****

**COMPUTER NETWORKS**

**LAB MANUAL**

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Table of Contents

[LAB # 1 2](#_Toc25255)

[Topic: Commands 2](#_Toc16433)

[ LAB # 2 7](#_Toc427)

Topic: [Hubs,Switches and Router 7](#_Toc27237)

[ LAB # 5 8](#_Toc25739)

Topic: Bridge[: 8](#_Toc5402)

[ LAB # 3 1](#_Toc15858)2

Topic:[Topologies 1](#_Toc31879)2

[ LAB # 4 1](#_Toc8800)4

[1. 2-Servers with domain name: 1](#_Toc1593)4

[2. Email Server: 1](#_Toc11245)6

[ LAB # 6 1](#_Toc4804)9

[1. Telnet Configuration 1](#_Toc13145)9

[2. Router Configuration through PC:(TELNET) 2](#_Toc31616)1

[Dynamic Host Configuration Protocol (DHCP): 2](#_Toc15720)3

1.[Configure DHCP Server through CLI: 2](#_Toc20237)4

[ LAB # 7 2](#_Toc32564)7

[1. FTP Server: 2](#_Toc5343)7

[ What Does Static Routing Mean? 3](#_Toc19061)0

[2. Static Routing using two Routers: 3](#_Toc3580)0

[3. Static Routing using three Routers: 3](#_Toc23304)1

[ LAB # 8 3](#_Toc13961)4

[1. RIP Routing using three Routers: 3](#_Toc26731)4

[ LAB # 9 3](#_Toc27229)5

[1. Wireless Router: 3](#_Toc28369)5

[Wireless Router GUI: 3](#_Toc4277)6

[ Disable DHCP Server 3](#_Toc5801)6

[ Change Network Name 3](#_Toc3590)6

[ Change security Mode(WEP)+ Enter Key1: 3](#_Toc308)7

[ Connect Wireless Router in PC: 3](#_Toc32007)7

* **LAB # 1**

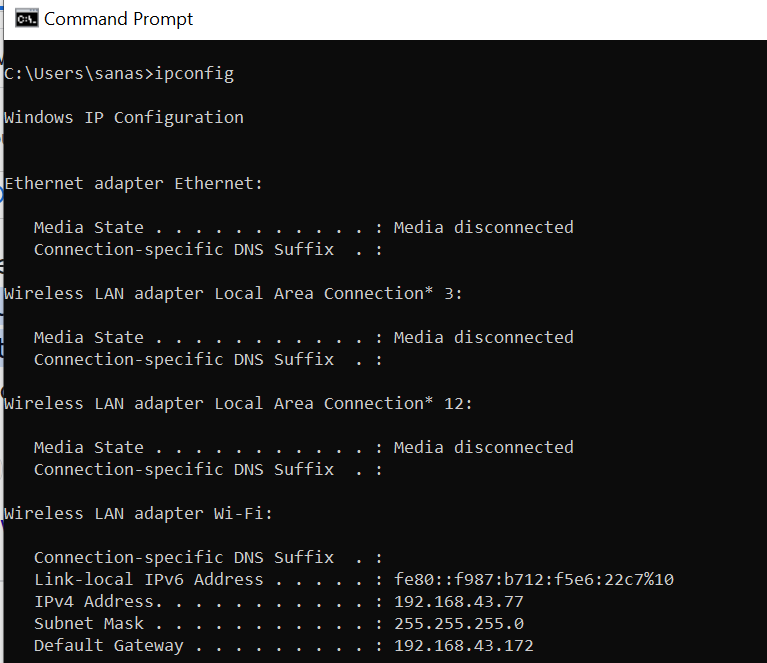
**Topic:** **Commands**

1. **IPCONFIG** (standing for "**Internet Protocol configuration**")shows IP address, Sub-net Mask, and Default gateway for all adapters.

The basic syntax of the command is “ipconfig [options],” where “options” are the optional parameters used to modify the command’s output. Some of these most used options include:

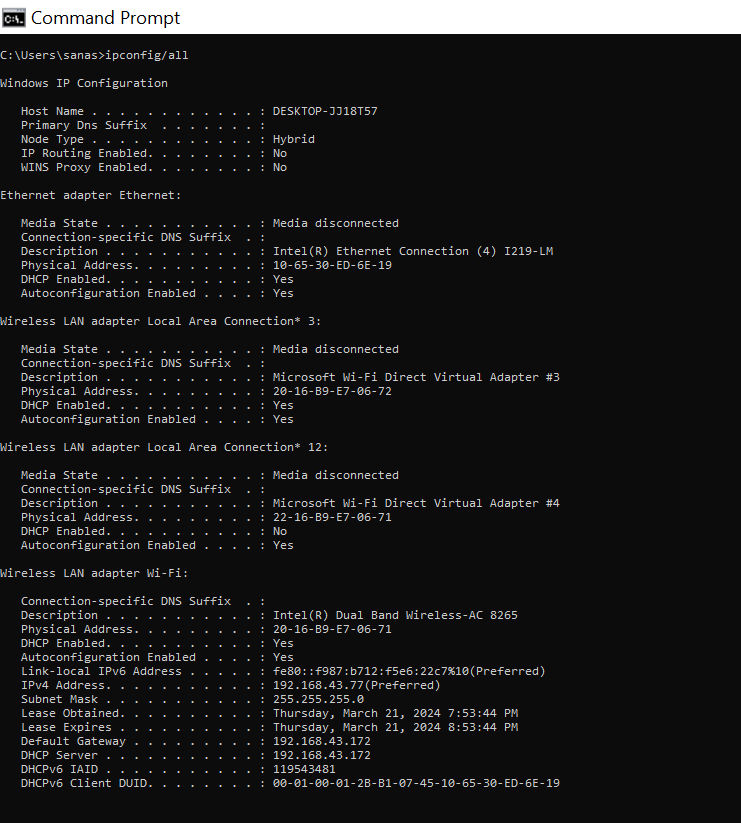
* ****ipconfig /all****
* ****ipconfig**** ****/release****
* ****ipconfig**** ****/renew****
* ****ipconfig**** ****/flushdns****
* ****ipconfig**** ****/?****or ****/help****:

In this first lab,we only discuss **ipconfig/all** command.



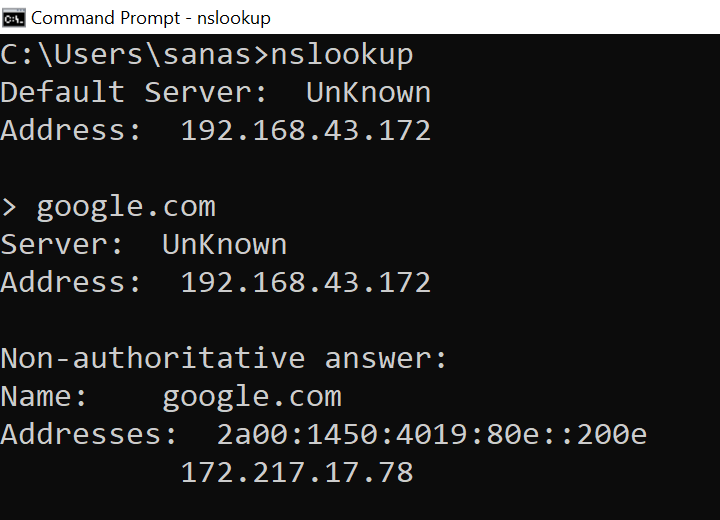
1. **IPCONFIG /ALL** shows the description of each network connection along with additional information such as your physical (MAC) address, DHCP connections, Lease times( the amount of time before the DHCP server reclaims an IP address) as well as in-depth IPv6 information.

|  |  |
| --- | --- |
| **Physical Address** | The MAC address or hardware address of your network adapters |
| **DHCP Enabled** | Shows what your network connection is using: static IP address or DHCP |
| **IPv4 Address** | Indicates the IP address of your Windows device |
| **Sub-net Mask** | Distinguish between a host address and a network address in the IP address |
| **Lease Obtained** | The time your hardware received the IP address |
| **Default Gateway** | The address of the router interface |
| **DHCP Server** | Automatically provides and assigns IP addresses to your computer |
| **DNS Servers** | Servers that translate domain names into IP addresses |

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1. **nslookup Command:**

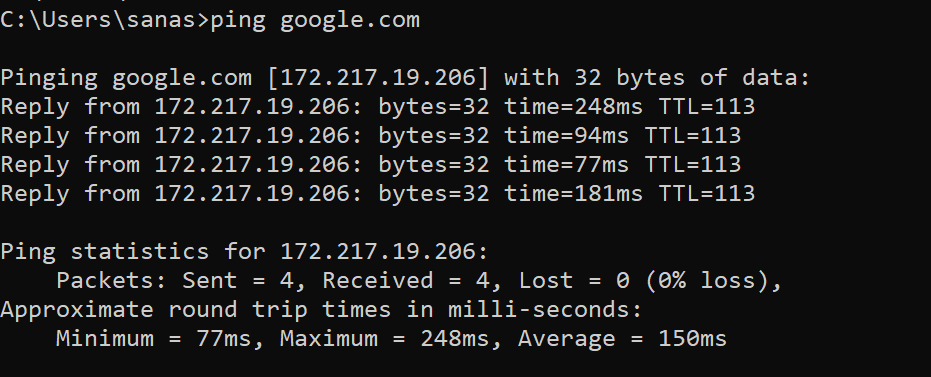
Nslosokup (stands for “Name Server Look-up”) is a useful command for getting information from the DNS server. It is a network administration tool for querying the Domain Name System (DNS) to obtain domain name or IP address mapping or any other specific DNS record. It is also used to troubleshoot DNS-related problems.

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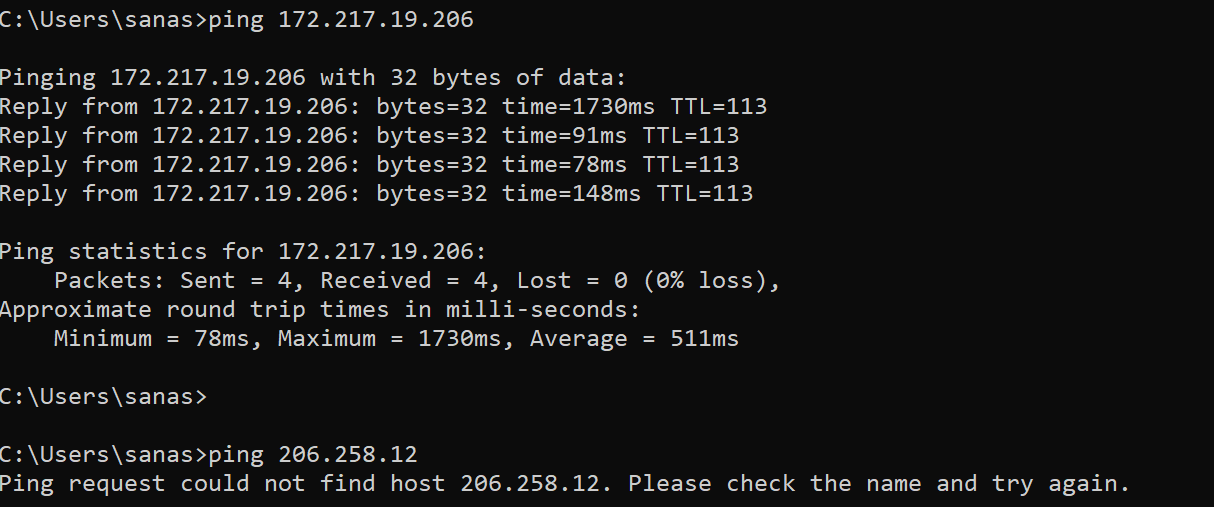
1. **Ping Command:**

Ping command is used to find when a source or node is reachable or not. Ping is a simple command that can test the reachability of a device on the network.

**Syntax:** “Ping domain name”

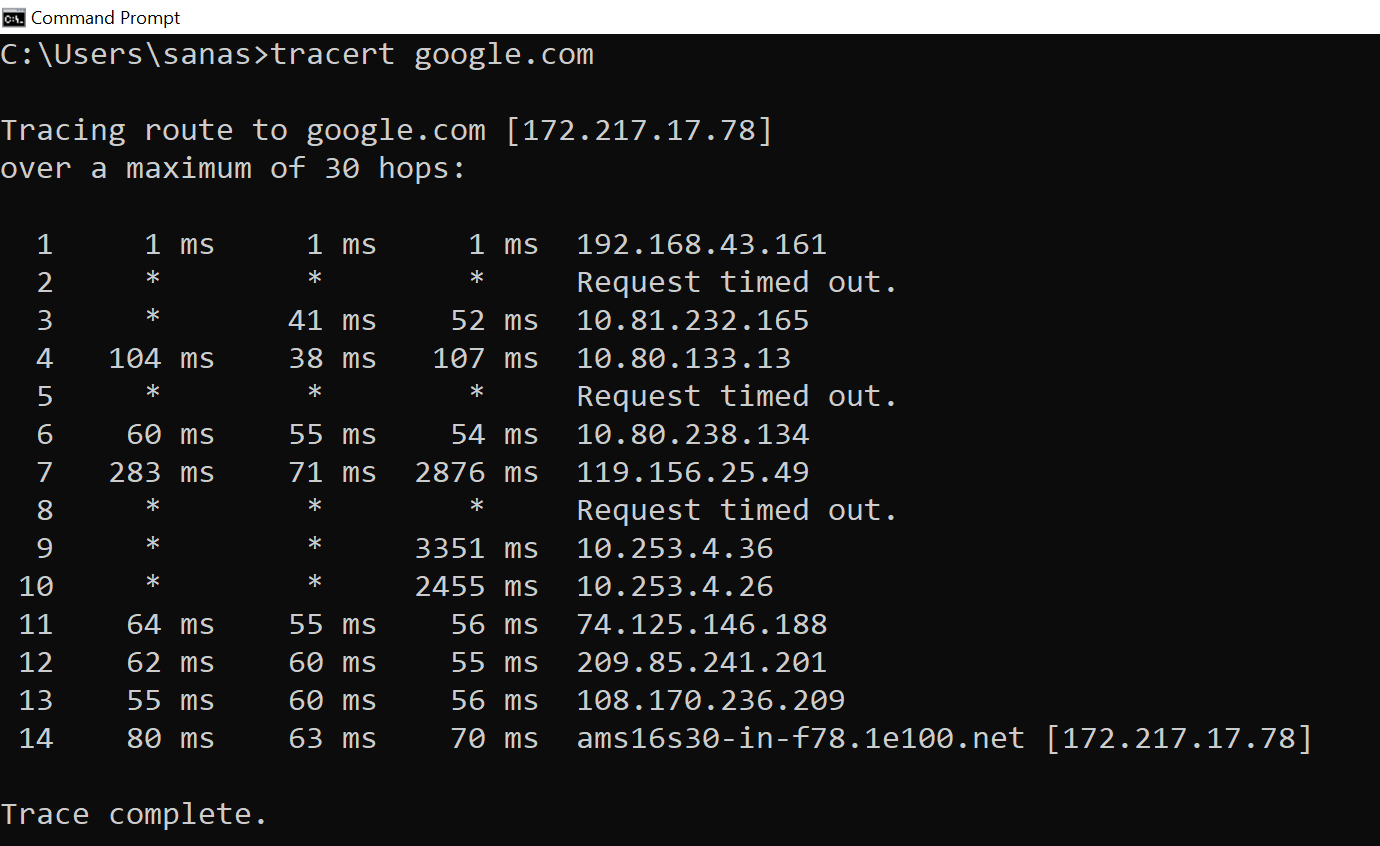
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**Using IP-Address**

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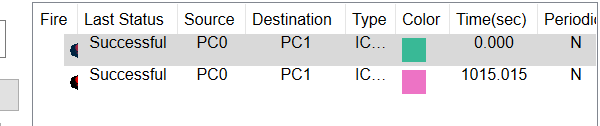
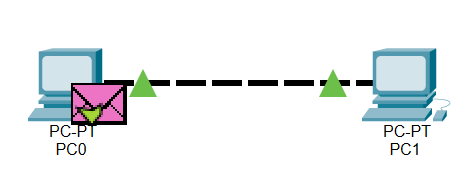
1. **Tracert Command:** Tracert (Traceroute) is a command you use to 'trace' the route that a packet takes when traveling to its destination. It's useful for tracing network problems, discovering where connections fail, and tracking down latency problems.

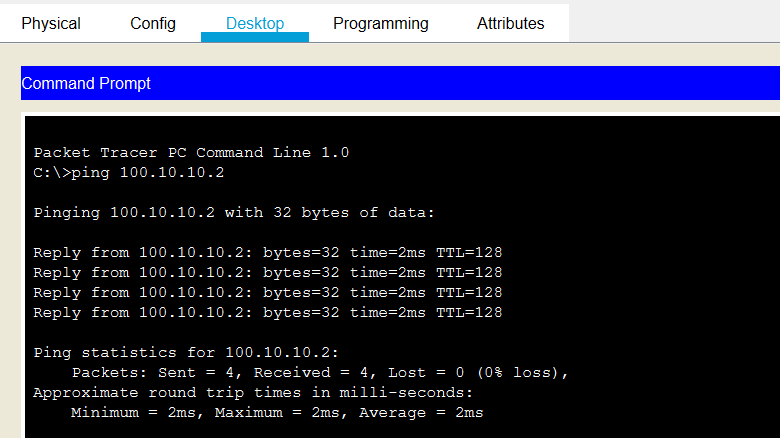
**Syntax:** tracert domain name

****

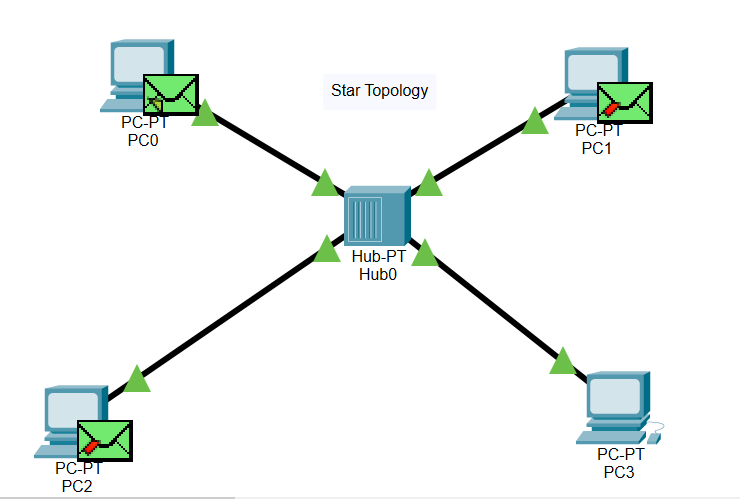
1. **Peer to Peer Network:**

P2P network,****a simple network of computers that share files and resources among each other without a central server.****

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1. ****Star Topology:**** A star topology is a topology for a Local Area Network (LAN) in which all nodes are individually connected to a central connection point, like a hub or a switch.

