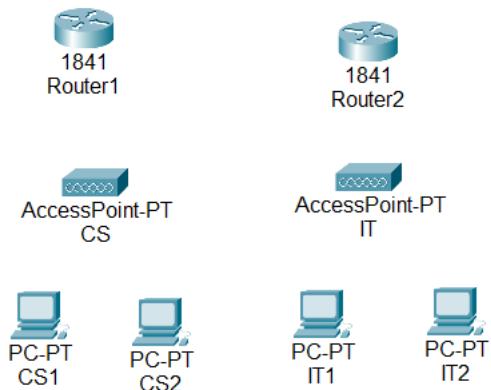
Components: Router, Access points, PC's

Theory: A wireless access point (WAP), or more generally just access point (AP), is a networking hardware device that allows other Wi-Fi devices to connect to a wired network. An access point is a device that creates a wireless local area network, or WLAN, usually in an office or large building.

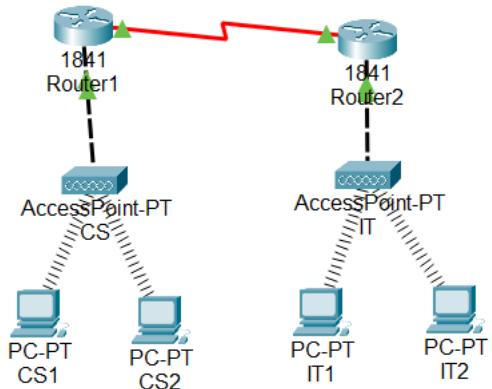
Cisco Packet tracer Setup:



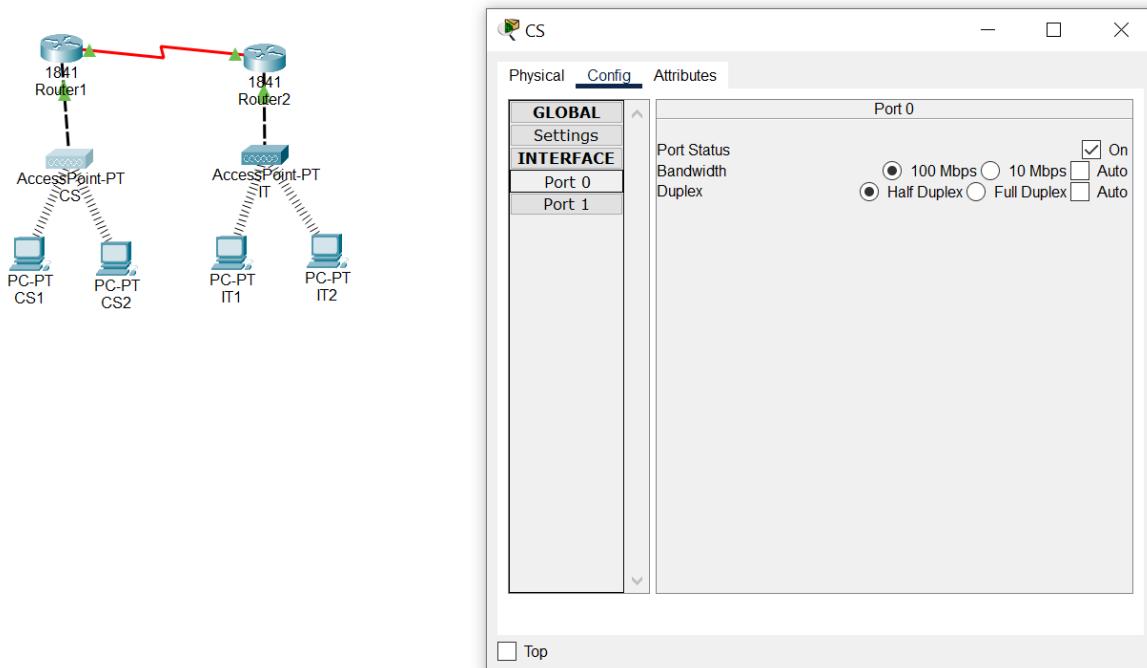
Step 1: Arrange all devices as following

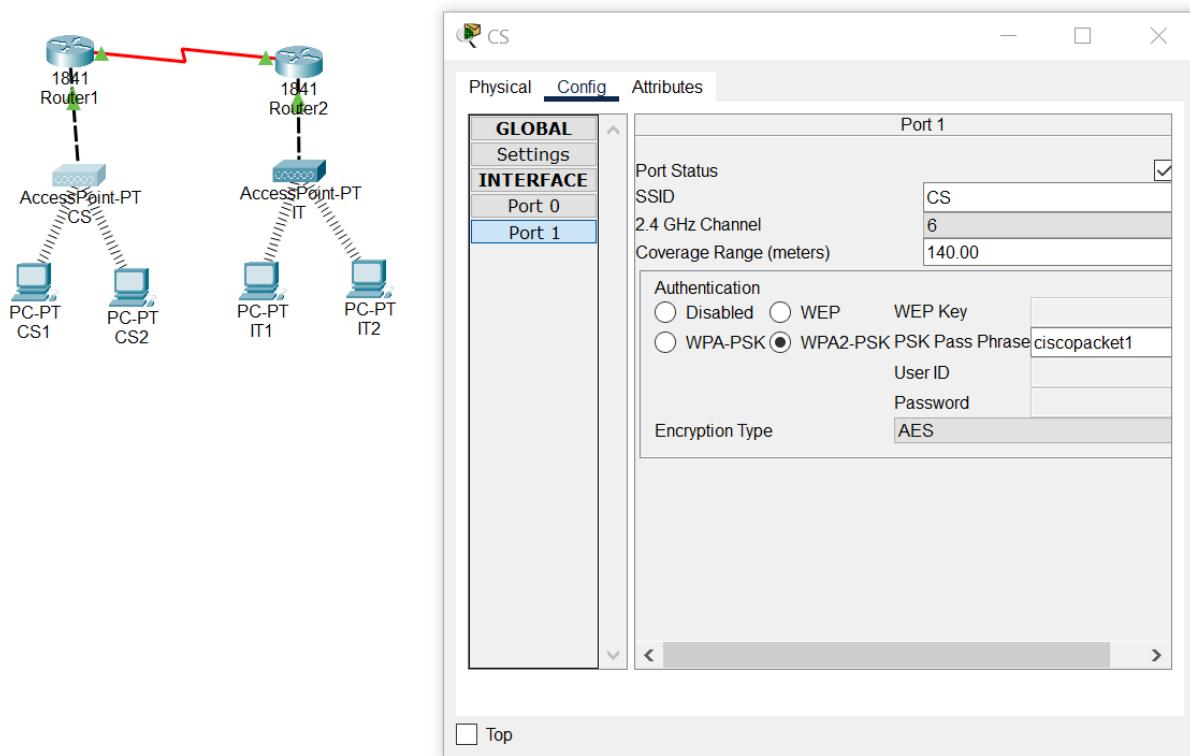


Step 2: Configure Access Points (A)

