Walchand College of Engineering, Sangli

[An Autonomous Institute]

Department of Information Technology

Second Year B.Tech.

Computer Networking

Journal

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Course teacher: Mr. M.G.Rathi

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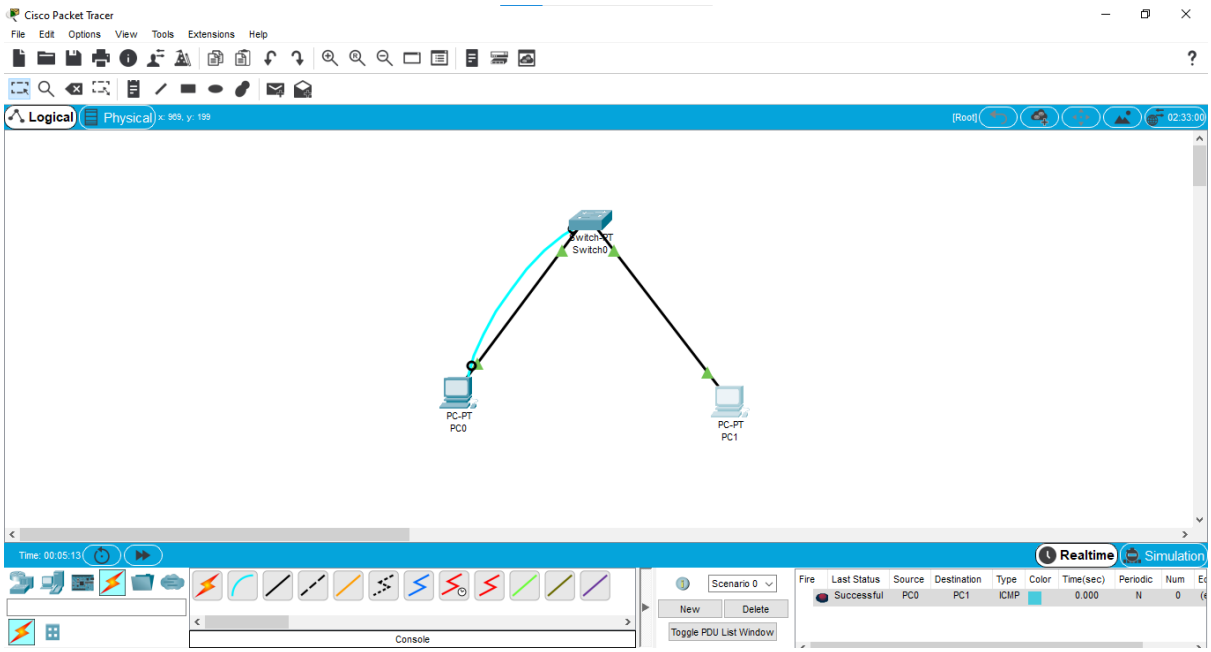
EXPERIMENT NO.: 1-A

Title: To study packet transfer between two machines via a switch.

Devices: Switch, PC

Topology Design:



Steps and Commands:

1. First, we connected two PC through a switch.

2. Then the IP address was assigned to each PC.

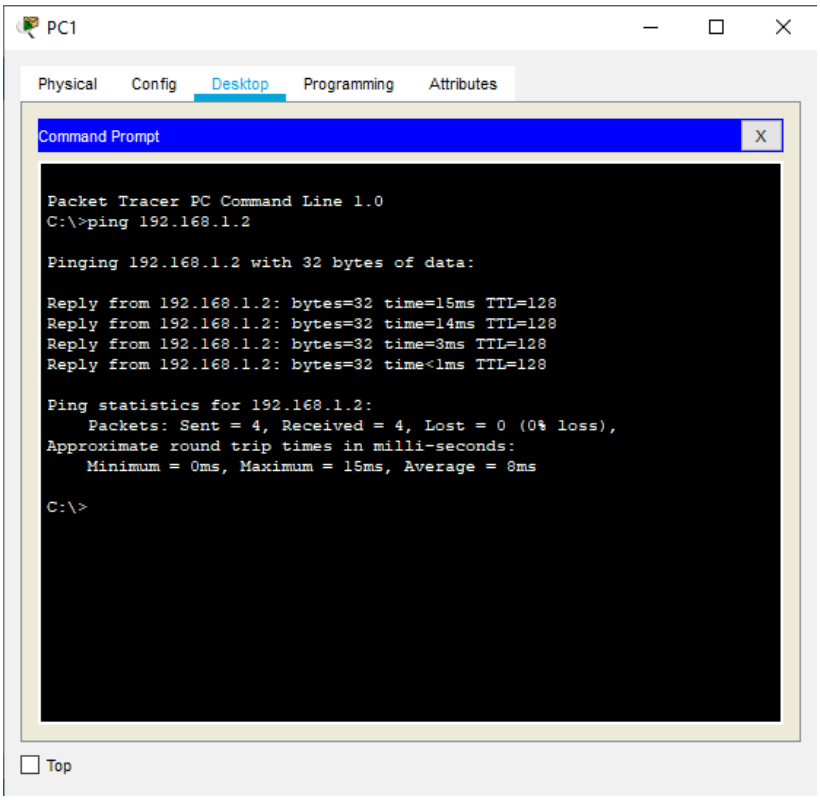
3. As soon as we connect the PC in the switch their IP address and the Mac address are stored in the switch in the data link layer.

4. If PC1 is sending the packet then the packet will contain the source address and the destination address.

5. Once the packet reaches the switch it will check for the destination address and forward the packet to the assigned PC

6. And hence the packet was transferred from PC1 to PC2.

Screenshot:



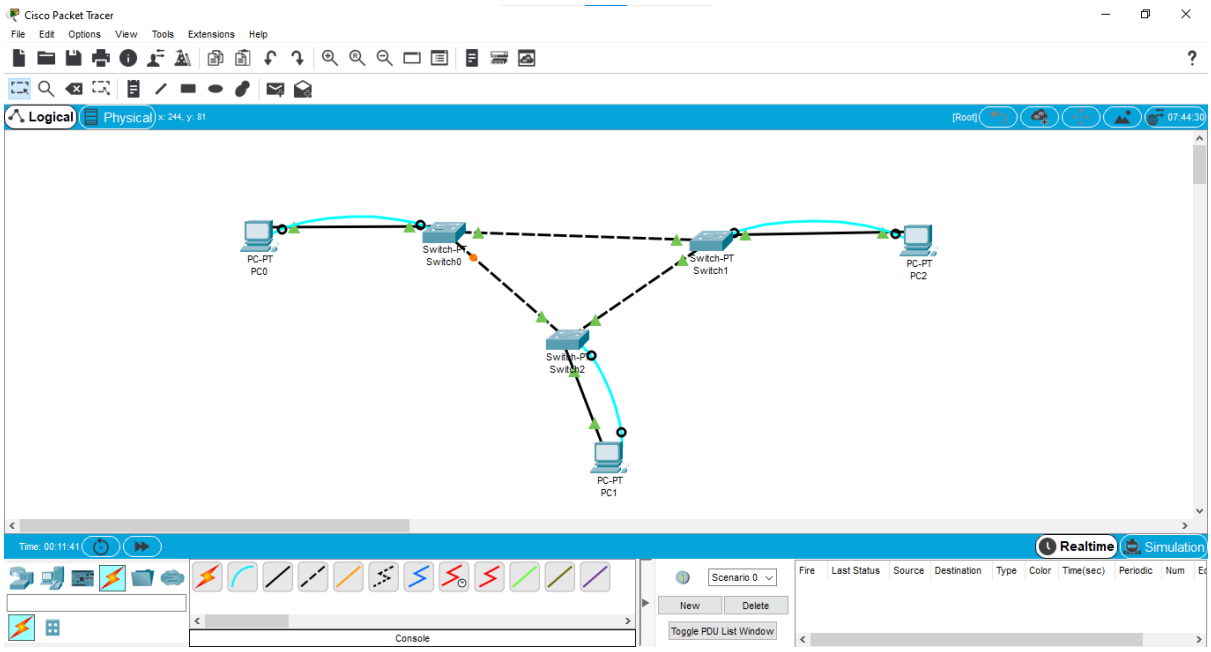
Conclusion: Switch contains the Mac address table through which the destination address is located and the packet is sent to the specified location in the network.

EXPERIMENT NO.: 01-B

Title: Experiment to verify what happens when switches are connected in loop and packet is sent.

Devices: Switch, PC

Topology Design:



Steps and Commands:

- When STP is not running :

  1. When switches are connected in the loop the and STP is not running then When a switch gets broadcast from a network device, it forwards it out through all ports. The neighbouring switch will get that broadcast and forward the broadcast through all other ports, and due to the loop, this broadcast will make its way to the original switch that received the broadcast from the network device.

  2. When the broadcast arrives, it will not know that it has seen it before, so it will forward it to all other ports.

  3. This process will be repeated thousands of times per second, causing a huge volume of traffic from a single broadcasted Ethernet frame.

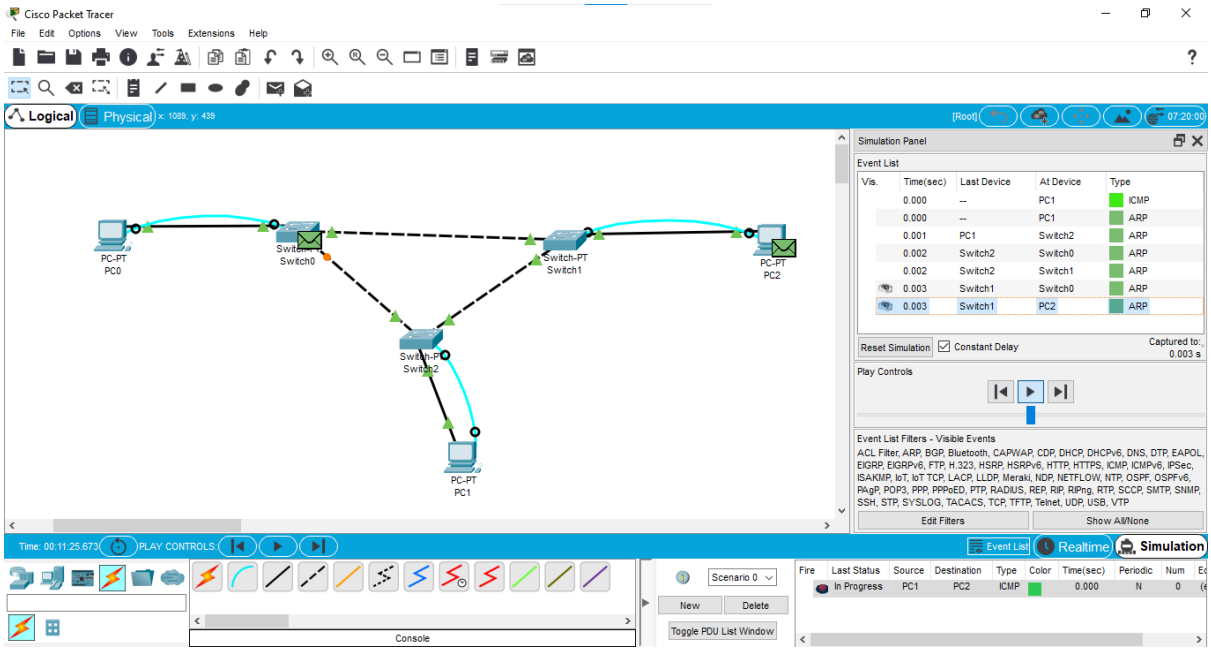
- When STP is running :

  1. If the loop is present in the network then switch knows the shortest minimal path to transfer the packet to the specified destination.