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* ****LAB # 2****

****Hubs,Switches and Router****

To connect two or more devices we use intermediate devices

**Hub**: work at physical layer, cheap , rarely used.

**Switches**: IP address use.

**Router:** Mac address use

**Similarity:** Use in LAN

**Difference between Host and Server Network**

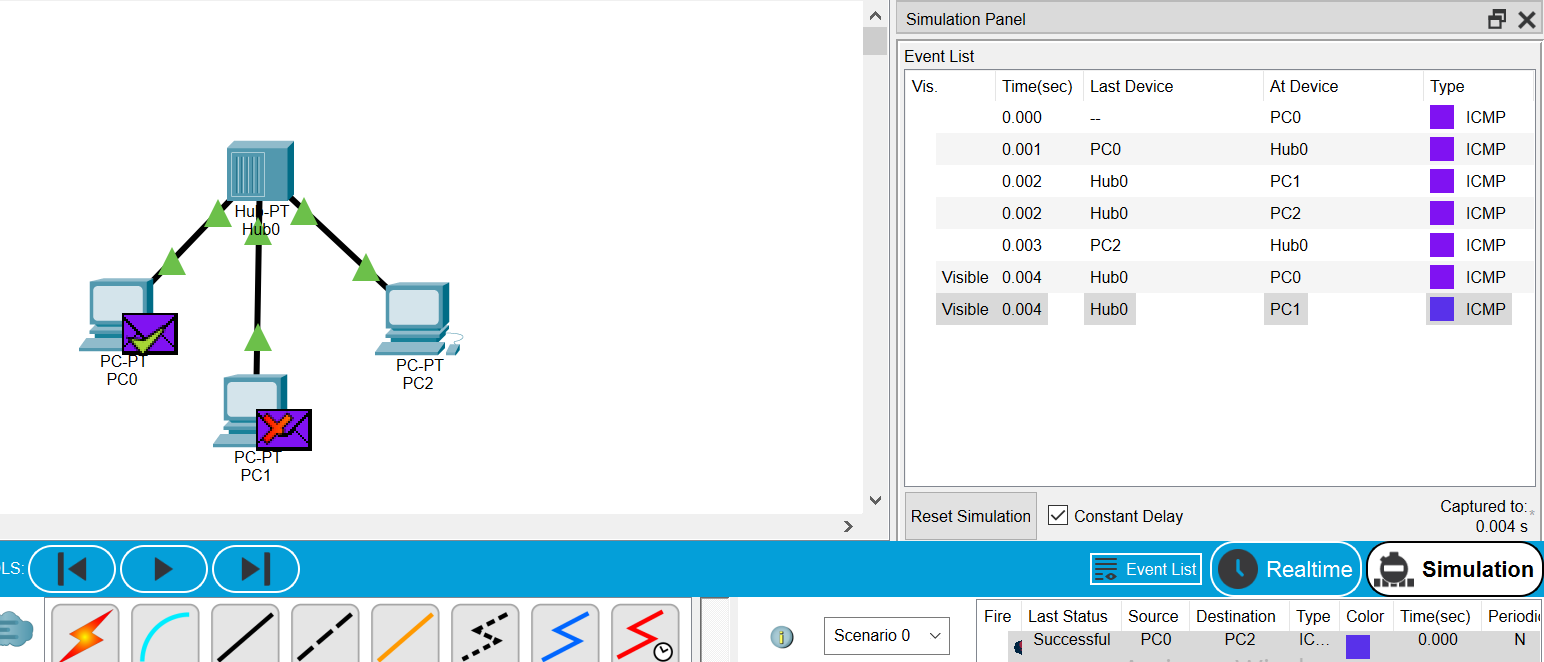
**Host:**

* Has a unique IP address
* It could be any personal PC

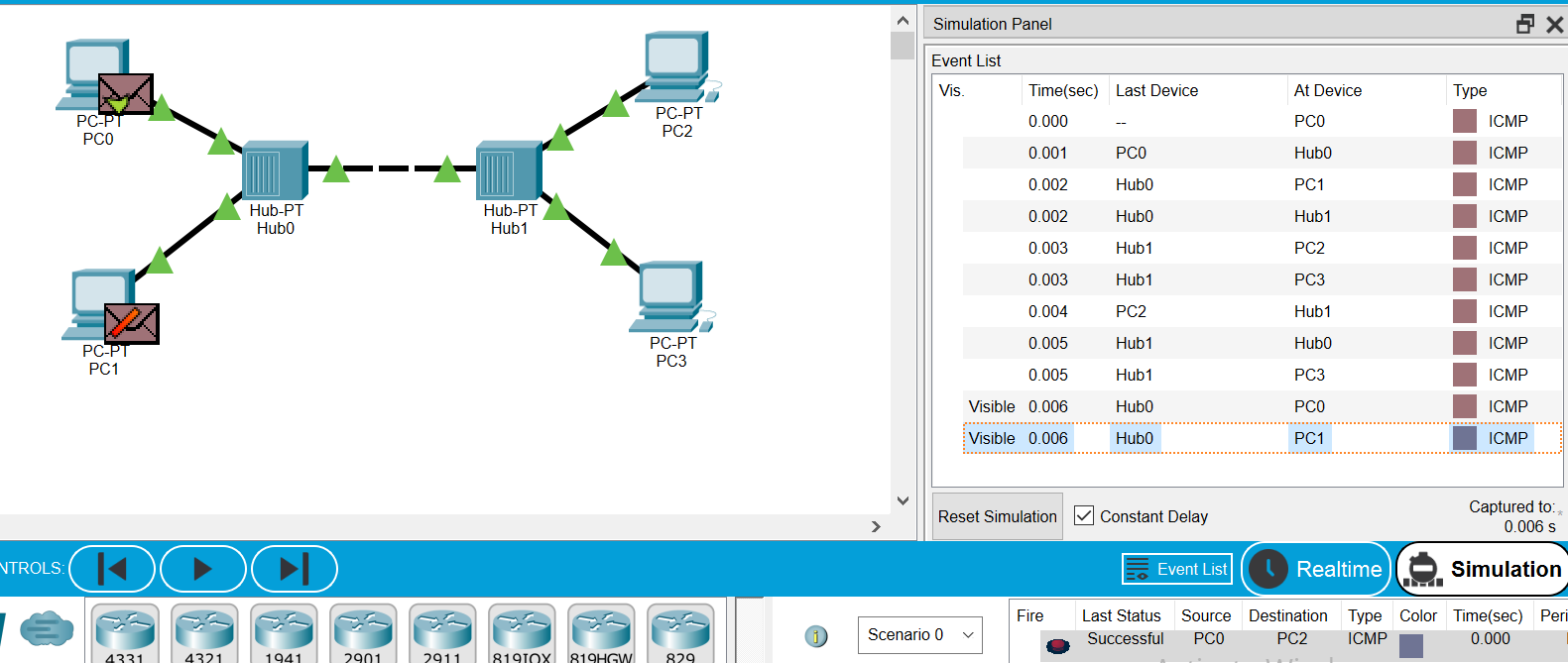
**Server:**

* A hardware or could be a software
* It provide services to other programs and devices in the network

1. One Hub connect with three devices:

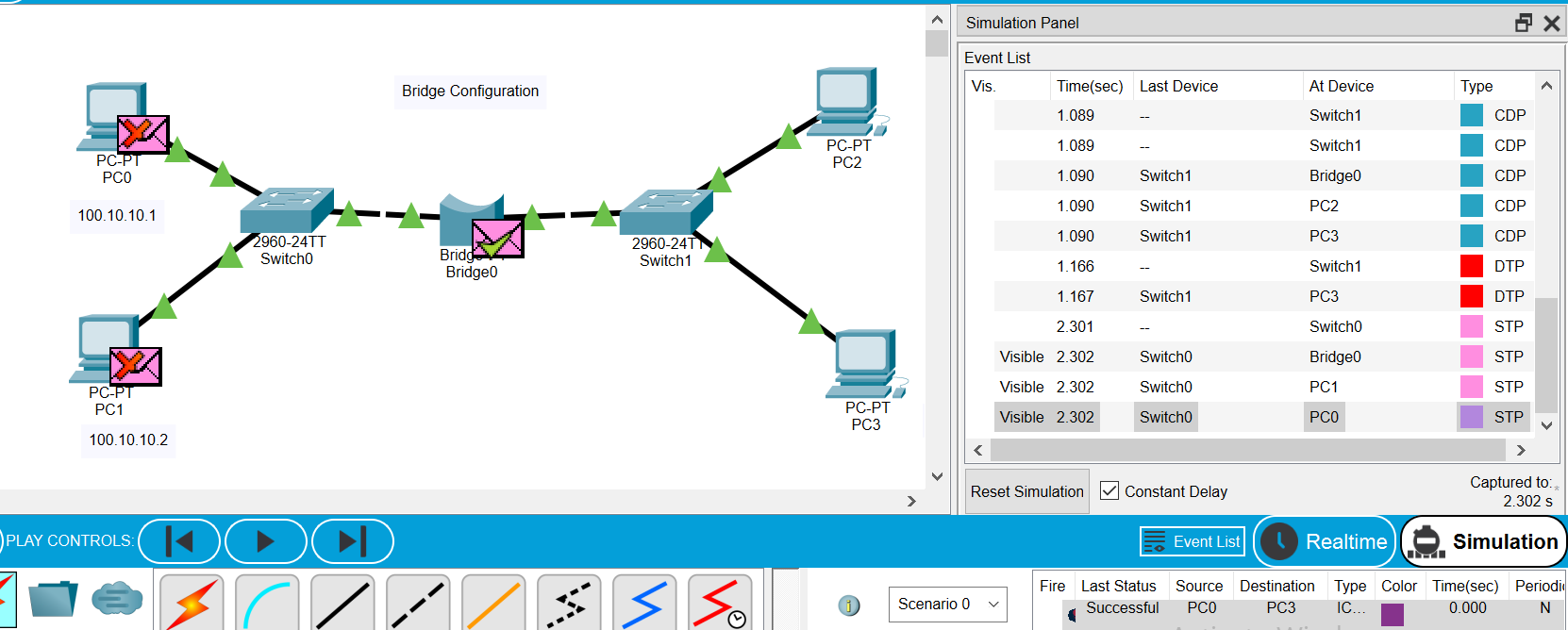


1. Two hubs connect with each other:

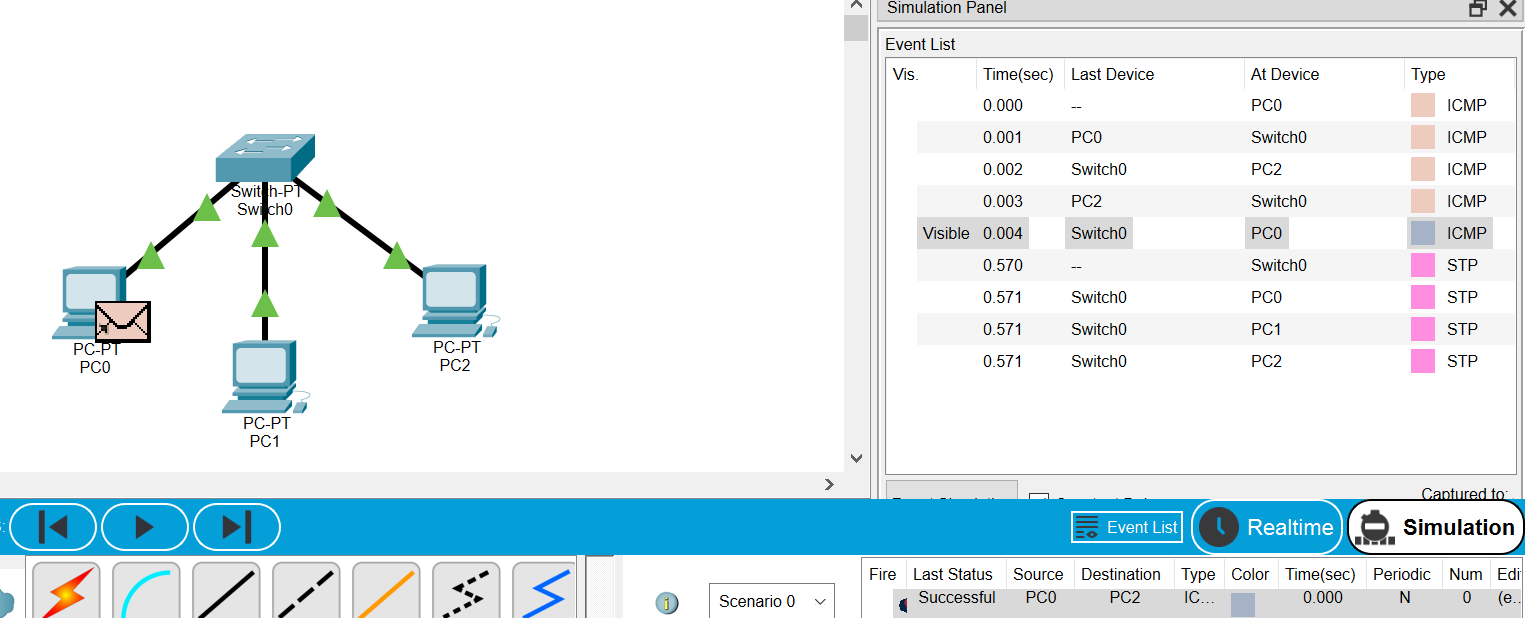


* ****LAB # 5****

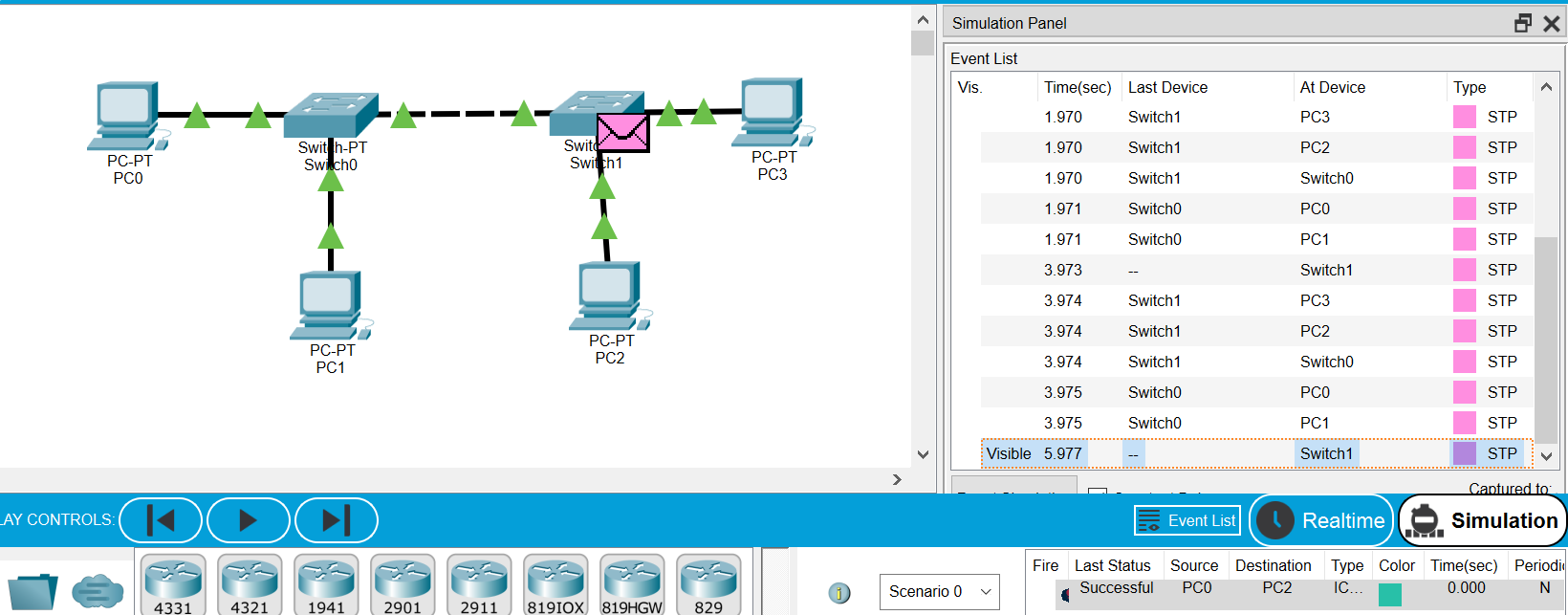
1. Bridge: A bridge is a network device that connects multiple sub-networks to create a single network. It provides interconnection with other computer networks that use the same protocol. Through a bridge, multiple LAN's can be connected to form a larger and extended LAN.