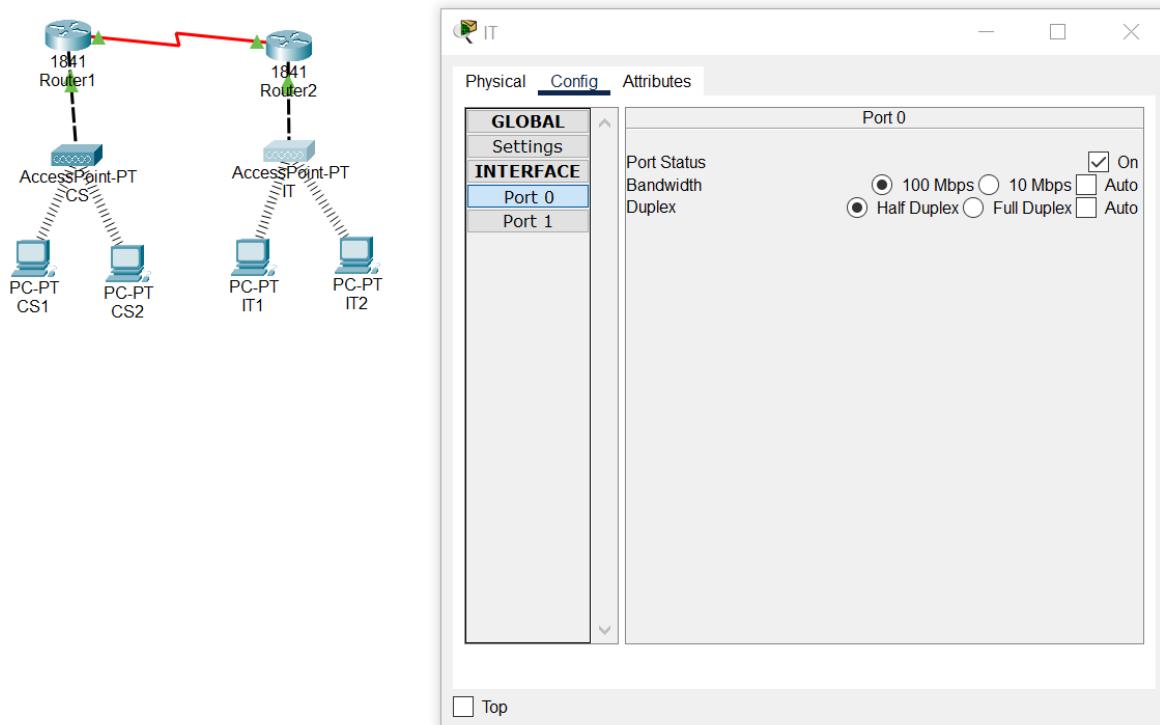


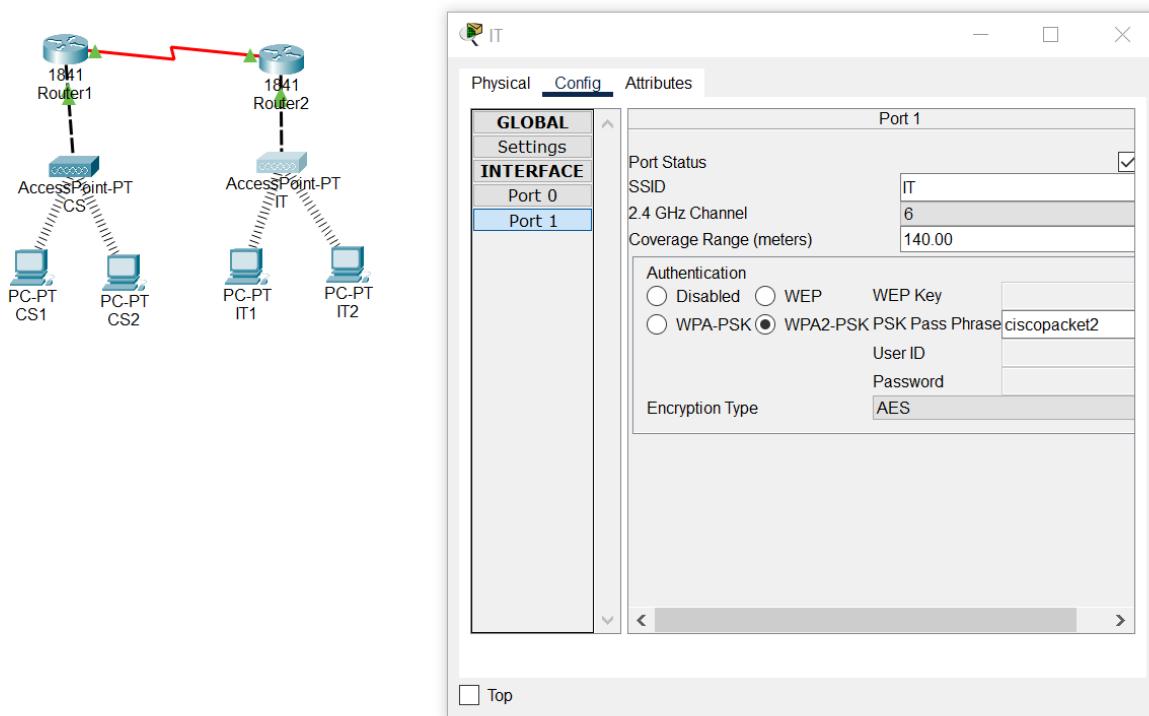
AP-1



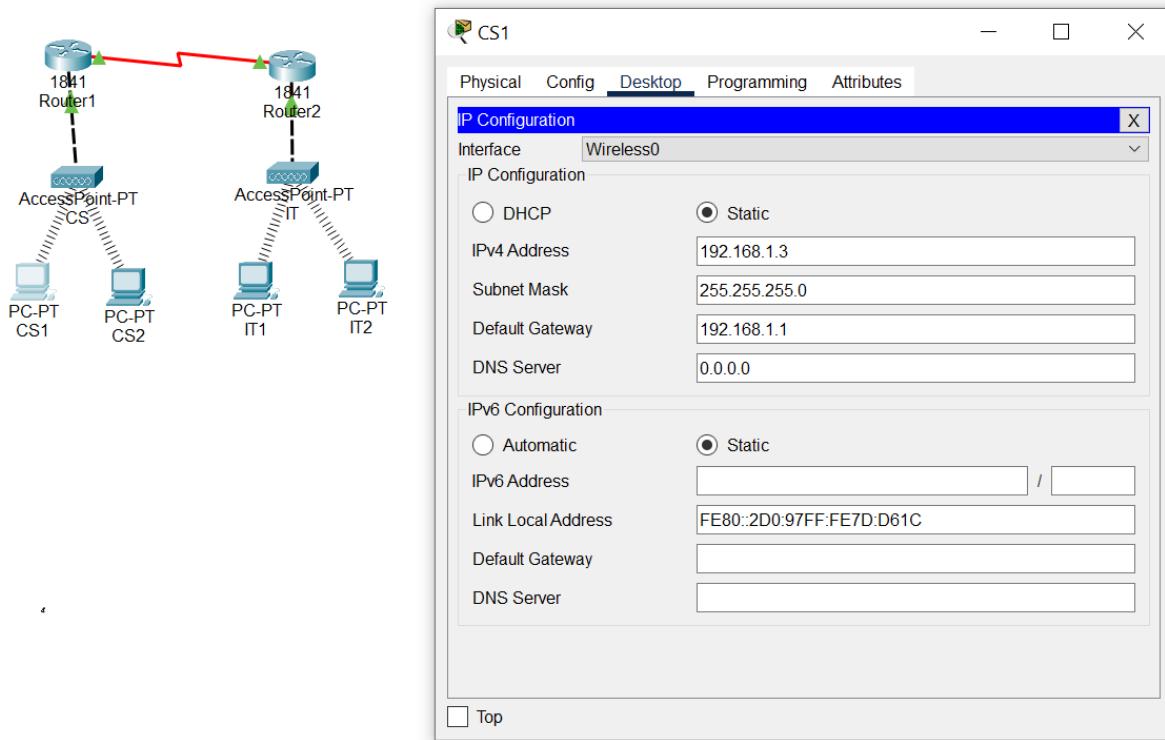


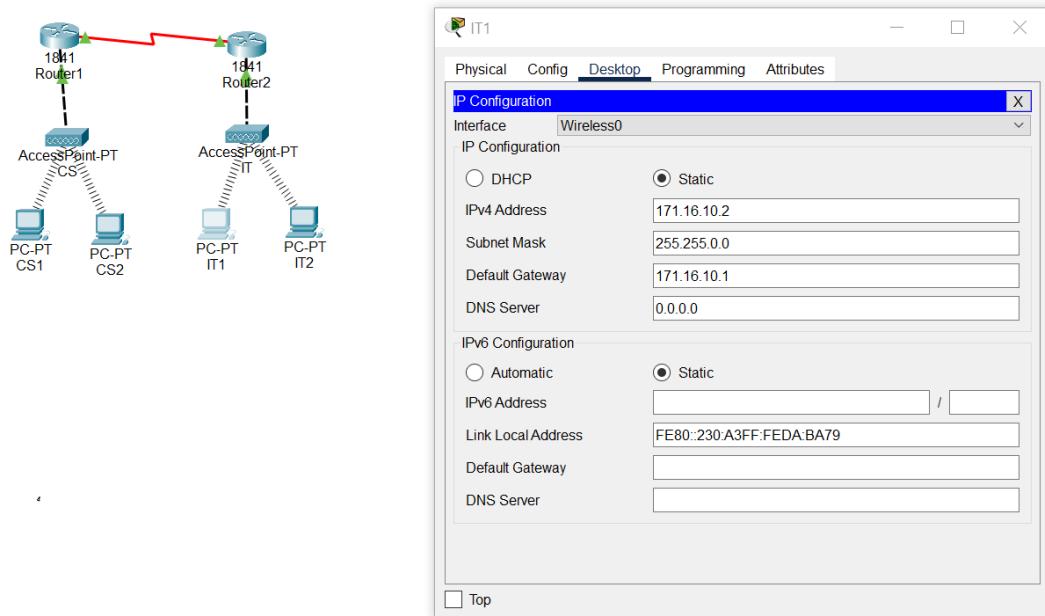
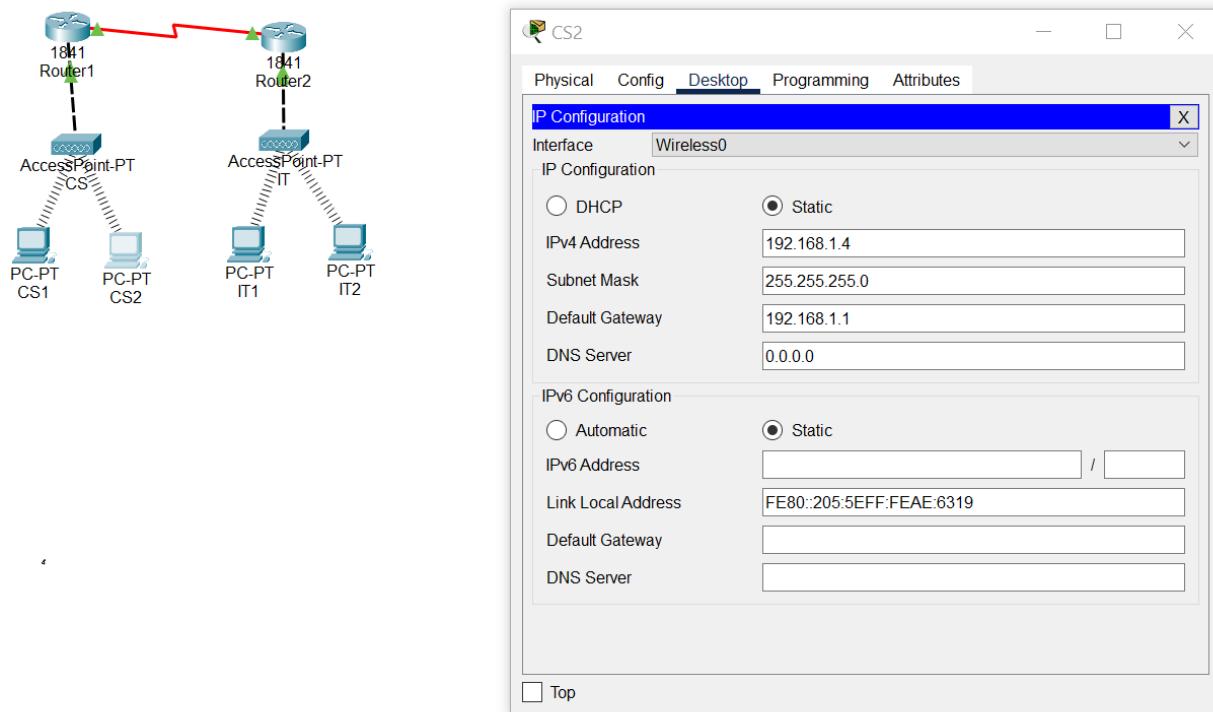
AP-2

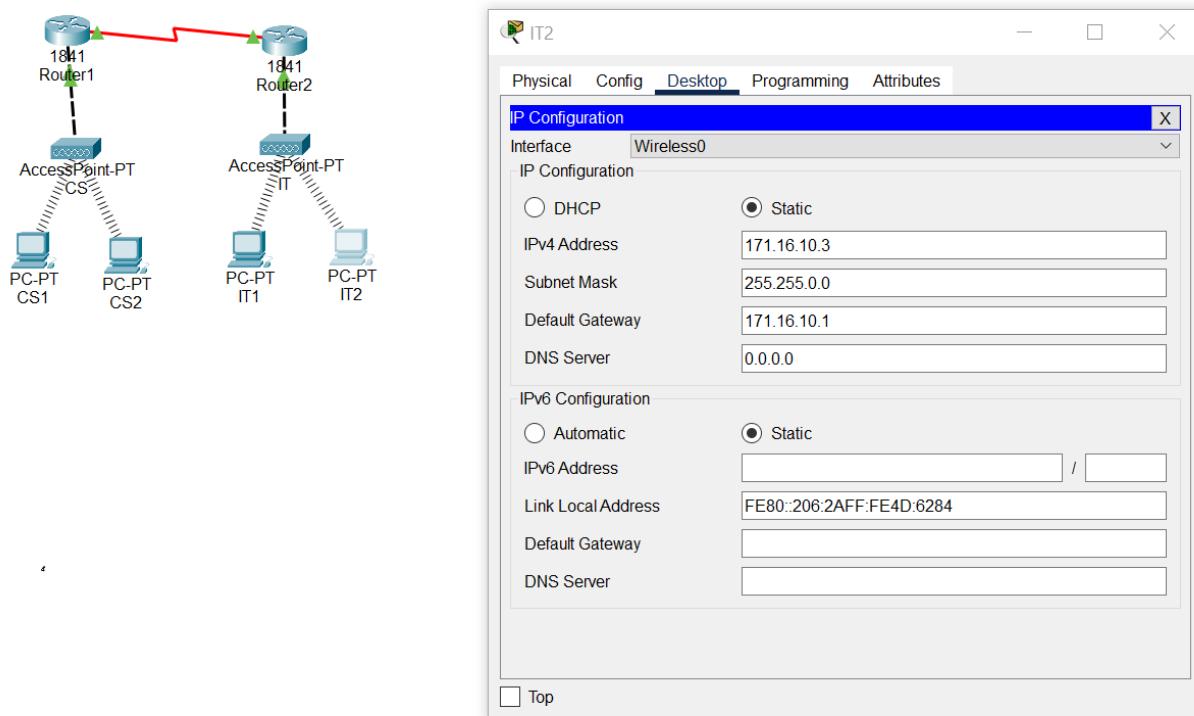




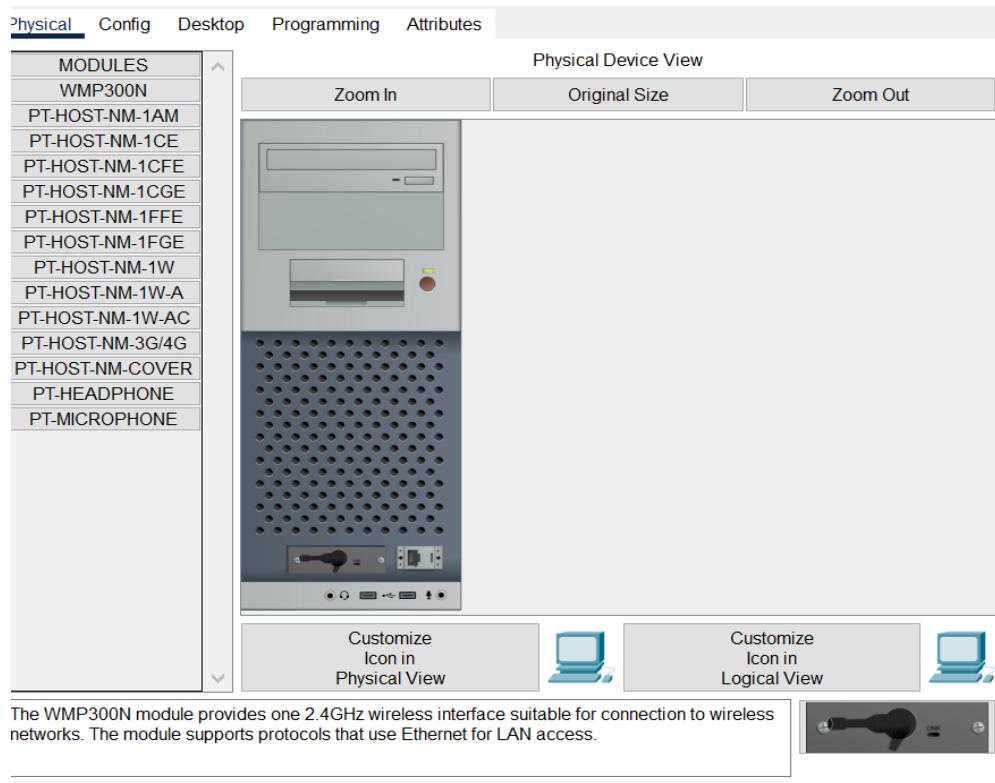
Step 3: Configure and Setup IP Address for all devices (PC's)



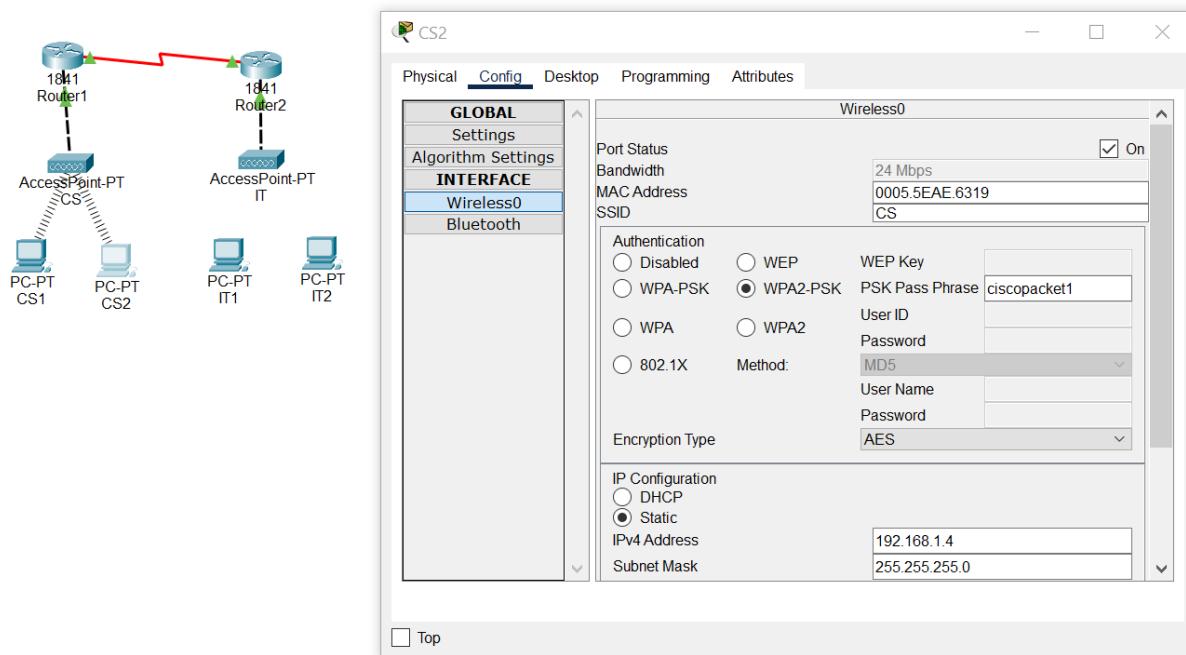
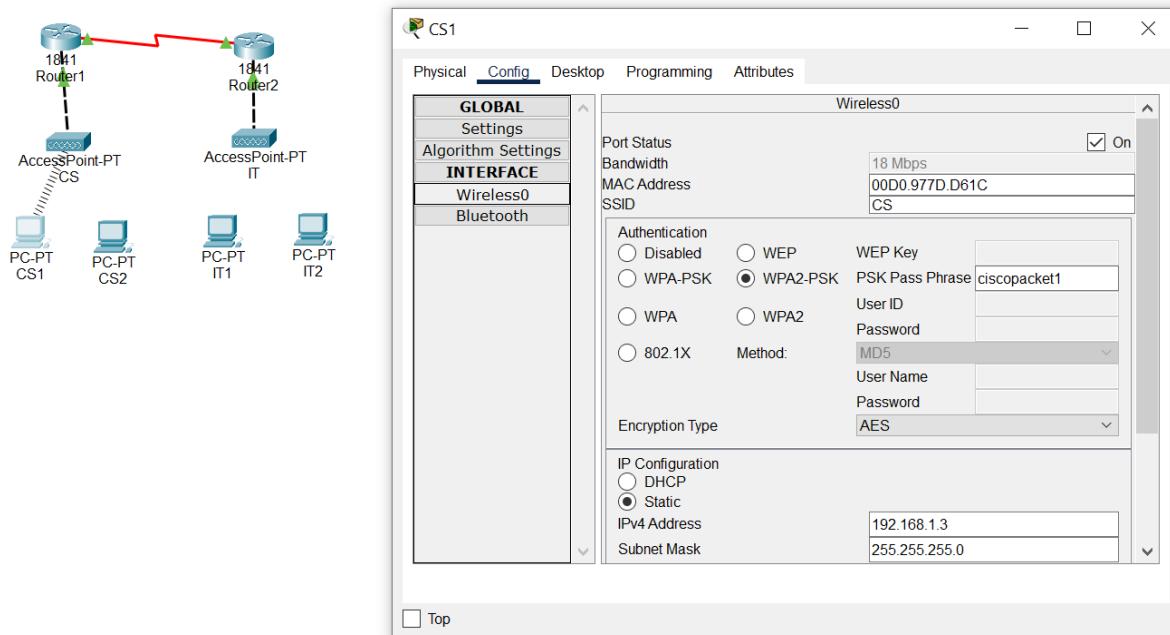