2. While the packet is transferred one of the connections is eliminated and the packet is transferred from the rest of the network.

3. The minimum spanning tree protocol is used to select the path to transfer the packet.

Screenshot:



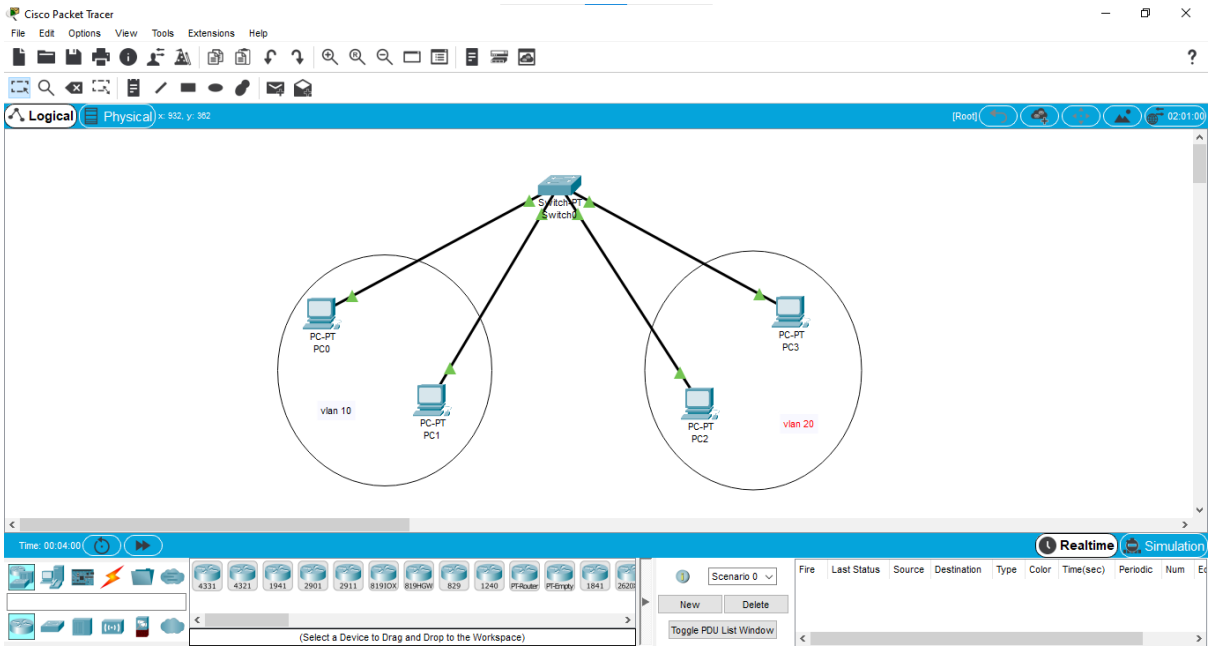
Conclusion: It is verified that if STP is used and whenever the loop is detected then one of the connections is eliminated from the network.

EXPERIMENT NO.: 01-C

Title: To create a virtual LAN in the switch.

Devices: Switch, PC

Topology Design:



Steps and Commands:

1. Frist the network of PCs and switch is created as shown in the screenshot.

2. Then those PCs that we don't want to provide access by the other devices in the same switch are merged into one virtual LAN

Procedure for creating VLAN using Cisco Packet Tracer :

1. Configure terminal

2. Then create VLAN and provide the number of VLAN

3. At this moment the VLAN is created in the switch but the VLAN ports are on allotted yet

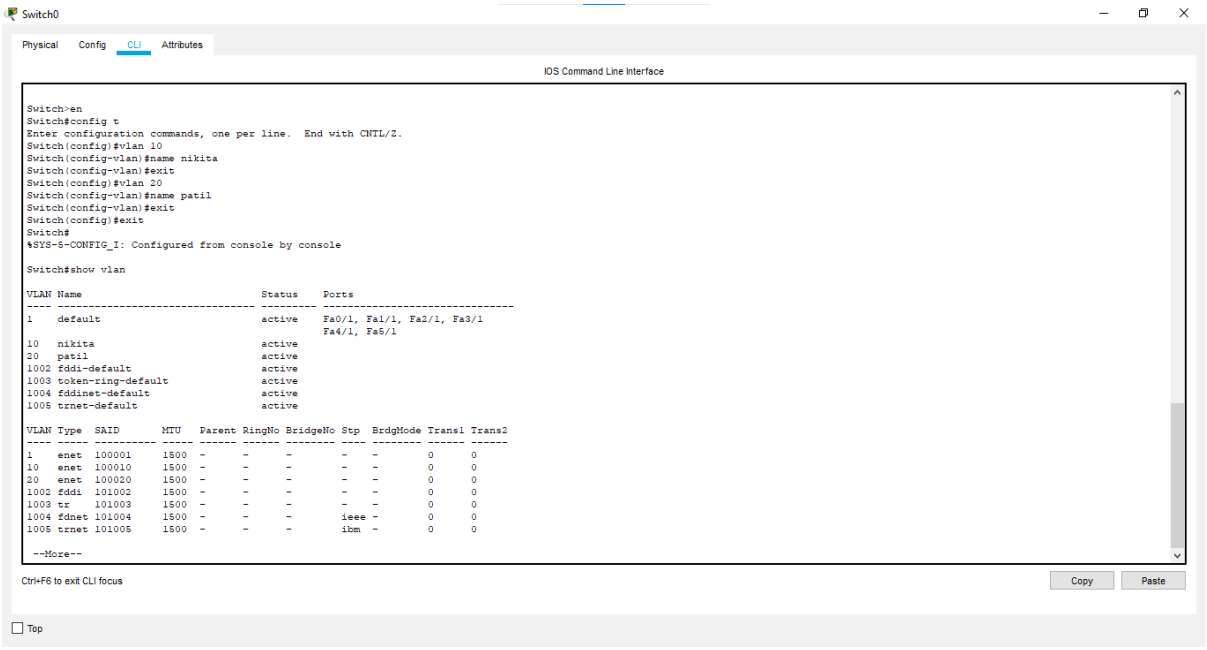
4. To allocate the ports for the VLAN we need to create the interface range and provide the range of ports

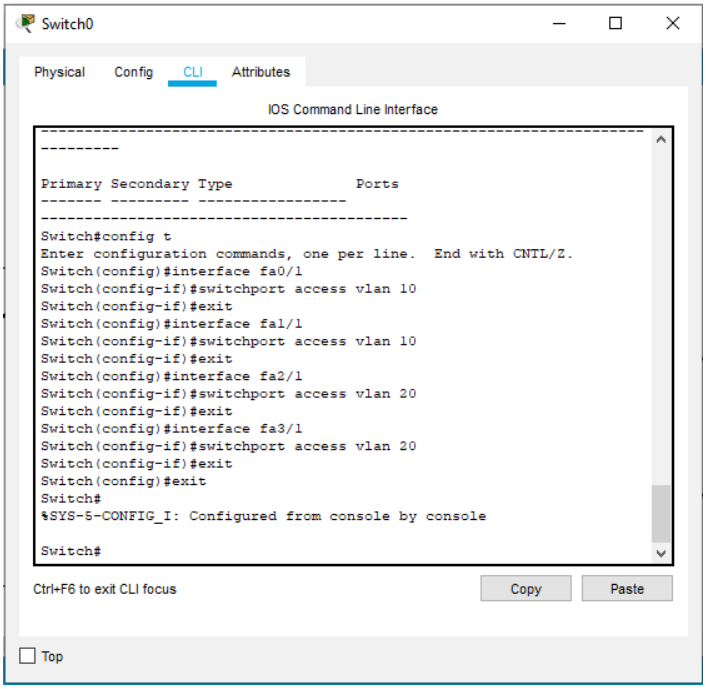
5. And then switchport mode access

6. Switchport access VLAN no.

7. And hence the VLAN is created in the single switch.

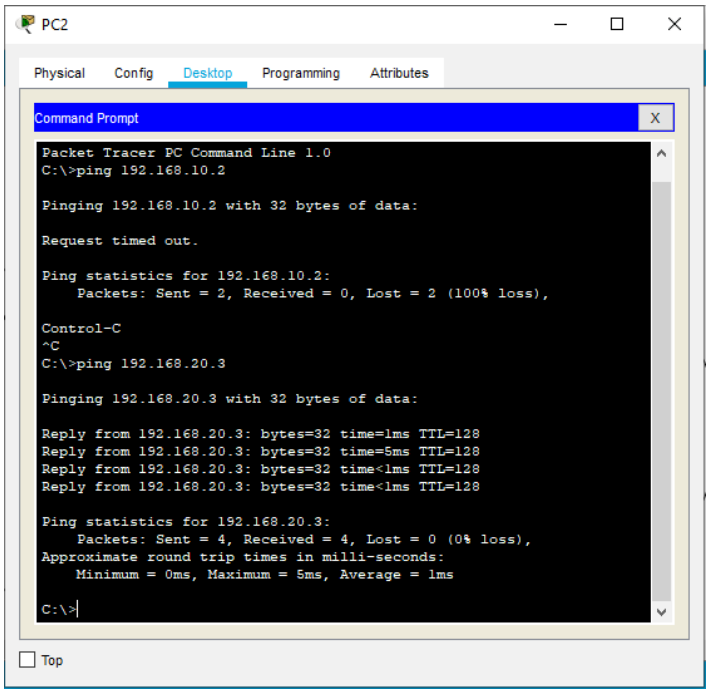
Screenshot :


Switch0
Physical
Config
CLI
Attributes
IOS Command Line Interface
Switch>en
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name nikita
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name patil
Switch(config-vlan)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console
Switch#show vlan
VLAN Name Status Ports
1 default active Fa0/1, Fa1/1, Fa2/1, Fa3/1
Fa4/1, Fa5/1
10 nikita active
20 patil active
1002 fddi-default active
1003 token-ring-default active
1004 fddinet-default active
1005 trnet-default active
VLAN Type SAID MTU Parent RingNo BridgeNo Stp BrdgMode Trans1 Trans2
1 enet 100001 1500 - - - - - 0 0
10 enet 100010 1500 - - - - - 0 0
20 enet 100020 1500 - - - - - 0 0
1002 fddi 101002 1500 - - - - - 0 0
1003 tr 101003 1500 - - - - - 0 0
1004 fdnet 101004 1500 - - - ieee - 0 0
1005 trnet 101005 1500 - - - ibm - 0 0
--More--
Ctrl+F6 to exit CLI focus
Copy
Paste
Top


Switch0
Physical
Config
CLI
Attributes
IOS Command Line Interface

Primary Secondary Type Ports

Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface fa0/1
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#interface fa1/1
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#interface fa2/1
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
Switch(config)#interface fa3/1
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console
Switch#
Ctrl+F6 to exit CLI focus
Copy
Paste
Top



Conclusion : Using VLAN we can create the virtual LAN in the same network so the it become isolated from the rest of the network and no other network device are able to access them.