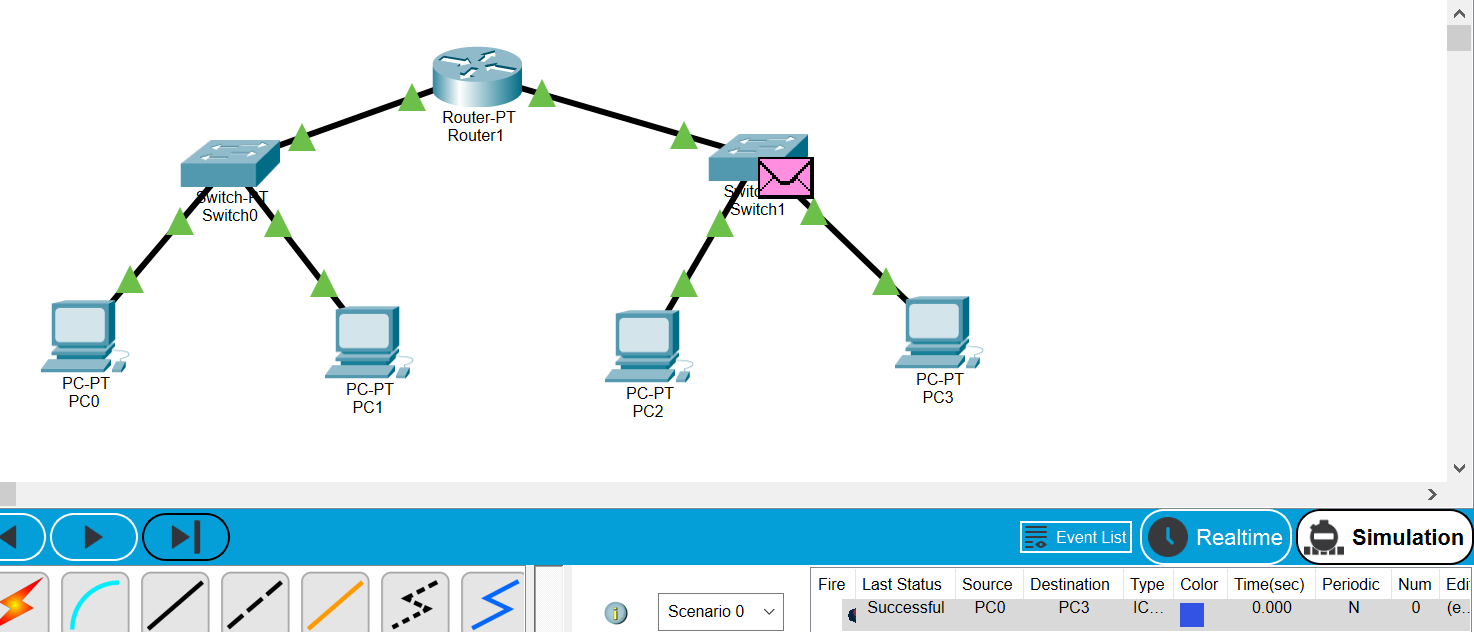
1. One switch connect with 3 PC’s:



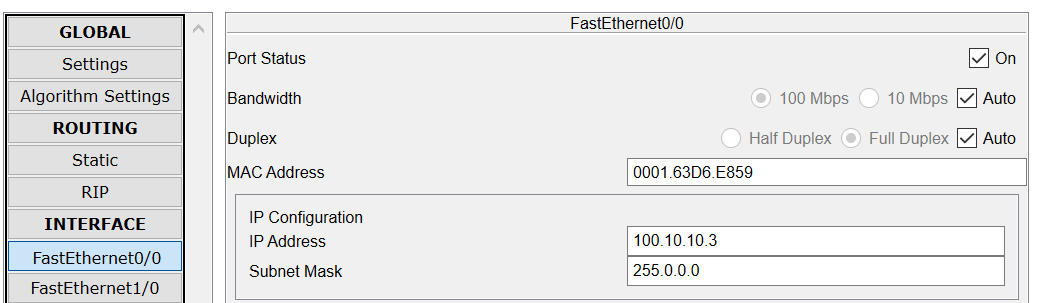
1. Two switches connect with each other:



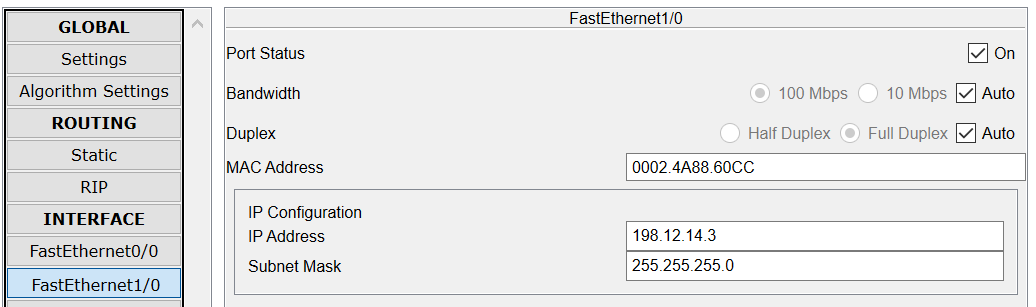
1. **Two Switches connect with one Router:**

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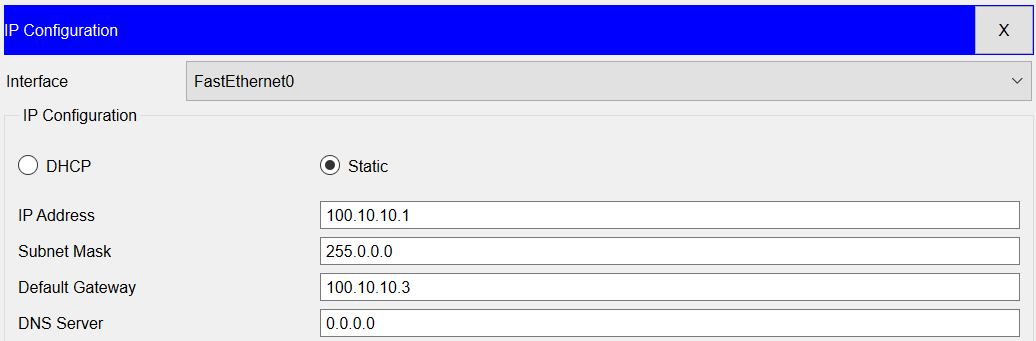
**Router IP configuration Fast Ethernet 0/0:**

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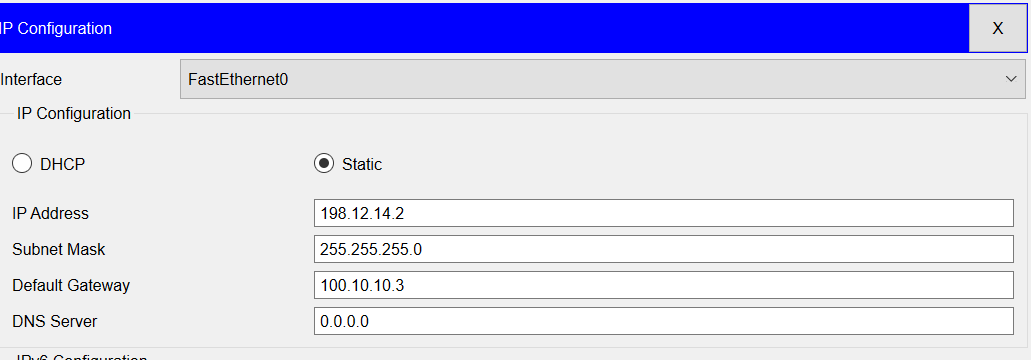
**Router IP configuration Fast Ethernet 0/1:**

****

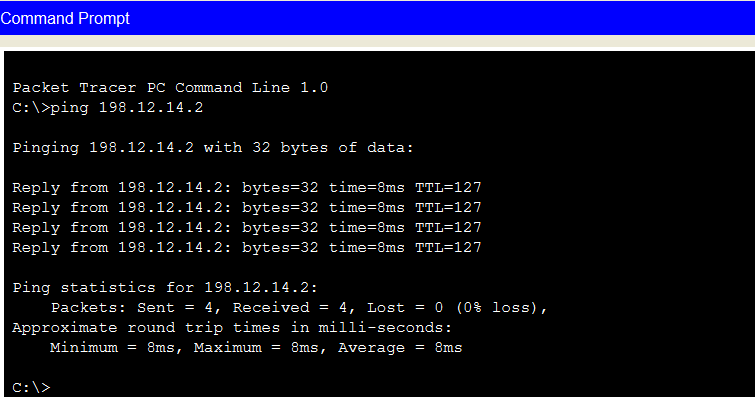
**PC0 IP Configuration and Default Gateway:**

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**PC3 IP Configuration and Default Gateway:**



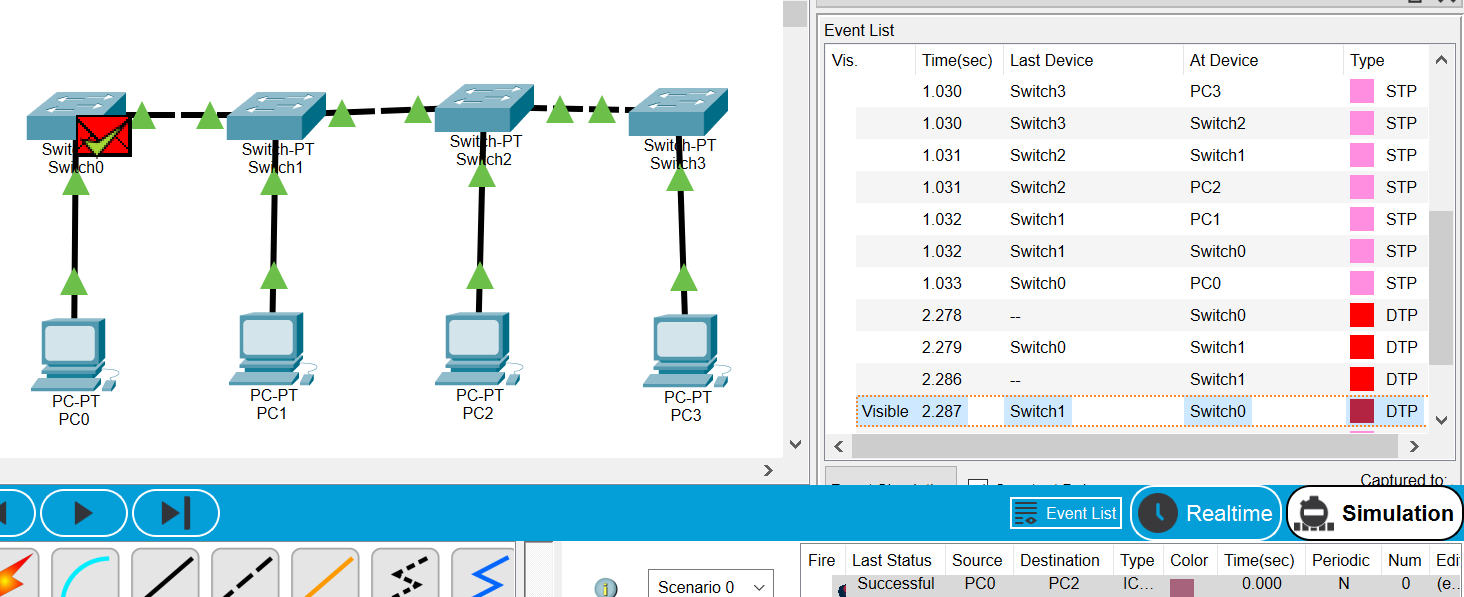
**Ping Command from PC0(100.10.10.1) to PC3(198.12.14.2):**

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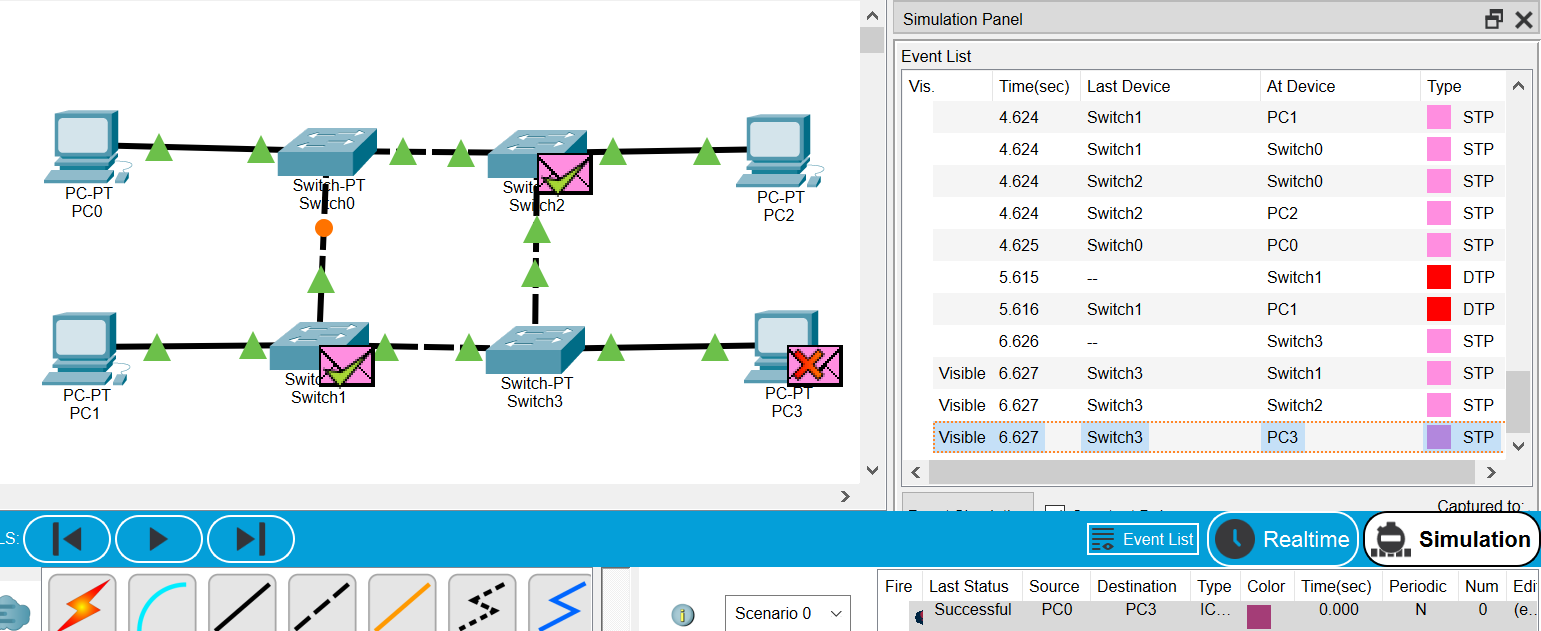
* LAB # 3

### Topologies

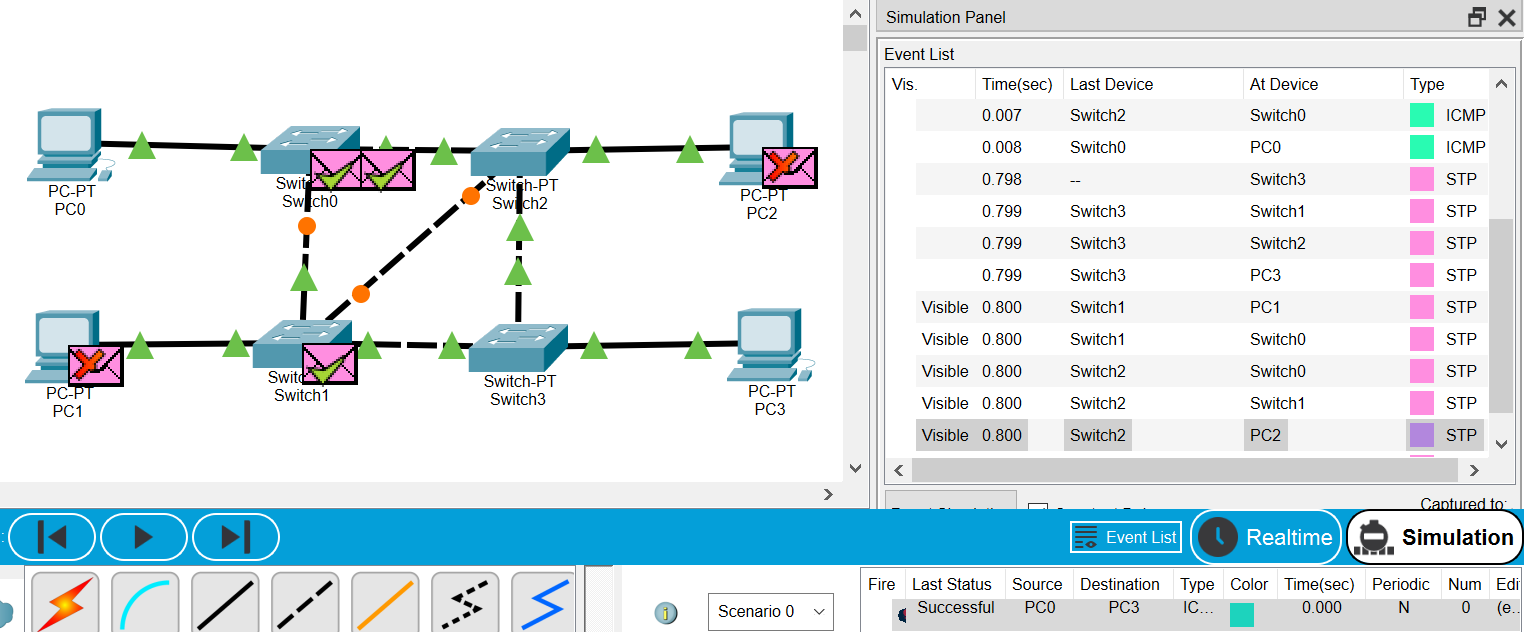
1. Bus Topology: is a type of network topology in which all devices are connected to a single cable called a "bus." This cable serves as a shared communication medium, allowing all devices on the network to receive the same signal simultaneously.