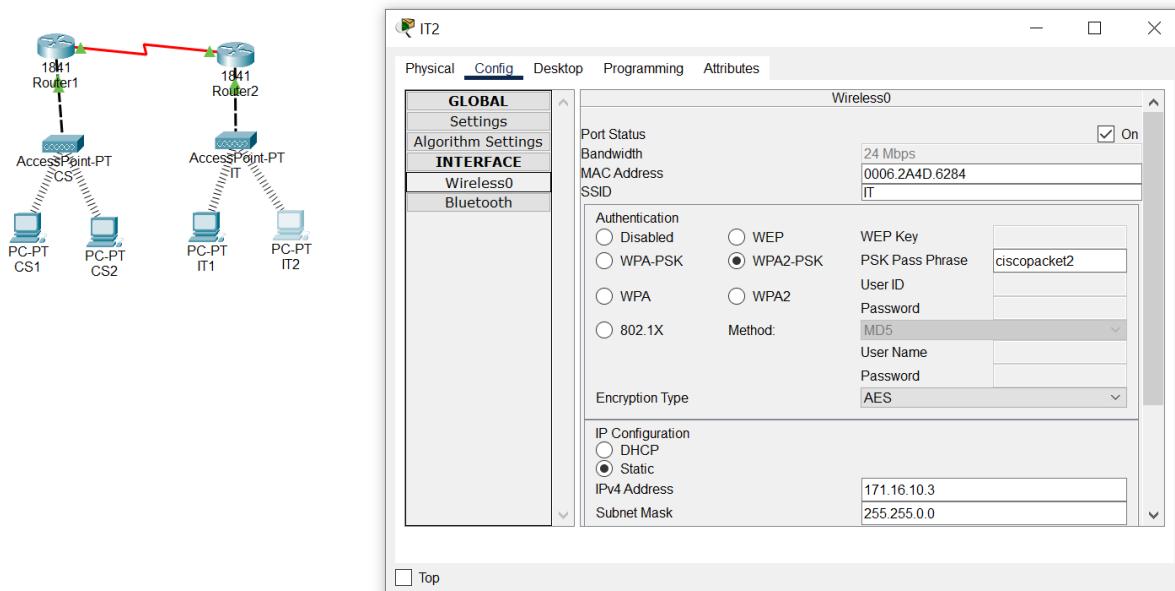


Note: Change all port adapters with wireless adapter for all PC's

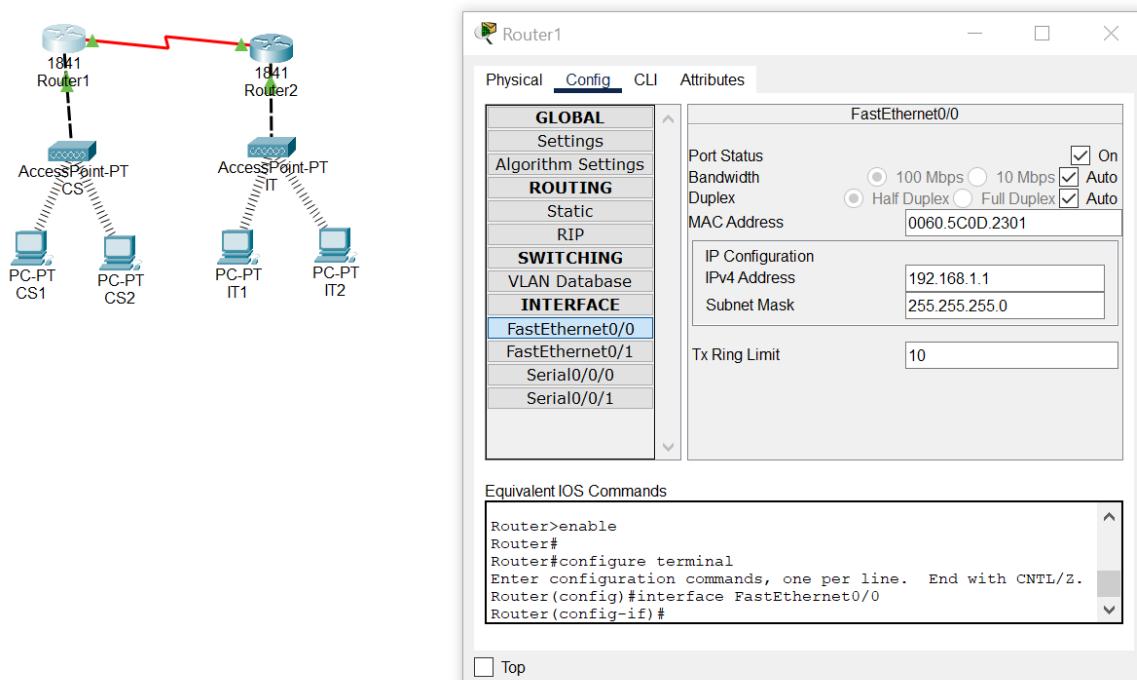


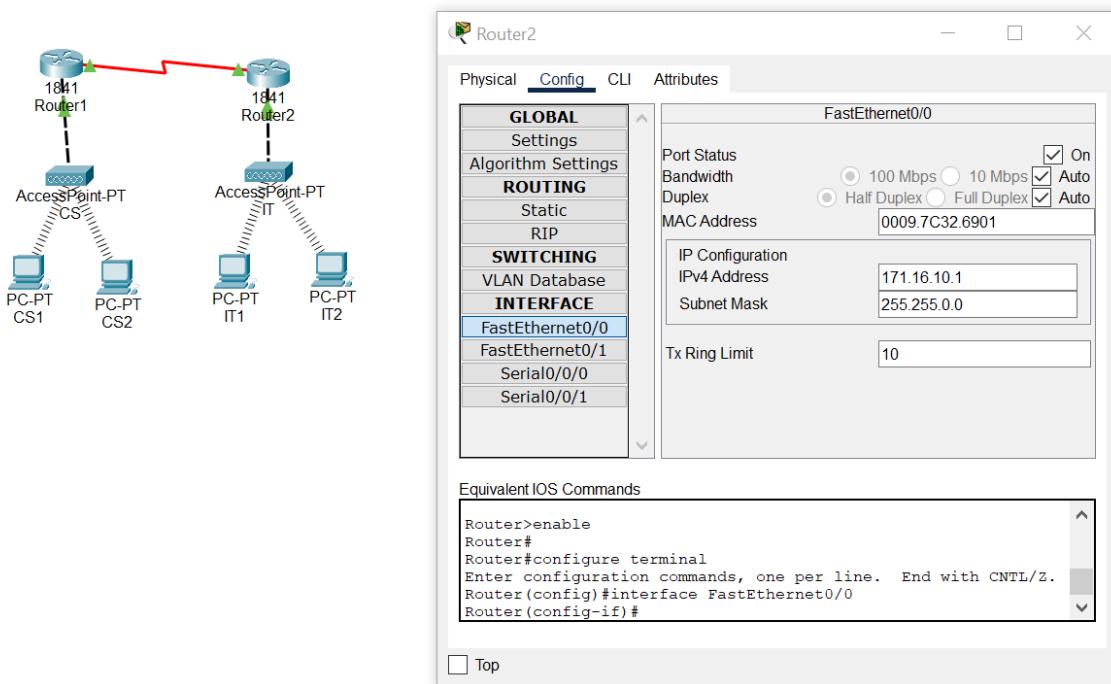
Step 4: Configure Access points with PC's



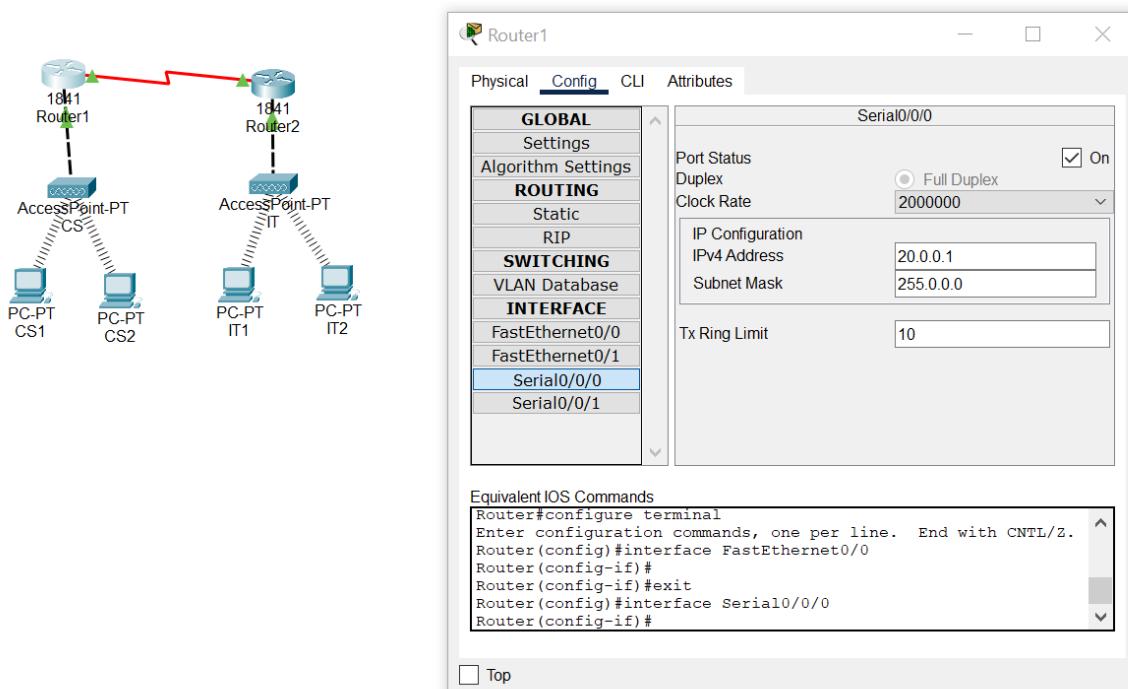


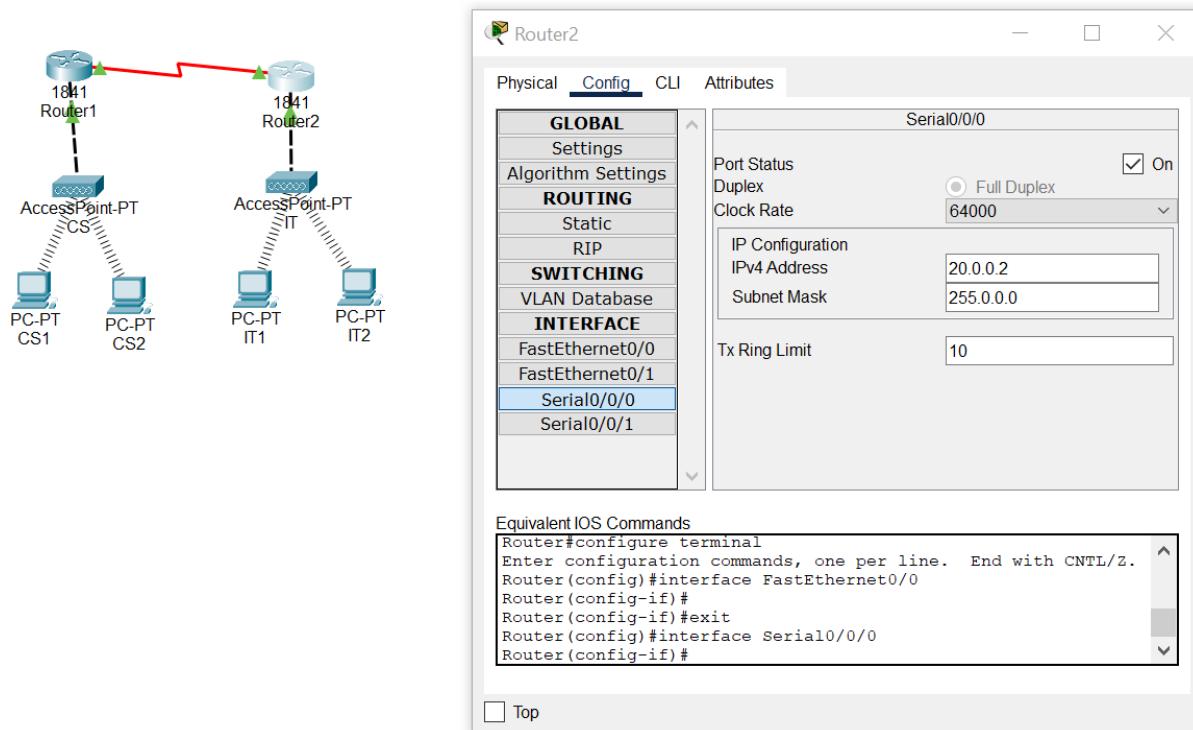
Step 5: Connect routers with Access points and configure them