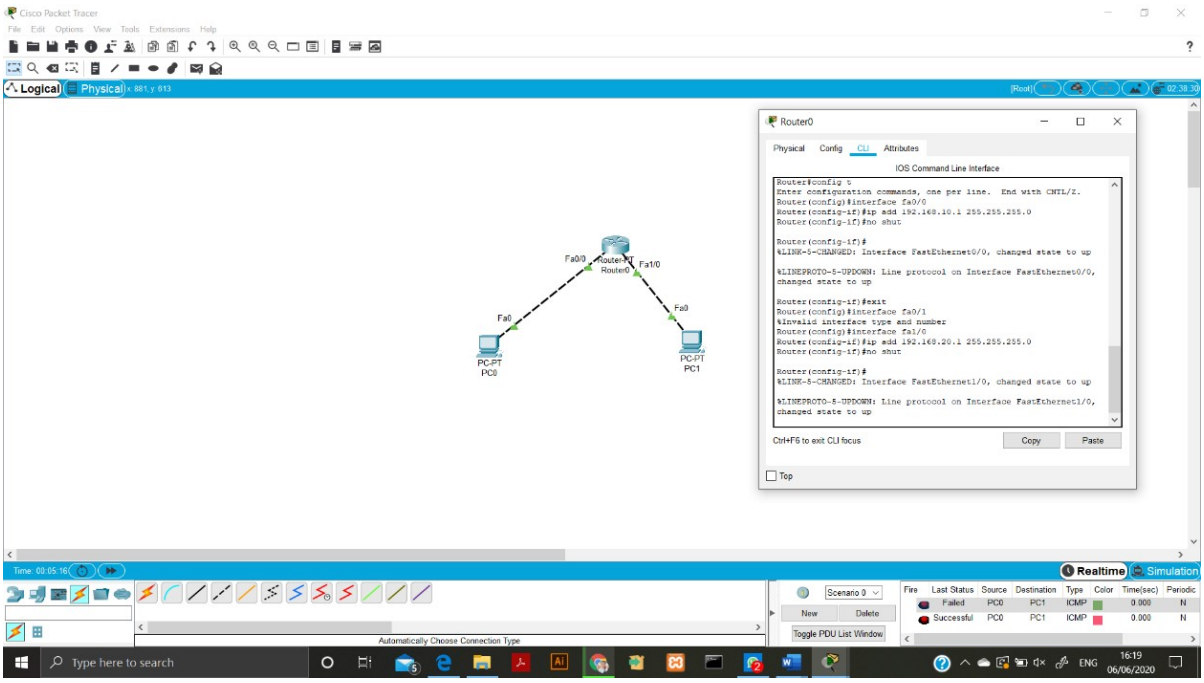
EXPERIMENT NO.: 02

Title: Configuring the Router

Devices: Router, PC

A router is a networking device that forwards data packets between computer networks. Routers perform the traffic directing functions on the Internet. When a data packet comes in on one of the lines, the router reads the network address information in the packet header to determine the ultimate destination.

Topology Design:



Steps and Commands:

1. Type **enable** to get to *privileged mode* (this gives you more options in configuring the router)
2. Type **config terminal** (or **config t** for short) to access the configuration menu.
3. Type **interface fastethernet0/0** to access Ethernet0/0
4. Type **IP address 192.168.10.1 255.255.255.0** to assign an IP address and subnet mask to the interface.
5. Type **no shutdown** to open the interface up for business.

Now we have to do the same thing for *fastethernet0/1*. If you don't, there still won't be a connection to PC1! Make sure to enter the IP address carefully

1. Type **interface fastethernet0/1**

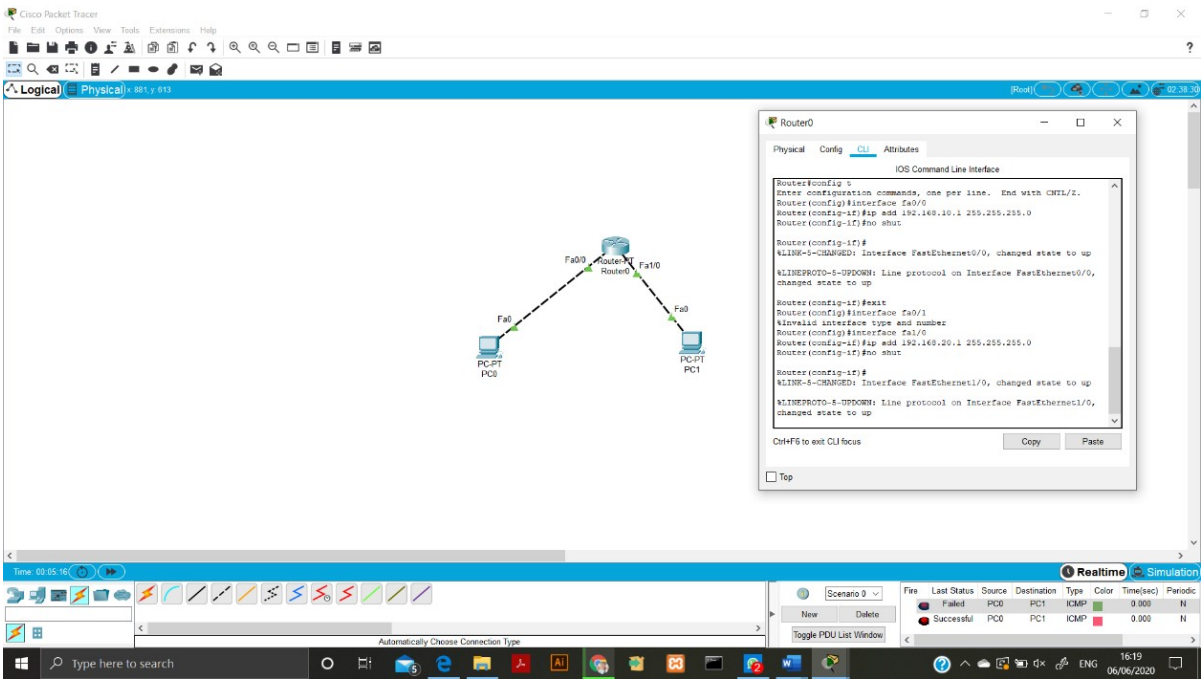
2. Type **IP address 192.168.20.1 255.255.255.0**

3. Type no **shut down**

At this point, our router is configured properly.

Our last step is to configure the default gateway on each desktop computer. The gateway is the address we assigned to the Ethernet port that the desktop is connected to. It will allow the computer to interface with another network.

Screenshot:



Conclusion:

While switches allow different devices on a network to communicate, routers allow different networks to communicate. A router is a networking device that routes data packets between computer networks. A router can connect networked computers to the Internet, so multiple users can share a connection.

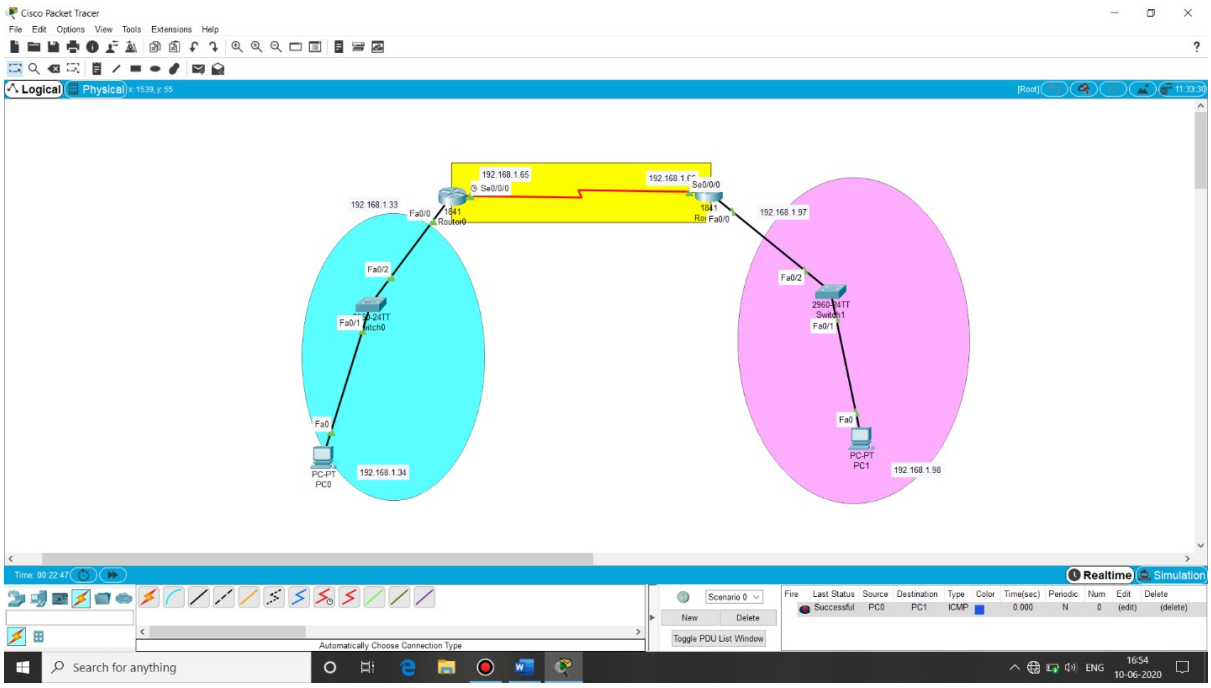
EXPERIMENT NO.: 03

Title: Subnetting

To subnet a network is to create logical divisions of the network subnetting, therefore, involves dividing the network into smaller portions called subnets. Subnetting applies to IP addresses because this is done by borrowing bits from the host portion of the IP address. In a sense, the IP address then has three components - the network part, the subnet part and, finally, the host part.