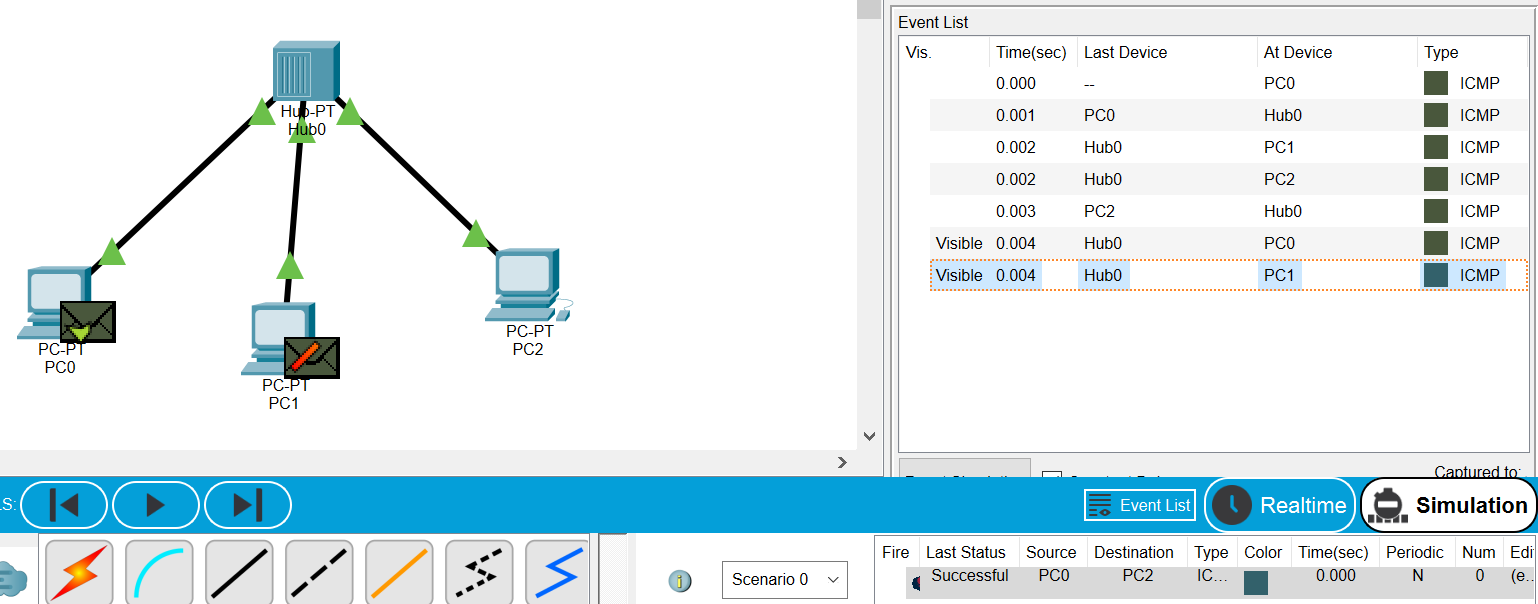
1. Ring Topology: is a type of network configuration where devices are connected in a circular manner, forming a closed loop. In this setup, each device is connected to exactly two other devices, creating a continuous pathway for data transmission.



1. Mesh Topology: is a type of computer network in which each node (computer or other device) is connected to every other node in the network. This type of network is often used in large organizations or companies because it can handle a large amount of data traffic and can be easily expanded.

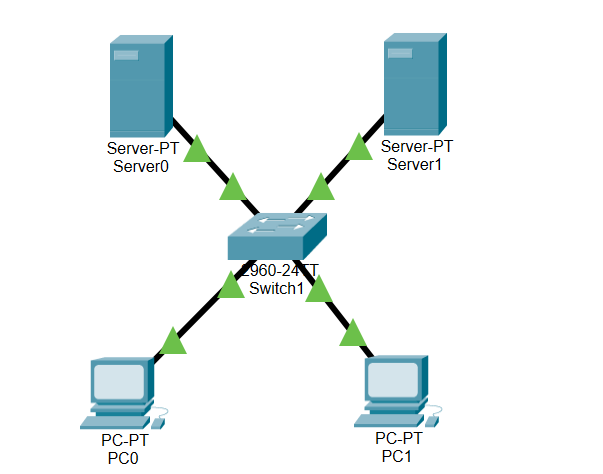


1. Star Topology: is a network topology in which each network component is physically connected to a central node such as a router, hub or switch. In a star topology, the central hub acts like a server and the connecting nodes act like clients.

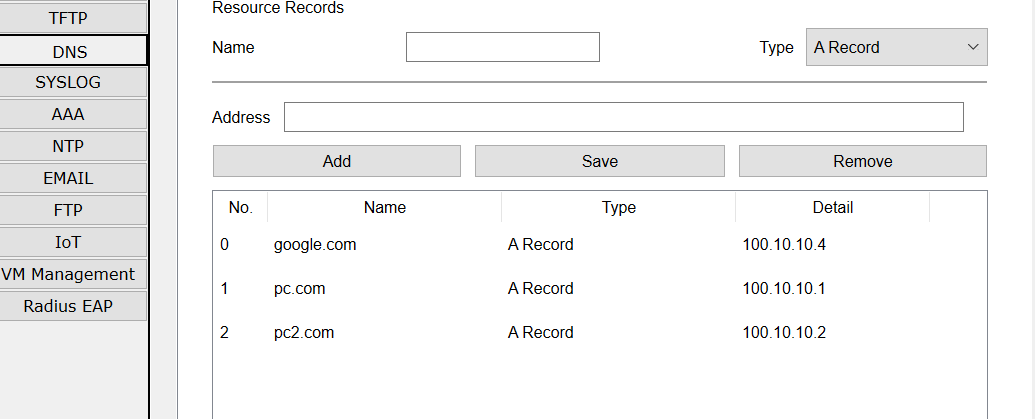


* LAB # 4

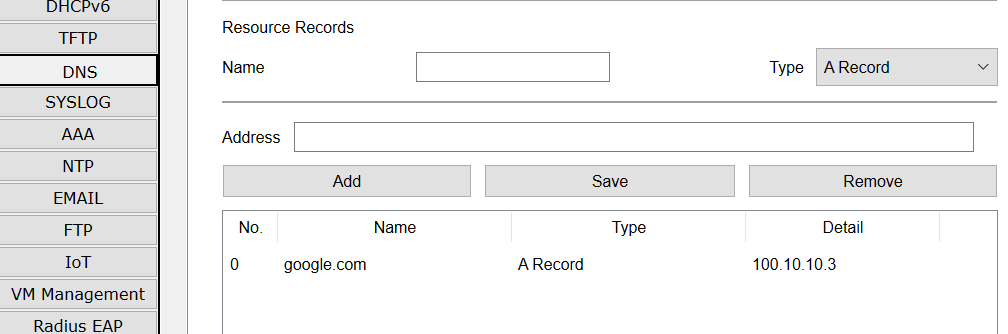
1. 2-Servers with domain name:



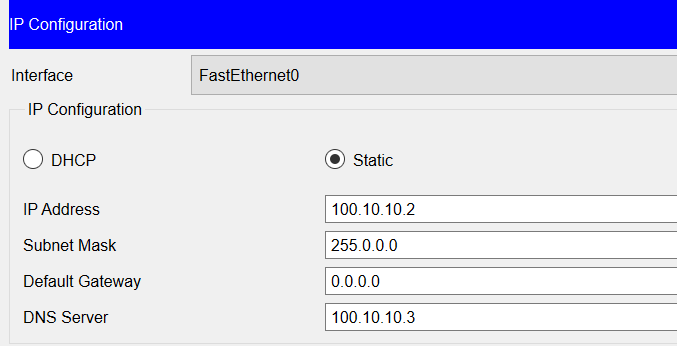
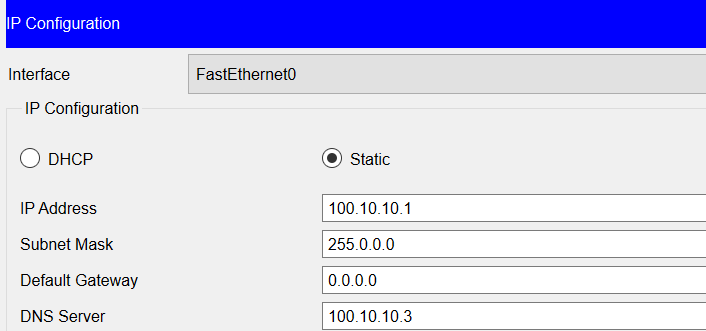
Server-PT Server0 DNS Configuration:



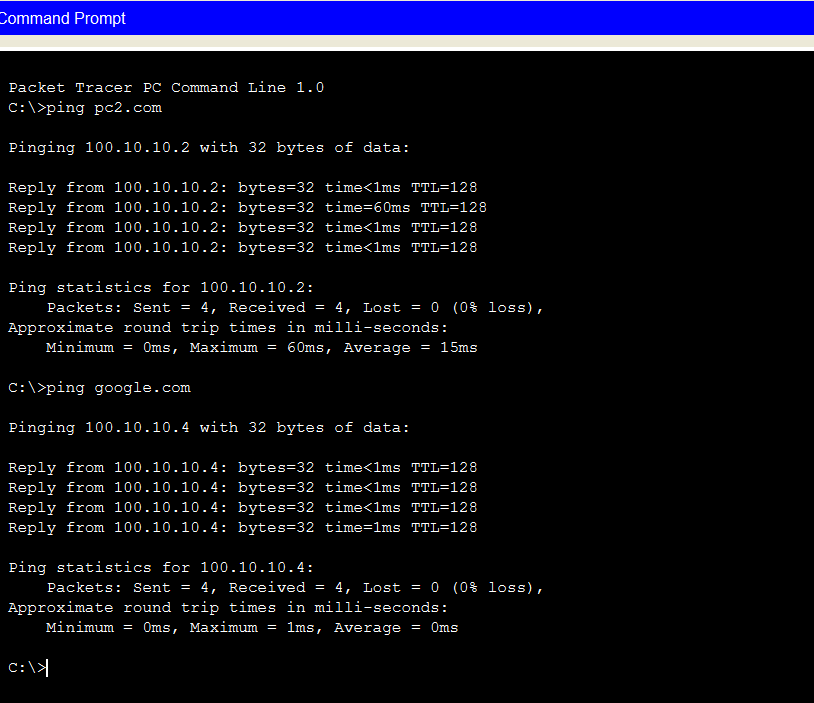
Server-PT Server1 DNS :



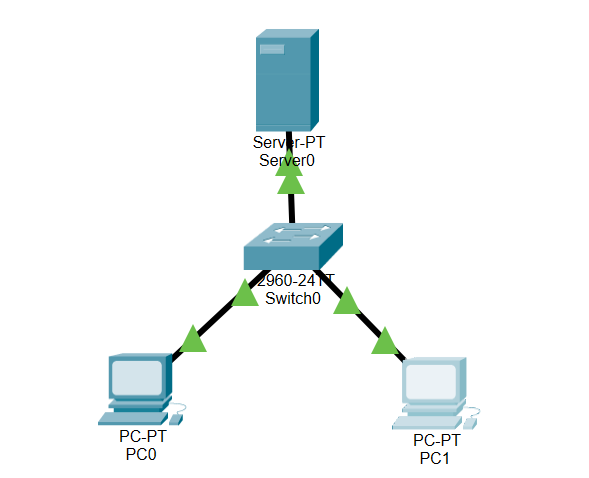
PC0 IP Configuration: PC1 IP Configuration:



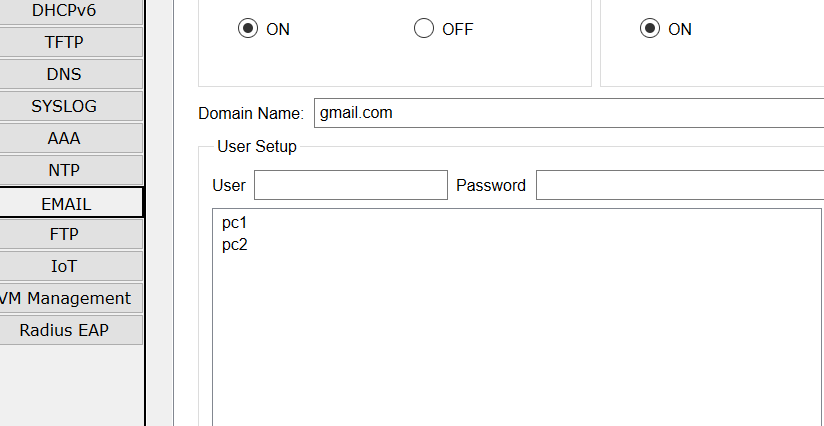
PING COMMAND:



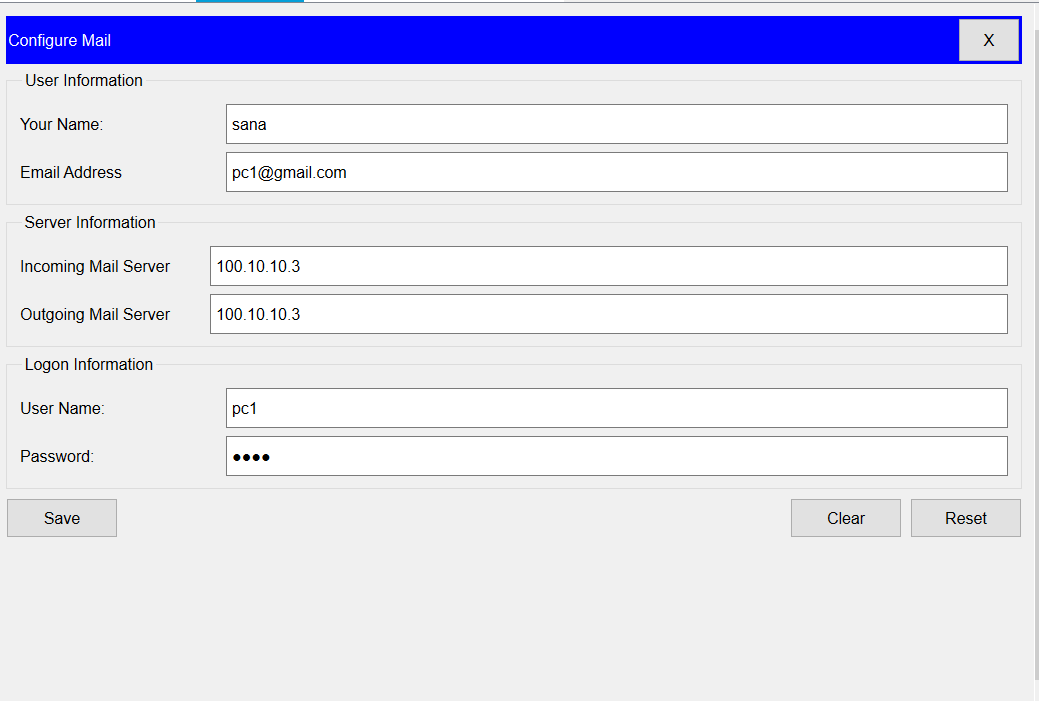
1. Email Server:



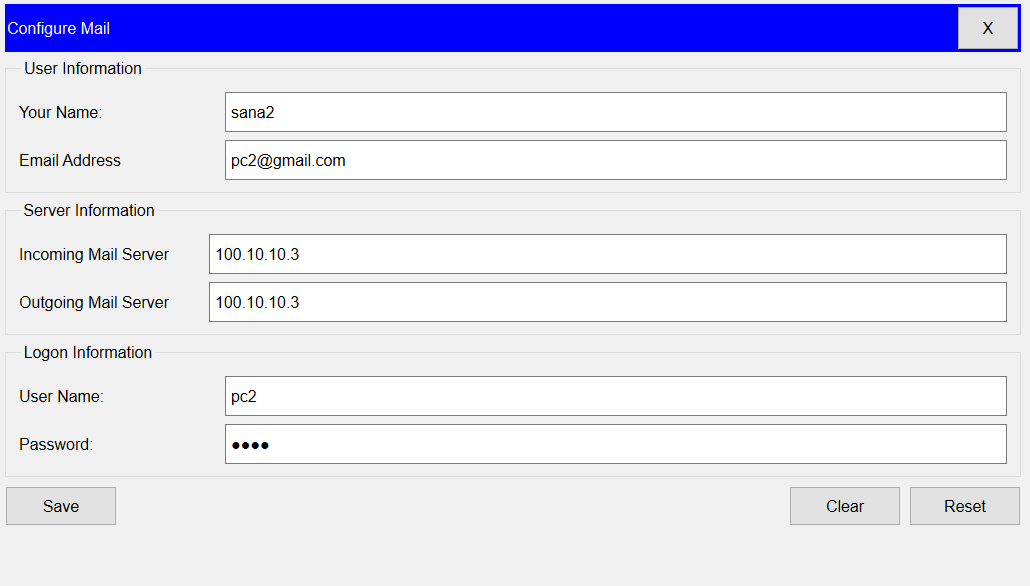
Sever Email:



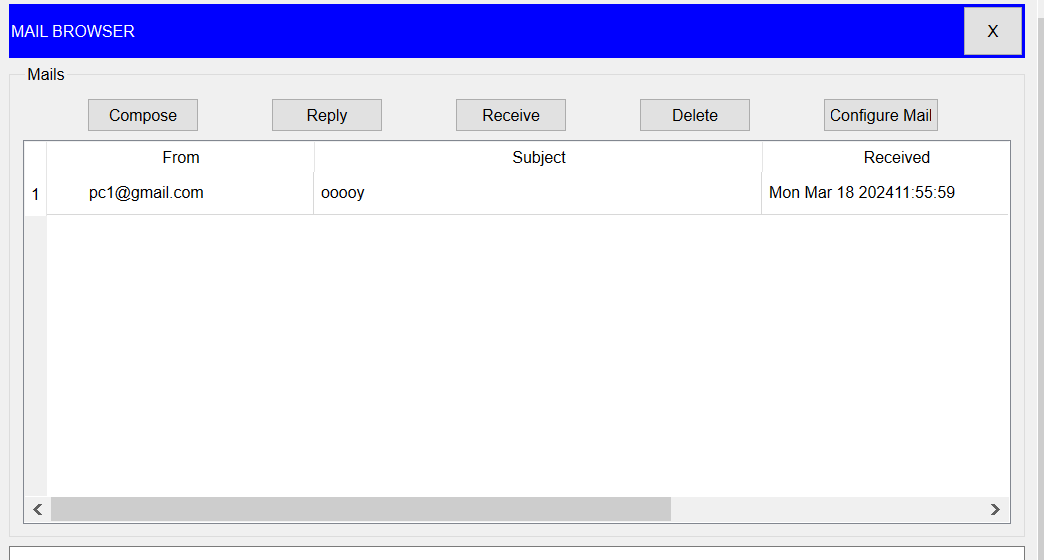
PC0 Email Configuration:



PC1 Email Configuration:



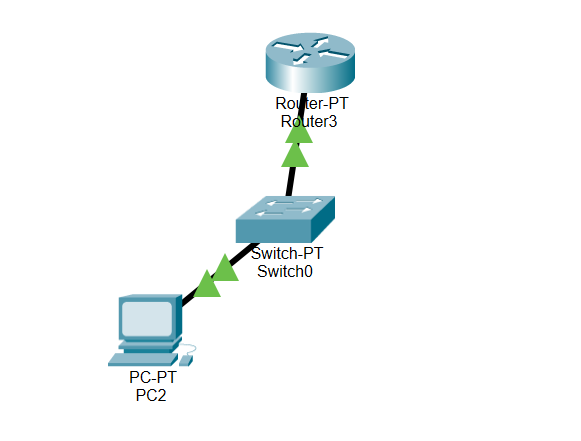
Received Email from PC0 to PC1:

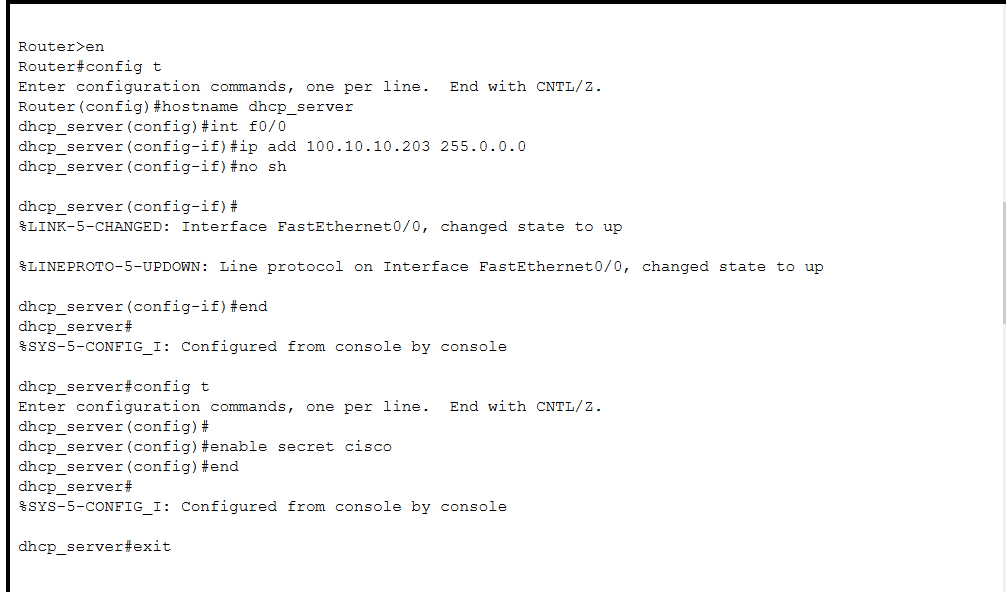
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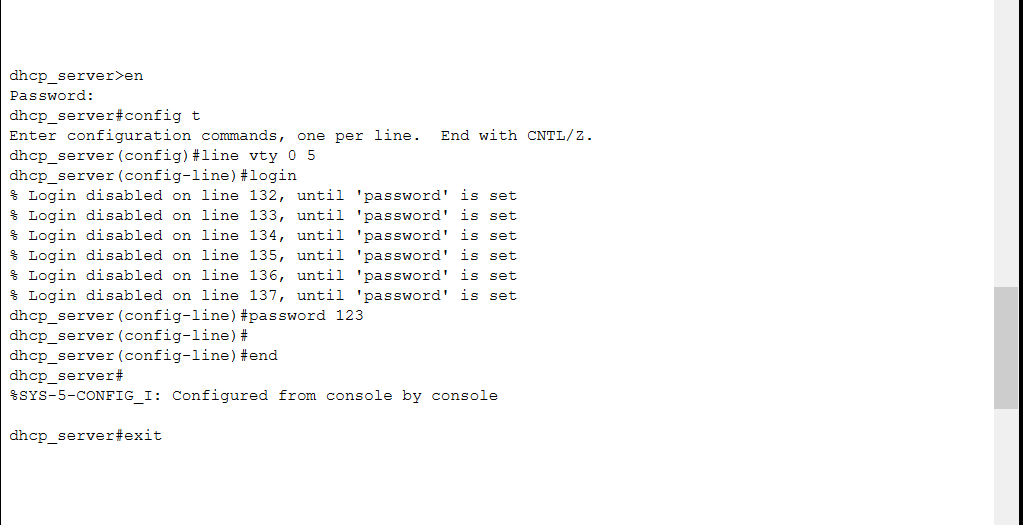
* ****LAB # 6****

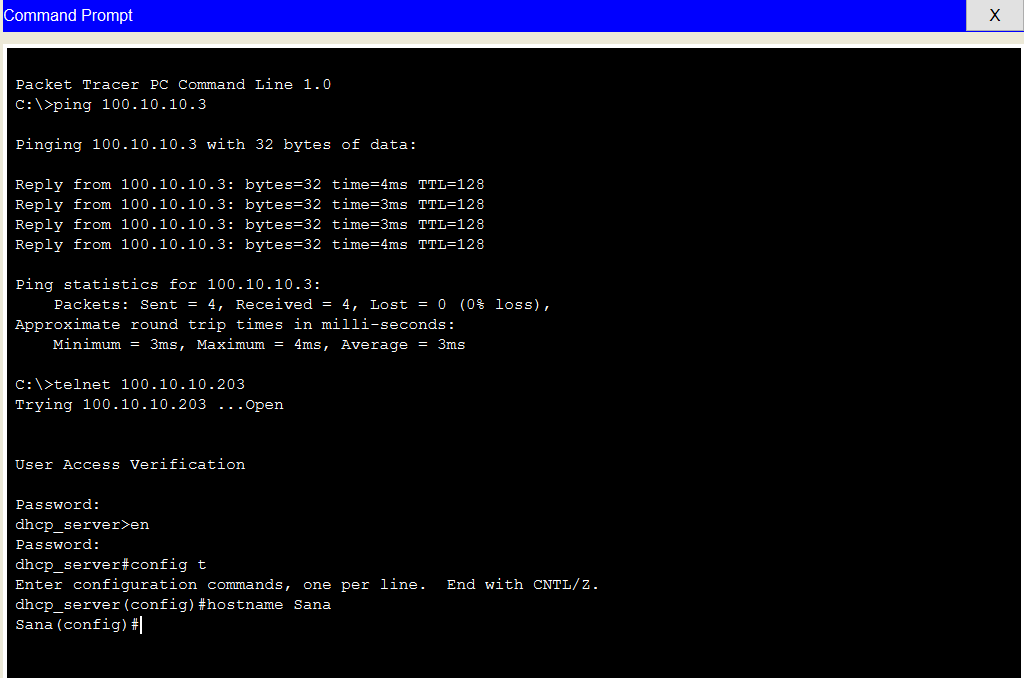
1. **Telnet Configuration**

To telnet the router from our PC we will have to assign an IP address to our PC. After that, we will assign the IP address to the router interface which is connected with that PC. To make the telnet work perfectly, our PC and router should be on the same network as PC and router is connected directly.

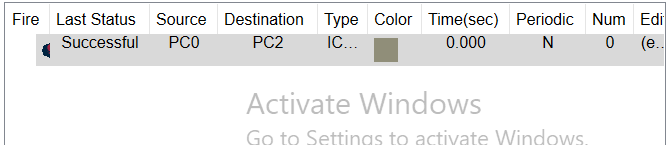
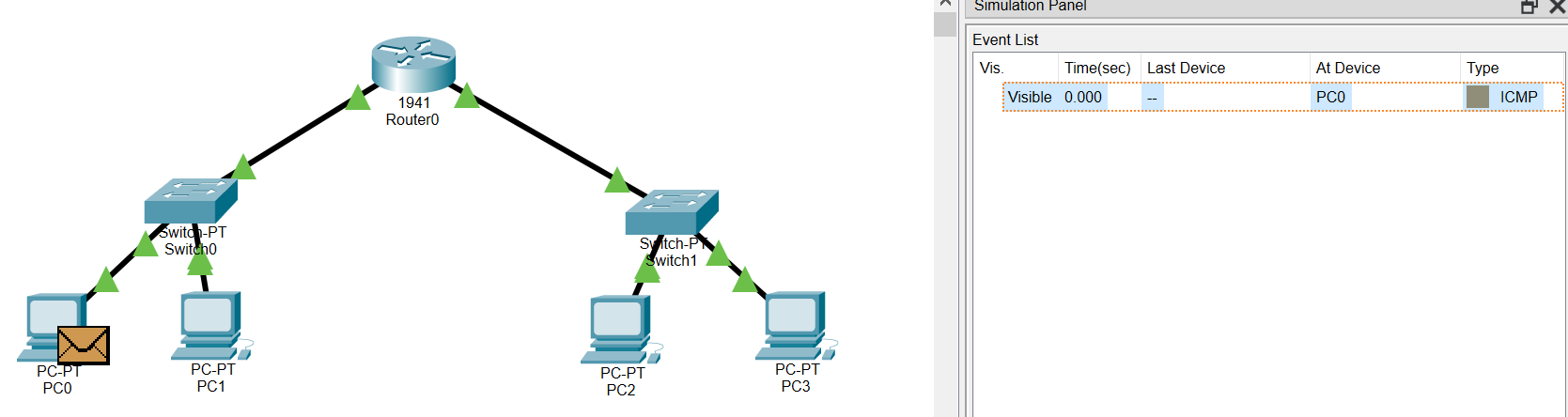
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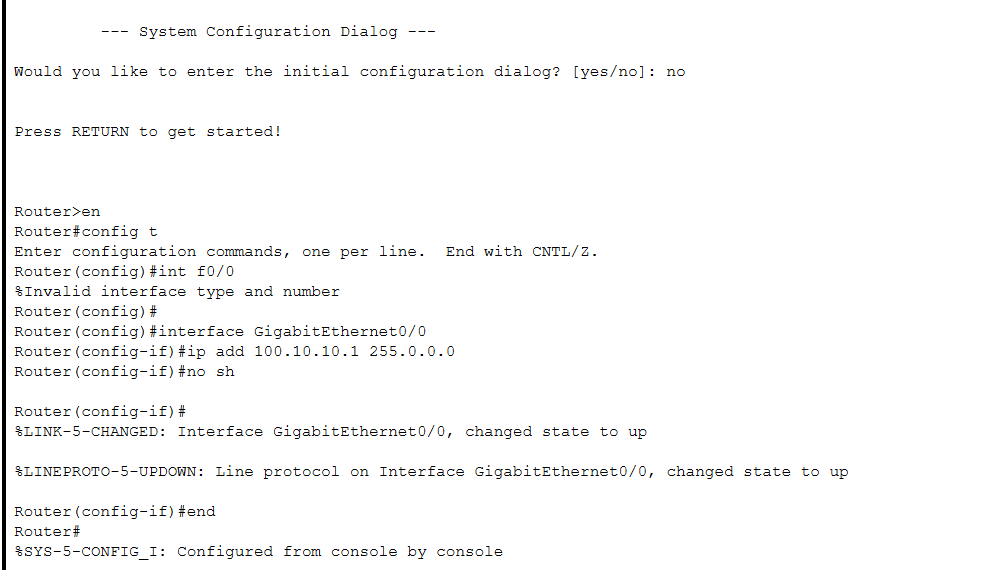
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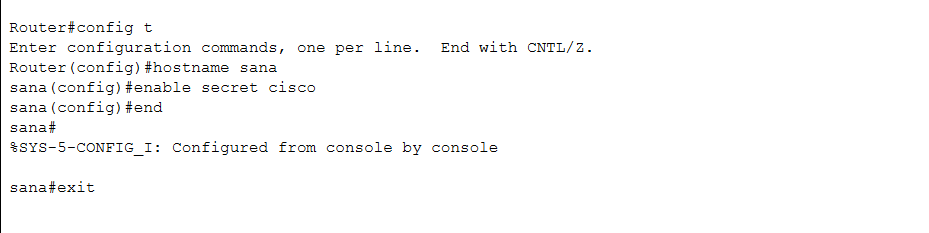
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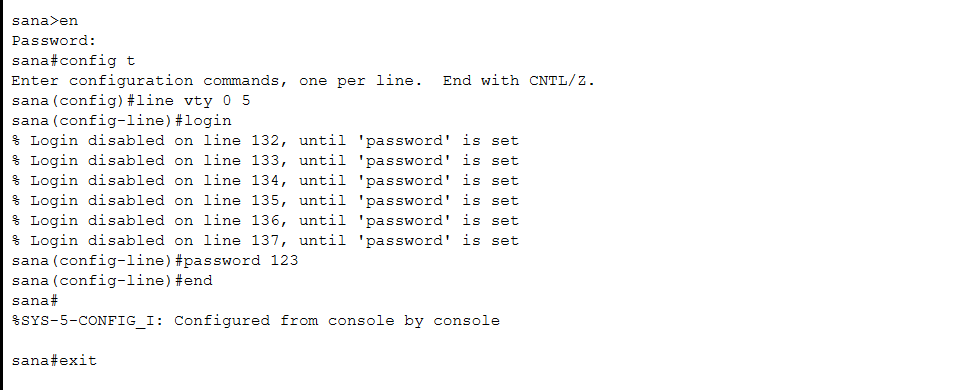
1. ****Router Configuration through PC:(TELNET)****

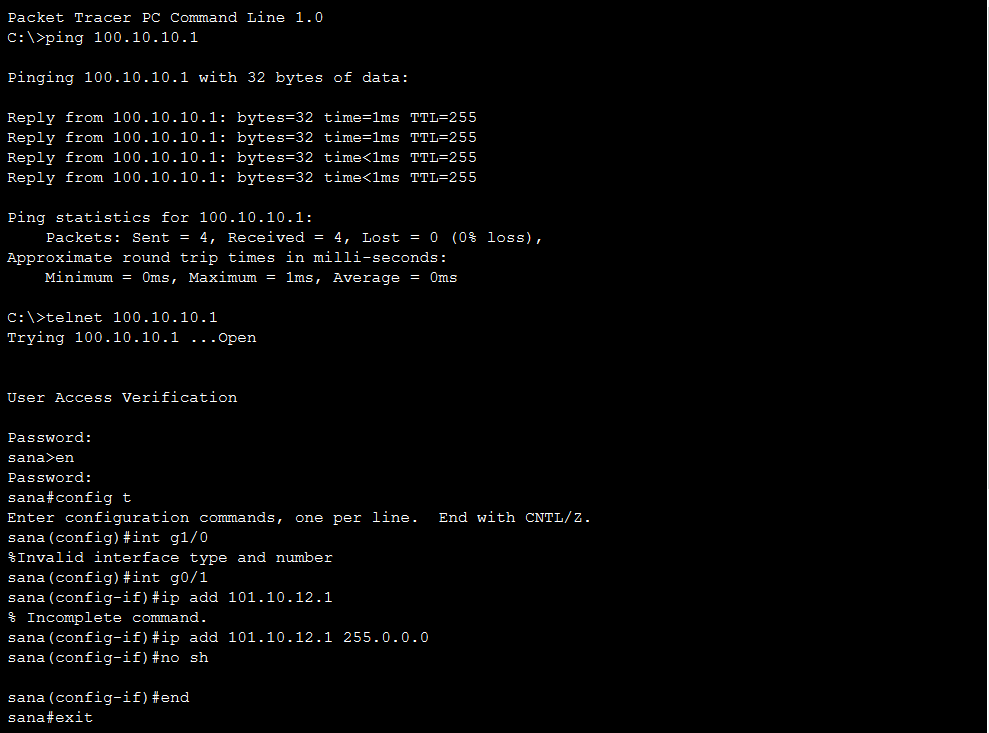
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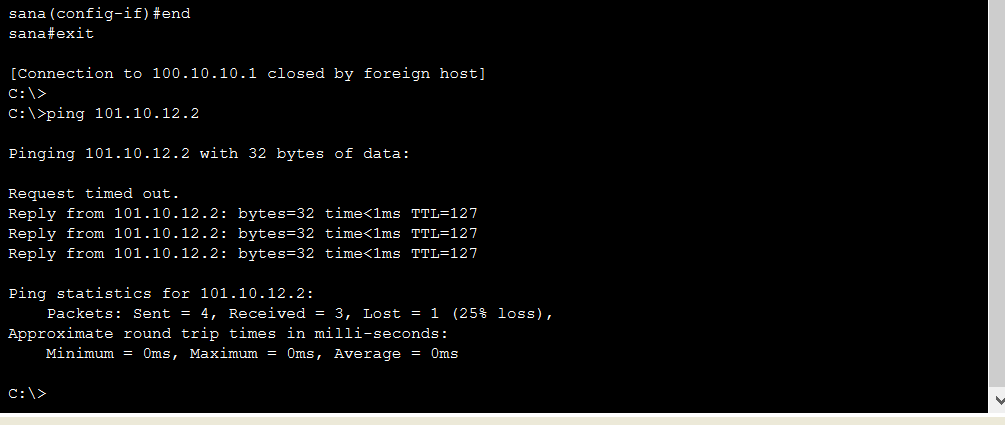
****Router CLI:****