Connect Routers with serial ports and configure





Router2

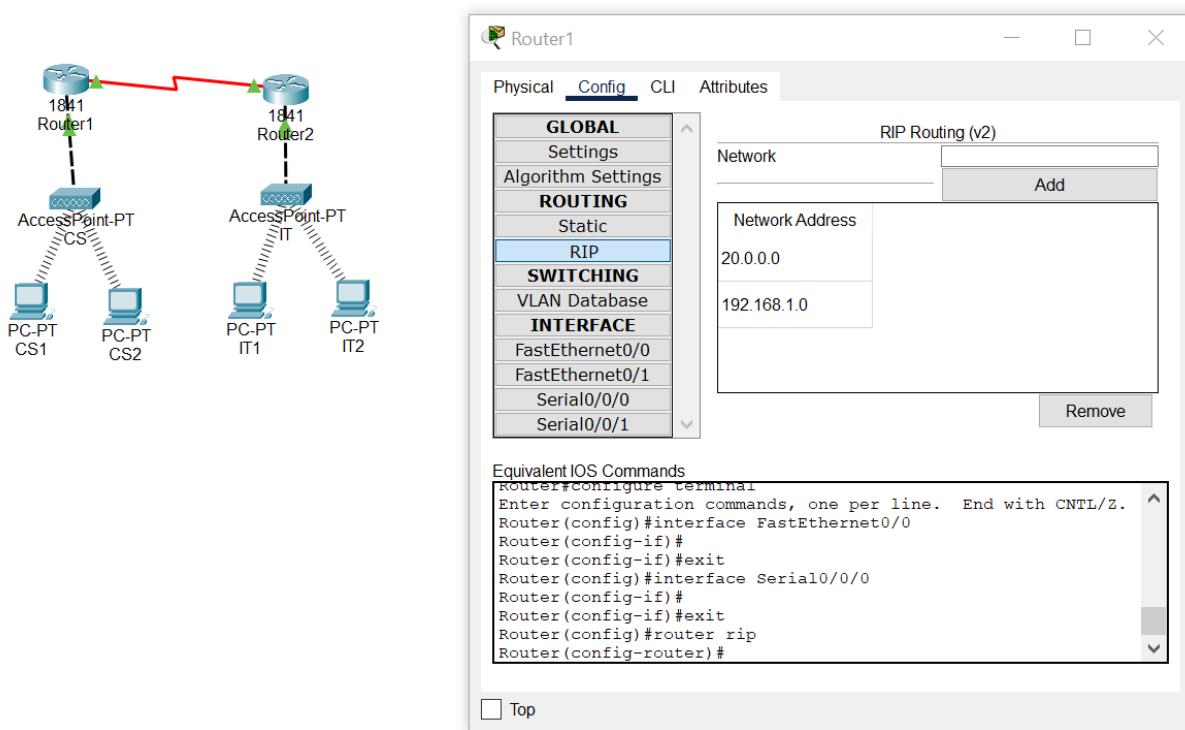
Physical Config CLI Attributes

GLOBAL	Serial0/0/0
Settings	
Algorithm Settings	
ROUTING	
Static	
RIP	
SWITCHING	
VLAN Database	
INTERFACE	
FastEthernet0/0	
FastEthernet0/1	
Serial0/0/0	
Serial0/0/1	

Port Status: On
Duplex: Full Duplex
Clock Rate: 64000
IP Configuration:
IPv4 Address: 20.0.0.2
Subnet Mask: 255.0.0.0
Tx Ring Limit: 10

Equivalent IOS Commands

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#router rip
Router(config-router)#
```



Router1

Physical Config CLI Attributes

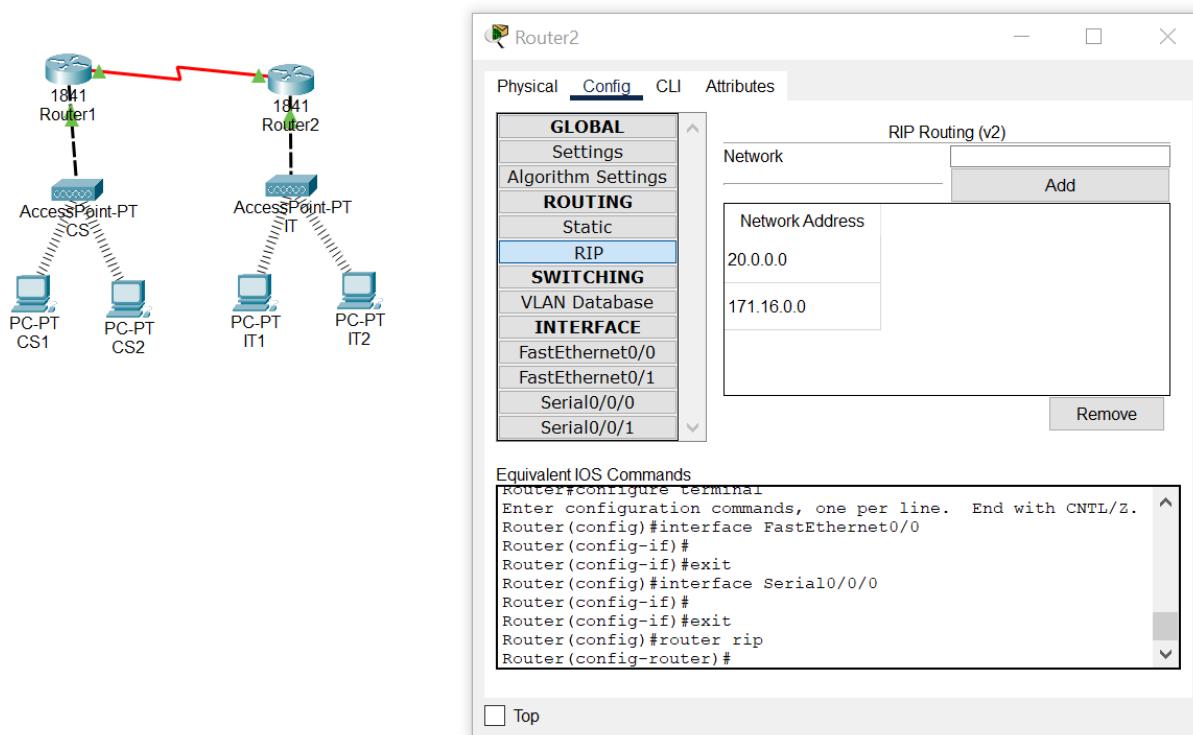
GLOBAL	RIP Routing (v2)
Settings	
Algorithm Settings	
ROUTING	
Static	
RIP	
SWITCHING	
VLAN Database	
INTERFACE	
FastEthernet0/0	
FastEthernet0/1	
Serial0/0/0	
Serial0/0/1	

Network: 20.0.0.0
Add

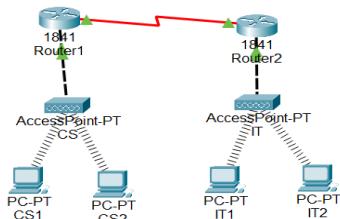
Network Address: 192.168.1.0

Equivalent IOS Commands

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#router rip
Router(config-router)#
```



Step 6: Check the connection



PDU List Window											
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete	
Successful		IT2	IT1	ICMP	■	0.000	N	0	(edit)	(delete)	
Successful		CS2	CS1	ICMP	■	0.000	N	1	(edit)	(delete)	
Successful		IT2	CS1	ICMP	■	0.000	N	2	(edit)	(delete)	

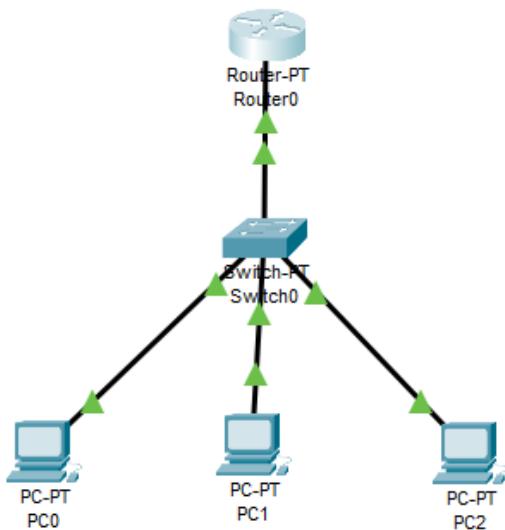
Practical No: 08

Aim: Configure fast Ethernet on router using packet tracer

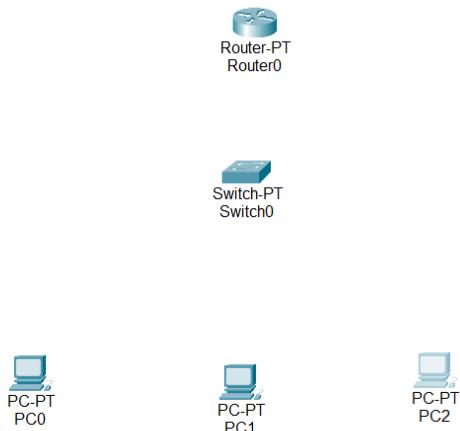
Components: Router, Switches, PC's

Theory: Fast Ethernet is used for departmental backbones, connections to high-speed servers, and connections to workstations running bandwidth-intensive software such as CAD or multimedia applications.

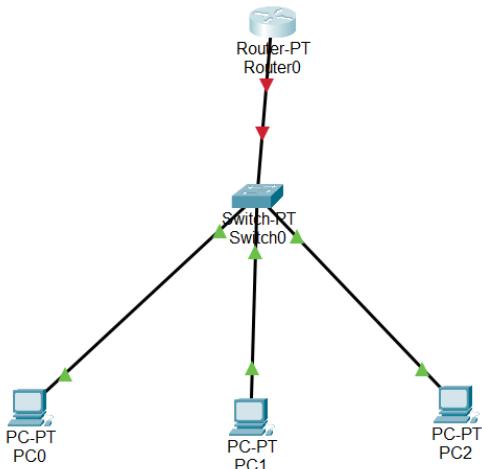
Cisco Packet tracer Setup:



Step 1: Arrange all devices



Step 2: Connect all devices using Ethernet cable



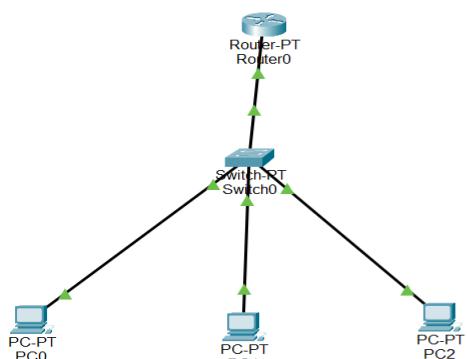
Step 3: Configure Router using CLI

Using following commands:

```

configure t
hostname R1
enable password cisco
interface fa0/0
ip address 192.168.2.1 255.255.255.0
no shutdown
exit
Exit