Devices: Router, Switch, PC

Topology Design:



Steps and Commands:

At first router:-

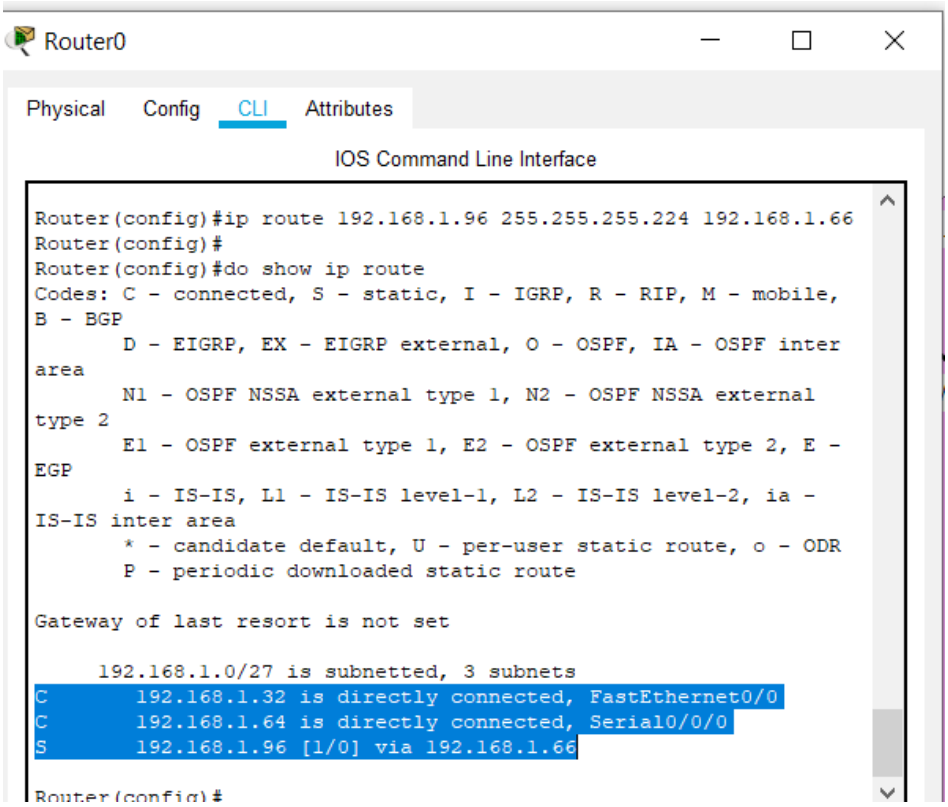
1. Enable the router
2. Configure the router
3. Interface the fastEthernet0/0 port
4. Give the IP address as 192.168.1.33 255.255.255.224
5. Now interface the serial0/0 port of router
6. Give the IP address to the serial port of the router as 192.168.1.65 255.255.255.224
7. Now give the IP route as 192.168.1.96 255.255.255.224 192.168.1.66

At second router:-

1. Enable the router

2. Configure the router
3. Interface the fastEthernet0/0 port
4. Give the IP address as 192.168.1.97 255.255.255.224
5. Now interface the serial0/0 port of router
6. Give the IP address to the serial port of the router as 192.168.1.66 255.255.255.224
7. Give the clock rate
8. Now give the IP route as 192.168.1.32 255.255.255.224 192.168.1.65

Screenshots:



Conclusion:

- For components to communicate on a network, each needs a unique address. For computer networks using the Internet Protocol, these addresses are numeric and are commonly referred to as IPs .
- To make efficient use of IP addresses we also need logical groupings of devices. A subnet then, is a logical organization of connected network devices.

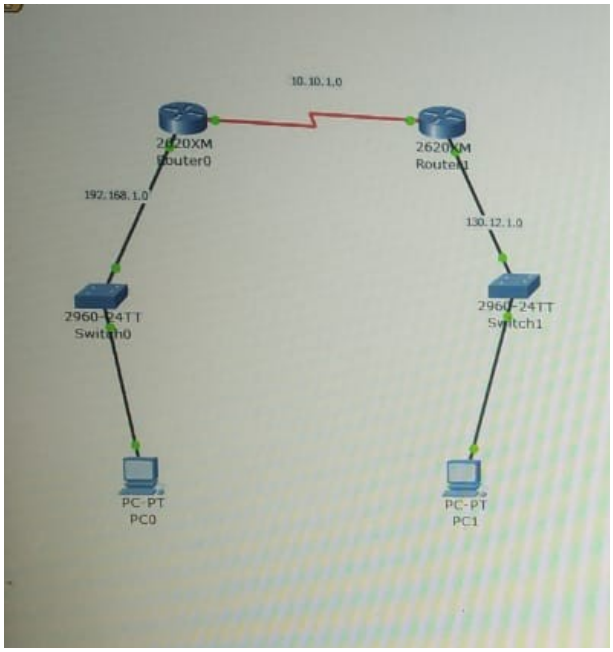
EXPERIMENT NO.: 04

Title: RIP

A simple routed network has been set up to assist in reviewing RIP routing behavior. In this activity, you will configure RIP across the network and set up end devices to communicate on the network.

Devices: Router, Switch, PC

Topology Design:



Steps and Commands:

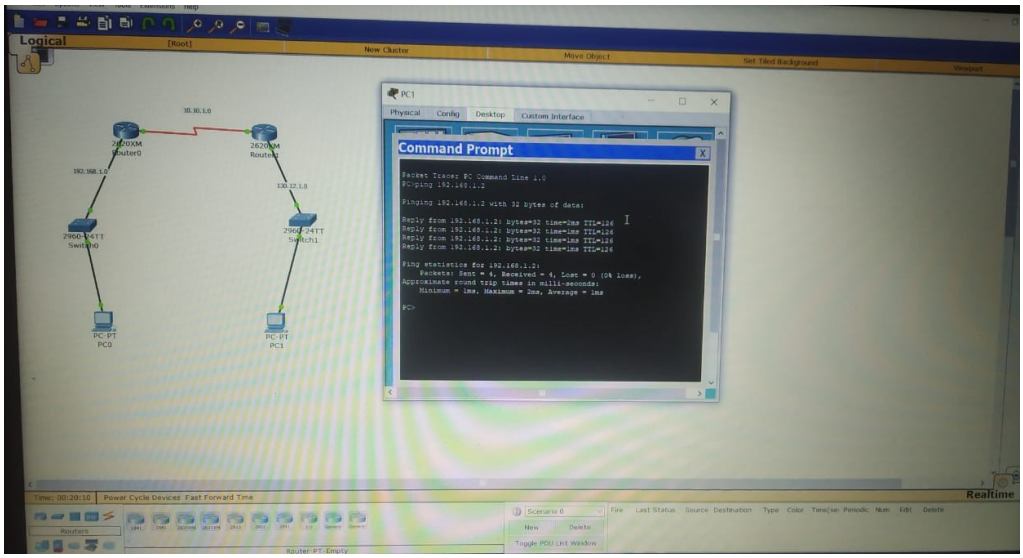
- Step 1: Configure the first router and enable RIP.
    1. From the CLI, configure interface Fast Ethernet 0/0 using the IP address 10.0.0.254 /8
    2. Configure interface serial 0/0/0 using the first usable IP address in network 192.168.1.0/24 to connect to the second router. Set the clock rate at 64000.
    3. Configure interface serial 0/0/1 using the first usable IP address in network 192.168.2.0/24 with a clock rate of 64000.
    4. Using the no shutdown command, enable the configured interfaces.
    5. Configure RIP to advertise the networks for the configured interfaces.
    6. Configure the end devices.

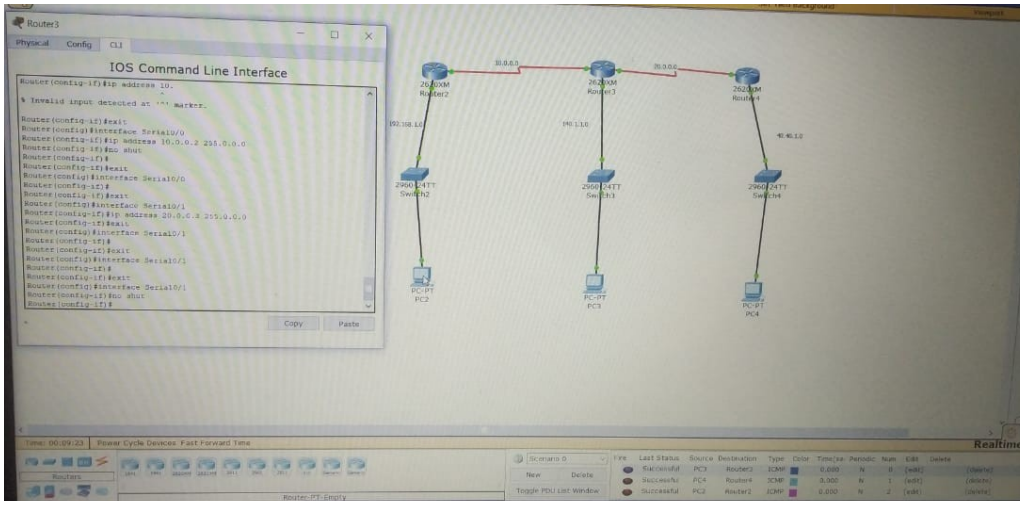
- Step 2: Configure the second router and enable RIP.
    1. Configure interface Fast Ethernet 0/0 using the first usable IP address in network 192.168.0.0 /24 to connect to the third router.

2. Configure interface serial 0/0/0 using the second usable IP address in network 192.168.1.0 /24 to connect to the first router.
3. Configure interface Fast Ethernet 0/1 using the IP address 172.16.254.254 /16.
4. Using the no shutdown command, enable the configured interfaces.
5. Configure RIP to advertise the networks for the configured interfaces.
6. Configure the end devices.

- Step 3: Verify the RIP configuration on each router.
    1. At the command prompt for each router, issue the commands show IP protocols and show IP route to verify RIP routing is fully converged. The show IP protocols command displays the networks the router is advertising and the addresses of other RIP routing neighbors. The show IP route command output displays all routes known to the local router including the RIP routes which are indicated by an “R”.
    2. Every device should now be able to successfully ping any other device in this activity.

Screenshots:





Conclusion:

The purpose of subnetting a network address is to provide a way to logically divide large networks into smaller, more manageable pieces to make the most efficient use of address space. This can be done with any public or private network address.