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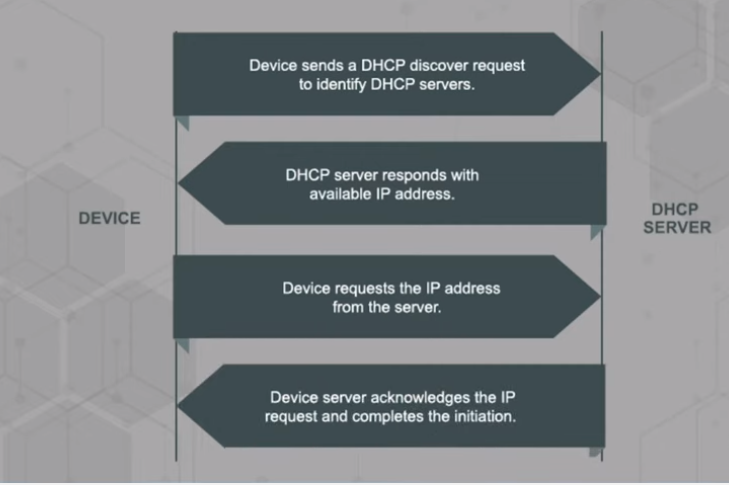
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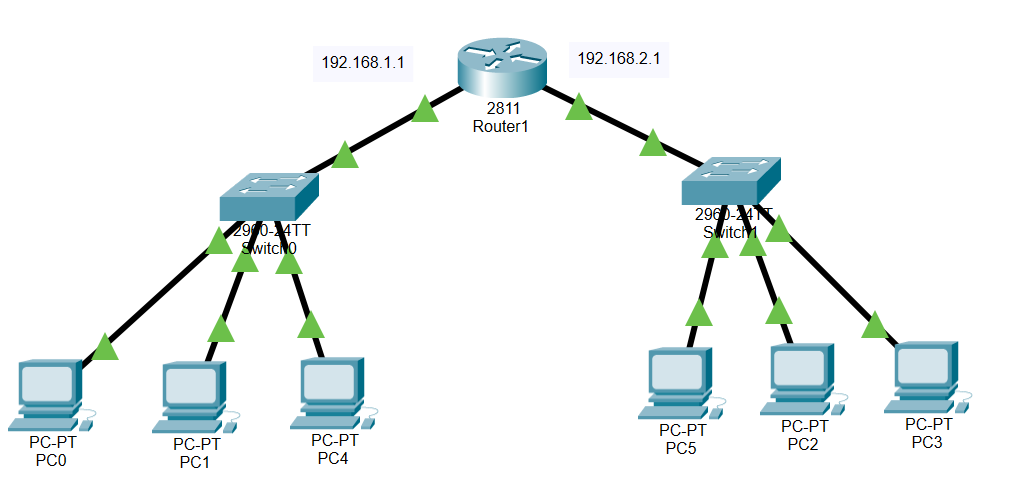
* **Dynamic Host Configuration Protocol (DHCP):**

The **Dynamic Host Configuration Protocol** (**DHCP**) is a network management protocol used on Internet Protocol (IP) networks for automatically assigning IP addresses and other communication parameters to devices connected to the network using a client–server architecture.

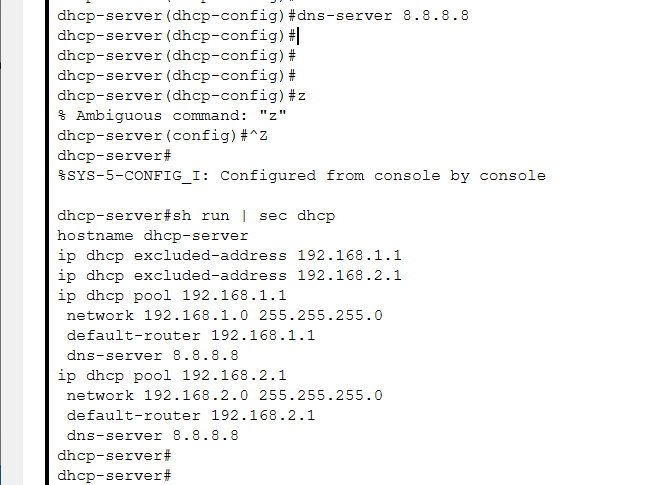
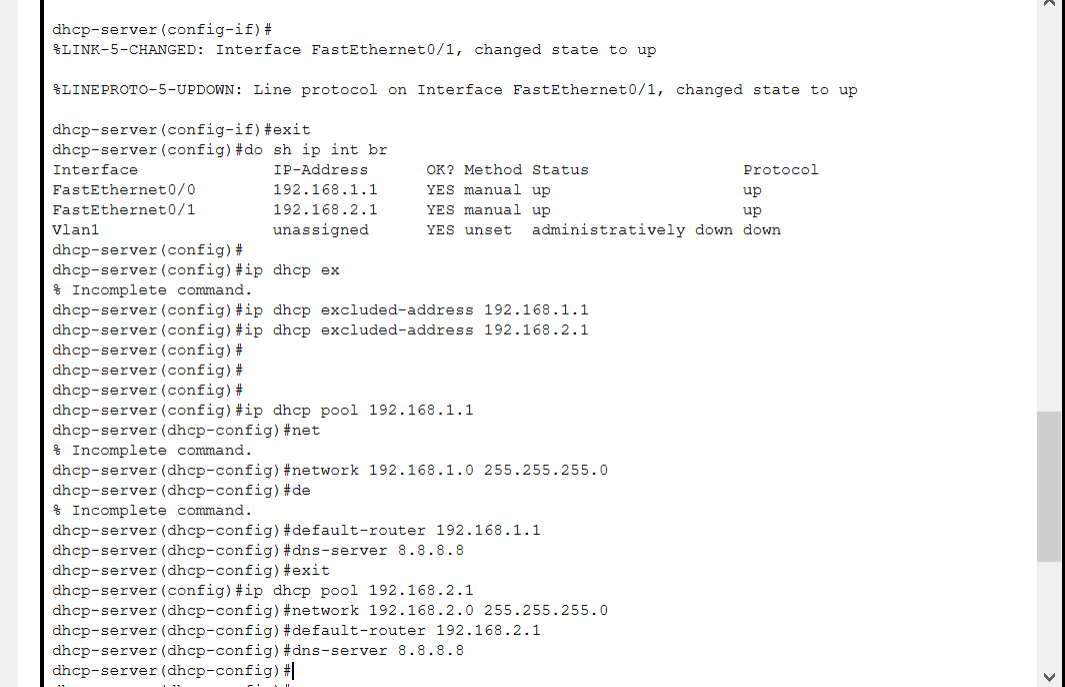
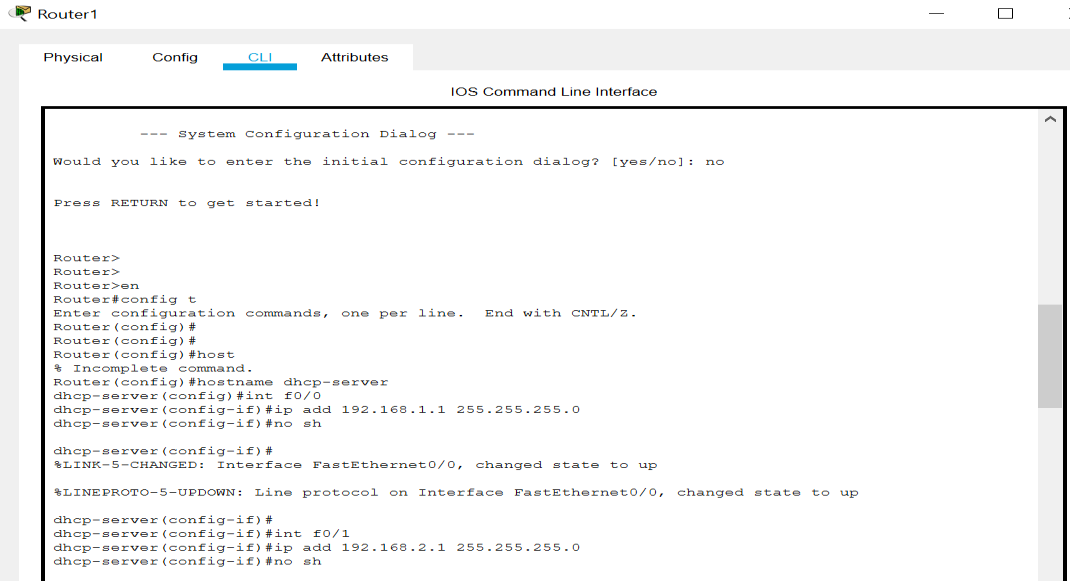
DHCP services exist for networks running Internet Protocol version 4 (IPv4), as well as version 6 (IPv6). The IPv6 version of the DHCP protocol is commonly called DHCPv6.



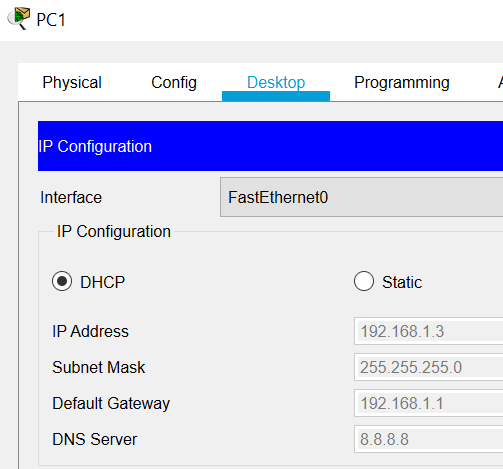
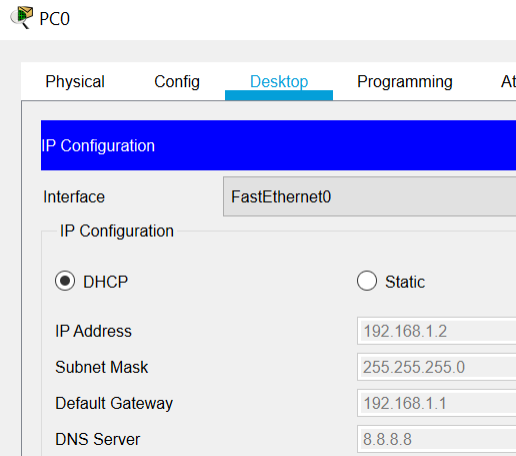
 **ARCHITECTURE AND CONFIGURATION:**



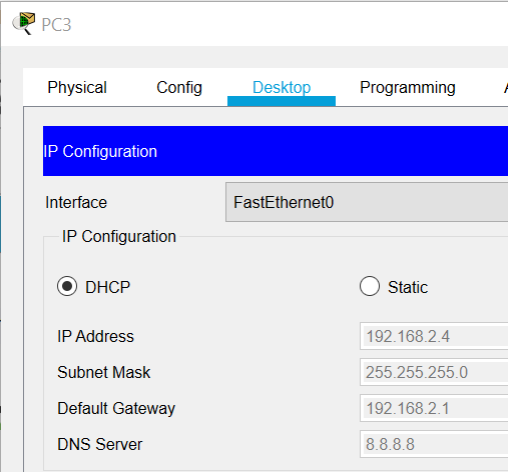
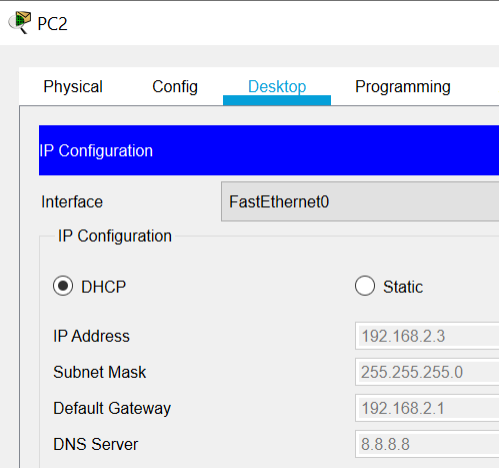
**Configure DHCP Server through CLI:**



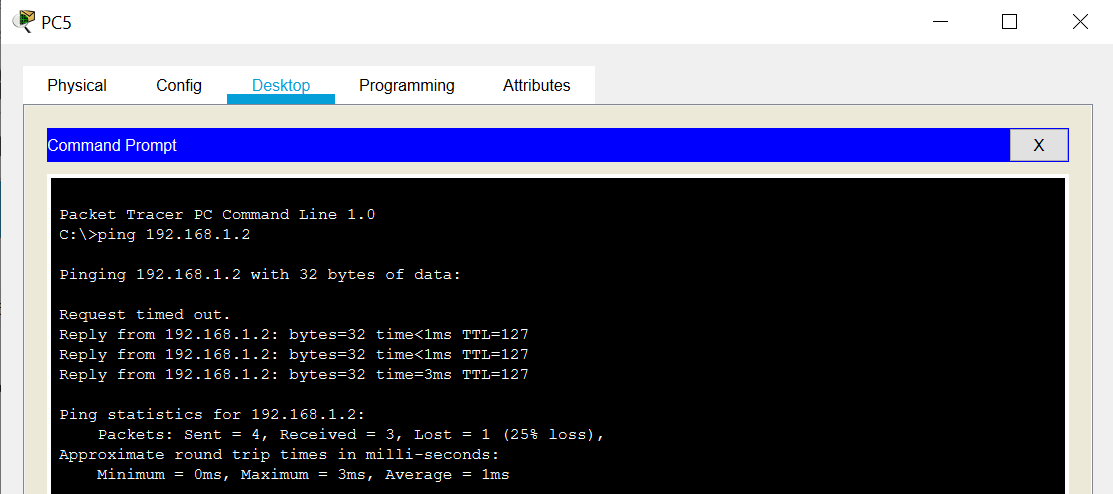
**PC0,PC1 IP Configuration through DHCP:**



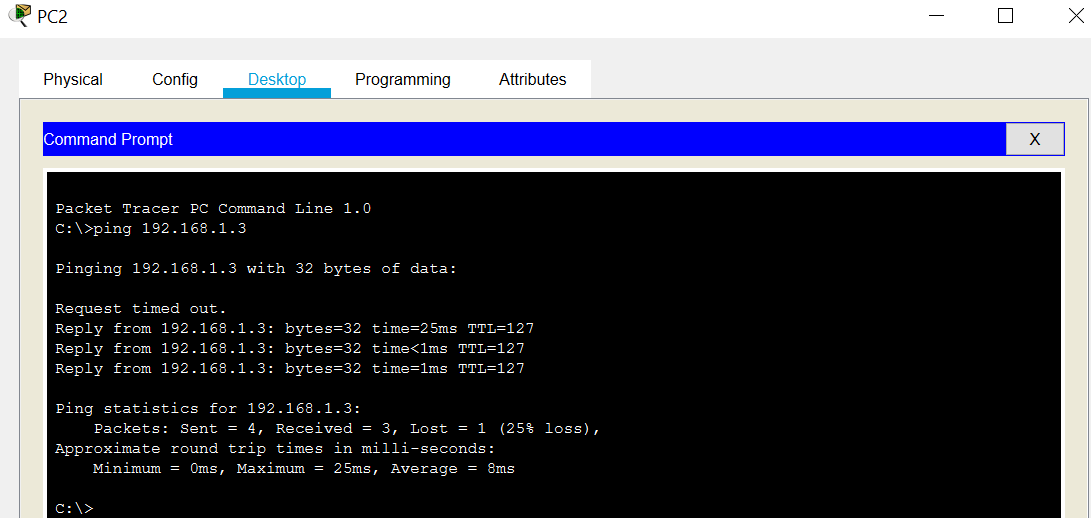
**PC2,PC3 IP Configuration through DHCP:**



**PING Command from PC0 to PC5 :**



**PING Command from PC1 to PC2:**

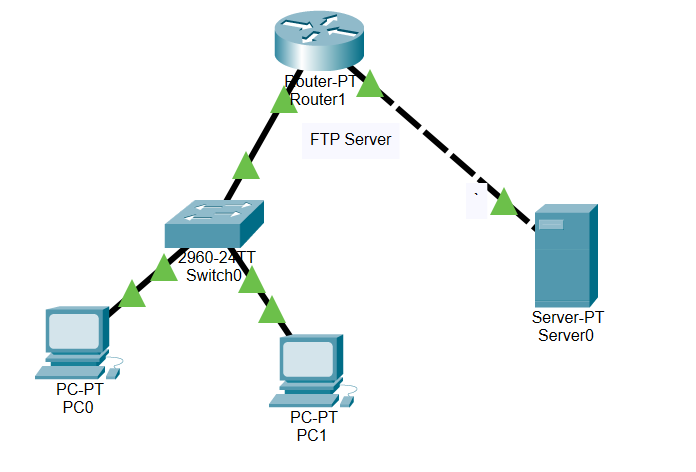


* ****LAB # 7****

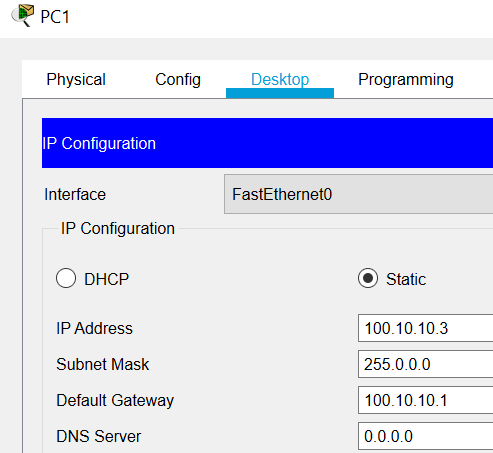
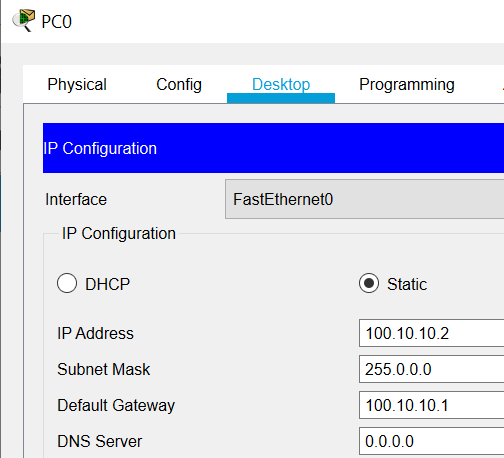
1. FTP Server:

File transfer protocol server (commonly known as FTP Server) is computer software that facilitates the secure exchange of files over a TCP/IP network. It runs the file transfer protocol (FTP), a standard communication protocol that operates at the network level, to establish a secure connection between the devices in a client-server architecture and efficiently transmit data over the internet.