```



```

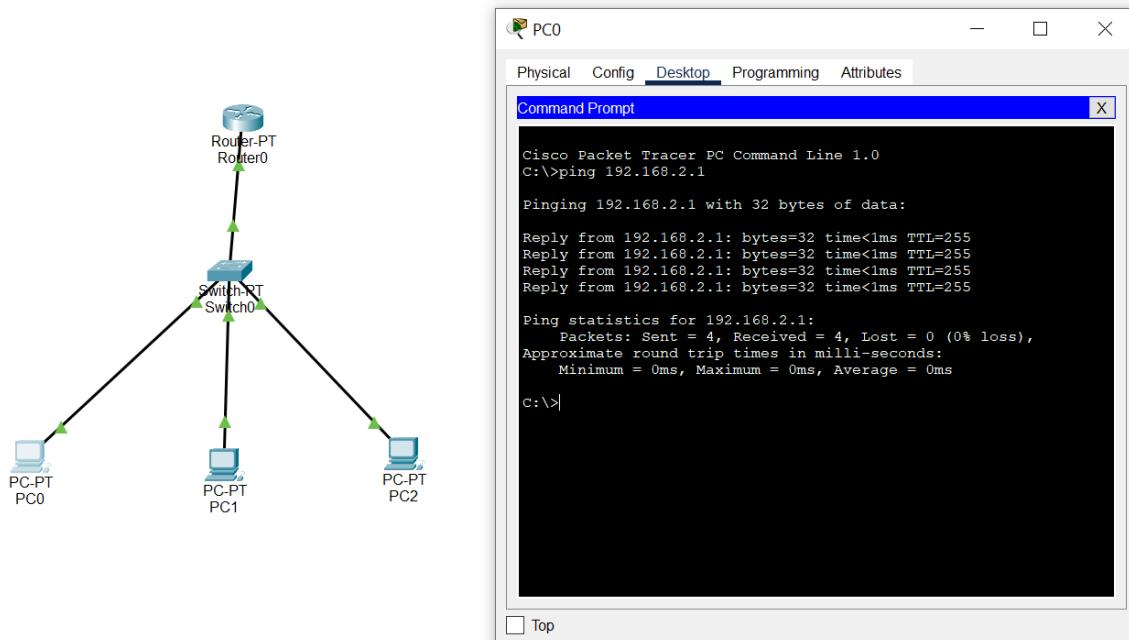
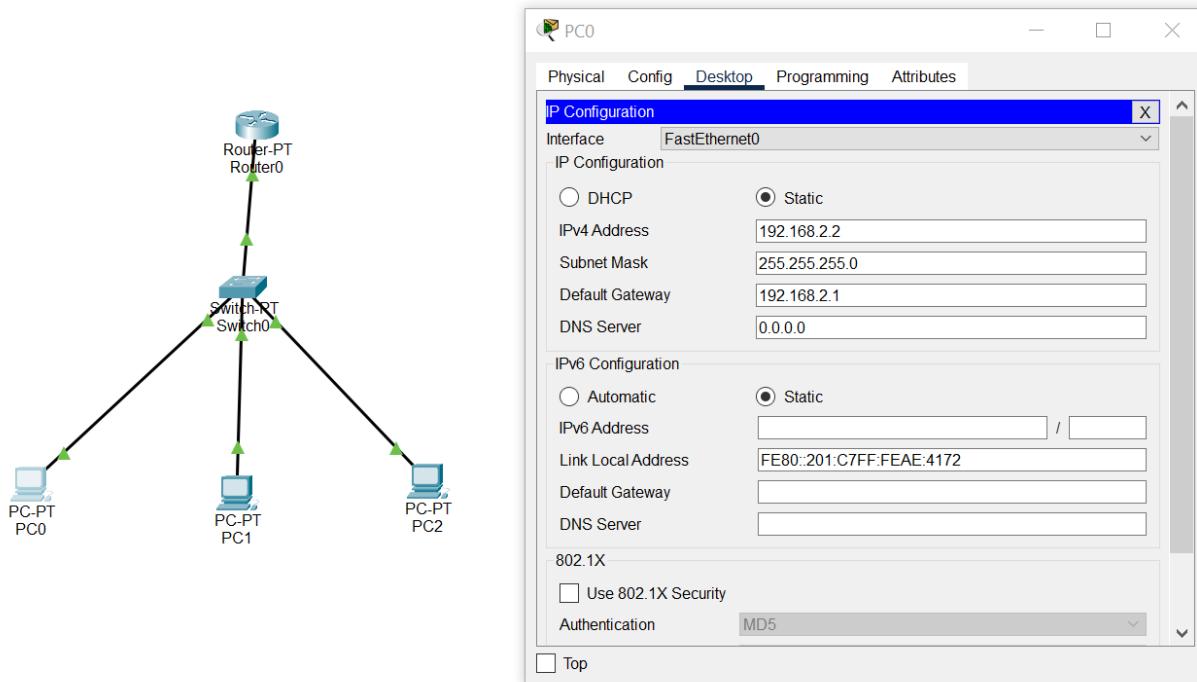
Router>enable
Translating "enable"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find
computer address

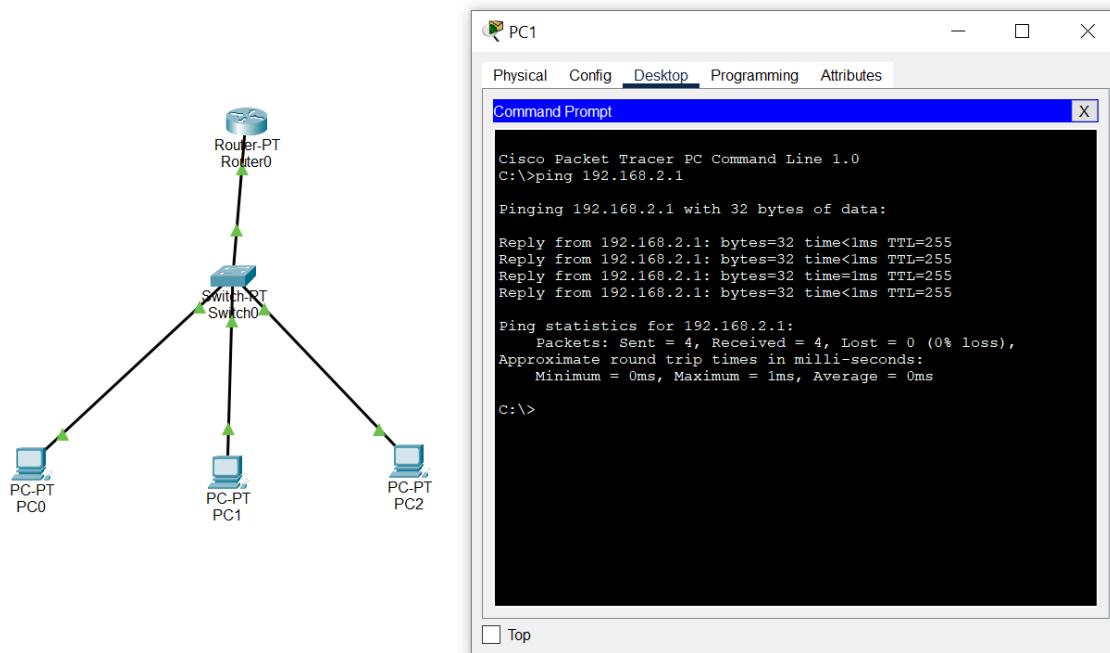
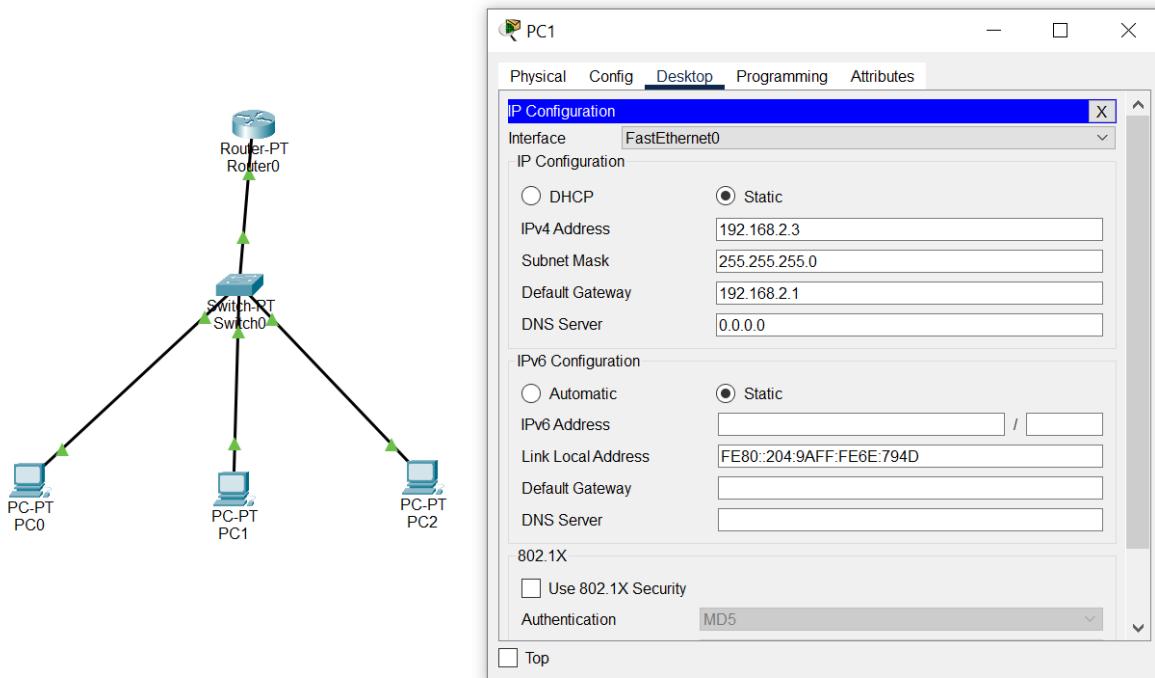
Router>enable
Router>configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R1
R1(config)#enable password cisco
R1(config)#config terminal
%Invalid hex value
R1(config)#interface fa0/0
R1(config-if)#ip address 192.168.2.1 255.255.255.0
R1(config-if)#no shutdown

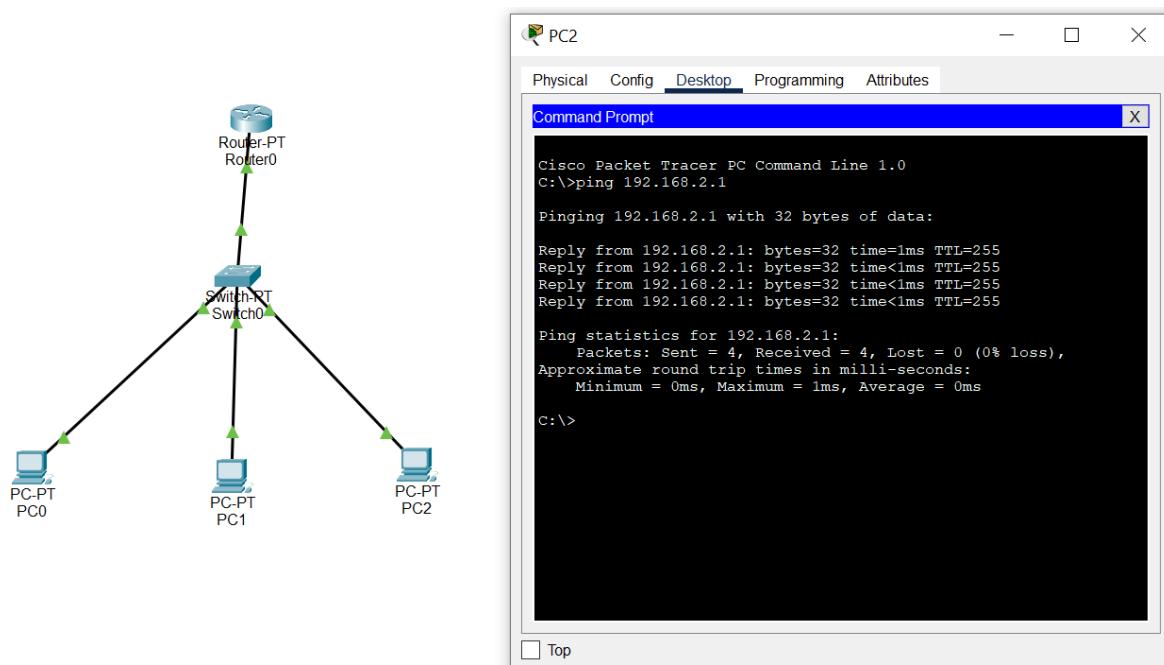
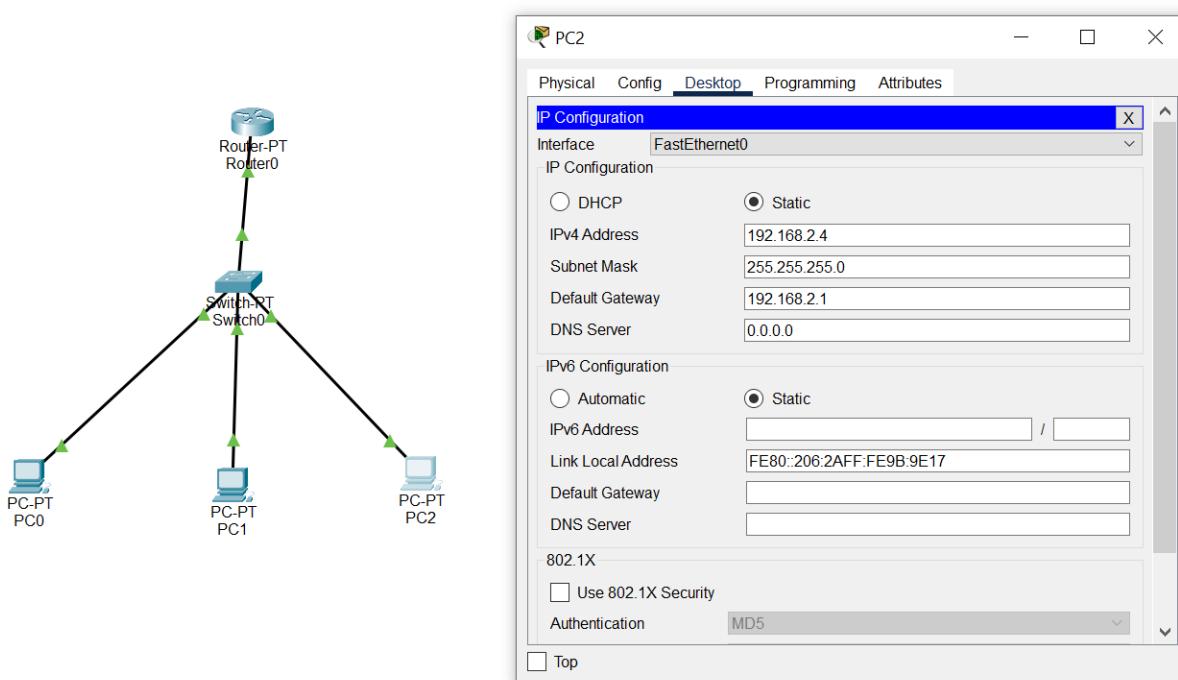
R1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to
up
%LINEPROTO-5-UPDOWN: Line protocol on Interface
FastEthernet0/0, changed state to up
R1(config-if)#exit
R1(config)#

```

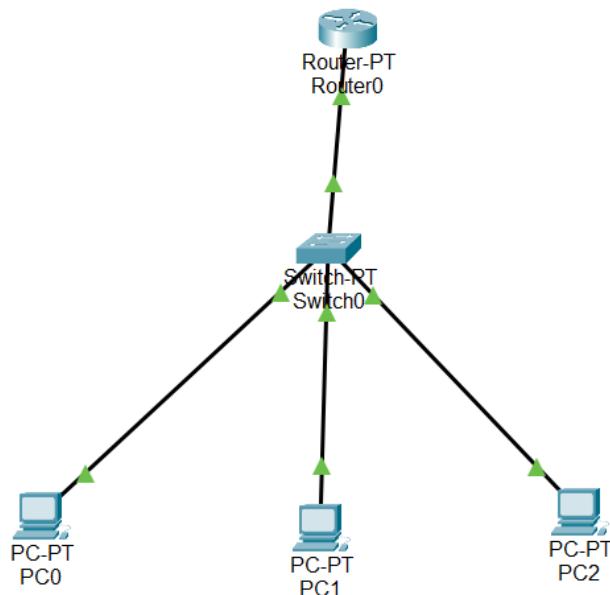
Step 4: Configure All PC's and check the connection







Step 5: Check the connection



PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
●	Successful	PC0	Router0	ICMP	■	0.000	N	0	(edit)	(delete)
●	Successful	PC1	Router0	ICMP	■	0.000	N	1	(edit)	(delete)
●	Successful	PC2	Router0	ICMP	■	0.000	N	2	(edit)	(delete)
●	Successful	PC0	PC1	ICMP	■	0.000	N	3	(edit)	(delete)
●	Successful	PC1	PC2	ICMP	■	0.000	N	4	(edit)	(delete)