EXPERIMENT NO.: 05

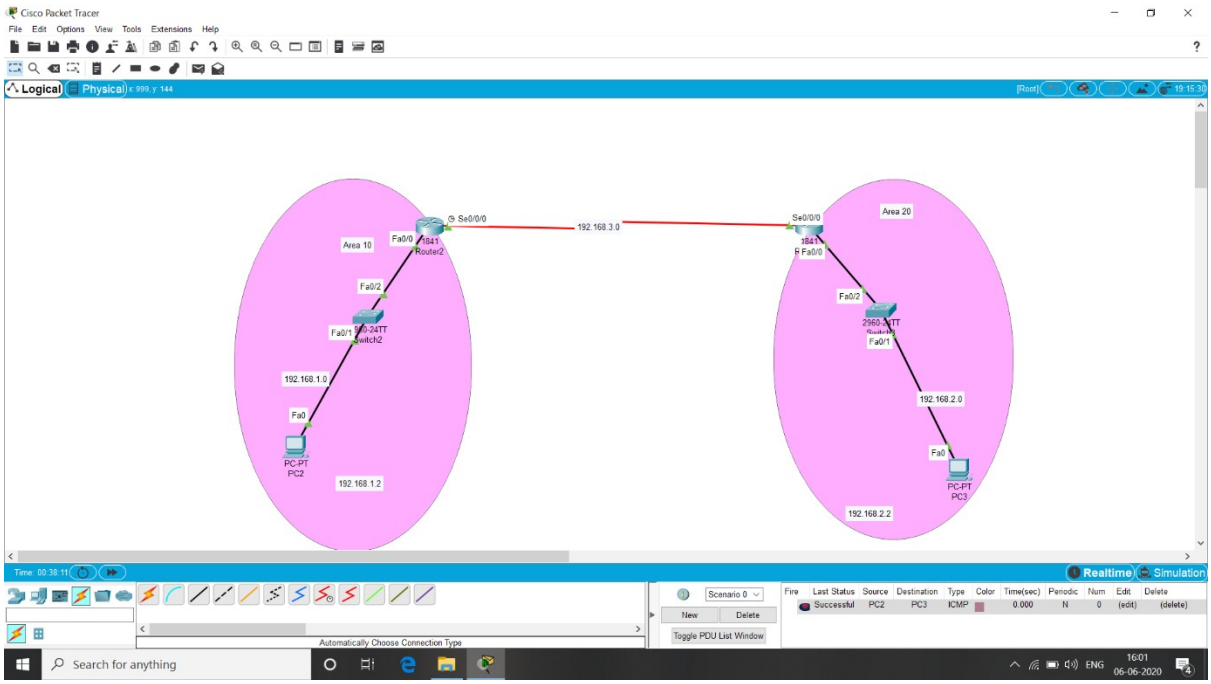
Title: Border Gateway Protocol

Border Gateway Protocol (BGP) is used to exchange routing information for the internet and is the protocol used between ISP which are different ASes.

The protocol can connect any internetwork of an autonomous system using an arbitrary topology. The only requirement is that each AS has at least one router that can run BGP and that is router connect to at least one other AS's BGP router. BGP's main function is to exchange network reachability information with other BGP systems. Border Gateway Protocol constructs an autonomous systems' graph based on the information exchanged between BGP routers.

Devices: Router, Switch, PC

Topology Design:



Steps and Commands:

- Step 1: Configure the first router and enable BGP.

  1. From the CLI, configure interface Fast Ethernet 0/0 using the IP address 192.168.1.1

  2. Configure interface serial 0/0/0 using the first usable IP address in network 192.168.3.1 /24 to connect to the second router. Set the clock rate at 64000.

3. Here we create two areas as area 10 and area 20

4. (config)#router bgp 10

5. (config-router)network 192.168.1.0

6. (config-router)network 192.168.2.0

7. (config-router)network 192.168.3.0

8. (config-router) # neighbor 192.168.3.2 remote-as 20

9. (config-bgp-10) # neighbor 192.168.2.2 remote-as 20

10. To check bgp type command show ip bgp

- Step 2: Configure the second router and enable BGP.

1. Configure interface Fast Ethernet 0/0 using the first usable IP address in network 192.168.2.1/24 to connect to the third router.

2. Configure interface serial 0/0/0 using the second usable IP address in network 192.168.3.2/24 to connect to the first router.

3. Using the no shutdown command, enable the configured interfaces.

4. (config)#router bgp 20

5. (config-router)network 192.168.1.0

6. (config-router)network 192.168.2.0

7. (config-router)network 192.168.3.0

8. (config-router) # neighbor 192.168.3.1 remote-as 10

9. (config-bgp-10) # neighbor 192.168.1.2 remote-as 10

10. To check bgp type command show ip bgp

11. ping 192.168.3.2

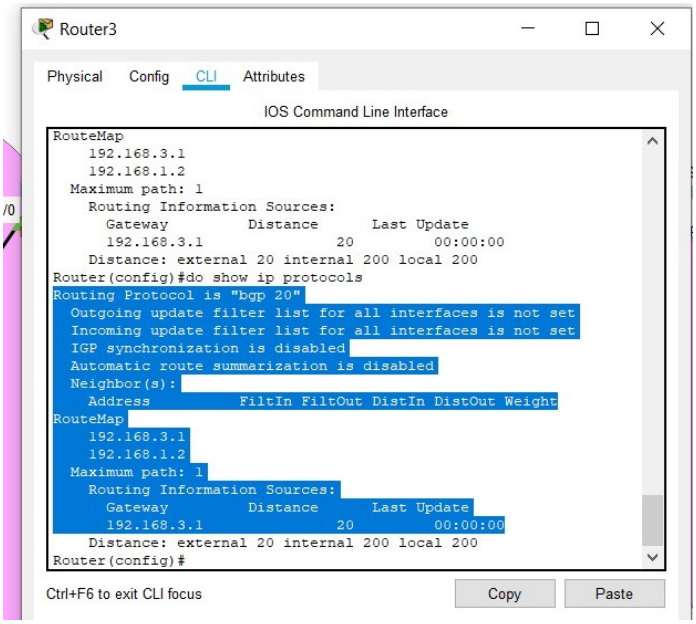
12. Configure the end devices.

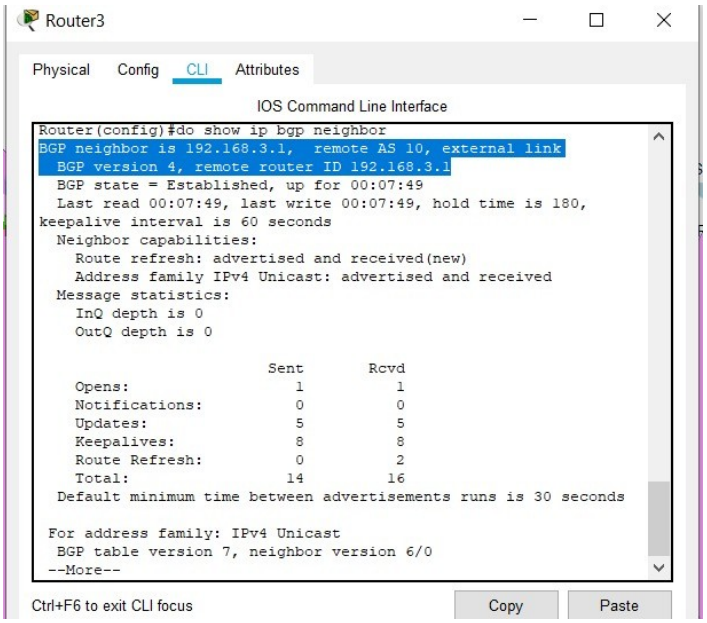
- Step 3: Verify the BGP configuration on each router using command show ip bgp.
1. Every device should now be able to successfully ping any other device in this activity.

Screenshots:

```
Router(config)#do show ip protocols
Routing Protocol is "bgp 20"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  IGP synchronization is disabled
  Automatic route summarization is disabled
  Neighbor(s):
    Address          FiltIn FiltOut DistIn DistOut Weight RouteMap
    192.168.3.1
    192.168.1.2
  Maximum path: 1
    Routing Information Sources:
      Gateway         Distance      Last Update
      192.168.3.1              20          00:00:00
    Distance: external 20 internal 200 local 200
Router(config)#
```

Ctrl+F6 to exit CLI focus





Conclusion:

1. Routing messages are the highest precedence traffic on the Internet, and each BGP router gives them priority over all other traffic.

2. The information is important to construct a graph of AS connectivity from which routing loops may be shortened.

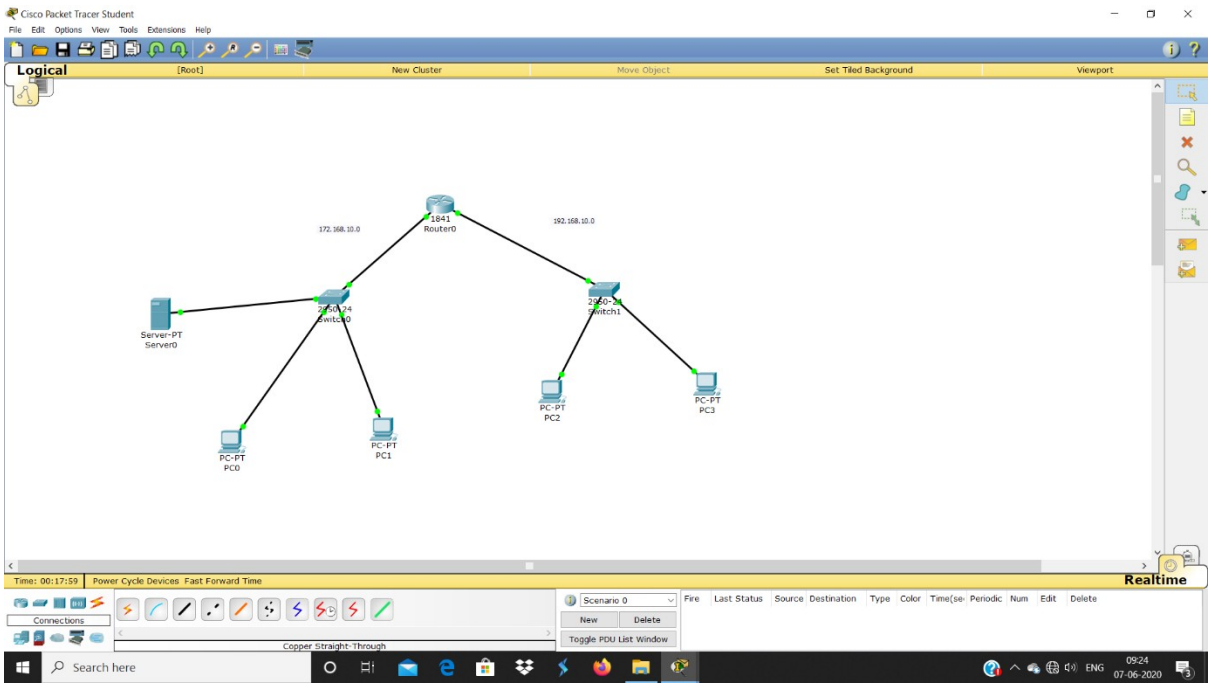
3. Only protocol that can deal well with having multiple connections to unrelated routing domains.

EXPERIMENT NO.: 06

Title: DHCP

Devices: Server, Router, Switch, PCs.

Topology Design:



Steps and Commands:

1. First take server, router, switches and nodes (PCs)

2. Connect all components as shown in above topology.

3. Give ip addresses to all PCs

4. To give ip address to router commands are:

For fastethernet

```
$router>en
#config t
#interface fastethernet 0/0
#ip addess 172.168.10.1 255.255.255.0
#no shutdown
#interface fastethernet 0/1
#ip addess 192.168.10.1 255.255.255.0
#no shutdown
#ip helper-address 172.168.10.2
#exit
```

5. DHCP server configuration:

5.1 click on server

5.2 Go to Services

5.3 click on DHCP

5.4 make Services on

5.5 add Pool Name: pool1

Default gateway: 172.168.10.1 (ip address of interface 0/0)

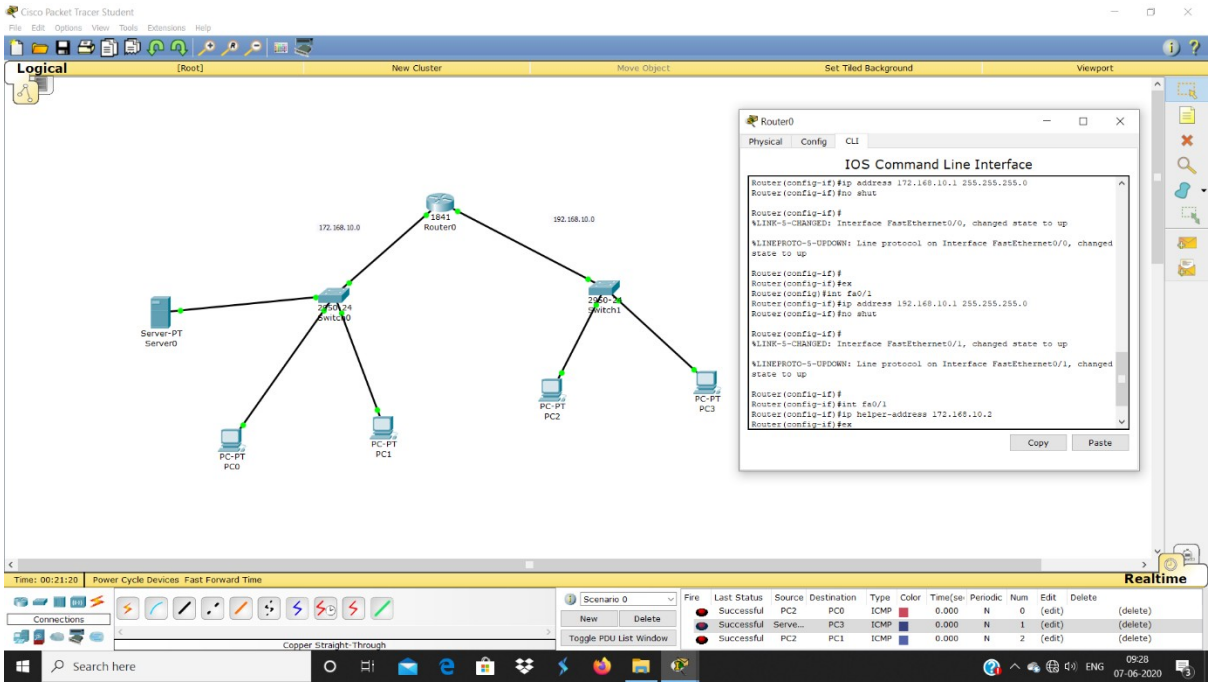
Start IP Address: 172.168.10.11 (Starting ip address)

Subnet Mask: 255.255.255.0

5.6 add click on add and save (pool1 is successfully added)

5.7 Similarly add pool2.

Screenshots:



Conclusion:

In this way, we can configure the nodes (PCs) by using DHCP.

EXPERIMENT NO.: 07

Title: DNS and FTP

- DNS:

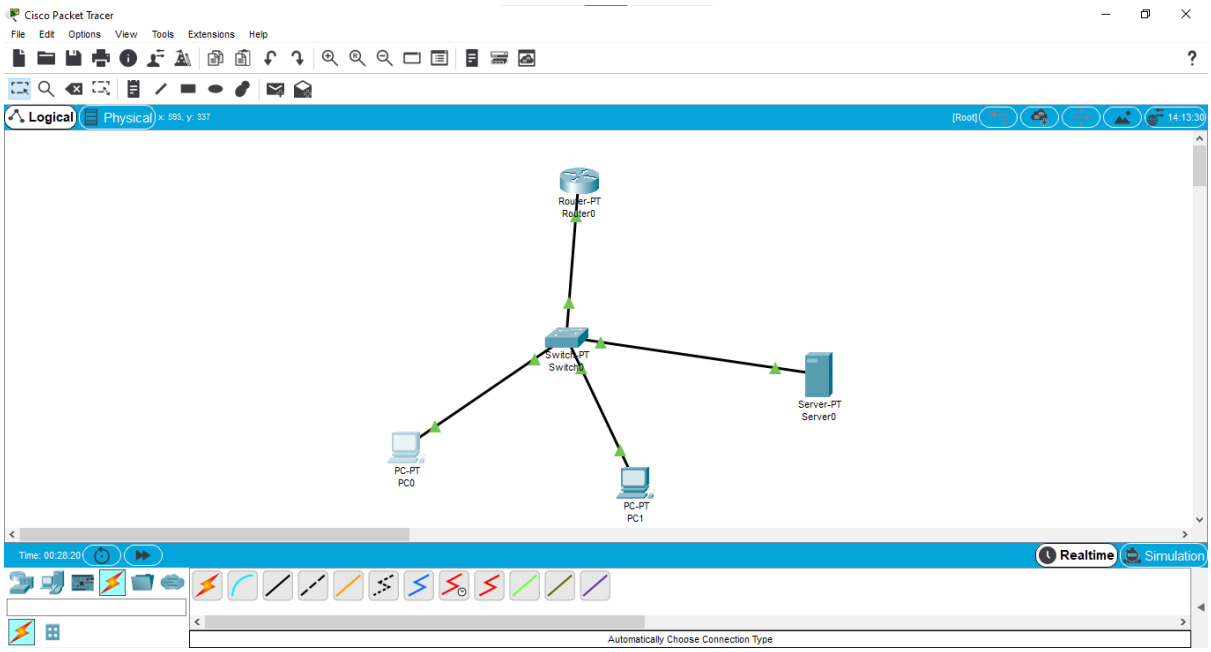
  A **Domain Name System** (**DNS**) server resolves hostnames into IP addresses. Although we can access a network host using its IP address, DNS makes it easier by allowing us to use domain names which are easier to remember.

  - FTP:

  The **File Transfer Protocol (FTP)** is a standard network protocol used for the transfer of computer files between a client and server on a computer network.

Devices: Router, Switch, PC, Server

Topology Design:



Steps and Commands:

Working of DNS:

1. Build the network topology.
2. Configure static IP addresses on the PCs and the server.
3. Configure DNS service on the generic server.
4. To do this, click on the server, then click on the Services tab. Click on the DNS server from the menu. First, turn ON the DNS service, then define names of the hosts and their corresponding IP addresses.
5. Click on **add** then **save**. Repeat this for the other PC and the server.
6. Ping the hosts from one another using their names instead of their IP addresses. If the DNS service is turned on and all IP configurations are okay, then ping should work.

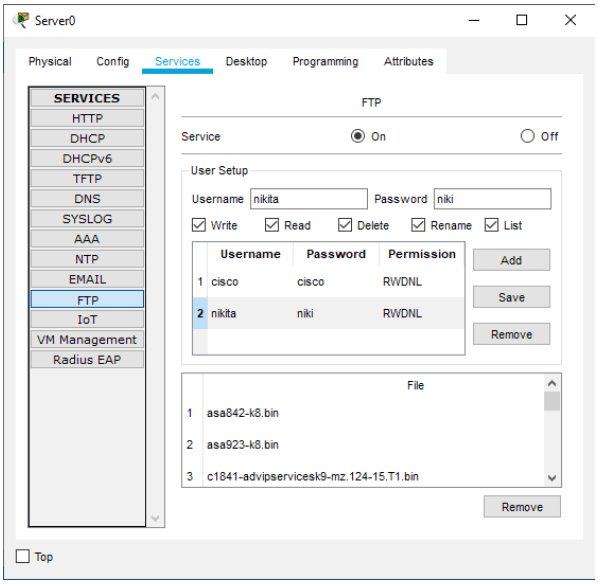
Working of FTP:

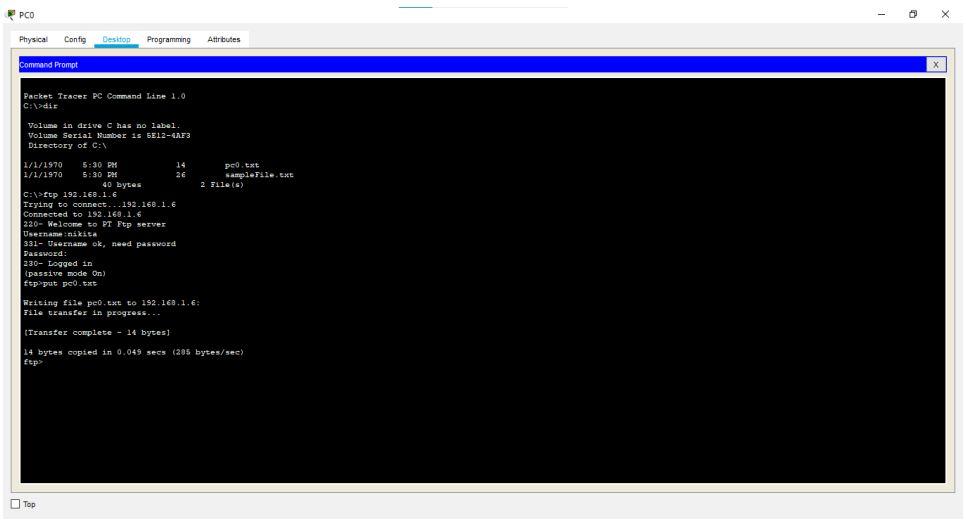
1. Build the network topology.
2. Configure static IP addresses on the Laptop and the server.
3. Now try using an **FTP client** built in the Laptop to send files to an **FTP server** configured in the Server.
4. From the Laptop's command prompt, FTP the server using the server IP address by typing: Provide the **username** and **password** for ftp login.
5. **Create** a file in the Laptop then **upload** it to the server using **FTP**.
6. To do this, open the Text Editor in the Laptop, create a file and give it your name of choice. Type any text in the editor then save your file. e.g. myFile.txt.
7. . Now upload the file from the Laptop to the server using FTP. (An FTP connection has to be started first. But this is what we've done in step 3)
8. So to do an FTP upload, we'll type: put MyFile.txt

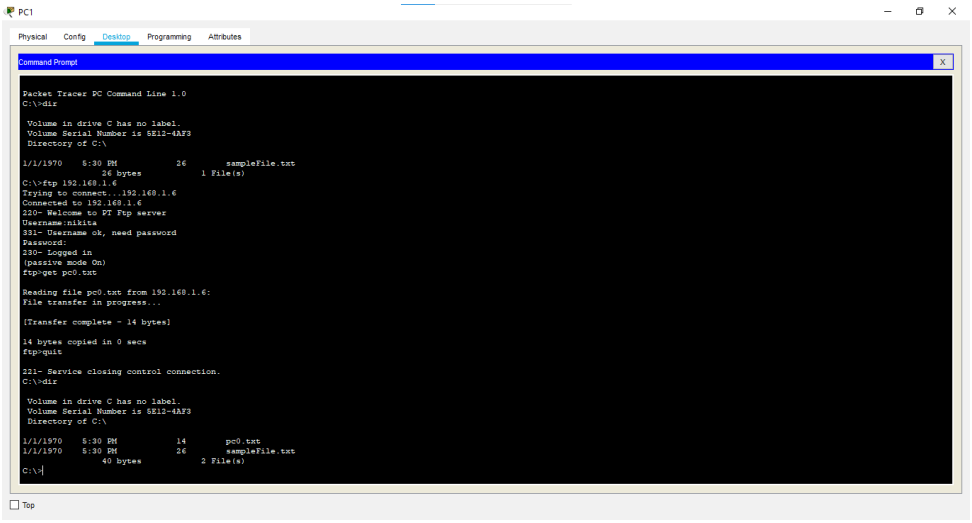
9. Once the file upload is successful, go to the Server FTP directory to verify if the file sent has been received. To do this, go to Server-> Services->FTP. Here look for MyFile.txt sent from the laptop.
10. And then get MyFile.txt this command is used to get that file.

Screenshots:

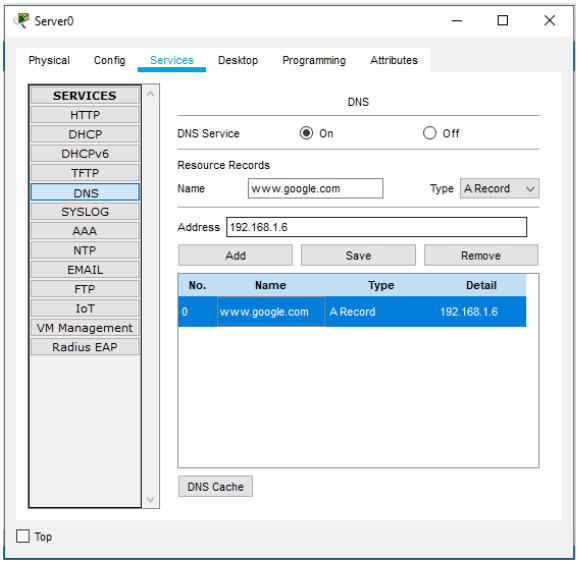
FTP:

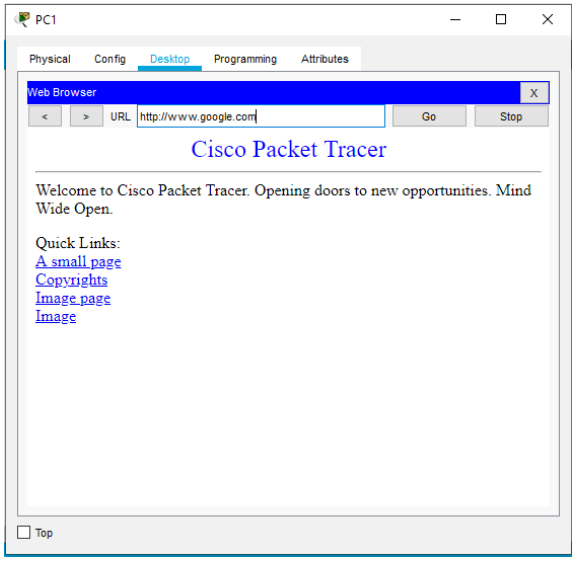


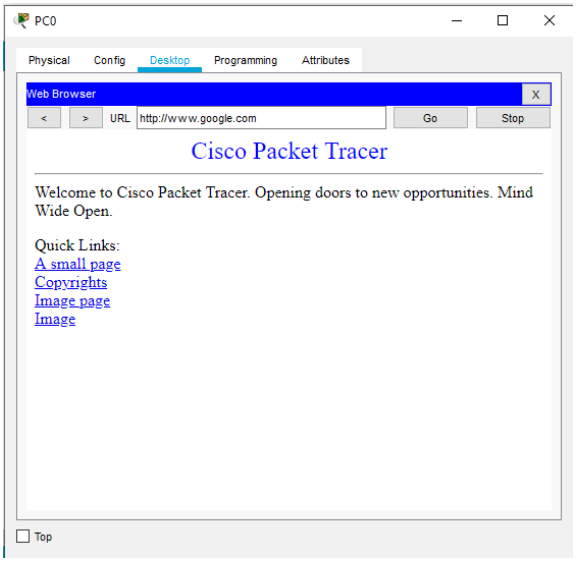



PC1
Physical
Config
Desktop
Programming
Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>dir
Volume in drive C has no label.
Volume Serial Number is 8E12-4AF3
Directory of C:\
1/1/1970 5:30 PM 26 sampleFile.txt
26 bytes 1 File(s)
C:\>ftp 192.168.1.6
Trying to connect...192.168.1.6
Connected to 192.168.1.6
220- Welcome to PT Ftp server
Username:nikita
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>get pc0.txt
Reading file pc0.txt from 192.168.1.6:
File transfer in progress...
[Transfer complete - 14 bytes]
14 bytes copied in 0 secs
ftp>quit
221- Service closing control connection.
C:\>dir
Volume in drive C has no label.
Volume Serial Number is 8E12-4AF3
Directory of C:\
1/1/1970 5:30 PM 14 pc0.txt
1/1/1970 5:30 PM 26 sampleFile.txt
40 bytes 2 File(s)
C:\>
Top

DNS:


Server0
Physical
Config
Services
Desktop
Programming
Attributes
SERVICES
HTTP
DHCP
DHCPv6
TFTP
DNS
SYSLOG
AAA
NTP
EMAIL
FTP
IoT
VM Management
Radius EAP
DNS
DNS Service
On
Off
Resource Records
Name
www.google.com
Type
A Record
Address
192.168.1.6
Add
Save
Remove
No.
Name
Type
Detail
0
www.google.com
A Record
192.168.1.6
DNS Cache
Top


PC1
Physical
Config
Desktop
Programming
Attributes
Web Browser
URL
http://www.google.com
Go
Stop
Cisco Packet Tracer
Welcome to Cisco Packet Tracer. Opening doors to new opportunities. Mind Wide Open.
Quick Links:
A small page
Copyrights
Image page
Image
Top



Conclusion:

In this way, we configured DNS and FTP server. Also, we did not require to remember the domain names.

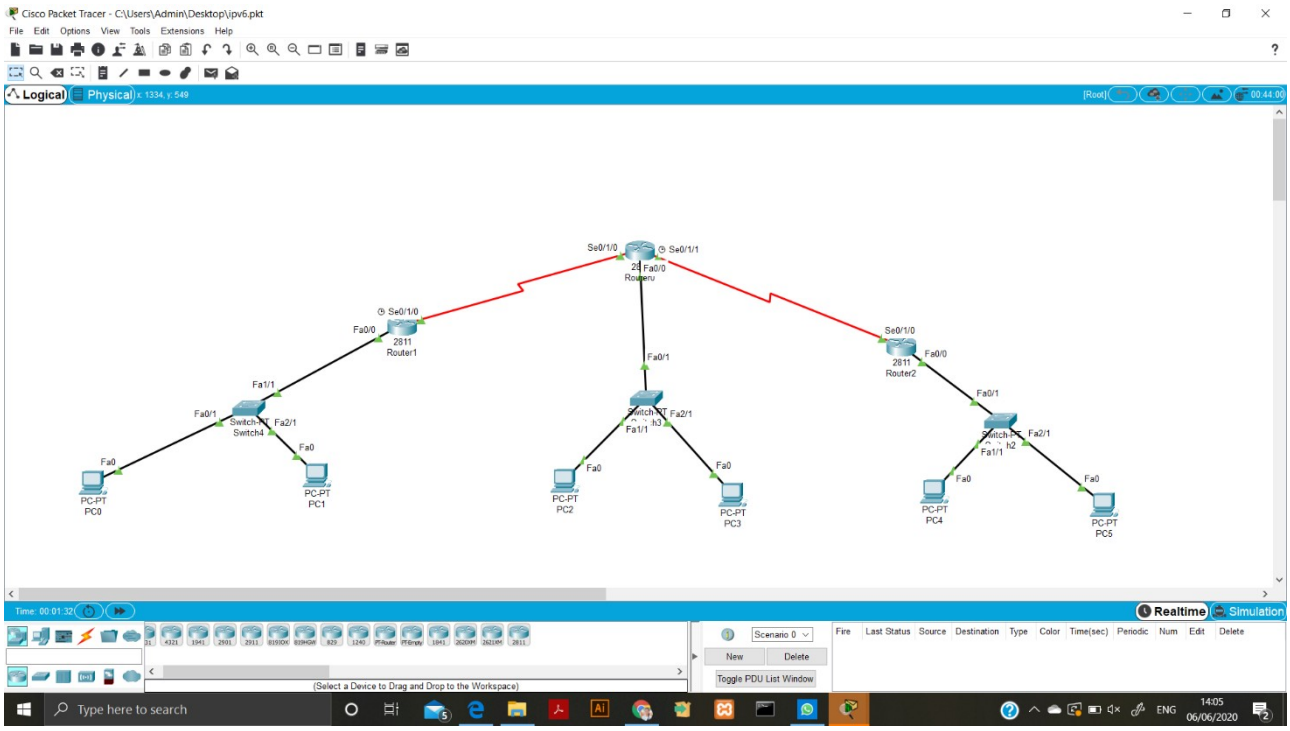
EXPERIMENT NO.: 08

Title: IPV6

IPv6 is the latest version of the Internet Protocol, which identifies devices across the internet so they can be located. Every device that uses the internet is identified through its IP address for internet communication to work.

Devices: Router, Switch, PC

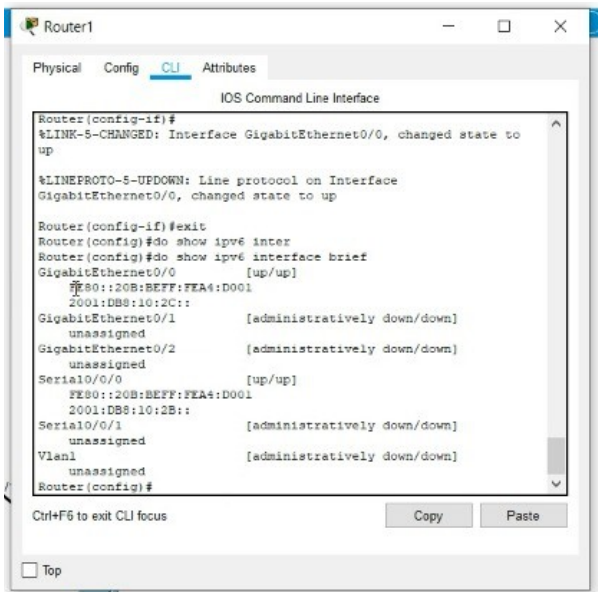
Topology Design:

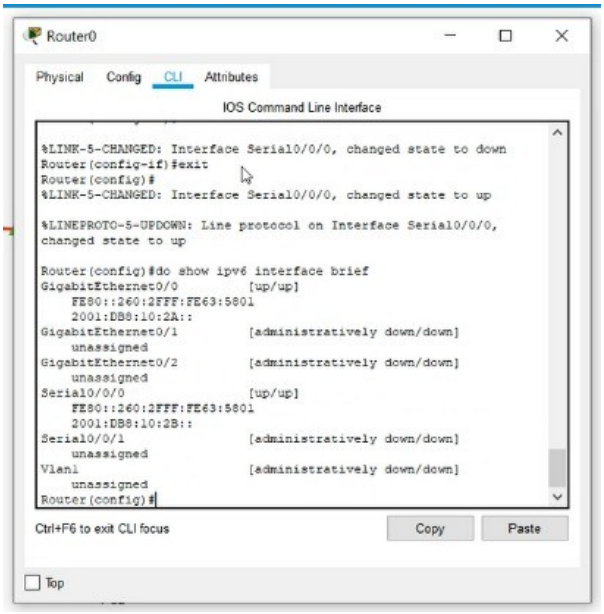


Working:

1. Begin by configuring the router. Enter the interface configuration mode and enable IPv6 on the interface.
2. Next, we will configure a link-local address and a global unicast address on this interface. We'll use *eui-64* to reduce the configuration.
3. Verify that the interface is *up* and has two IPv6 addresses.
4. These IPv6 addresses may vary when you try them out, as they are based on the MAC address. Enable routing so that this router can be identified as a default gateway.
5. The configuration of the router is now done, let's move on to the PCs. Go to the **Desktop** tab of the PC, open **IP Configuration**, and under the **IPv6 Configuration** section, choose **Auto Config**. The gateway and the PC's IP address will be assigned automatically.
6. To view the IPv6 address from the command line of PCs, use the *ipv6config* command.

Screenshots:





Conclusion:

IPv6 overcomes many of the limitations of IPv4 while introducing new features and functionality to make the job of the network administrator easier. Where IPv6 is significantly different from IPv4, the changes are meant to enhance the administration experience.

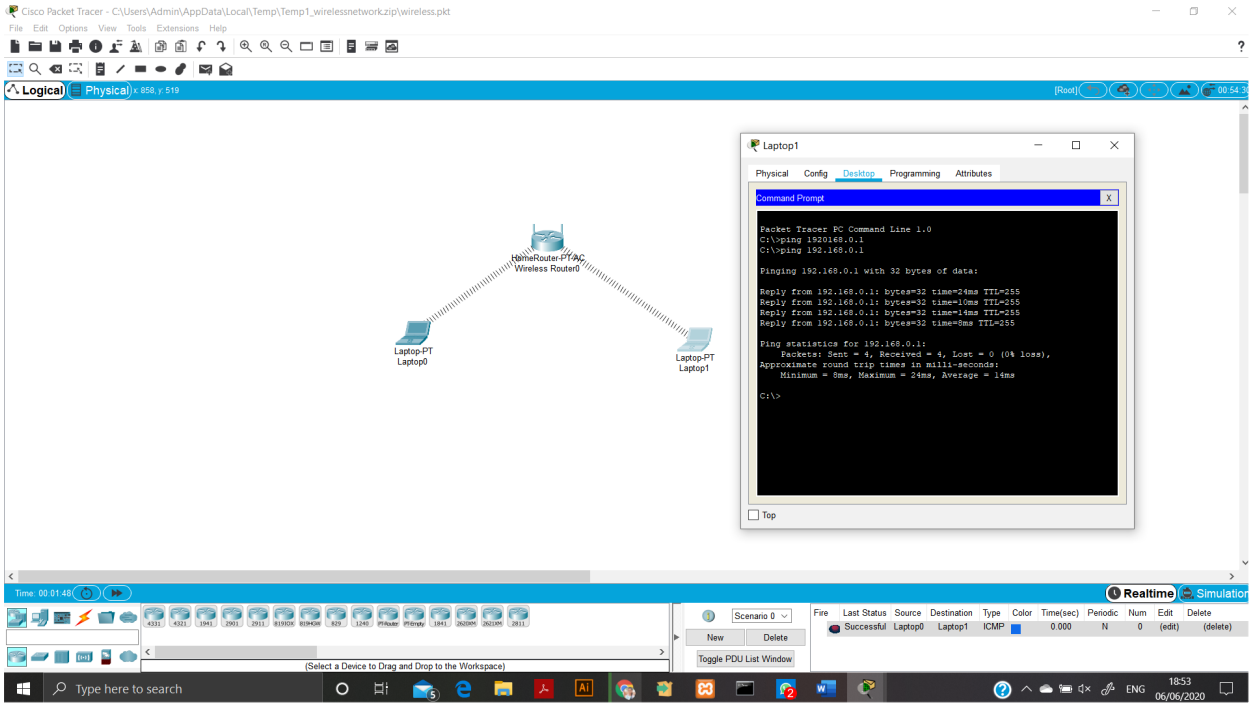
EXPERIMENT NO. : 09

Title: Wi-Fi Router Configuration

A wireless router, also called a Wi-Fi router, combines the networking functions of a wireless access point and a router. A router connects local networks to other local networks or the Internet.

Devices: WiFi Router, Laptop

Topology Design:



Steps and Commands:

1. Still, in the **Wireless** tab, under the **Wireless Security** sub-tab, change security mode to **WPA personal,**
2. then set the **passphrase** field to a password of your choice. Scroll down and **Save settings**
3. The LAN network is now secured for wireless access. To test whether its protected, click **Laptop1->Desktop->Wireless.**
4. A new window appears that shows the now secured wireless network. Click **connect.** You can now see the name of the wireless network (**ITLab**, in my case) and its signal strength.
5. Again, click **connect, t**hen provide the security First get into Cisco Packet Tracer and in the physical mode, pick a wireless router and two laptops.

6. For the laptops, replace the already-installed wired LAN module with a wireless adapter module Make sure that you first power off each laptop before you make any replacement then restore the power after replacement.
7. Once you have the wireless modules in place, you'll see the wireless connections come up between the laptops and the wireless router

8. We'll access the router from the PC or the laptops using the router's LAN interface. The LAN interface is simply the default gateway of the LAN. So now, on the ADMIN PC browser, type the IP address of the LAN interface of the wireless router. (192.168.0.1 by default), then hit **Go.**

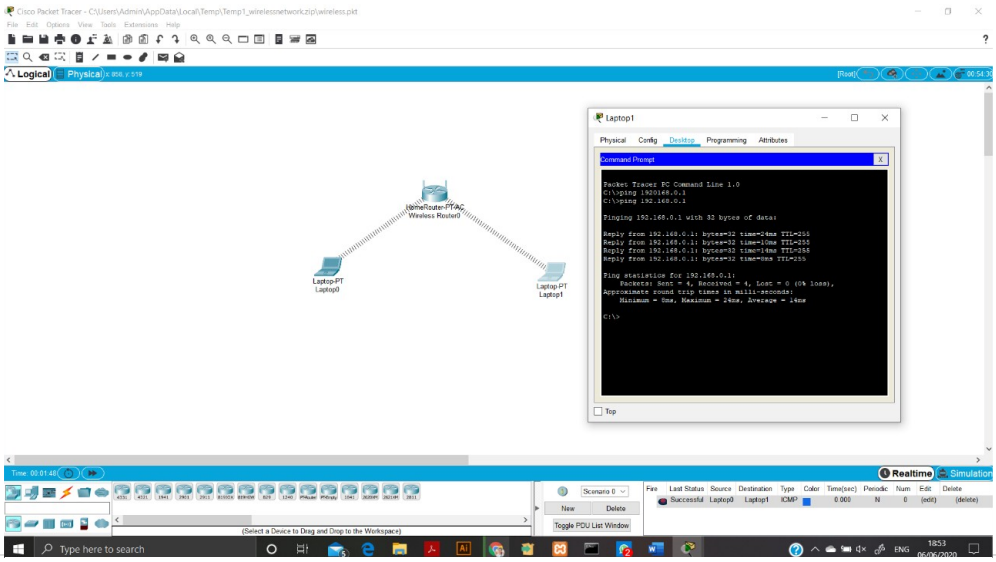
9. A login prompt appears. Provide the username (**admin)** and password (**admin**) to be allowed into the GUI of the router.

- **Adding security for wireless LAN access:**

The LAN network we have just setup has no wireless security features enabled. So, let's implement some level of wireless security to our LAN.

10. Access the GUI of the wireless router (either by clicking on Router icon or from Admin PC browser), then click on the Wireless tab. Under the Basic Wireless Settings sub-tab, change the default wireless SSID to any name of your choice. I have named mine 'ITLab'. After this, don't forget to save settings.
11. pre-shared key for the Wi-Fi that you set, then connect. Laptop 1 is now connected to the Wi-Fi network. You can see at the bottom right of the screen that the wireless network adapter on the laptop is active.
12. Repeat this process for the Laptop2.
13. At last ping the server from Laptops. Ping should succeed.

Screenshots:



Conclusion:

By using Wi-Fi Router, we can be able to connect with the internet without any physical connection. It also provides many security options to keep connections safe and secure. It is fast and also easy to configure as there is no physical connection.