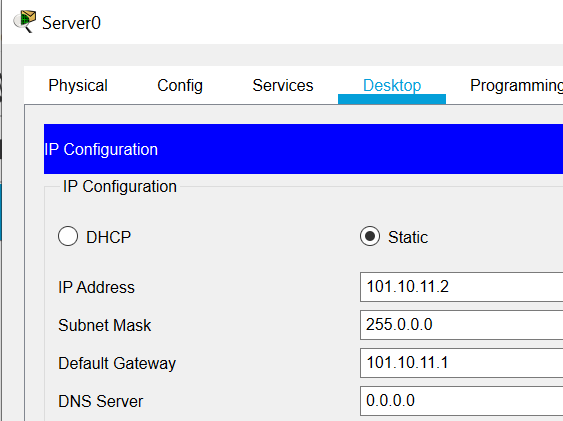
 They are primarily used for two essential functions, **“Put”** and **“Get.”** It allows uploading (Put) files to the server from the client device and downloading (Get) files from the server on the client device. FTP server helps to accommodate the following functions. We can read,write,delete, rename and edit files through ftp server.



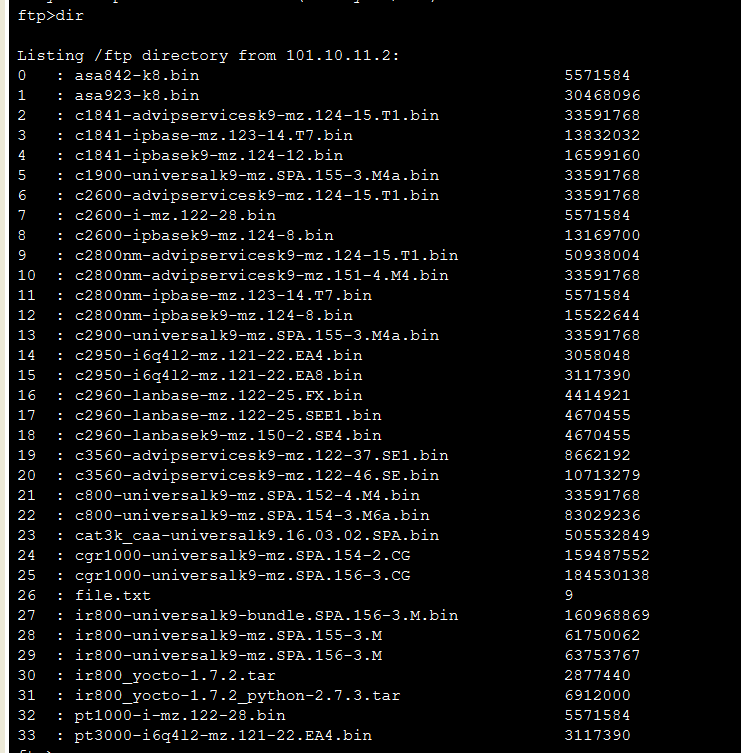
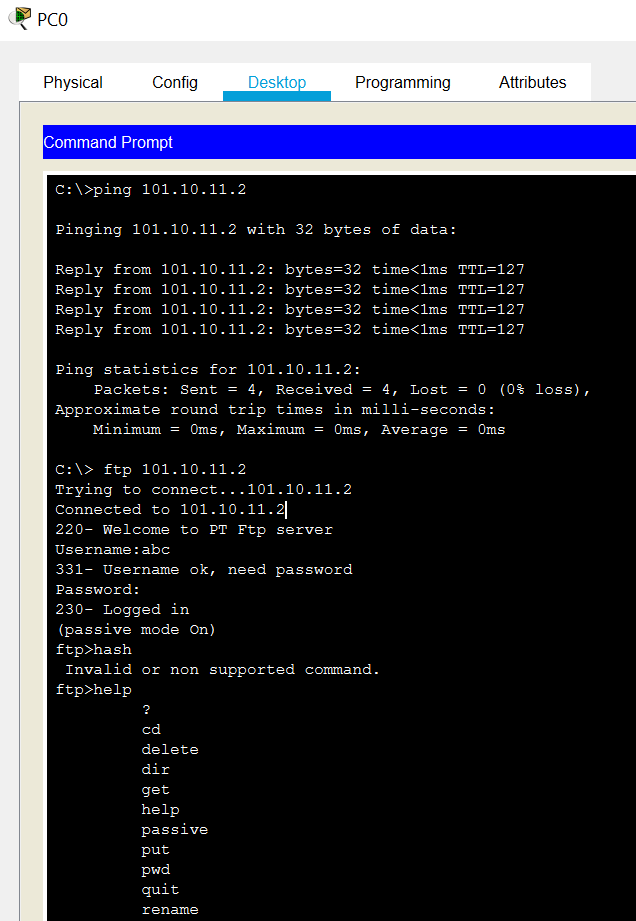
**PC0 Configuration:** **PC1 Configuration:**

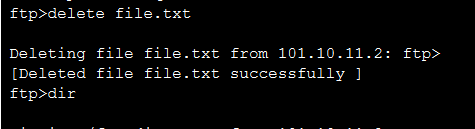
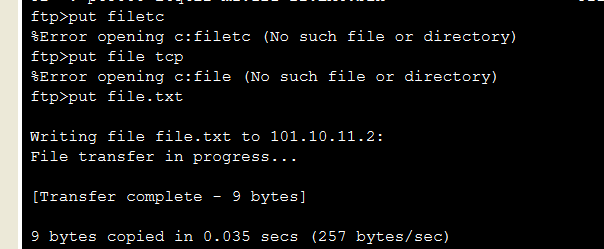


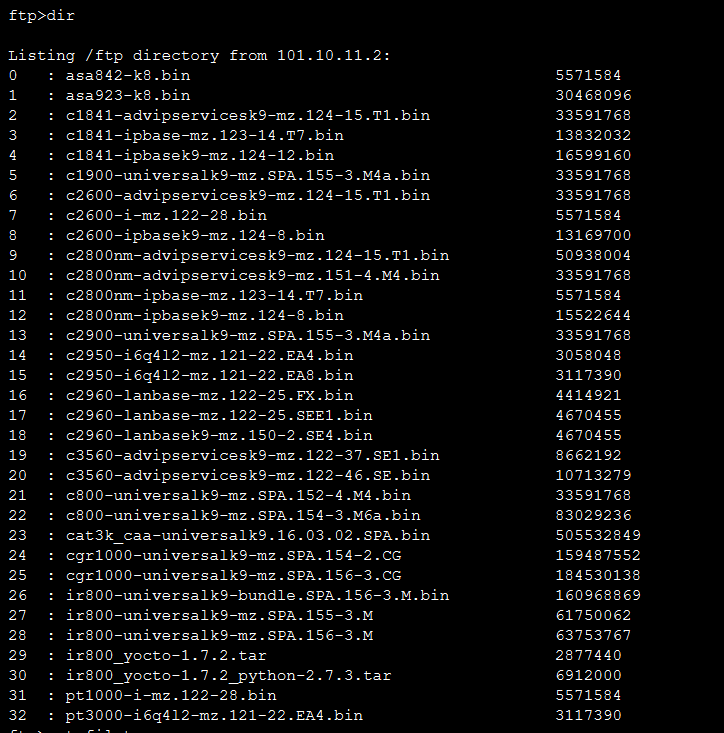
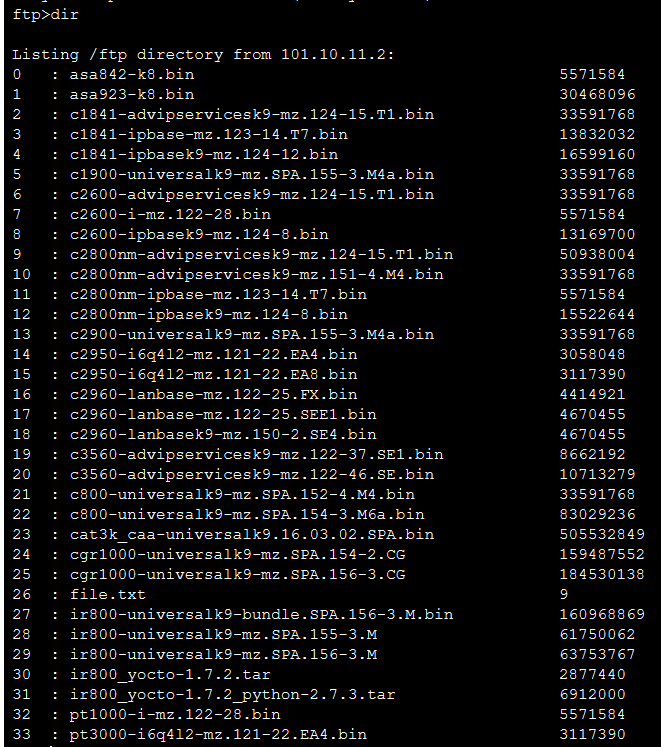
**Server configuration:**



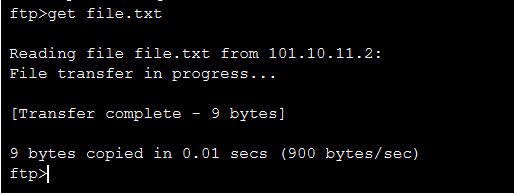
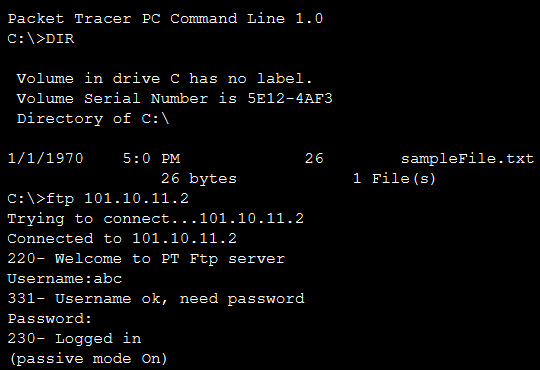
**FTP COMMANDS:**







**PC1 CMD:**

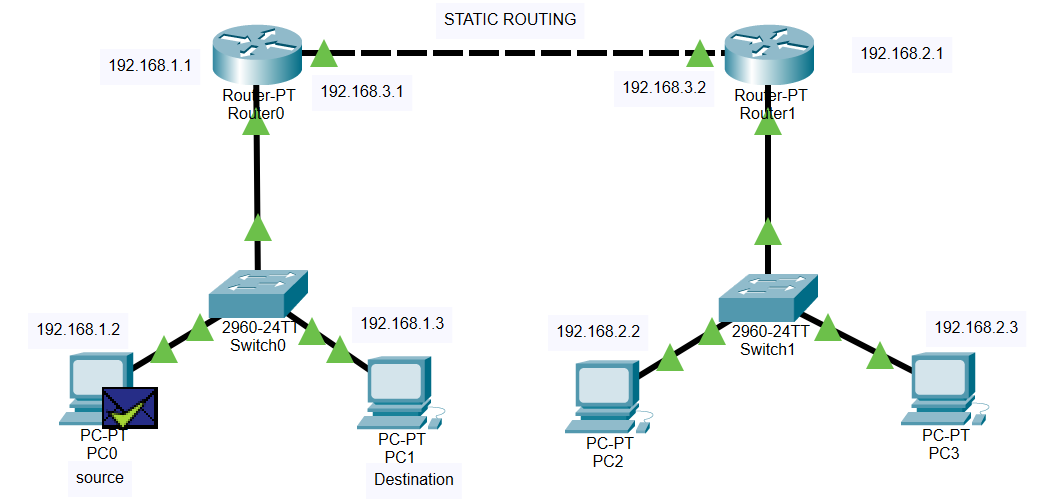


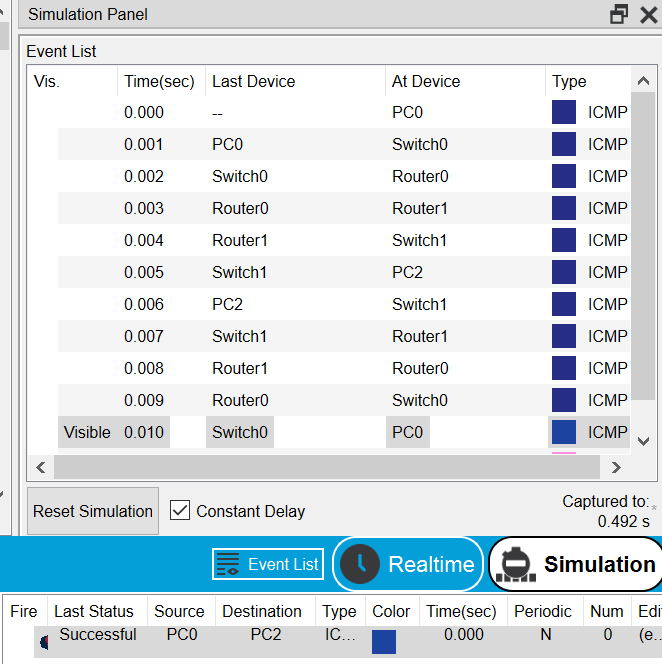
1. Static Routing using two Routers:

## **What Does Static Routing Mean?**

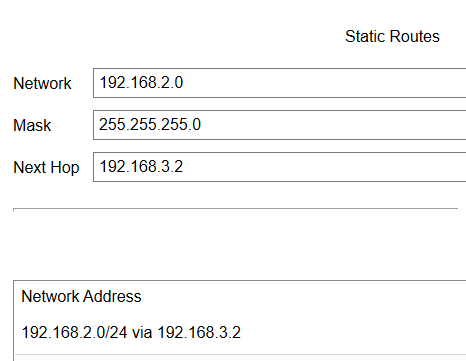
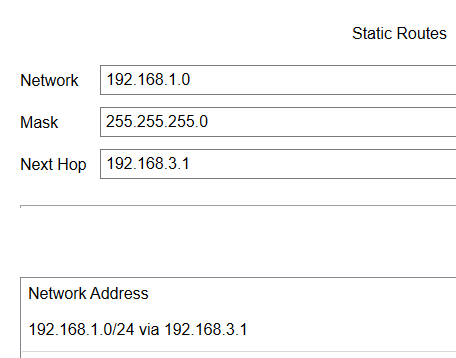
Static routing is a type of network routing technique. Static routing is not a routing protocol; instead, it is the manual configuration and selection of a network route usually managed by the network administrator. It is employed in scenarios where the network parameters and environment are expected to remain constant.

Static routing is only optimal in a few situations. Network degradation, latency and congestion are inevitable consequences of the non-flexible nature of static routing because there is no adjustment when the primary route is unavailable.