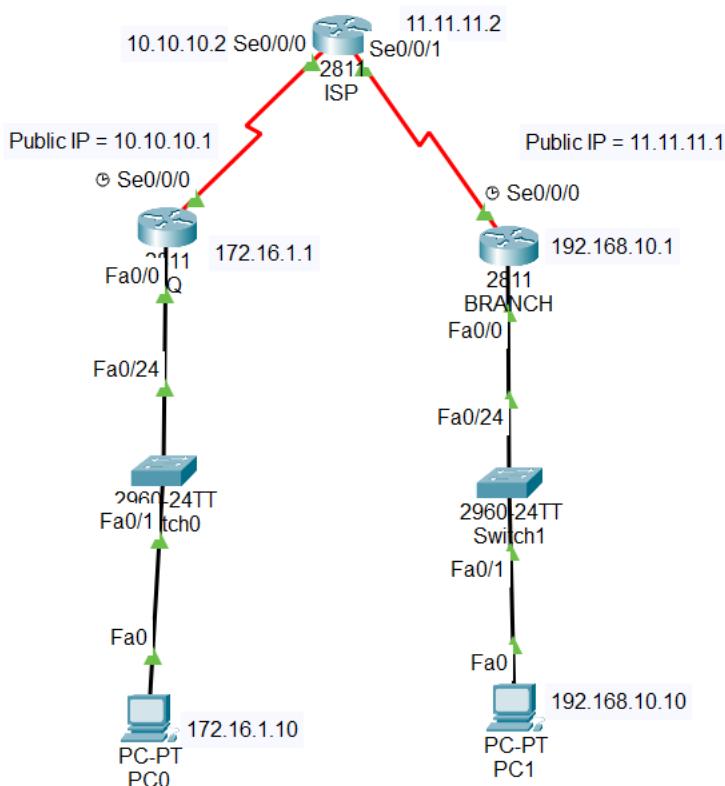
Practical No: 10

Aim: Configure Site-to-Site Wireless Link

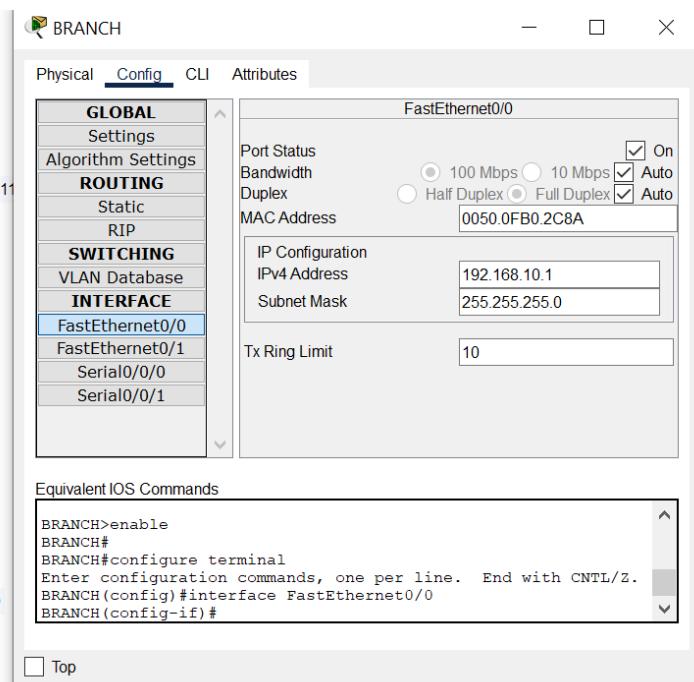
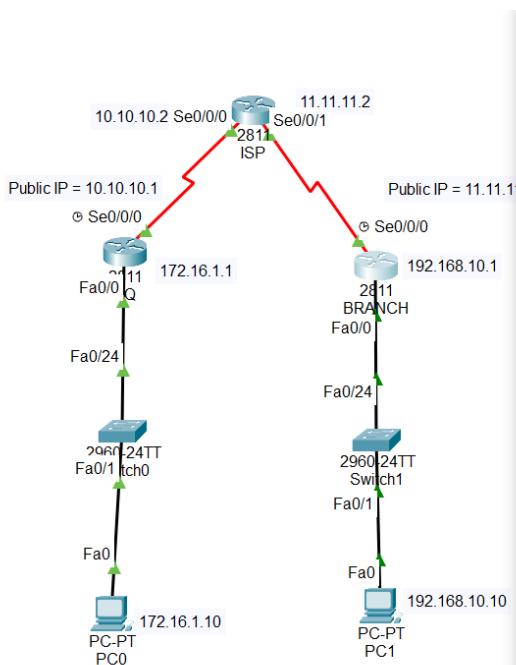
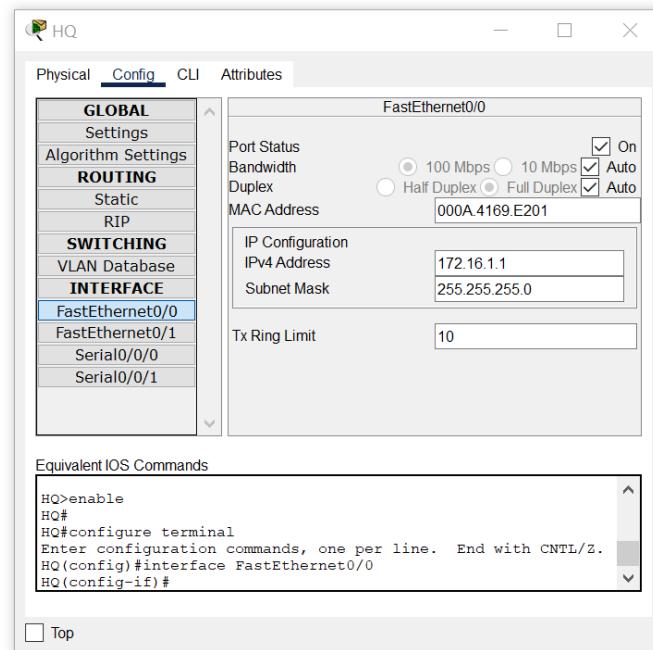
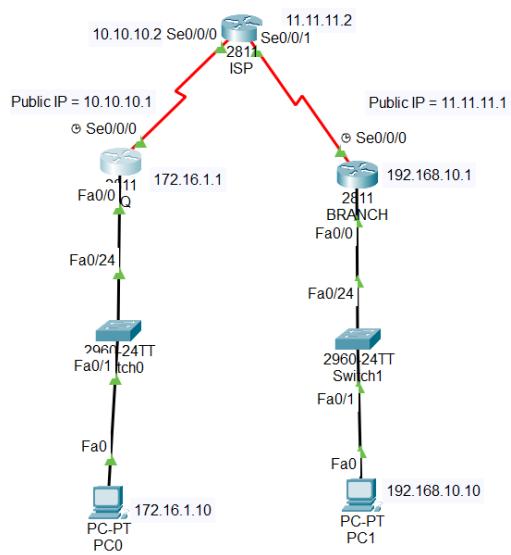
Components: PCs, Routers and Switches

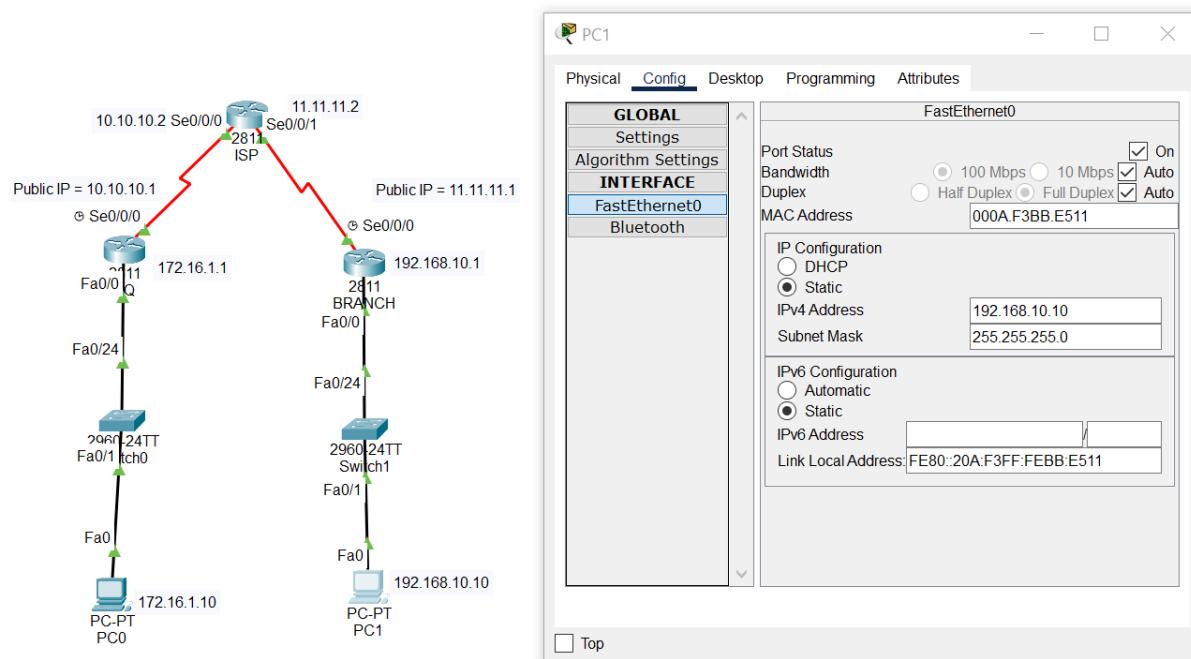
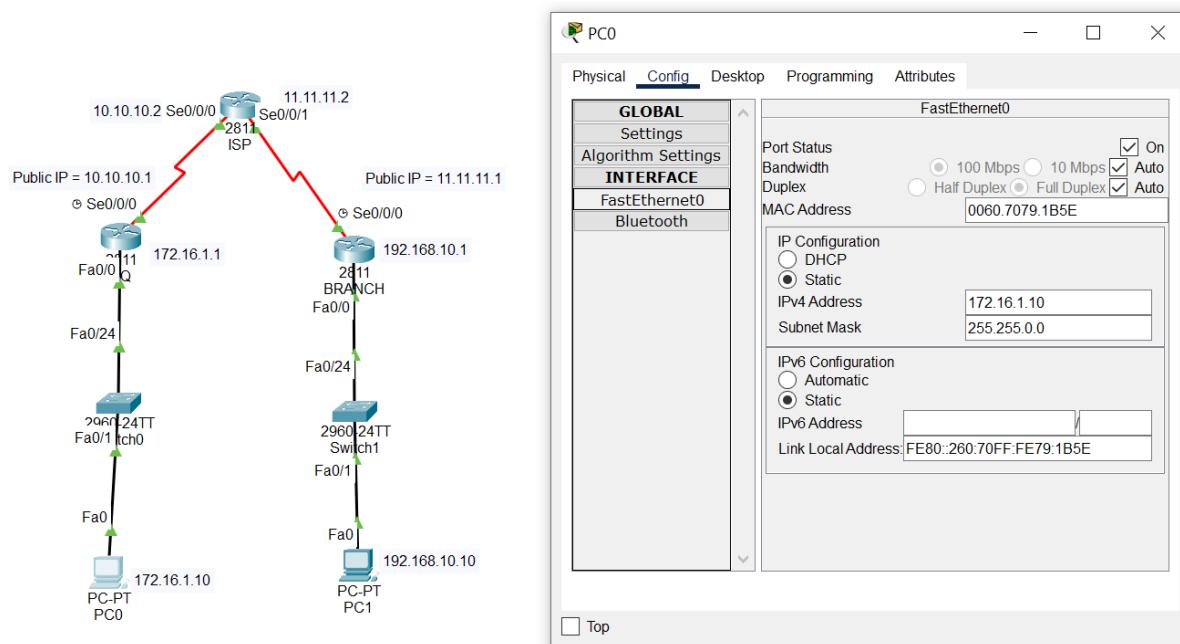
Theory: A remote location several miles away requires connectivity to the existing wired network. The two LAN segments will use a wireless bridge for their physical layer connection using two Cisco Aironet Bridges (BR1310s).

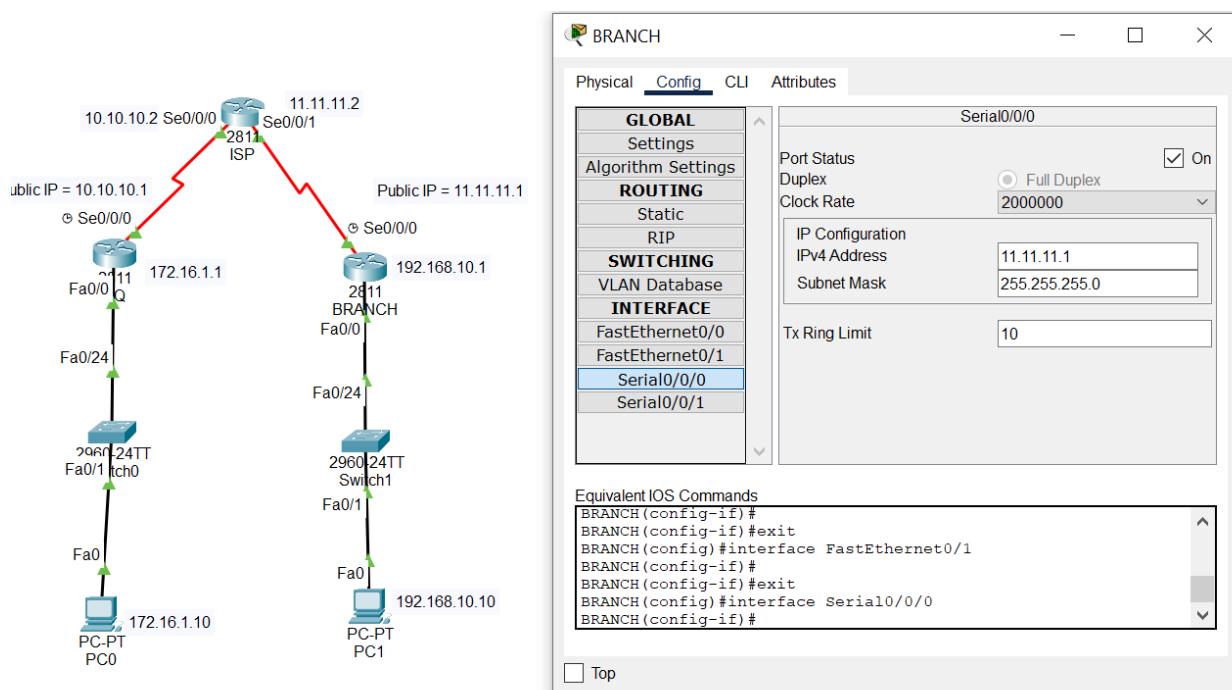
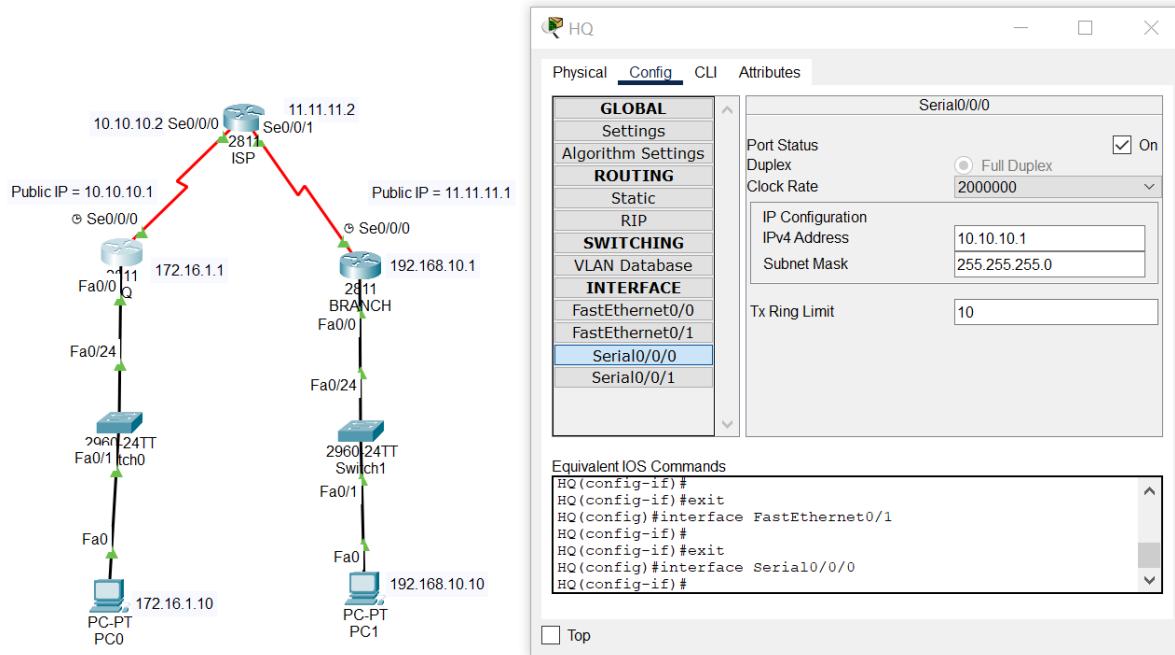
Cisco Packet tracer Setup:

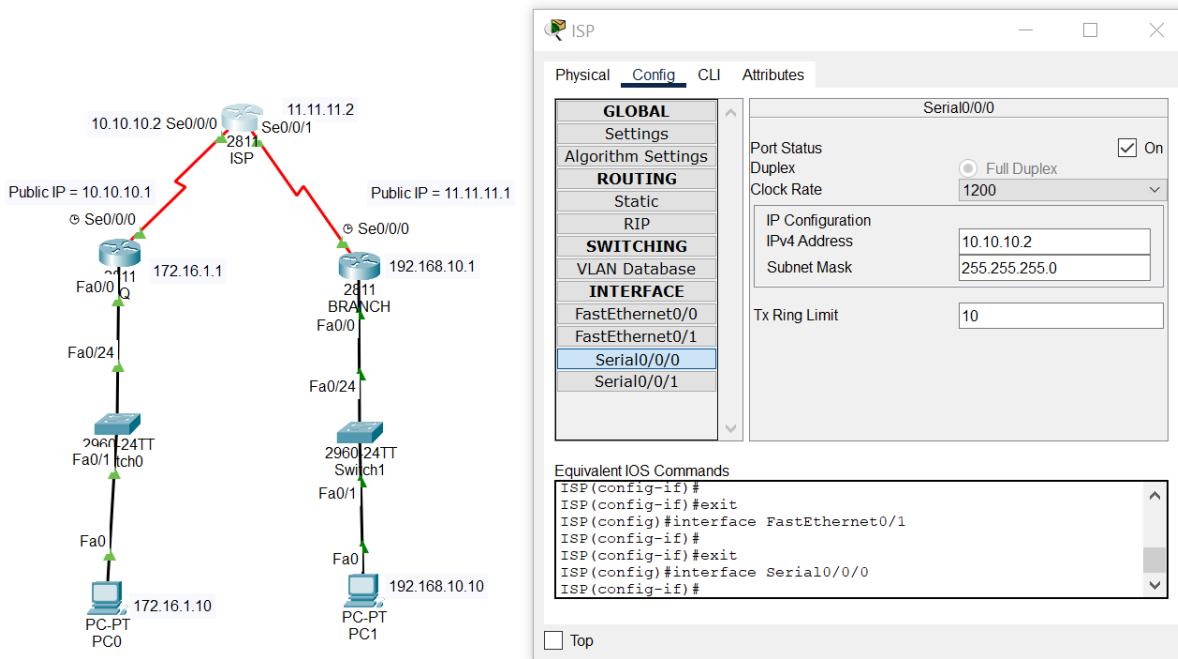


Step 1: Assign to all the Router

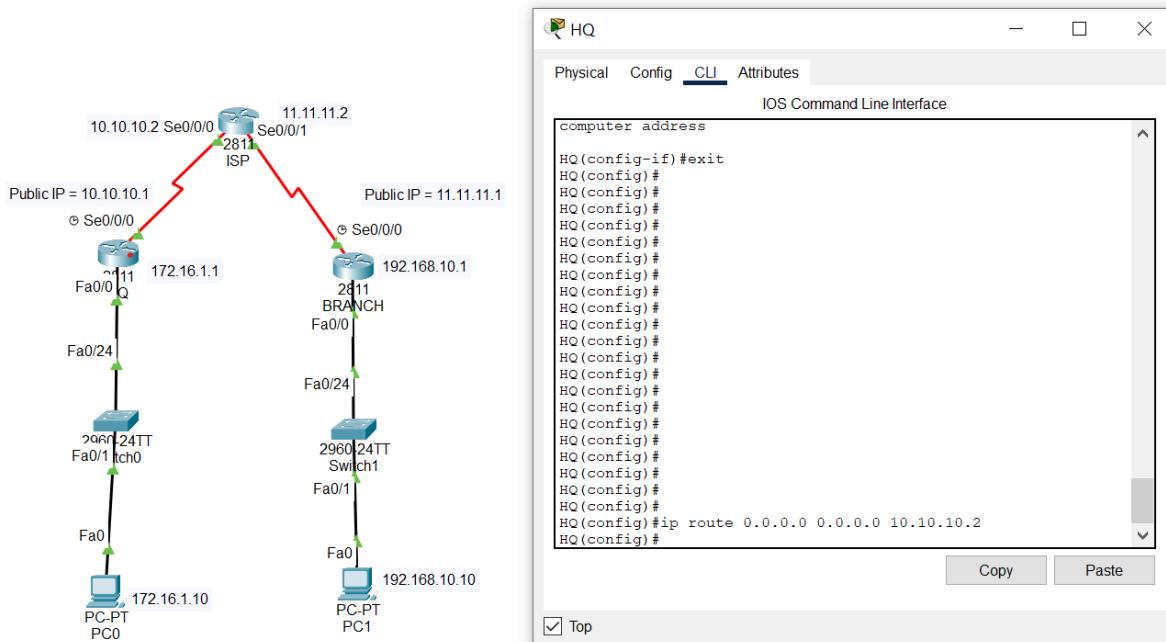


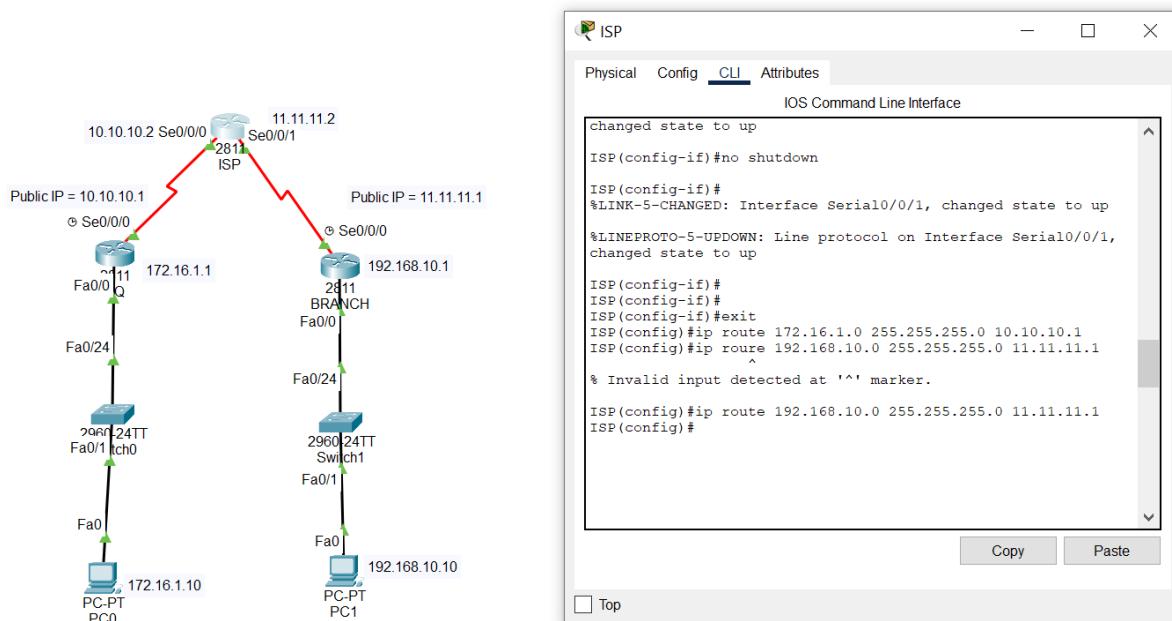
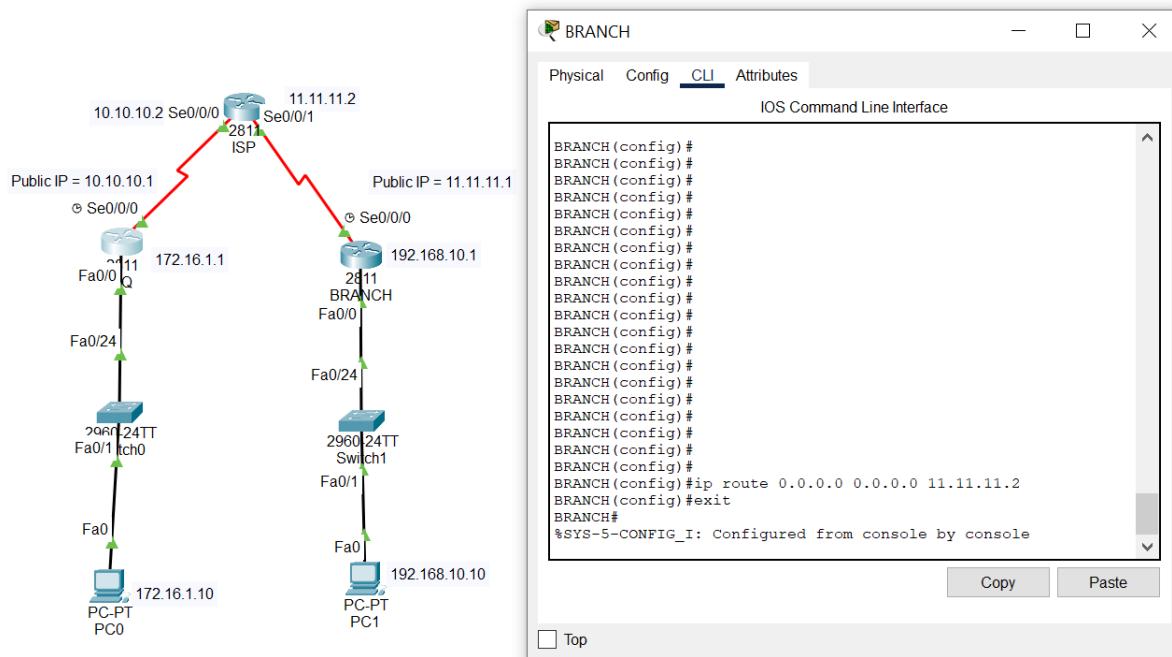


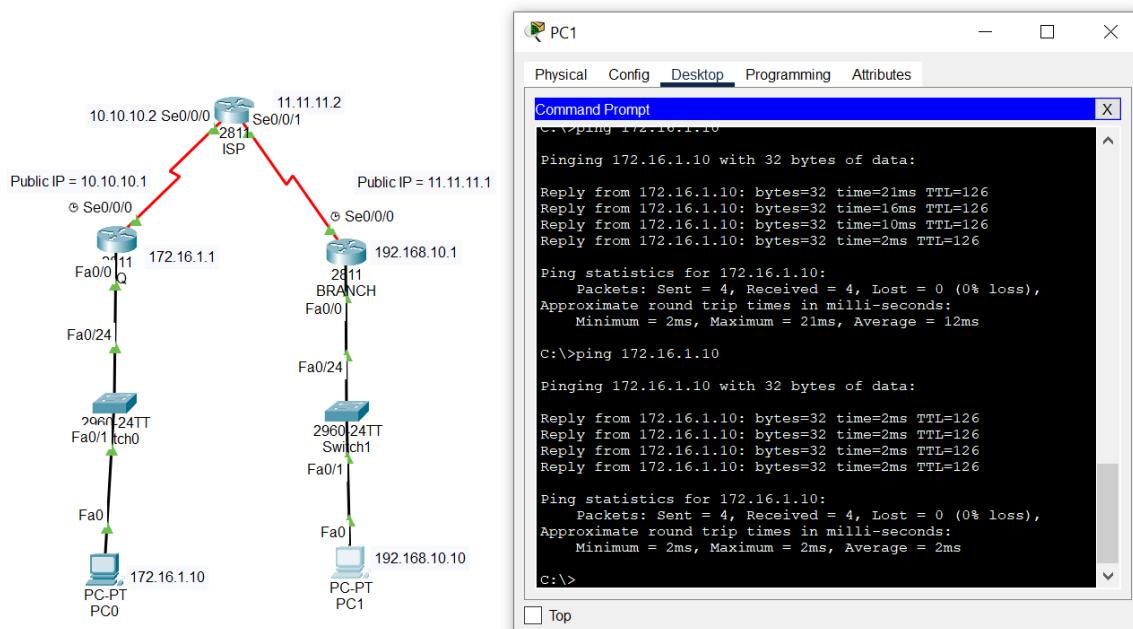
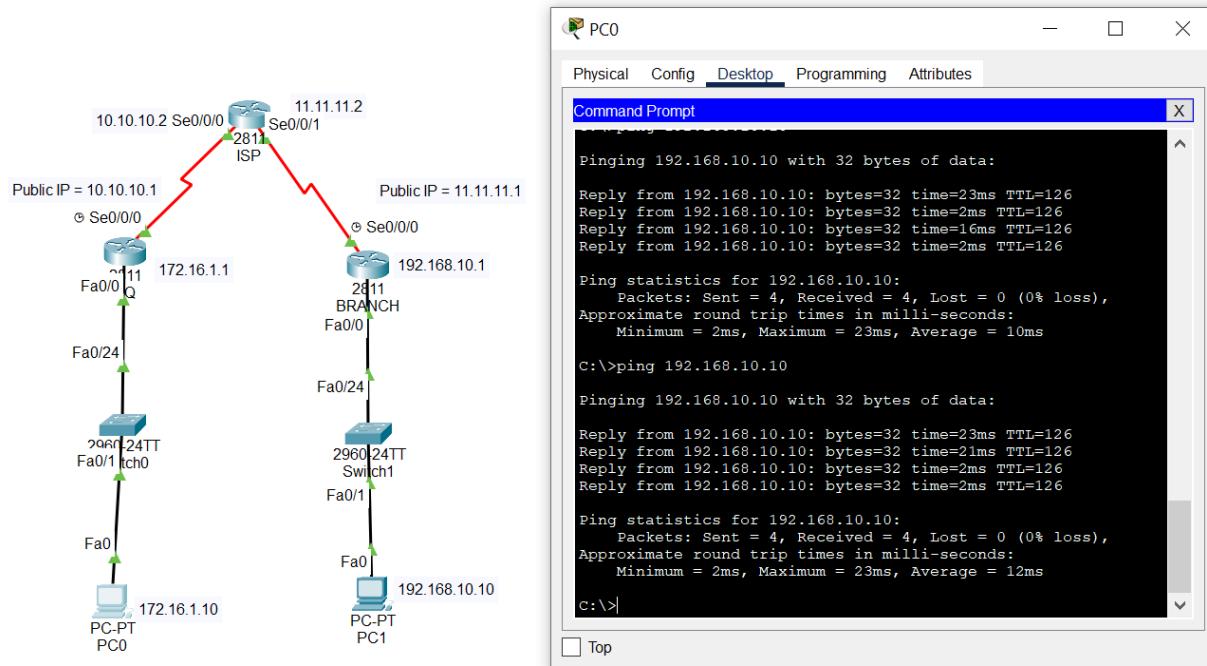




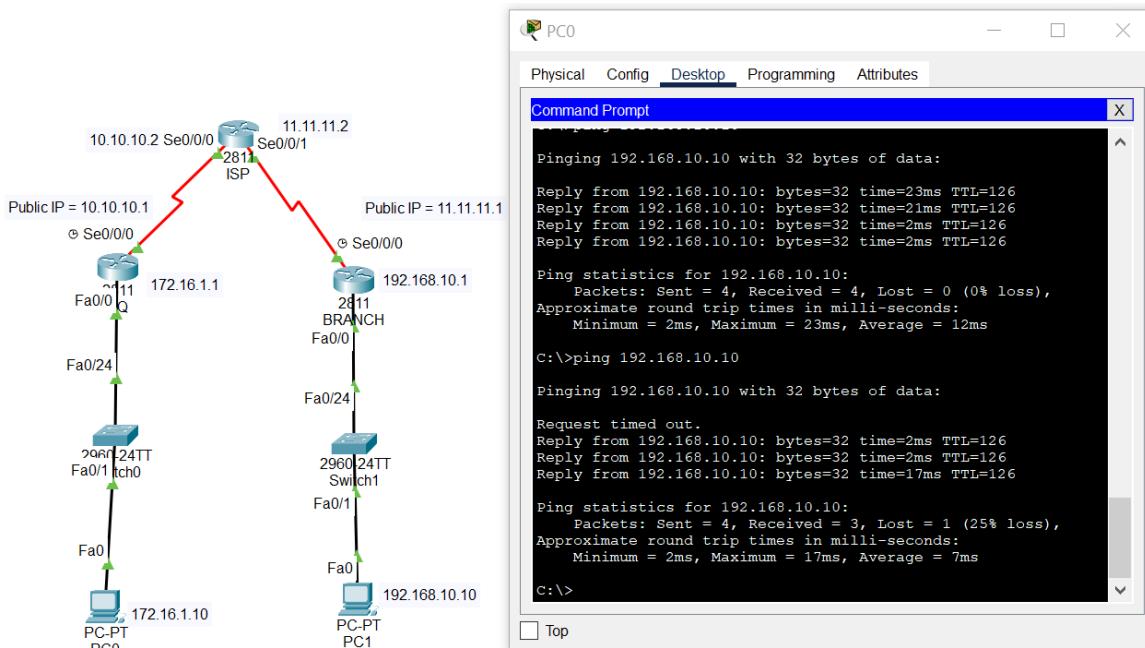
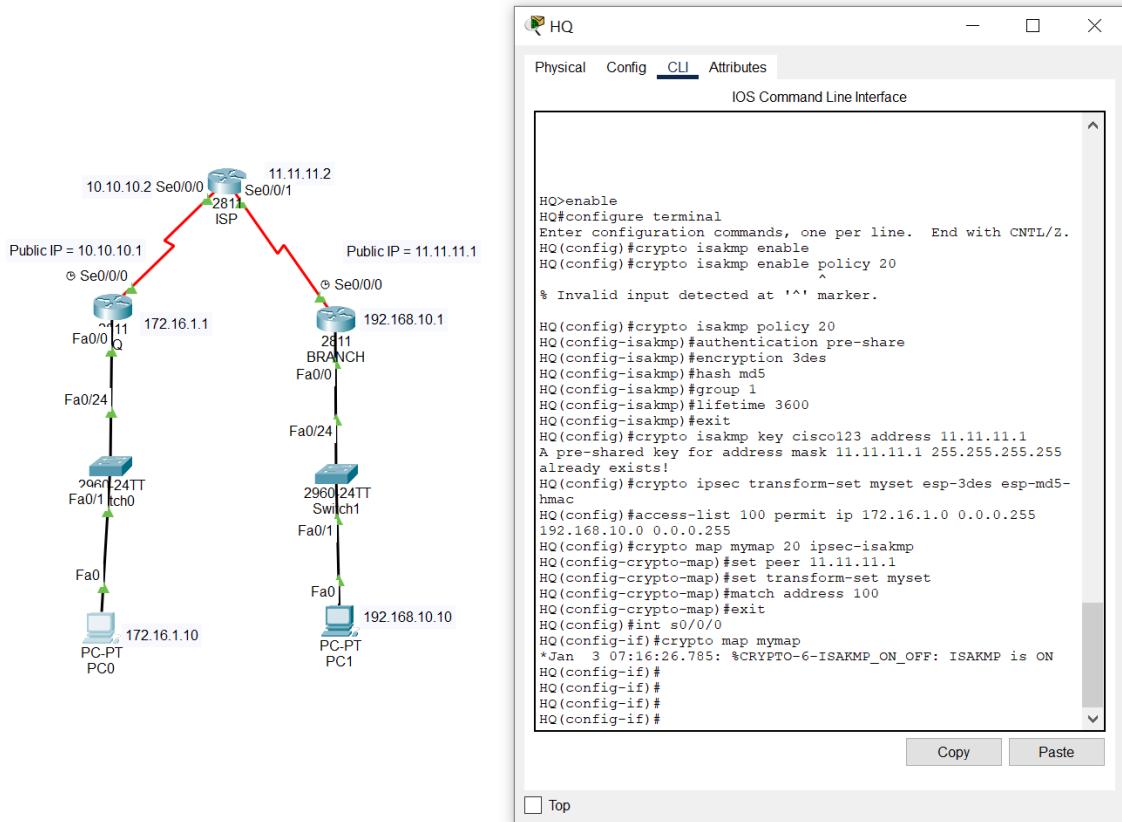
Step 2: Configure Default Router on HQ and BRANCH and static Router from ISP

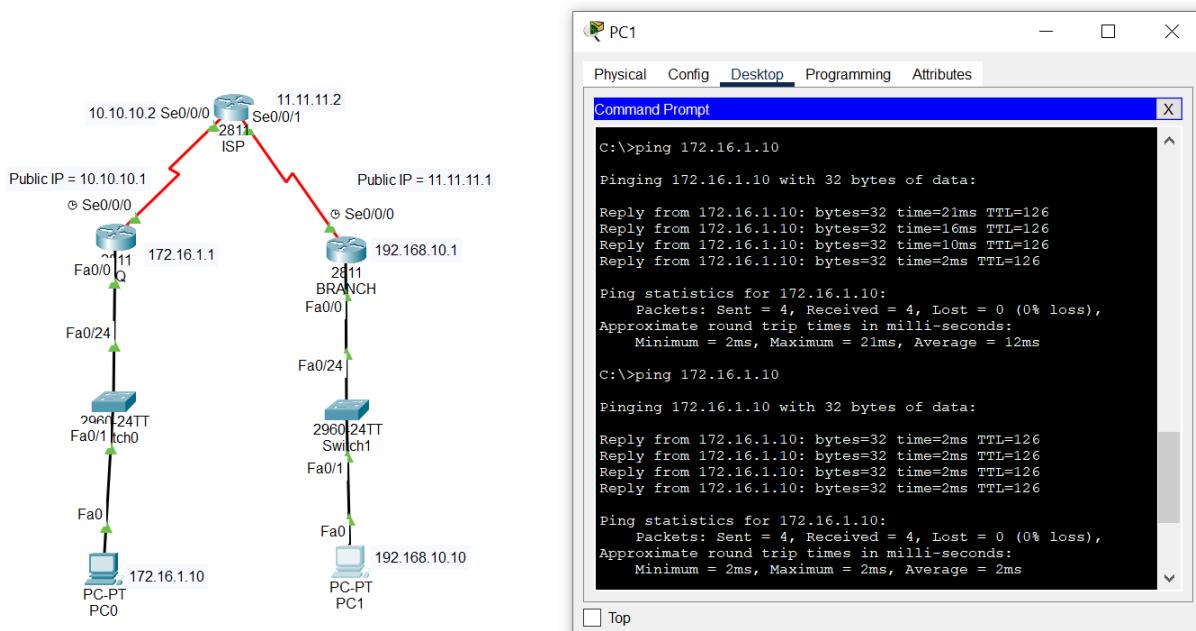
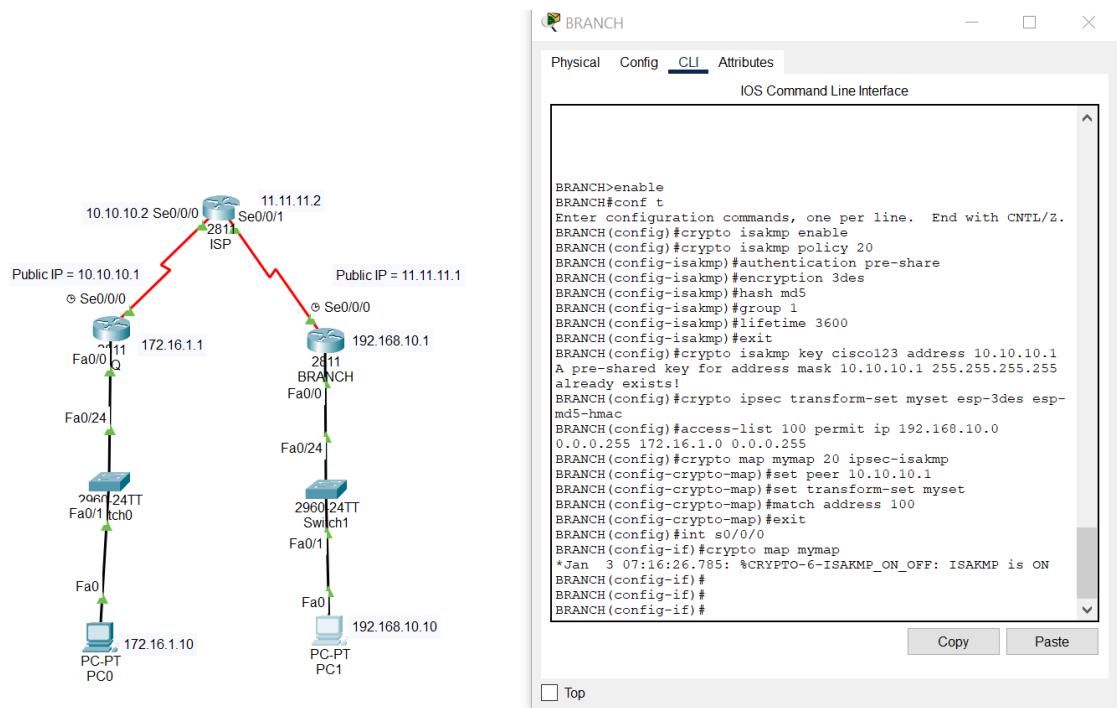






Step 3: Configure VP site to site





Step 4: Testing and Verify VPN