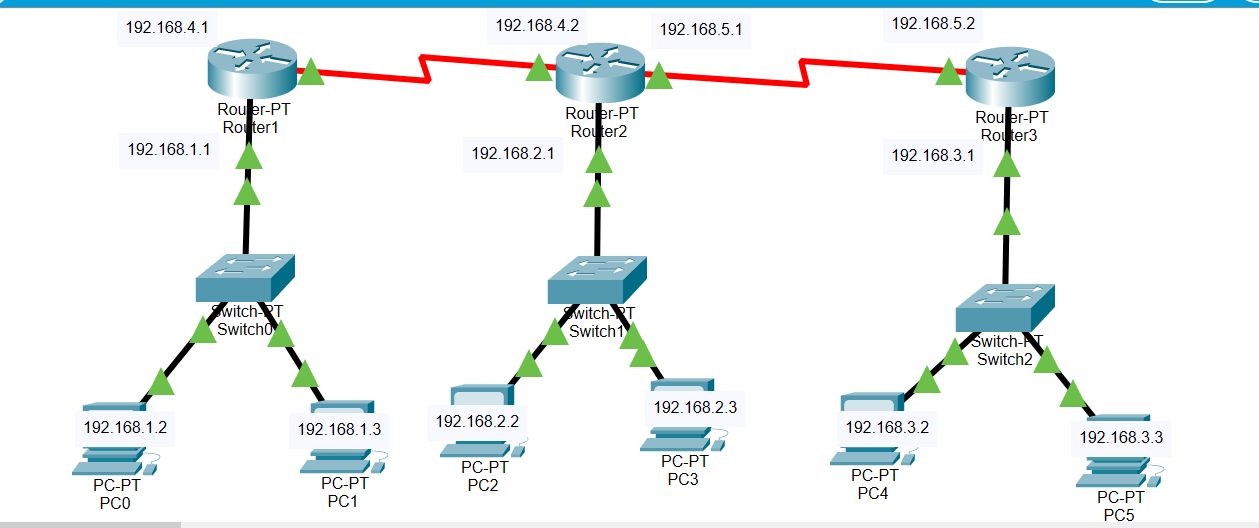


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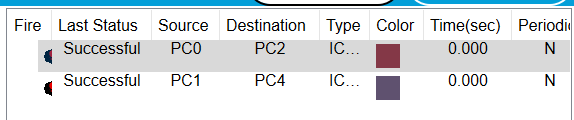
****Router0 (Static): Router1 (Static):****

**** ****

1. Static Routing using three Routers:



Status:

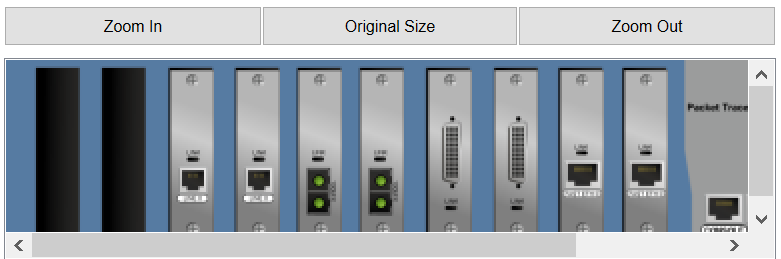


Adding Ports :

R1:



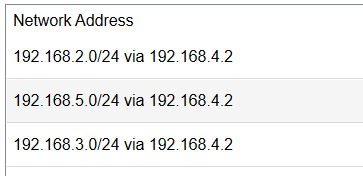
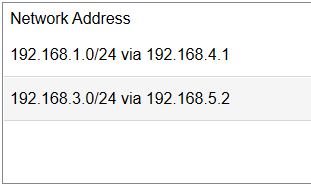
R2:



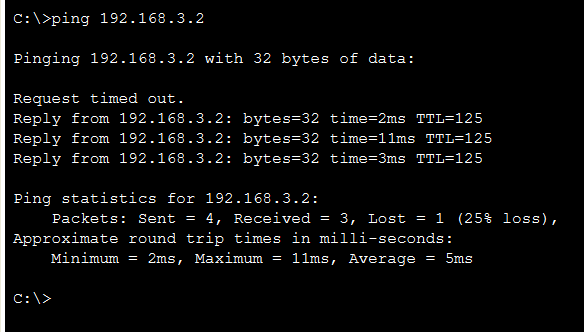
R3:



R1: R2: **R3:**



Ping CMD:



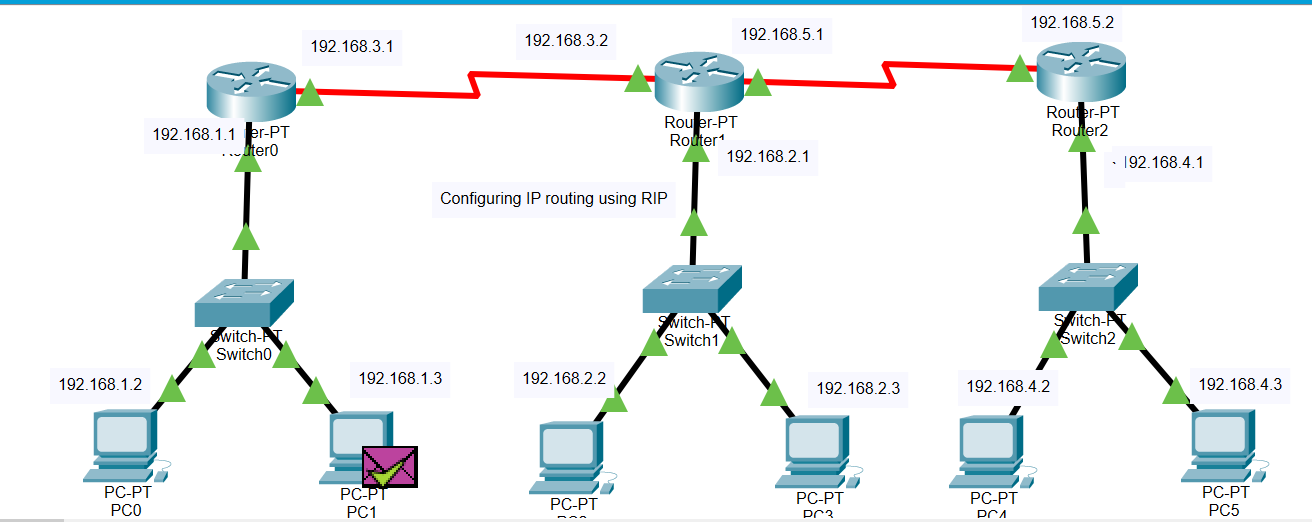
* ****LAB # 8****

1. RIP Routing using three Routers:

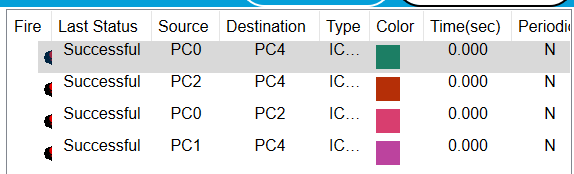
The static routing is not feasible in a large network. Hence, to implement routing in an easier way we can use the dynamic routing protocols.

Routing information protocol (RIP) is one of the dynamic protocols that can be used for the routing. The best part is that Rip protocol is very easy to configure.

RIP is distance vector routing protocol and hop count to determine the route in the network. Rip protocol only works till 15 hops and it does not work if the network is more than 15 hops away so this prevents RIP to work properly in a big network.

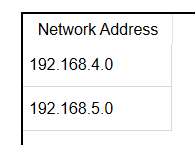
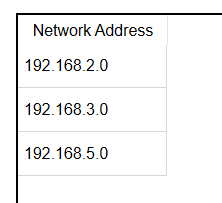
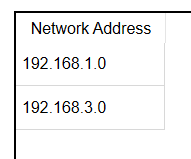


Status:



RIP (Network Address):

R1: R2: R3



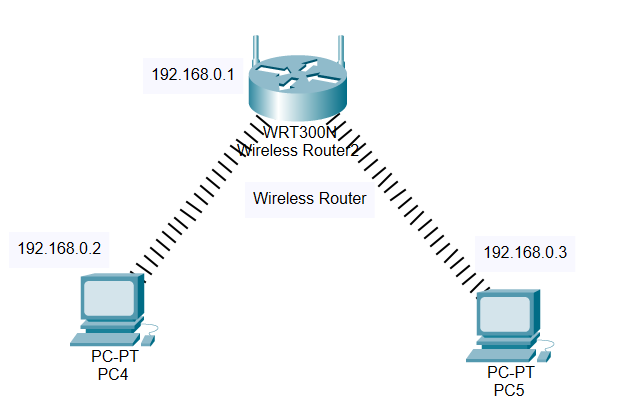
* ****LAB # 9****

1. Wireless Router:

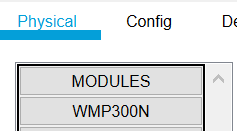
[A wireless router is a device that](https://www.bing.com/ck/a?!&&p=cc4c7cab4e49e58eJmltdHM9MTcxNjE2MzIwMCZpZ3VpZD0xMjAwYTM1NS1mZTA4LTZiMjYtMDRhMy1iMThhZmZkMzZhMGUmaW5zaWQ9NTgzNg&ptn=3&ver=2&hsh=3&fclid=1200a355-fe08-6b26-04a3-b18affd36a0e&psq=wireless+router+def&u=a1aHR0cHM6Ly93d3cuY2lzY28uY29tL2MvZW4vdXMvcHJvZHVjdHMvd2lyZWxlc3Mvd2lyZWxlc3Mtcm91dGVyLmh0bWw&ntb=1" \t "https://www.bing.com/_blank)**[combines the networking functions of a wireless access point and a router](https://www.bing.com/ck/a?!&&p=cc4c7cab4e49e58eJmltdHM9MTcxNjE2MzIwMCZpZ3VpZD0xMjAwYTM1NS1mZTA4LTZiMjYtMDRhMy1iMThhZmZkMzZhMGUmaW5zaWQ9NTgzNg&ptn=3&ver=2&hsh=3&fclid=1200a355-fe08-6b26-04a3-b18affd36a0e&psq=wireless+router+def&u=a1aHR0cHM6Ly93d3cuY2lzY28uY29tL2MvZW4vdXMvcHJvZHVjdHMvd2lyZWxlc3Mvd2lyZWxlc3Mtcm91dGVyLmh0bWw&ntb=1" \t "https://www.bing.com/_blank)**. [It connects devices to the network wirelessly, using radio frequencies](https://www.bing.com/ck/a?!&&p=75d319adad2634eaJmltdHM9MTcxNjE2MzIwMCZpZ3VpZD0xMjAwYTM1NS1mZTA4LTZiMjYtMDRhMy1iMThhZmZkMzZhMGUmaW5zaWQ9NTgzOA&ptn=3&ver=2&hsh=3&fclid=1200a355-fe08-6b26-04a3-b18affd36a0e&psq=wireless+router+def&u=a1aHR0cHM6Ly93d3cuY2lzY28uY29tL2MvZW4vdXMvcHJvZHVjdHMvd2lyZWxlc3Mvd2lyZWxlc3Mtcm91dGVyLmh0bWw&ntb=1" \t "https://www.bing.com/_blank), [and enables Internet and local network access](https://www.bing.com/ck/a?!&&p=a6a7ad3cce351d71JmltdHM9MTcxNjE2MzIwMCZpZ3VpZD0xMjAwYTM1NS1mZTA4LTZiMjYtMDRhMy1iMThhZmZkMzZhMGUmaW5zaWQ9NTg0MA&ptn=3&ver=2&hsh=3&fclid=1200a355-fe08-6b26-04a3-b18affd36a0e&psq=wireless+router+def&u=a1aHR0cHM6Ly93d3cudGVjaG9wZWRpYS5jb20vZGVmaW5pdGlvbi8xMDA2NS93aXJlbGVzcy1yb3V0ZXI&ntb=1" \t "https://www.bing.com/_blank). [A wireless router is usually found in a wireless local area network (WLAN) for home and small office networks](https://www.bing.com/ck/a?!&&p=fe2a87aca1d51516JmltdHM9MTcxNjE2MzIwMCZpZ3VpZD0xMjAwYTM1NS1mZTA4LTZiMjYtMDRhMy1iMThhZmZkMzZhMGUmaW5zaWQ9NTg0Mg&ptn=3&ver=2&hsh=3&fclid=1200a355-fe08-6b26-04a3-b18affd36a0e&psq=wireless+router+def&u=a1aHR0cHM6Ly93d3cudGVjaG9wZWRpYS5jb20vZGVmaW5pdGlvbi8xMDA2NS93aXJlbGVzcy1yb3V0ZXI&ntb=1" \t "https://www.bing.com/_blank). [It can be connected to a wired or wireless WAN](https://www.bing.com/ck/a?!&&p=68076138053fe7a7JmltdHM9MTcxNjE2MzIwMCZpZ3VpZD0xMjAwYTM1NS1mZTA4LTZiMjYtMDRhMy1iMThhZmZkMzZhMGUmaW5zaWQ9NTg0NA&ptn=3&ver=2&hsh=3&fclid=1200a355-fe08-6b26-04a3-b18affd36a0e&psq=wireless+router+def&u=a1aHR0cHM6Ly93d3cudGVjaG9wZWRpYS5jb20vZGVmaW5pdGlvbi8xMDA2NS93aXJlbGVzcy1yb3V0ZXI&ntb=1" \t "https://www.bing.com/_blank).

To set up a Wireless router in Cisco Packet Tracer, follow these steps:

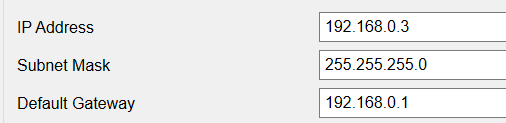
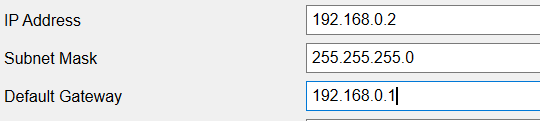
1. On the left-hand side of the Packet Tracer window, find the “Routers” category.
2. Select a router model and drag it into the workspace.
3. Add two PCs to the workspace.
4. [Connect the router to the PCs using Ethernet cables](https://www.bing.com/ck/a?!&&p=bcddb809a039d654JmltdHM9MTcxNjE2MzIwMCZpZ3VpZD0xMjAwYTM1NS1mZTA4LTZiMjYtMDRhMy1iMThhZmZkMzZhMGUmaW5zaWQ9NTgxNA&ptn=3&ver=2&hsh=3&fclid=1200a355-fe08-6b26-04a3-b18affd36a0e&psq=wireless+router+in+cisco+packet+tracer&u=a1aHR0cHM6Ly9jY25hdHV0b3JpYWxzLmluL3BhY2tldC10cmFjZXIvY29ubmVjdGluZy1hLXJvdXRlci10by1hLXN3aXRjaC1pbi1wYWNrZXQtdHJhY2VyLw&ntb=1" \t "https://www.bing.com/_blank).
5. [Configure the router by connecting to it and setting up wireless settings](https://www.bing.com/ck/a?!&&p=32fd3ba8b0301e44JmltdHM9MTcxNjE2MzIwMCZpZ3VpZD0xMjAwYTM1NS1mZTA4LTZiMjYtMDRhMy1iMThhZmZkMzZhMGUmaW5zaWQ9NTgxNg&ptn=3&ver=2&hsh=3&fclid=1200a355-fe08-6b26-04a3-b18affd36a0e&psq=wireless+router+in+cisco+packet+tracer&u=a1aHR0cHM6Ly9jb250ZW50aHViLm5ldGFjYWQuY29tL2xlZ2FjeS9JVEUvNy4wMS9lbi9jb3Vyc2UvZmlsZXMvNi4xLjMuOSUyNTIwUGFja2V0JTI1MjBUcmFjZXIlMjUyMC0lMjUyMENvbm5lY3QlMjUyMHRvJTI1MjBhJTI1MjBXaXJlbGVzcyUyNTIwTmV0d29yay5wZGY&ntb=1" \t "https://www.bing.com/_blank).



PC Physical (WMP30N)

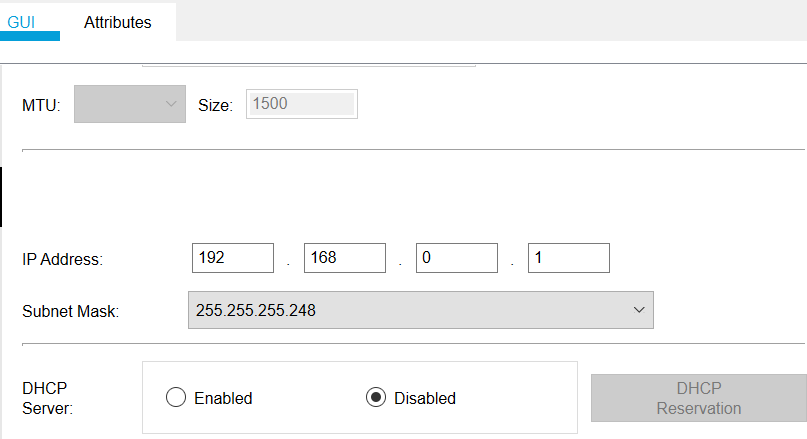


**PC4: PC5:**

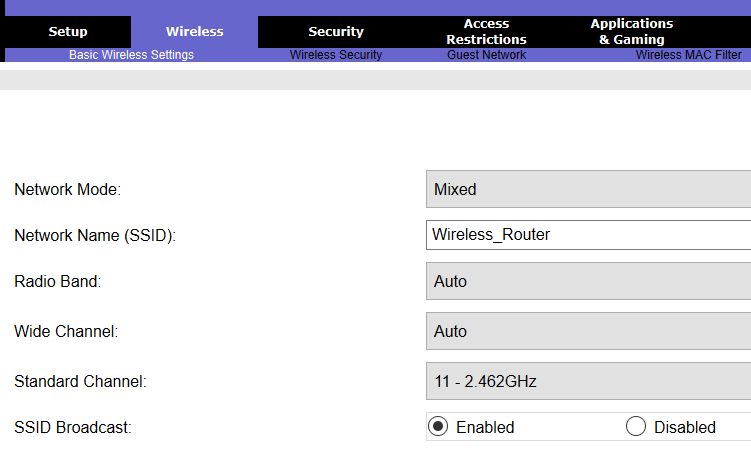


Wireless Router GUI:

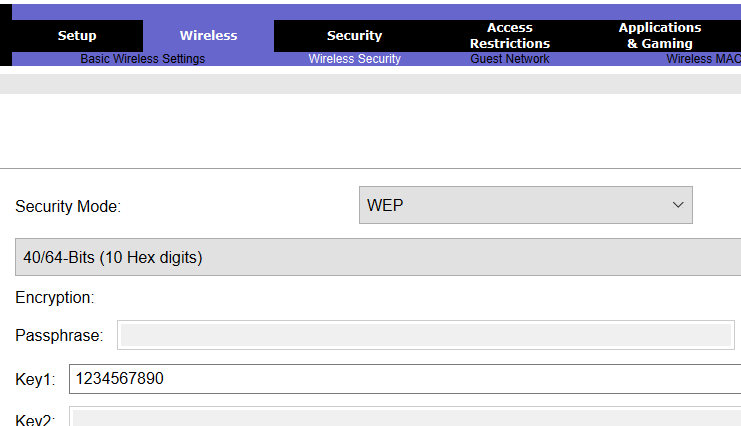
* Disable DHCP Server



* Change Network Name



* Change security Mode(WEP)+ Enter Key1:



* Connect Wireless Router in PC:

