# Cisco Packet Tracer Implementation: Building and Configuring Networks

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# CISCO PACKET TRACER IMPLEMENTATION BUILDING AND CONFIGURING NETWORKS

S. R. Jena

# Cisco Packet Tracer Implementation: Building and Configuring Networks

**S.R. Jena**

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**CISCO PACKET TRACER IMPLEMENTATION: BUILDING AND CONFIGURING NETWORKS**

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Written by S. R. Jena.

## Preface

Welcome to the World of Cisco Packet Tracer! This book "**Cisco Packet Tracer Implementation: Building and Configuring Networks**" serves as a comprehensive guide for network engineers, students, and enthusiasts who want to master the art of building and configuring networks using Cisco Packet Tracer. In today's digital age, networks play a critical role in connecting people, devices, and services. Whether it's a small home network, a campus-wide infrastructure, or an enterprise-level setup, the ability to design, implement, and troubleshoot networks is a valuable skillset. Cisco Packet Tracer, a powerful network simulation tool, provides a safe and efficient environment to practice and explore various networking concepts. This book is designed to take you on a journey through the world of network implementation using Cisco Packet Tracer. We will start with the basics, introducing you to the software, its features, and how to navigate its interface. As we progress, we will dive deeper into the key topics, including:

Network Topologies: Learn how to design and configure different network topologies, such as bus, star, ring, and mesh. Understand the strengths and weaknesses of each topology and their impact on network performance.

Routing Protocols: Explore the implementation of dynamic routing protocols, including RIP v1/v2, OSPF, and EIGRP. Understand how these protocols enable routers to exchange routing information and make intelligent forwarding decisions.

Network Services: Discover how to configure essential network services like DHCP (Dynamic Host Configuration Protocol), DNS (Domain Name System), and VLANs (Virtual Local Area Networks) to optimize network performance and enhance security.

Network Security: Master the implementation of firewall configurations using access control lists (ACLs) and understand how to control traffic flow to safeguard your network against unauthorized access and malicious activities.

Quality of Service (QoS): Learn how to control and prioritize network traffic using QoS mechanisms such as traffic shaping, prioritization, and policing to ensure optimal performance for critical applications.

Network Analysis: Explore techniques for analyzing network performance, measuring key metrics, and optimizing configurations and protocols to improve network efficiency and reliability.

In this book step-by-step instructions, hands-on exercises, and practical examples to reinforce your understanding of the concepts are given in well-organized manner. Additionally, the book provides valuable tips, best practices, and troubleshooting guidance to help you overcome common challenges encountered during network implementation. Whether you are a networking student aiming to gain practical experience, a network engineer seeking to expand your knowledge, or an enthusiast eager to build and experiment with networks, this book will serve as your comprehensive companion for Cisco Packet Tracer implementation. Get ready to embark on an exciting journey of learning, experimentation, and mastery as we delve into the fascinating world of network implementation using Cisco Packet Tracer.

**Let's get started!** **- S. R. Jena**

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**About the Author:**

**S. R. Jena** is currently working as Faculty Associate in the Department of Computer Science and Engineering at the École Centrale School of Engineering, Mahindra University, Hyderabad, India. He received his M. Tech degree in Information Technology form Utkal University, Bhubaneswar, Odisha, India in the year 2013, B. Tech in Computer Science and Engineering degree from BPUT, Rourkela, Odisha, India in the year 2010 and also certified by CCNA and Diploma in Computer Hardware and Networking Management from CTTC, Bhubaneswar, Odisha, India in the year 2011. He has more than 7 years of teaching experience from various reputed Universities and Colleges in India.

He is basically an Academician, an Author, a Researcher, a Trainer, a Reviewer of various International Journals and International Conferences and a Keynote Speaker. His publications have more than 250 citations, h index of 9, and i10 index of 7 (Google Scholar). He has published 14 international level books, around 25 international level research articles in various international journals, conferences, and filed 15 patents. He has been awarded by Bharat Education Excellence Awards in the year 2022, Excellent Performance in Educational Domain & Outstanding Contributions in Teaching in the year 2022 and Best Researcher by Gurukul Academic Awards in 2022. His research interests include Cloud and Distributed Computing, Internet of Things, Green Computing, Sustainability, Renewable Energy Resources, Internet of Energy etc.

He can be reached by Email: **soumyajena1989@gmail.com**

1. **Implement different network design topologies like Bus, Star, Ring and transfer the data packet from one PC to another PC.**

**Objective:**

Design topology (Bus, Star, Ring) and make configure the systems and transfer thepacket from one pc to another pc using Cisco Packet Tracer.

**Requirements:**

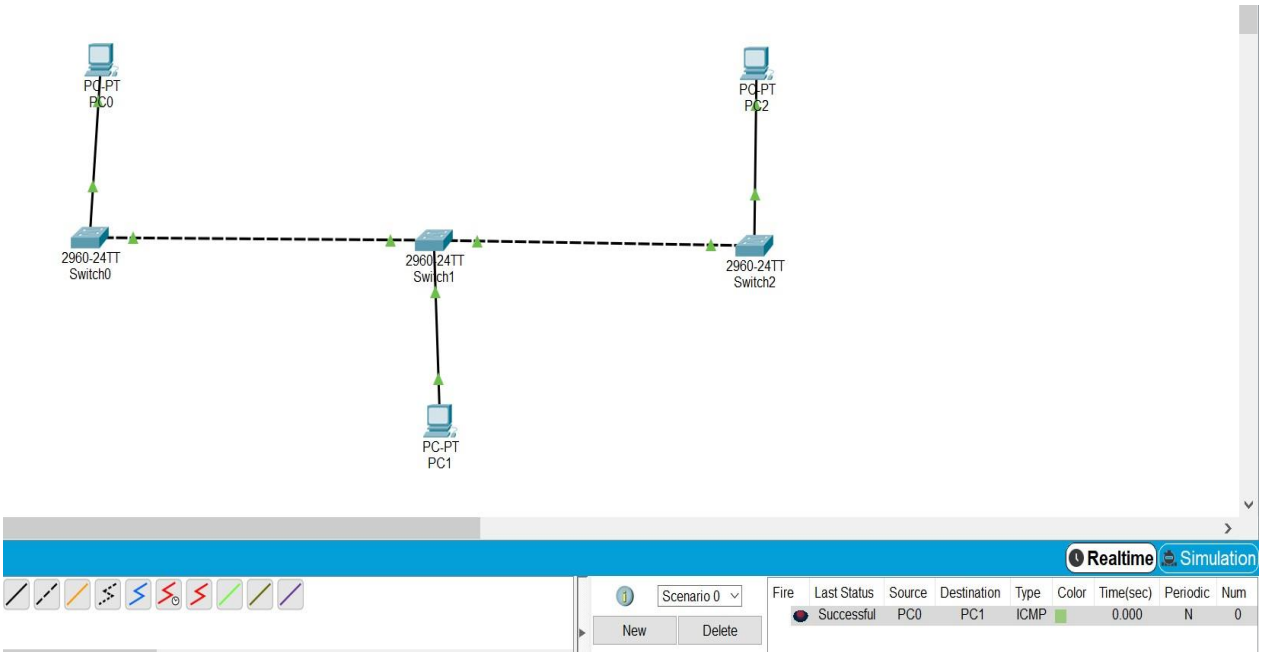
**Tools:**

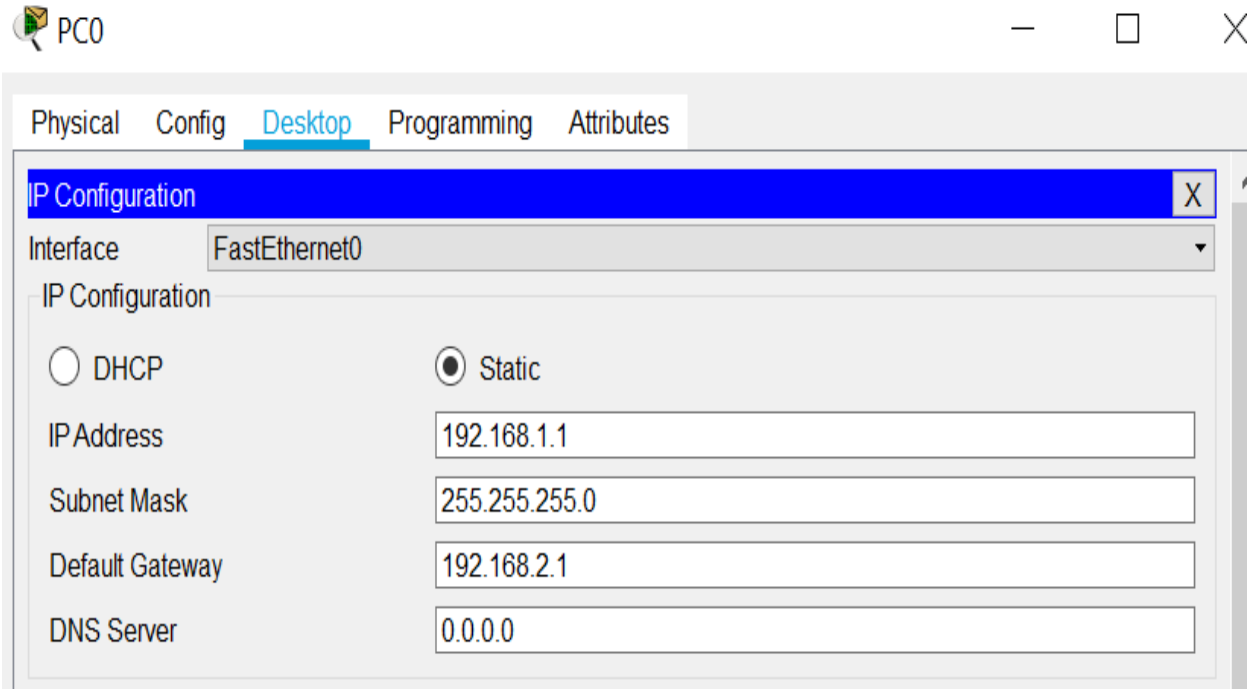
Cisco Packet Tracer 6.0.1 or higher version

**Topology Constructions Requirements:**

1. Three Windows PC or Linux PC for each LAN, Each PC must Have One NIC cards
2. One Switch (24 ports)
3. One Router-1841
4. One Server
5. One hub
6. Straight Line LAN (cat-5) Cables with RJ-45 Sockets

**Bus Topology:**

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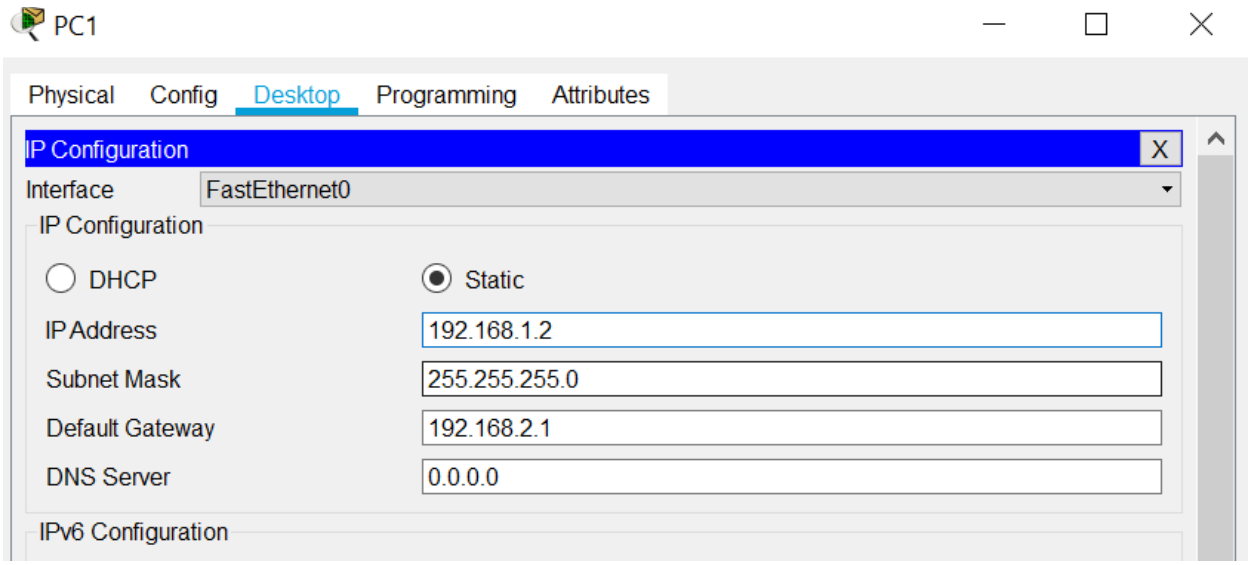
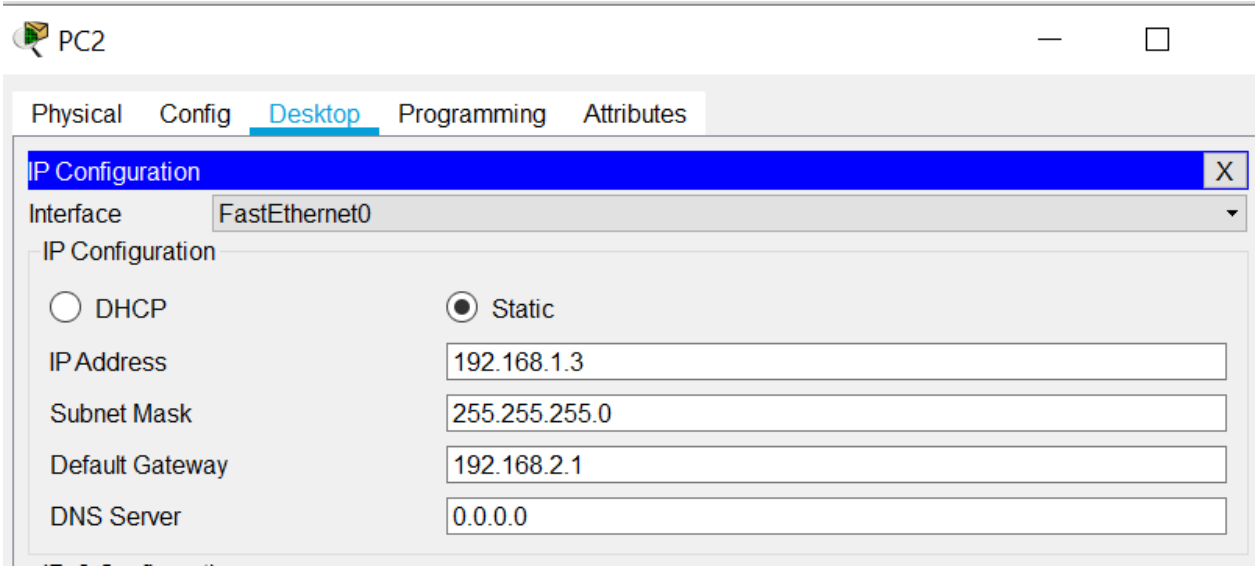
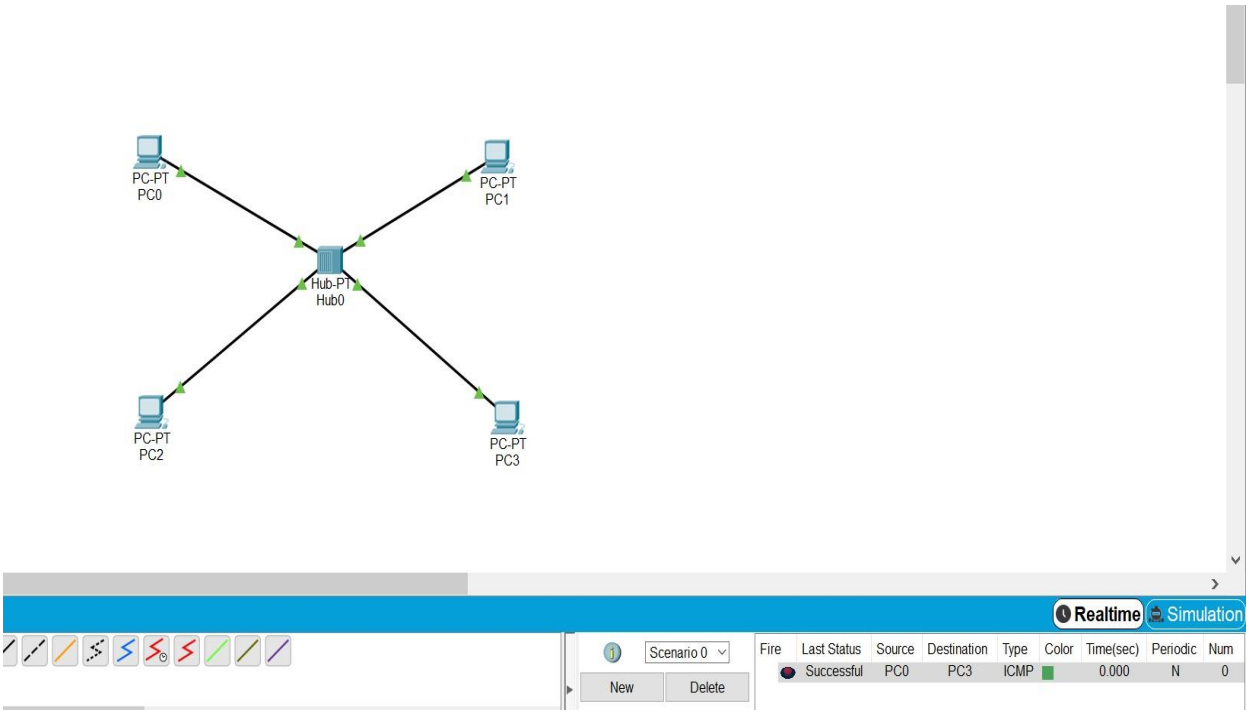
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IP Address
192.168.1.1
Subnet Mask
255.255.255.0
Default Gateway
192.168.2.1
DNS Server
0.0.0.0




**Star Topology:**


PC-PT
PC0
PC-PT
PC1
Hub-PT
Hub0
PC-PT
PC2
PC-PT
PC3
Realtime
Simulation
Scenario 0
New
Delete
Fire
Last Status
Source
Destination
Type
Color
Time(sec)
Periodic
Num
Successful
PC0
PC3
ICMP
0.000
N
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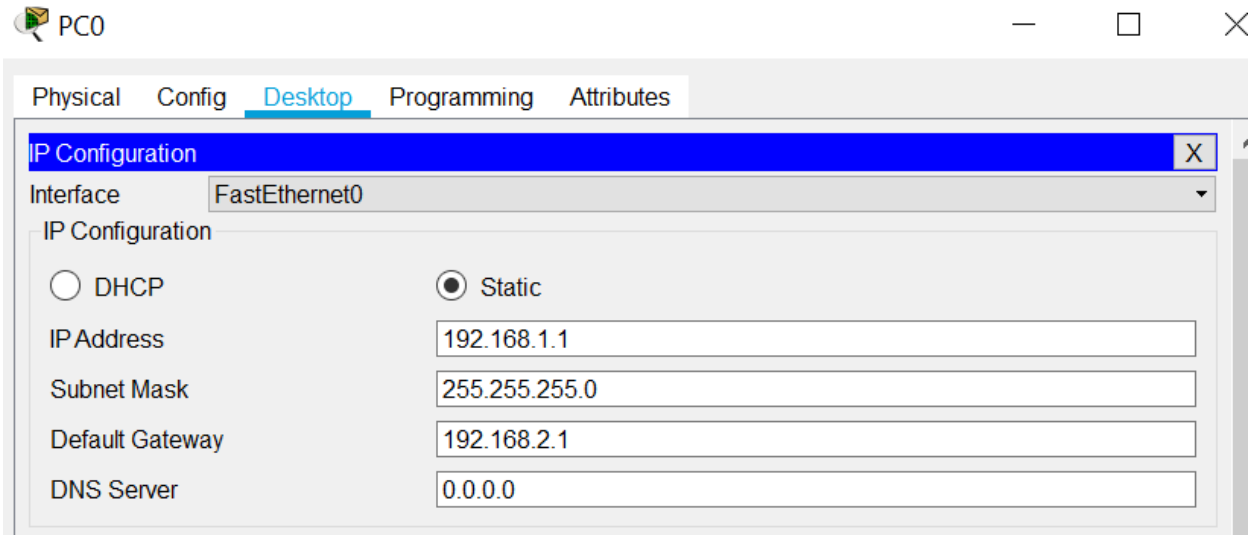
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IP Configuration
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Subnet Mask
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DNS Server
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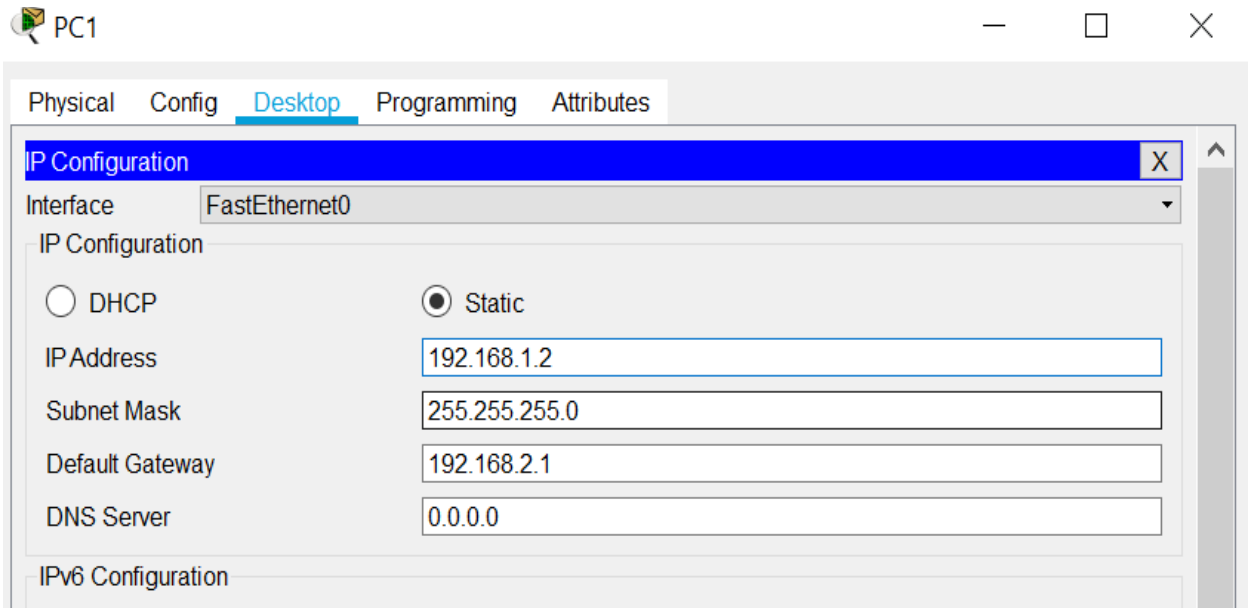
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DHCP
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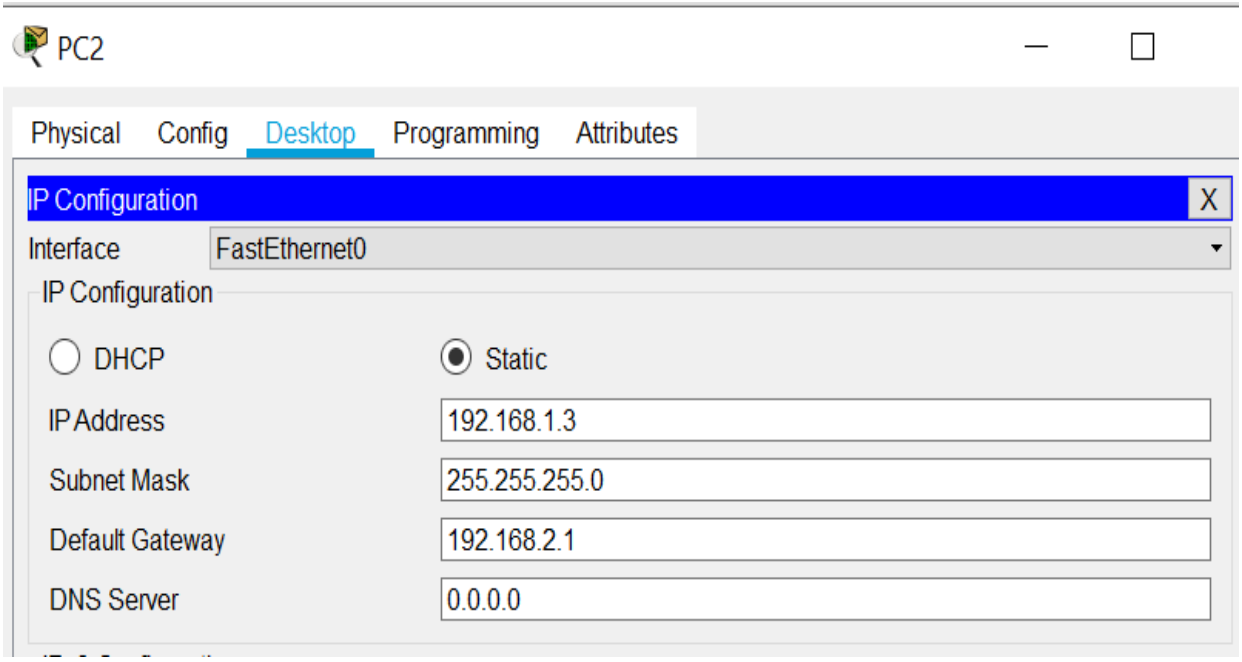
192.168.2.1
DNS Server
0.0.0.0
IPv6 Configuration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FastEthernet0
IP Configuration
DHCP
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192.168.2.1
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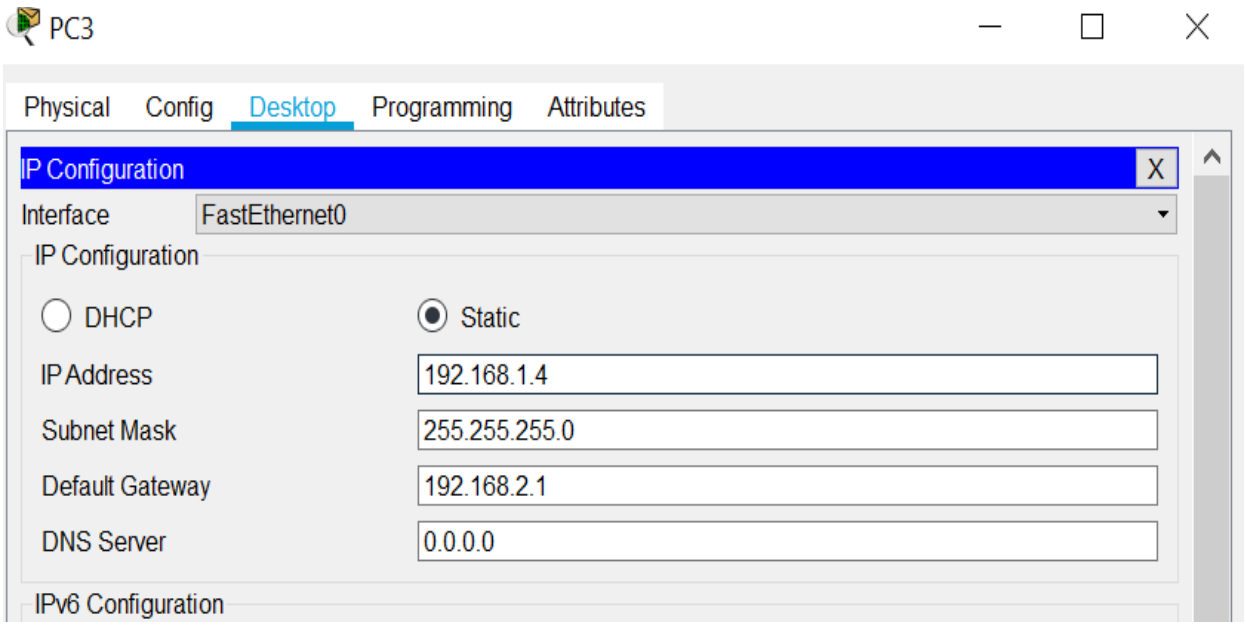
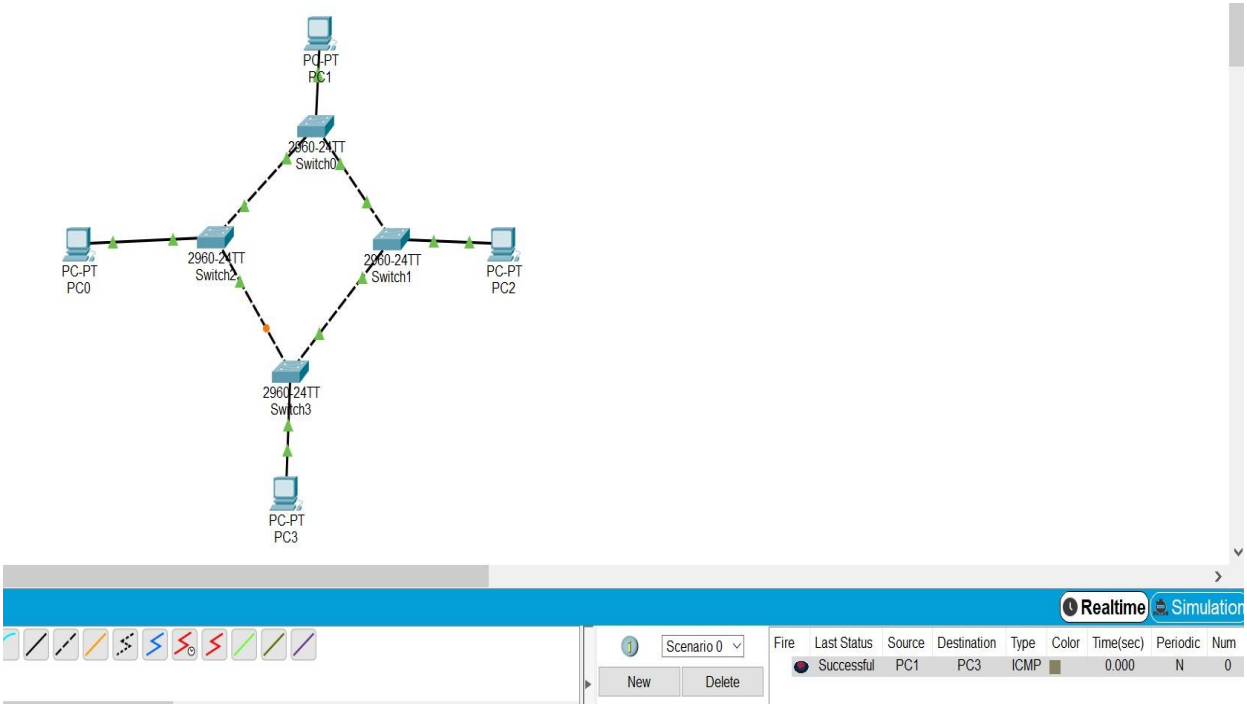
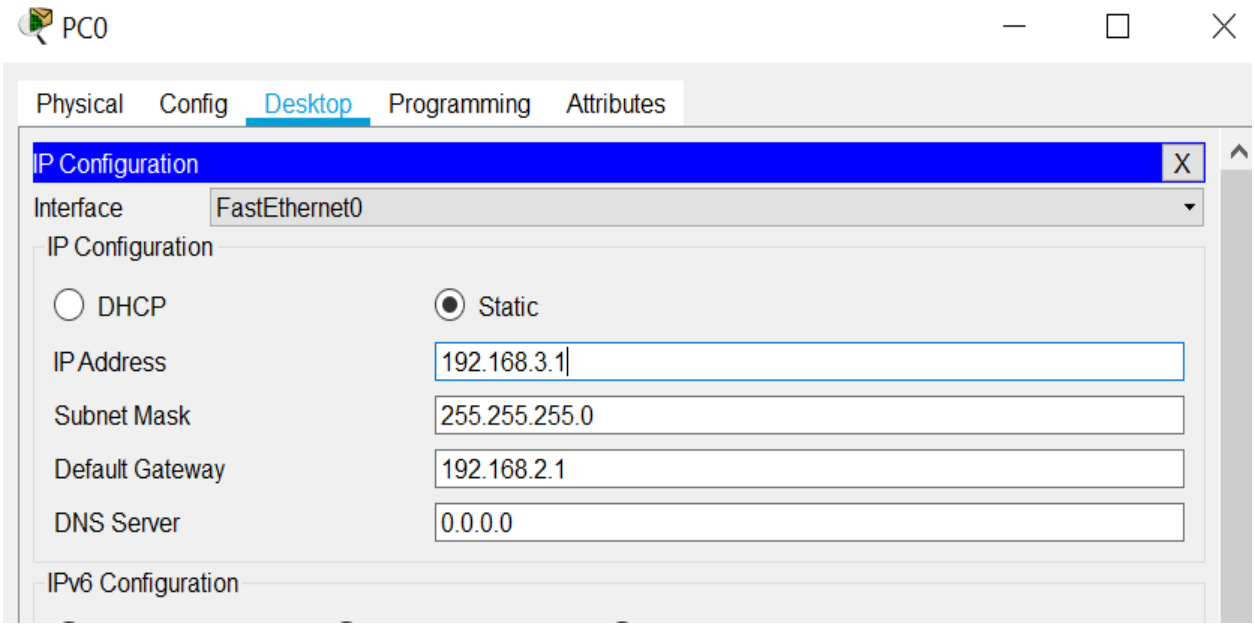



**Ring Topology:**

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IP Configuration
DHCP
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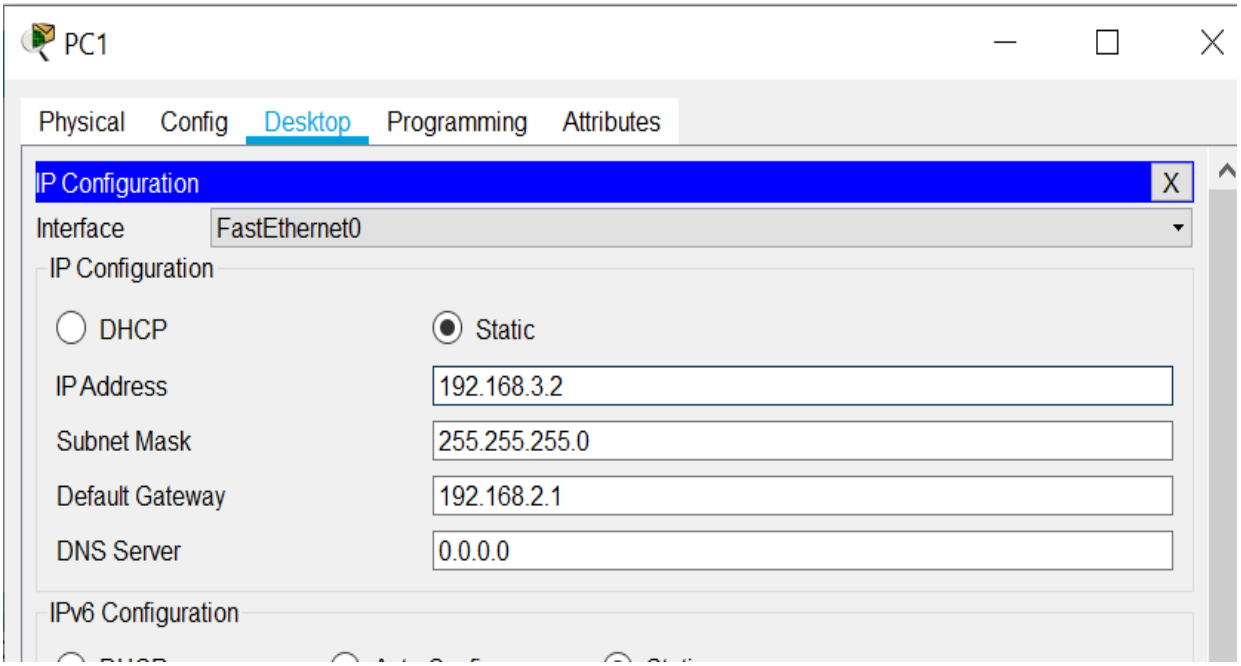
IP Address
192.168.3.1
Subnet Mask
255.255.255.0
Default Gateway
192.168.2.1
DNS Server
0.0.0.0
IPv6 Configuration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DNS Server
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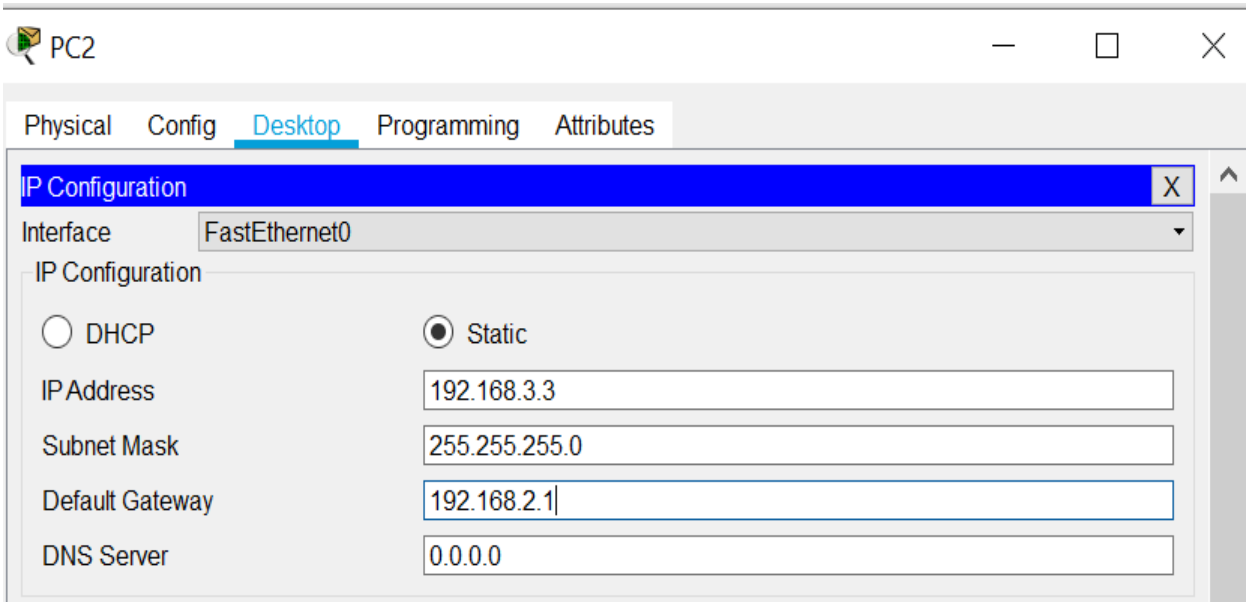
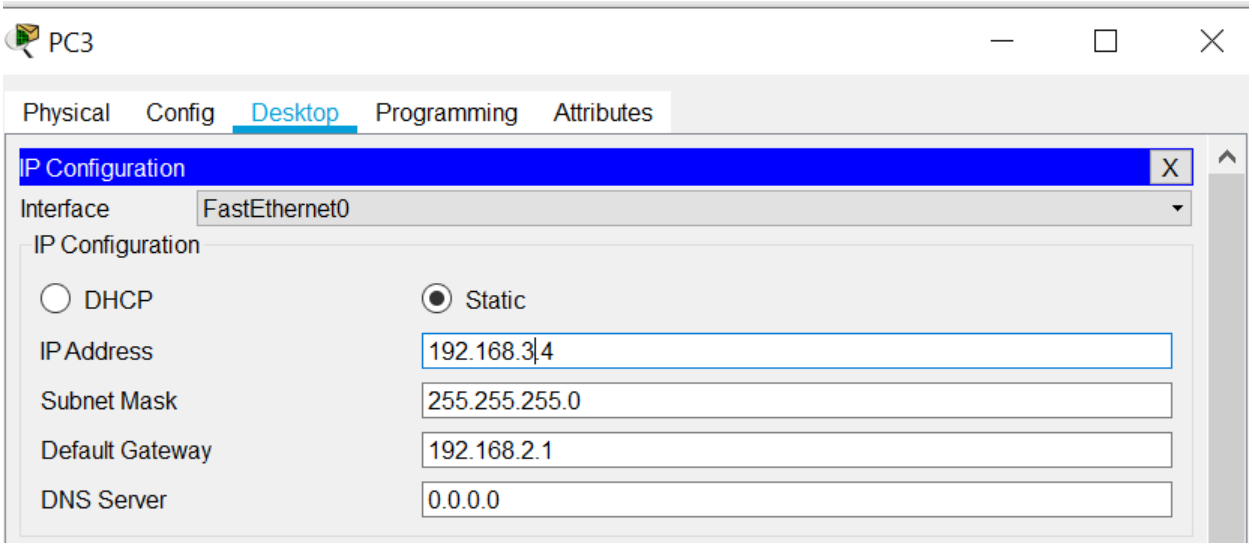
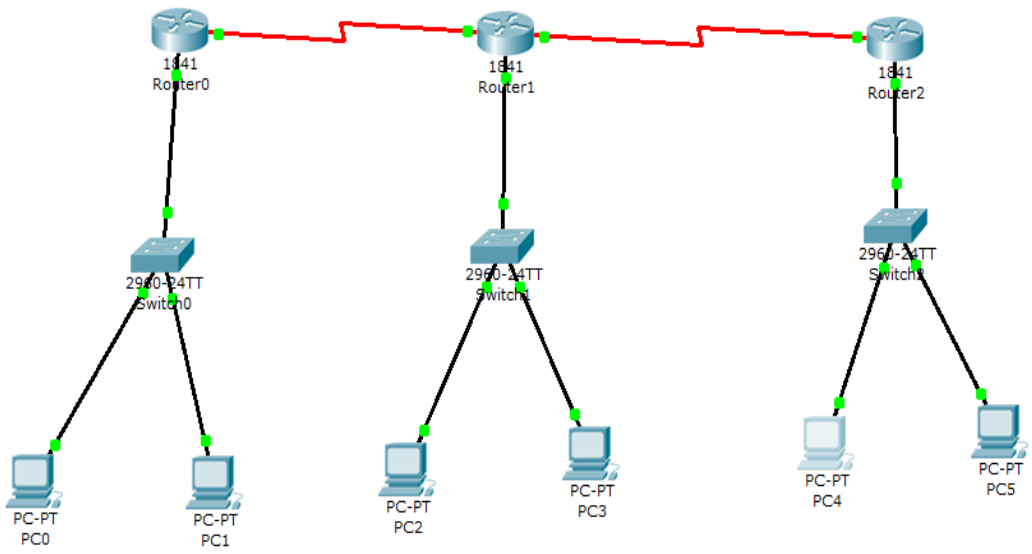
IPv6 Configuration




**2. Implement Routing Information Protocol (RIP Version 1) using Cisco Packet Tracer.**




**Procedure:**

Step 1: Create a network topology in Cisco Packet Tracer with multiple routers connected to each other. You can use the "Router" device from the "Routers" category to create the routers and connect them using appropriate cables.

Step 2: Double-click on each router to access the command line interface (CLI).

Step 3: Enable RIP routing on each router by entering the following command in global configuration mode:

router rip

Step 4: Configure the network statements to advertise the networks connected to each router. Use the following command in router configuration mode:

network network_address

Replace network_address with the actual network address of the interface connected to the network you want to advertise. Repeat this step for each connected network.

Step 5: Optionally, set a passive interface if you do not want to advertise a specific interface. Use the following command in interface configuration mode:

passive-interface interface_name

Replace interface_name with the name of the interface you want to set as passive.

Step 6: Exit router configuration mode by entering exit.

Step 7: Save the configuration changes by entering the copy running-config startup-config command.

Step 8: Repeat Steps 2-7 for each router in your network.

Step 9: Test the connectivity by pinging between devices in different networks. You can use the ping command followed by the IP address of the destination device.

RIP v1 should now be configured on your network. The routers will exchange routing information using RIP, and they will update their routing tables based on the received information. Remember that RIP v1 does not support subnet information and only uses hop count as the metric.

**Requirements:**

**Tools:**

Cisco Packet Tracer 6.0.1 or higher version

**Implementation:**

--- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: no
Press RETURN to get started!

**Router_0**

```
Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname router_0
router_0(config)#interface fa 0/0
router_0(config-if)#ip address 11.0.0.1 255.0.0.0
router_0(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
router_0(config-if)#interface serial 0/1/0
router_0(config-if)#ip address 10.0.0.1 255.0.0.0
router_0(config-if)#clock rate 64000
router_0(config-if)#bandwidth 64
router_0(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
router_0(config-if)#Ctrl+z
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up
```

```
router_0 con0 is now available
Press RETURN to get started.
router_0>show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGPD -
       EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area N1 -
       OSPF NSSA external type 1, N2 - OSPF NSSA external type 2 E1 -
       OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODRP -
       periodic downloaded static route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, Serial0/1/0
C    11.0.0.0/8 is directly connected, FastEthernet0/0

router_0>enable

router_0#config t
Enter configuration commands, one per line.  End with CNTL/Z.
router_0(config)#router rip
router_0(config-router)#network 10.0.0.0
router_0(config-router)#network 11.0.0.0
```

router_0(config-router)#^Z

**Router_1**

%SYS-5-CONFIG_I: Configured from console by console
--- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: no
Press RETURN to get started!

Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname router_1
router_1(config)#interface fa 0/0
router_1(config-if)#ip address 13.0.0.1 255.0.0.0
router_1(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
router_1(config-if)#interface serial 0/1/0
router_1(config-if)#ip address 10.0.0.2 255.0.0.0
router_1(config-if)#clock rate 64000
router_1(config-if)#bandwidth 64
router_1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
router_1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up
router_1(config-if)#interface serial 0/1/1
router_1(config-if)#ip address 12.0.0.1 255.0.0.0
router_1(config-if)#clock rate 64000
router_1(config-if)#bandwidth 64
router_1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
router_1(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to up
router_1(config-if)#^Z
%SYS-5-CONFIG_I: Configured from console by console
router_1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

```
        E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
        i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
        * - candidate default, U - per-user static route, o - ODR
        P - periodic downloaded static route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, Serial0/1/0
C    12.0.0.0/8 is directly connected, Serial0/1/1
C    13.0.0.0/8 is directly connected, FastEthernet0/0
router_1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
router_1(config)#router rip
router_1(config-router)#network 10.0.0.0
router_1(config-router)#network 12.0.0.0
router_1(config-router)#network 13.0.0.0
router_1(config-router)#^Z
%SYS-5-CONFIG_I: Configured from console by console
router_1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
        i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
        * - candidate default, U - per-user static route, o - ODR
        P - periodic downloaded static route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, Serial0/1/0
R    11.0.0.0/8 [120/1] via 10.0.0.1, 00:00:05, Serial0/1/0
C    12.0.0.0/8 is directly connected, Serial0/1/1
C    13.0.0.0/8 is directly connected, FastEthernet0/0
```

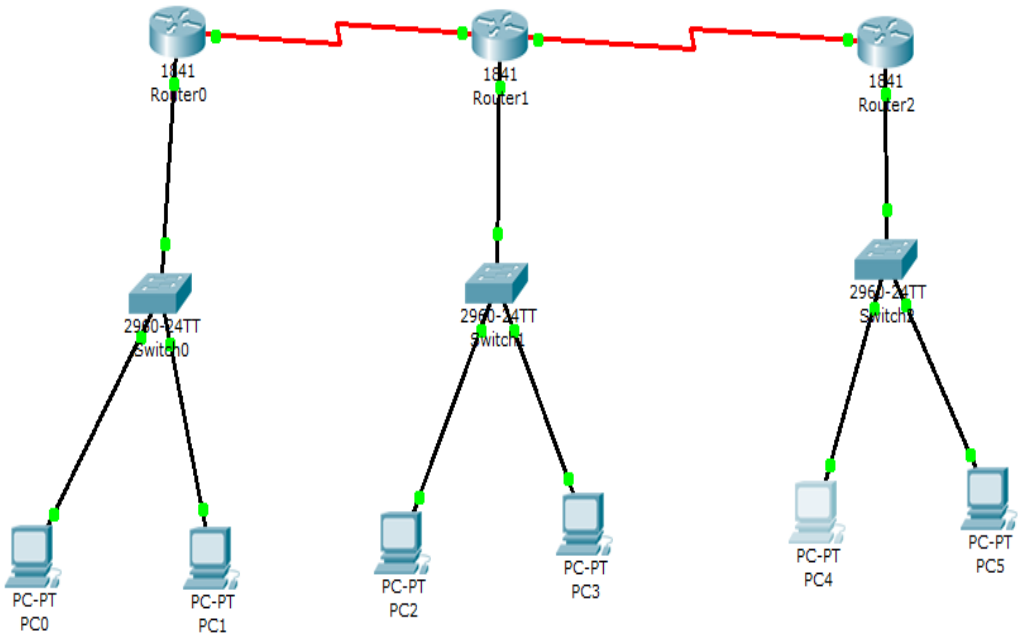
**Router_2**

```
--- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: no
Press RETURN to get started!

Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname router_2
```

```
router_2(config)#interface fa 0/0
router_2(config-if)#ip address 14.0.0.1 255.0.0.0
router_2(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
router_2(config-if)#interface serial 0/1/0
router_2(config-if)#ip address 12.0.0.2 255.0.0.0
router_2(config-if)#clock rate 64000
router_2(config-if)#bandwidth 64
router_2(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
router_2(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up
router_2(config-if)#^Z
%SYS-5-CONFIG_I: Configured from console by console
router_2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
router_2(config)#router rip
router_2(config-router)#network 14.0.0.0
router_2(config-router)#network 12.0.0.0
router_2(config-router)#^Z
%SYS-5-CONFIG_I: Configured from console by console
router_2#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

R    10.0.0.0/8 [120/1] via 12.0.0.1, 00:00:02, Serial0/1/0
R    11.0.0.0/8 [120/2] via 12.0.0.1, 00:00:02, Serial0/1/0
C    12.0.0.0/8 is directly connected, Serial0/1/0
R    13.0.0.0/8 [120/1] via 12.0.0.1, 00:00:02, Serial0/1/0
C    14.0.0.0/8 is directly connected, FastEthernet0/0

--- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: no
Press RETURN to get started!
```

```
Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname                router_2
router_2(config)#interface          fa          0/0
router_2(config-if)#ip address 14.0.0.1 255.0.0.0
router_2(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
router_2(config-if)#interface serial 0/1/0
router_2(config-if)#ip address 12.0.0.2 255.0.0.0
router_2(config-if)#clock rate 64000

router_2(config-if)#bandwidth 64
router_2(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
router_2(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up
router_2(config-if)#^Z
%SYS-5-CONFIG_I: Configured from console by console
router_2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
router_2(config)#router rip
router_2(config-router)#network 14.0.0.0
router_2(config-router)#network 12.0.0.0
router_2(config-router)#^Z
%SYS-5-CONFIG_I: Configured from console by console
router_2#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

R    10.0.0.0/8 [120/1] via 12.0.0.1, 00:00:02, Serial0/1/0
R    11.0.0.0/8 [120/2] via 12.0.0.1, 00:00:02, Serial0/1/0
C    12.0.0.0/8 is directly connected, Serial0/1/0
R    13.0.0.0/8 [120/1] via 12.0.0.1, 00:00:02, Serial0/1/0
C    14.0.0.0/8 is directly connected, FastEthernet0/0
```

**3. Implement Routing Information Protocol (RIP Version 2) using Cisco Packet Tracer.**




**Procedure:**

RIP v2 is an enhanced version of RIP that supports variable-length subnet masks (VLSM) and carries more information in its routing updates compared to RIP v1.

Here's a step-by-step guide to configuring RIP v2:

Step 1: Create a network topology in Cisco Packet Tracer with multiple routers connected to each other. Use the "Router" device from the "Routers" category to create the routers and connect them using appropriate cables.

Step 2: Double-click on each router to access the command line interface (CLI).

Step 3: Enable RIP routing and enter router configuration mode by entering the following commands in global configuration mode:

router rip
version 2

The version 2 command enables RIP v2.

Step 4: Configure the network statements to advertise the networks connected to each router. Use the following command in router configuration mode:

network network_address

Replace network_address with the actual network address of the interface connected to the network you want to advertise. Repeat this step for each connected network.

Step 5: Optionally, set a passive interface if you do not want to advertise a specific interface. Use the following command in interface configuration mode:

passive-interface interface_name

Replace interface_name with the name of the interface you want to set as passive.

Step 6: Exit router configuration mode by entering exit.

Step 7: Save the configuration changes by entering the copy running-config startup-config command.

Step 8: Repeat Steps 2-7 for each router in your network.

Step 9: Test the connectivity by pinging between devices in different networks. Use the ping command followed by the IP address of the destination device.

RIP v2 should now be configured on your network. The routers will exchange routing information using RIP v2, and they will update their routing tables based on the received information. RIP v2 supports VLSM and carries additional information such as subnet masks in its routing updates.

Remember that RIP has limitations in scalability and convergence time, so for larger networks or more advanced requirements, it is recommended to use other routing protocols such as OSPF or EIGRP.

**Requirements:**

**Tools:**

Cisco Packet Tracer 6.0.1 or higher version

**Implementation:**

--- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: no
Press RETURN to get started!

**Router_0**

```
Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname router_0
router_0(config)#interface fa 0/0
router_0(config-if)#ip address 11.0.0.1 255.0.0.0
router_0(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed stateto up
```

```
router_0(config-if)#interface serial 0/1/0
router_0(config-if)#ip address 10.0.0.1 255.0.0.0
router_0(config-if)#clock rate 64000
router_0(config-if)#bandwidth 64
router_0(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
router_0(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up
router_0 con0 is now available
Press RETURN to get started.
router_0>^Z
```

```
router_0>show ip route

C    10.0.0.0/8 is directly connected, Serial0/1/0
C    11.0.0.0/8 is directly connected, FastEthernet0/0

router_0>enable
router_0#config t
Enter configuration commands, one per line.  End with CNTL/Z.
router_0(config)#router rip
router_0(config-router)#version            2
router_0(config-router)#no auto-summary
router_0(config-router)#network 11.0.0.0
router_0(config-router)#network 10.0.0.0
router_0(config-router)#^Z
%SYS-5-CONFIG_I: Configured from console by console
router_0#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
```

**Router_1**

```
--- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: no
Press RETURN to get started!

Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname                    router_1
router_1(config)#interface            fa            0/0
router_1(config-if)#ip address 13.0.0.1 255.0.0.0
router_1(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed stateto up
router_1(config-if)#interface       serial       0/1/0
router_1(config-if)#ip address 10.0.0.2 255.0.0.0
router_1(config-if)#clock rate 64000
router_1(config-if)#bandwidth 64
router_1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
router_1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up
router_1 con0 is now available
```

```
Press RETURN to get started.
router_1>enable
router_1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
router_1(config)#interface serial 0/1/1
router_1(config-if)#ip address 12.0.0.1 255.0.0.0
router_1(config-if)#clock rate 64000
router_1(config-if)#bandwidth 64
router_1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/1, changed state to up
router_1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to up
router_1(config-if)#^Z
%SYS-5-CONFIG_I: Configured from console by console
router_1#show ip route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, Serial0/1/0
C    12.0.0.0/8 is directly connected, Serial0/1/1
C    13.0.0.0/8 is directly connected, FastEthernet0/0

router_1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
router_1(config)#router rip
router_1(config-router)#version 2
router_1(config-router)#no auto-summary
router_1(config-router)#network 13.0.0.0
router_1(config-router)#network 10.0.0.0
router_1(config-router)#network 12.0.0.0
router_1(config-router)#^Z
%SYS-5-CONFIG_I: Configured from console by console
router_1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

**Router_2**

```
        --- System Configuration Dialog ---
Continue with configuration dialog? [yes/no]: no
Press RETURN to get started!

Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname router_2
router_2(config)#interface fa 0/0
```

```
router_2(config-if)#ip address 14.0.0.1 255.0.0.0
router_2(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed stateto up
router_2(config-if)#interface serial 0/1/0
router_2(config-if)#ip address 12.0.0.2 255.0.0.0
router_2(config-if)#clock rate 64000
router_2(config-if)#bandwidth 64
router_2(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
router_2(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up
router_2(config-if)#^Z
%SYS-5-CONFIG_I: Configured from console by console
router_2#show ip route

C    12.0.0.0/8 is directly connected, Serial0/1/0
C    14.0.0.0/8 is directly connected, FastEthernet0/0

router_2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
router_2(config)#router rip
router_2(config-router)#version 2
router_2(config-router)#no auto-summary
router_2(config-router)#network 12.0.0.0
router_2(config-router)#network 14.0.0.0
router_2(config-router)#^Z
%SYS-5-CONFIG_I: Configured from console by console
router_2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
router_2#show ip route

R    10.0.0.0/8 [120/1] via 12.0.0.1, 00:00:15, Serial0/1/0
R    11.0.0.0/8 [120/2] via 12.0.0.1, 00:00:15, Serial0/1/0
C    12.0.0.0/8 is directly connected, Serial0/1/0
R    13.0.0.0/8 [120/1] via 12.0.0.1, 00:00:15, Serial0/1/0
C    14.0.0.0/8 is directly connected, FastEthernet0/0
router_0# show ip protocols
router_1#show ip protocols
router_2#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 14 seconds
```

```
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2 Interface
                    Send  Recv  Triggered RIP  Key-chain
  Serial0/1/0       2     2
  FastEthernet0/0   2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
        12.0.0.0
        14.0.0.0
Passive Interface(s):
Routing Information Sources:
        Gateway         Distance      Last Update
        12.0.0.1             120      00:00:25
Distance: (default is 120)
```

## 4. Implement Open Shortest Path First (OSPF) protocol using Cisco Packet Tracer.

**Procedure:**

OSPF is a link-state routing protocol that calculates the shortest path to a destination network based on cost.

Here's a step-by-step guide to configuring OSPF:

Step 1: Create a network topology in Cisco Packet Tracer with multiple routers connected to each other. Use the "Router" device from the "Routers" category to create the routers and connect them using appropriate cables.

Step 2: Double-click on each router to access the command line interface (CLI).

Step 3: Enable OSPF routing and enter router configuration mode by entering the following commands in global configuration mode:

router ospf process_id

Replace process_id with a unique number to identify the OSPF process on the router.

Step 4: Configure the OSPF area by entering the following command in router configuration mode:

network network_address wildcard_mask area area_id

Replace network_address with the network address of the interface connected to the network you want to include in OSPF routing. Replace wildcard_mask with the inverse of the subnet mask. Replace area_id with the ID of the OSPF area. Repeat this step for each connected network.

Step 5: Optionally, configure OSPF authentication if required. Use the following command in router configuration mode:

ip ospf authentication-key password

Replace password with the desired authentication password.

Step 6: Exit router configuration mode by entering exit.

Step 7: Save the configuration changes by entering the copy running-config startup-config command.

Step 8: Repeat Steps 2-7 for each router in your network.

Step 9: Test the connectivity by pinging between devices in different networks. Use the ping command followed by the IP address of the destination device.

OSPF should now be configured on your network. The routers will exchange link-state advertisements (LSAs) and build a topological database to calculate the shortest path to reach a destination network.

Remember that OSPF requires proper network design and planning, including the assignment of appropriate OSPF areas and router IDs. OSPF is scalable and provides fast convergence, making it suitable for larger networks.

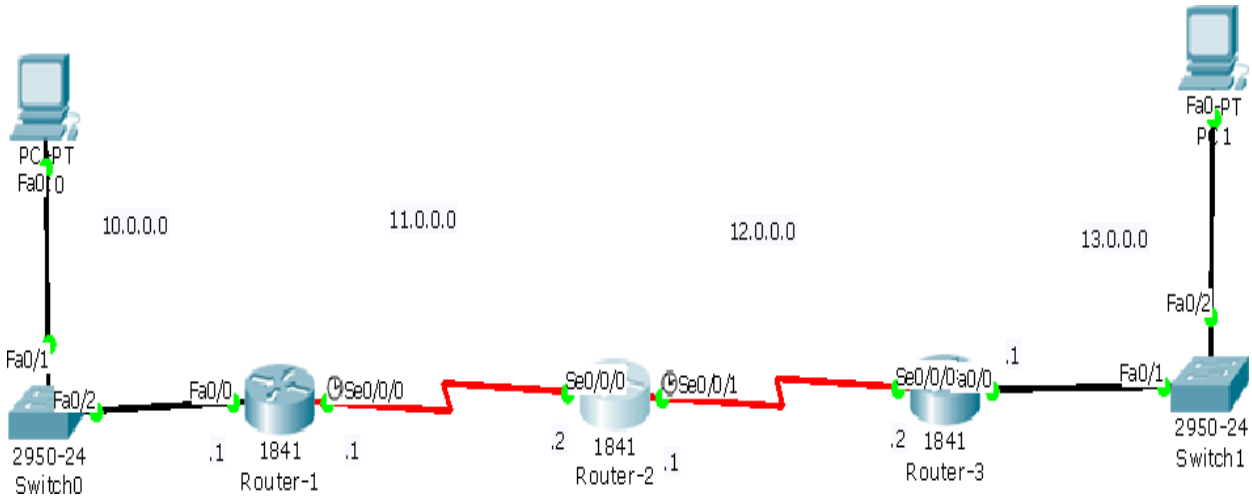
**Requirements:**

**Tools:**
Cisco Packet Tracer 6.0.1 or higher version

**Topology Constructions Requirements:**

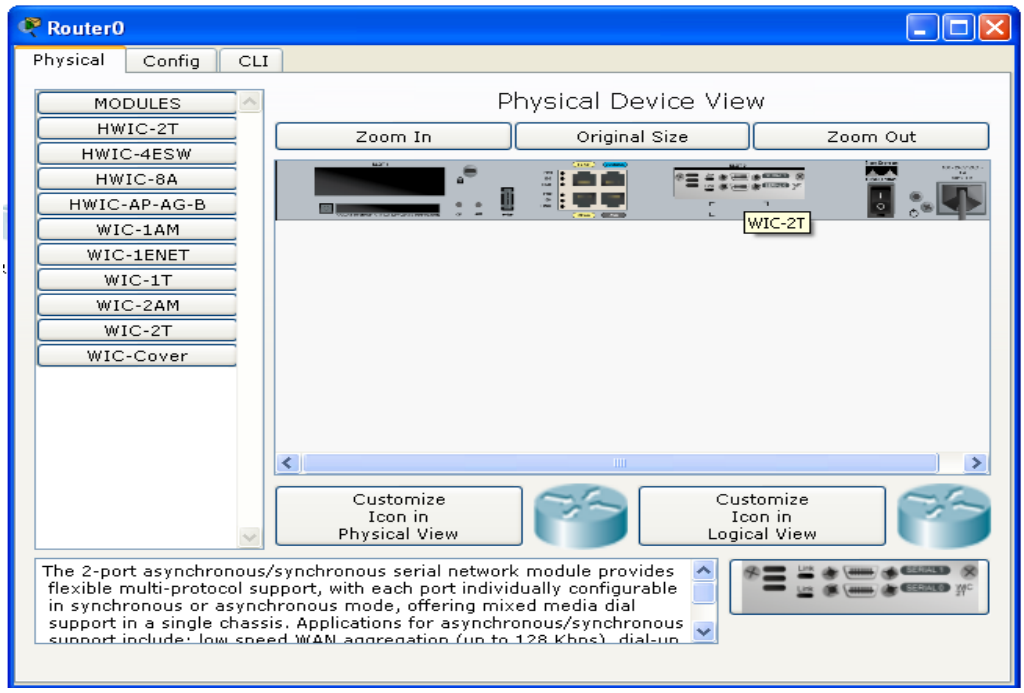
1. Two Windows PC or Linux PC for each LAN, Each PC must Have One NICcards.
2. Two Switch (24 port).
3. Three Routers 1841.
4. Straight Line LAN (cat-5) Cables with RJ-45 Sockets.
5. Class A- IP Address using Static IP configuration.

**Network Topology:**




**Router-to-Router Connectivity:**

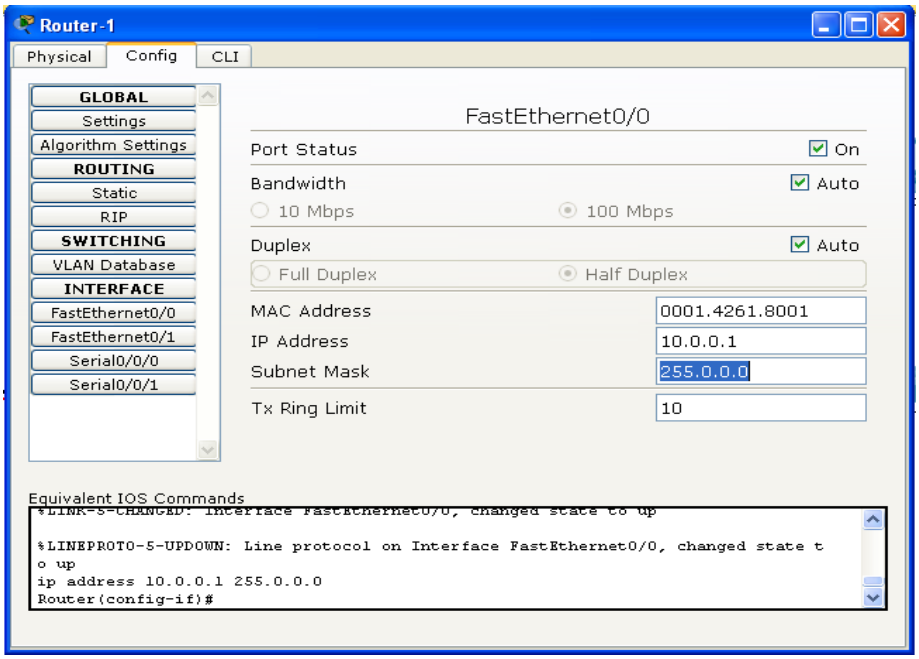
1. For connecting LAN to LAN Serial Port should be used.
2. By default, Router should not have a serial port. To have it, first switch off the Router and drag the WIC-2T interface into the Serial port Space and then switch on it.



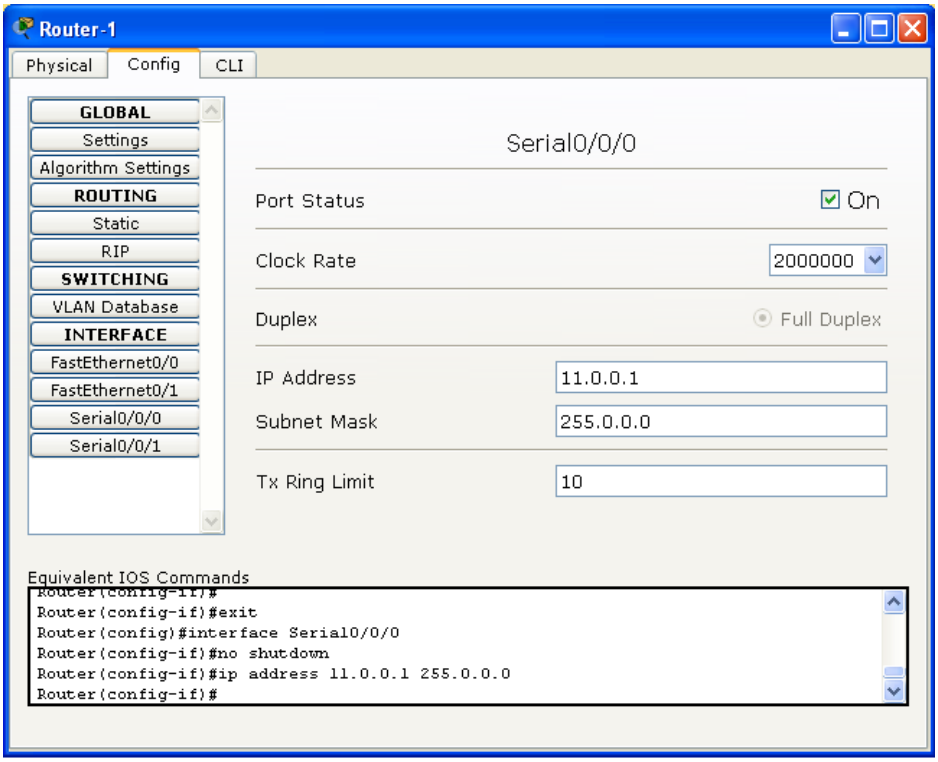

3. One side of the Serial port is DCE (Data Circuit Terminal Equipment) which requires Clock rate setup.
4. Another side of serial port is DTE (Data Terminating Equipment) which doesn't requires clock rate.

**Configuring Router-1's interface:**

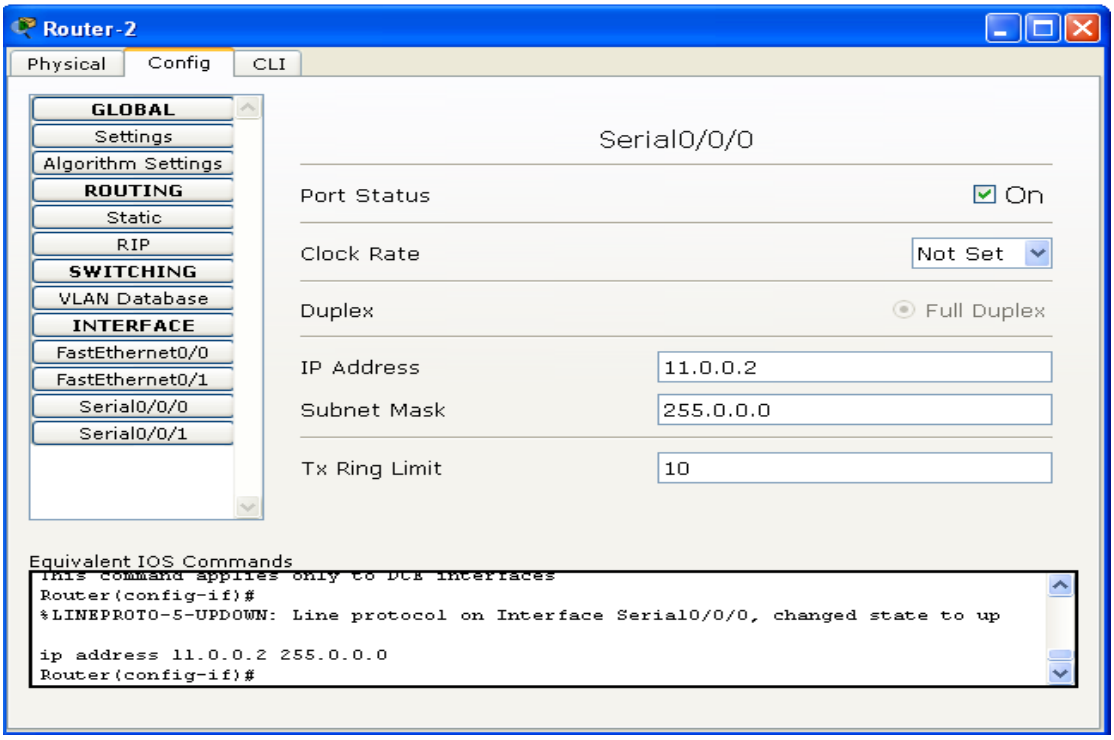
**Fast-Ethernet 0/0:**



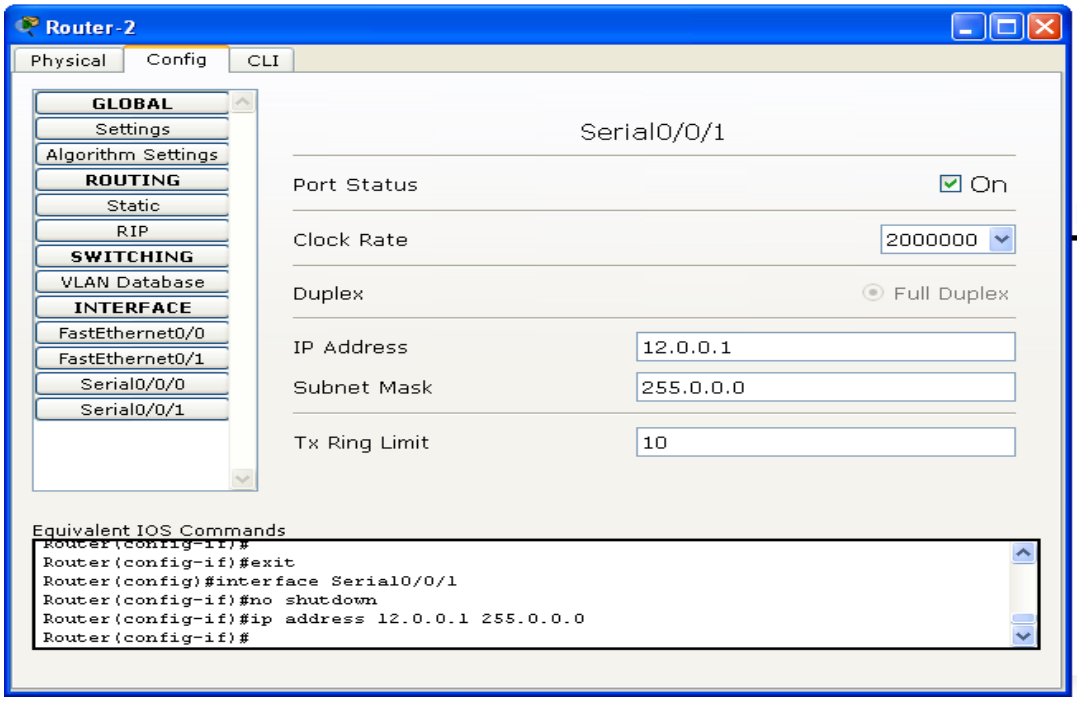

**Serial Port 0/0/0 (DCE – set Clock rate):**



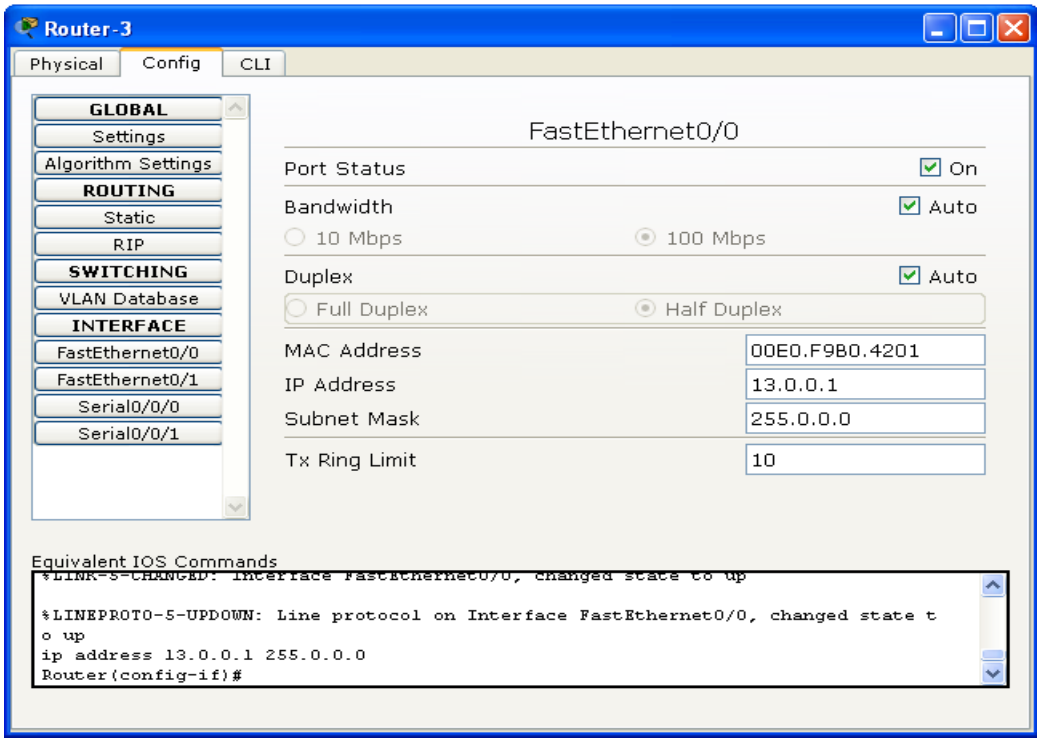

**Configuring Router-2's interface:**
**Serial Port 0/ 0/0 (DTE end):**



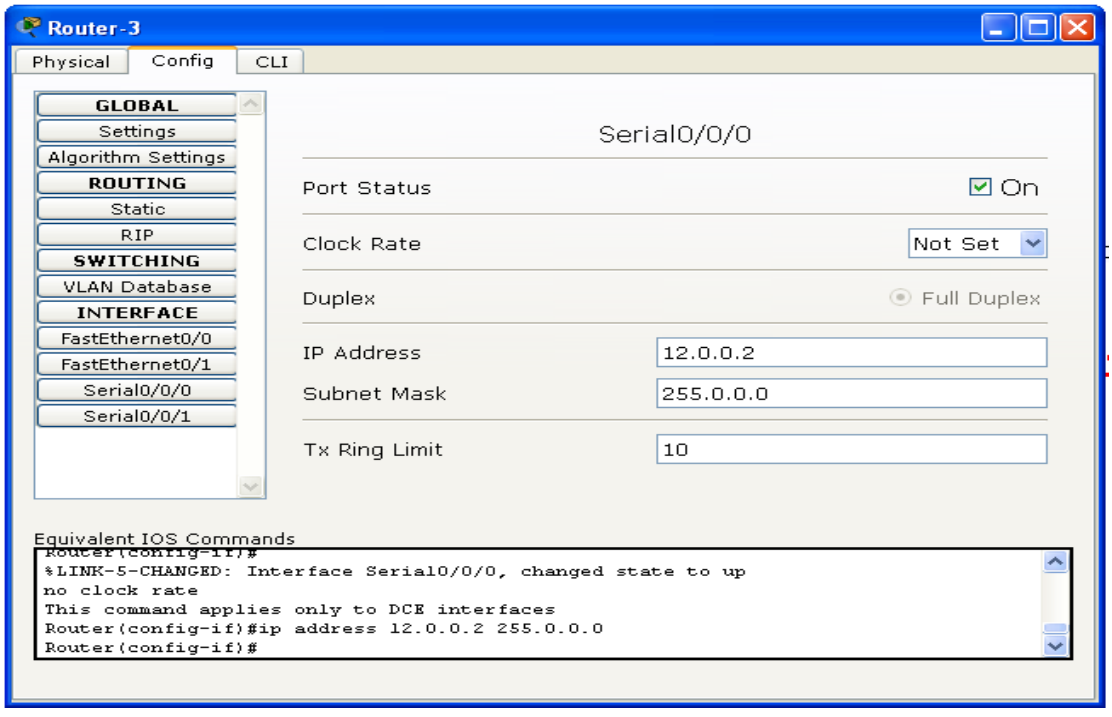

**Serial Port 0/0/1 (DCE – set Clock rate):**



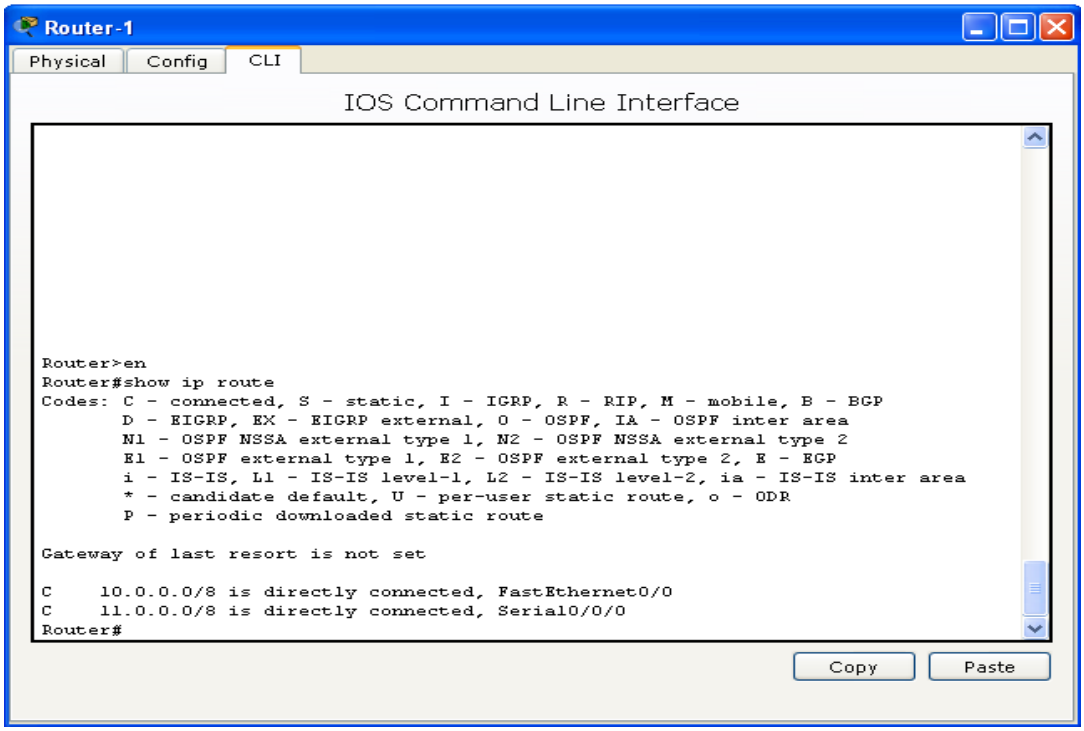

**Configuring Router-3's interface:**
**Fast-Ethernet 0/0:**



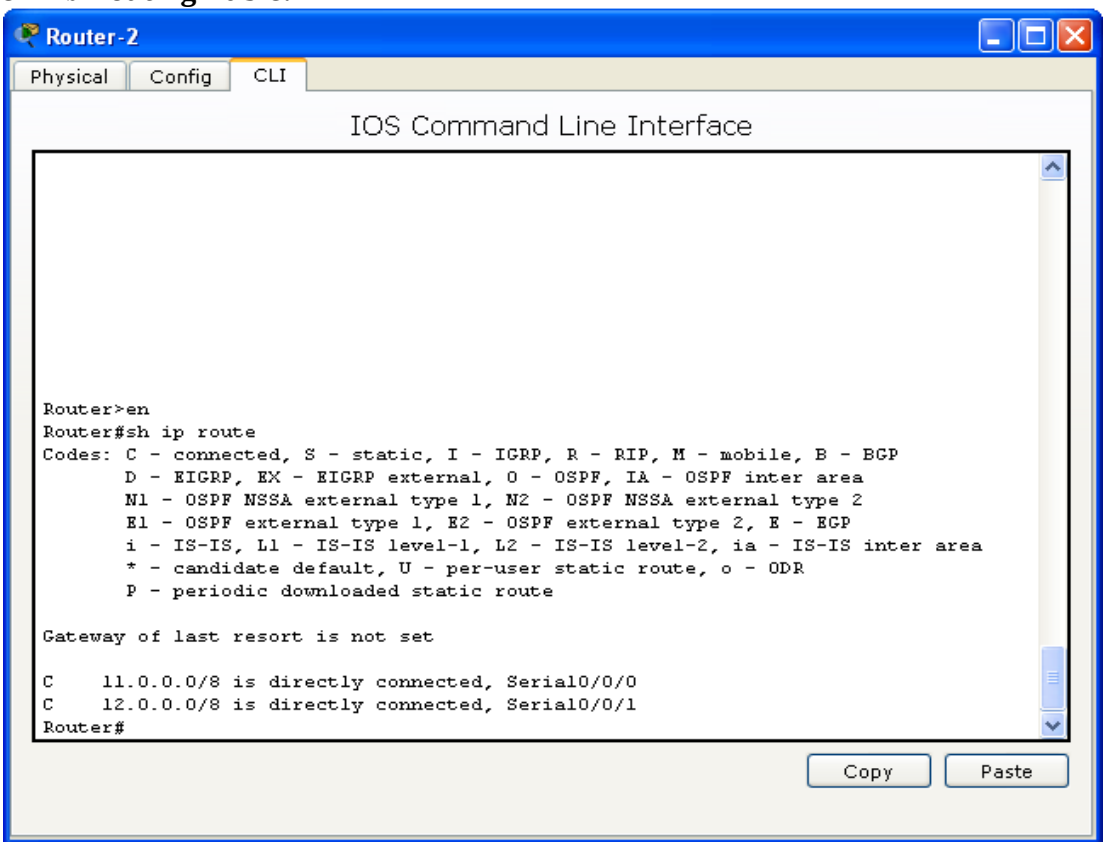

**Serial Port 0/0/0 (DTE – End):**



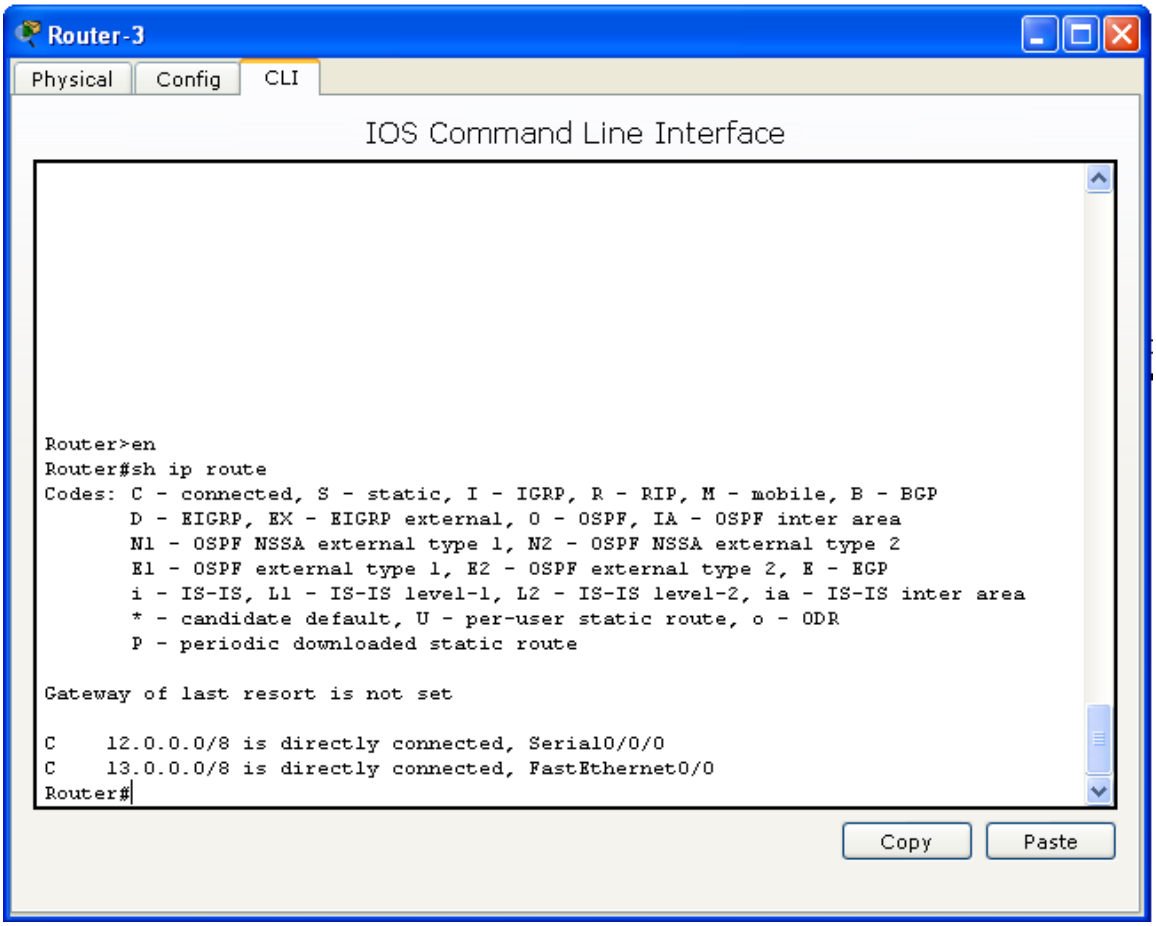

**Router-1's Routing Table:**




**Router-2's Routing Table:**




**Router-3's Routing Table:**




**Configure the center Router-2 for OSPF:**

Syntax: Router(config)# router ospf process-ID
Router(config)#router ospf 1

Syntax: Router(config-router)# network address wild-card area no.
Router(config-router)#network 11.0.0.0 0.255.255.255 area 1
Router(config-router)#network 12.0.0.0 0.255.255.255 area 1

**Note: The updates will send to the network those are in the same area group.Ensuring**

**the Routing Table of Router-2 (center):**

Router#sh ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B -BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODRP - periodic downloaded static route
Gateway of last resort is not set
C 11.0.0.0/8 is directly connected, Serial0/0/0 C
12.0.0.0/8 is directly connected, Serial0/0/1

**Ensuring the Routing Table of Router-1:**

```
Router#sh ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B -BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area N1 -
OSPF NSSA external type 1, N2 - OSPF NSSA external type 2E1 - OSPF
external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODRP -
periodic downloaded static route
Gateway of last resort is not set
    C    10.0.0.0/8 is directly connected, FastEthernet0/0
```

**Note: The Network 11.0.0.0 has been removed because it was configured in OSPFrouter.**

**Ensuring the Routing Table of Router-3:**

```
Router#sh ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B -BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area N1 -
OSPF NSSA external type 1, N2 - OSPF NSSA external type 2E1 - OSPF
external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODRP -
periodic downloaded static route
Gateway of last resort is not set
    C    13.0.0.0/8 is directly connected, FastEthernet0/0
```

Note:

- The Network 12.0.0.0 has been removed because it was configured in OSPFrouter.
- OSPF Router will send the updates only to the Routers those are configured with OSPF.
- OSPF: Triggered Updates means whenever changes in the network happens, it will send an updates to the neighbor router of OSPF.

For Routing Details Distribution Configure OSPF in Router-1 & 3 also. So these Routers are running RIP and OSPF protocols.

**OSPF in Router-1:**

```
Router(config)#router ospf 1
Router(config-router)#network 10.0.0.0 0.255.255.255 area 1
Router(config-router)#network 11.0.0.0 0.255.255.255 area 1
```

**OSPF in Router-3:**

```
Router(config)#router ospf 1
Router(config-router)#network 13.0.0.0 0.255.255.255 area 1
Router(config-router)#network 12.0.0.0 0.255.255.255 area 1
```

**After Configuration Routing table in Router-1:**

Router#sh ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGPD - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODRP - periodic downloaded static route

Gateway of last resort is not set

C 10.0.0.0/8 is directly connected, FastEthernet0/0 C
11.0.0.0/8 is directly connected, Serial0/0/0

O 12.0.0.0/8 [110/128] via 11.0.0.2, 00:09:42, Serial0/0/0 O
13.0.0.0/8 [110/129] via 11.0.0.2, 00:09:42, Serial0/0/0

**Routing Table in Router-3:**

Router#sh ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGPD - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODRP - periodic downloaded static route

Gateway of last resort is not set

O 10.0.0.0/8 [110/129] via 12.0.0.1, 00:11:17, Serial0/0/0 O
11.0.0.0/8 [110/128] via 12.0.0.1, 00:11:17, Serial0/0/0

C 12.0.0.0/8 is directly connected, Serial0/0/0

C 13.0.0.0/8 is directly connected, FastEthernet0/0

**Routing Table in Router-2:**

Router#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2 E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODRP - periodic downloaded static route

Gateway of last resort is not set

O 10.0.0.0/8 [110/65] via 11.0.0.1, 00:11:57, Serial0/0/0

C 11.0.0.0/8 is directly connected, Serial0/0/0 C
12.0.0.0/8 is directly connected, Serial0/0/1

O 13.0.0.0/8 [110/65] via 12.0.0.2, 00:11:57, Serial0/0/1

**5. Implement Dynamic Host Control Protocol (DHCP) using Cisco Packet Tracer.**

DHCP is a network protocol that automatically assigns IP addresses and other network configuration parameters to devices on a network.

Here's a step-by-step guide to configuring DHCP:

Step 1: Create a network topology in Cisco Packet Tracer with a router and multiple devices (e.g., PCs) connected to it. Use the "Router" device from the "Routers" category and "Generic PC" devices from the "End Devices" category.

Step 2: Double-click on the router to access the command line interface (CLI).

Step 3: Enter global configuration mode by entering the following command:

enable

configure terminal

Step 4: Configure the router's interface that connects to the network where you want to enable DHCP. Use the following commands:

interface interface_name

ip address ip_address subnet_mask

no shutdown

Replace interface_name with the name of the router's interface (e.g., FastEthernet0/0, GigabitEthernet0/0, etc.). Replace ip_address and subnet_mask with the appropriate values for your network.

Step 5: Enter DHCP configuration mode by entering the following command:

ip dhcp pool pool_name

Replace pool_name with a name for your DHCP pool.

Step 6: Configure the network parameters for the DHCP pool. Use the following commands:

network network_address subnet_mask

default-router default_gateway

dns-server dns_server_address

Replace network_address and subnet_mask with the network address and subnet mask of the network. Replace default_gateway with the IP address of the router's interface in the network.

Replace dns_server_address with the IP address of the DNS server you want to assign to the devices.

Step 7: Exit DHCP configuration mode by entering exit.

Step 8: Save the configuration changes by entering the copy running-config startup-config command.

Step 9: Repeat Steps 2-8 for each router in your network, if applicable.

Step 10: Test DHCP by connecting a device (e.g., PC) to the network and configuring it to obtain an IP address automatically. The device should receive an IP address, default gateway, and DNS server from the DHCP server (router).

DHCP should now be configured in your network, and devices can automatically obtain IP addresses and other network configuration parameters from the DHCP server.

Note: In Cisco Packet Tracer, the "Generic PC" devices may have limited DHCP configuration options compared to real-world DHCP servers. However, the basic DHCP functionality should still work as described above.

**Requirements:**

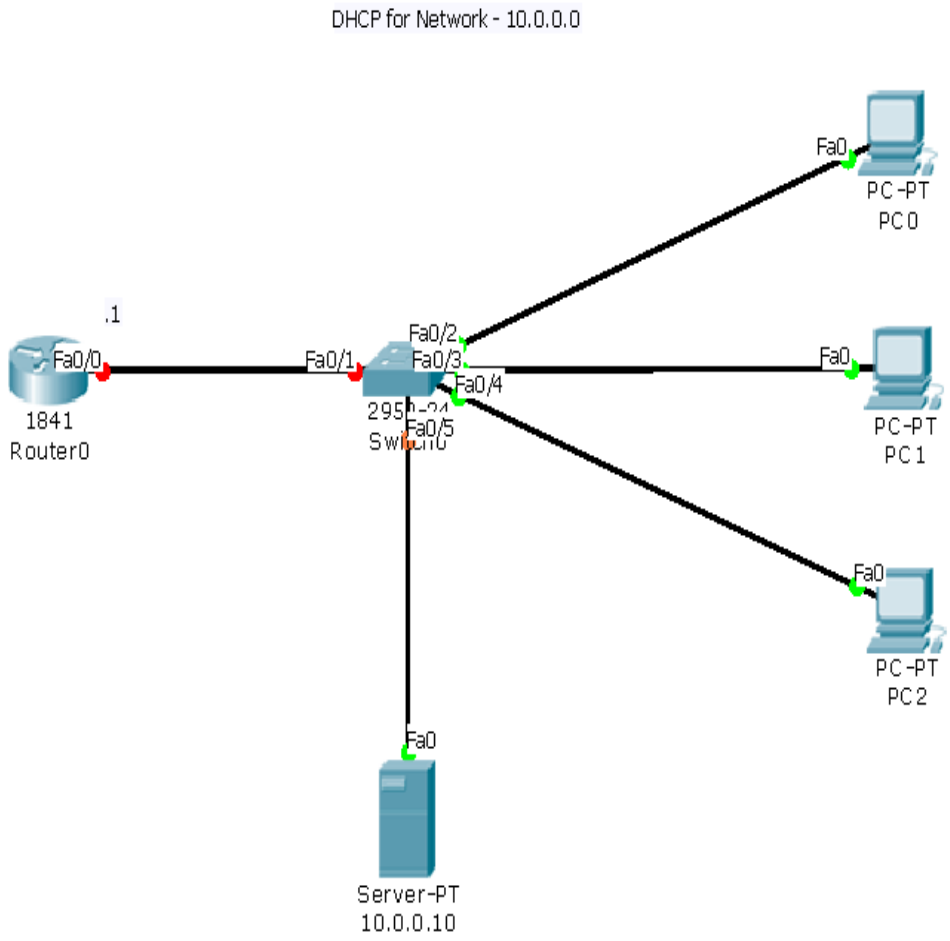
**Tools:**

2. Cisco Packet Tracer 6.0.1 or higher version

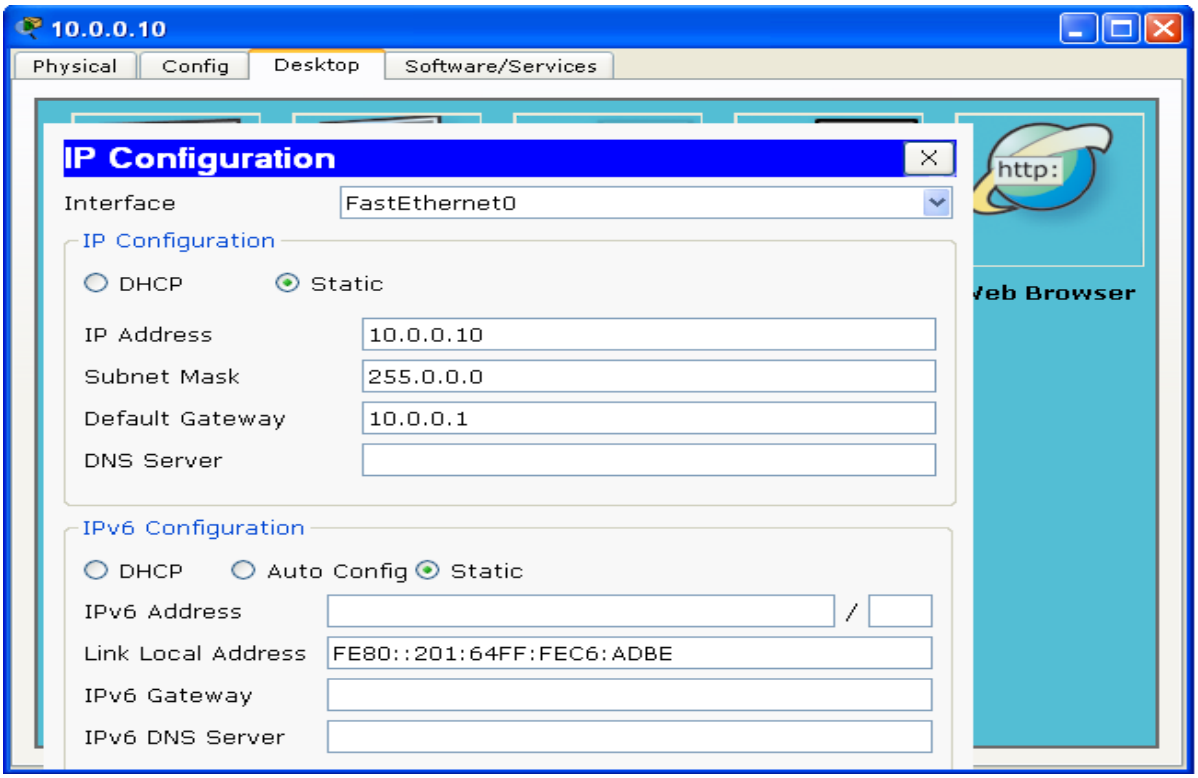
**Topology Constructions Requirements:**

7. Three Windows PC or Linux PC for each LAN, Each PC must Have One NICcards
8. One Switch (24 ports)
9. One Router-1841
10. One Server
11. Straight Line LAN (cat-5) Cables with RJ-45 Sockets
12. Class A- IP Address using DHCP configuration

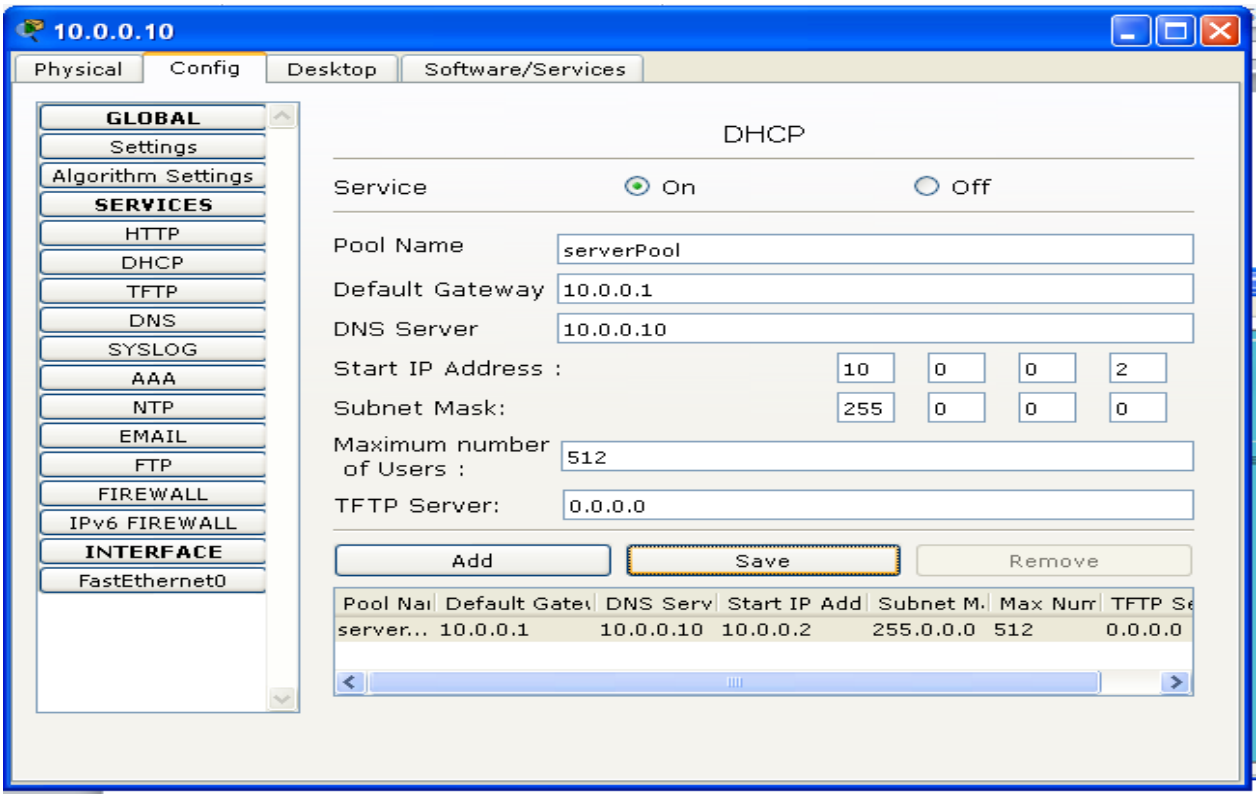
**Network Topology:**



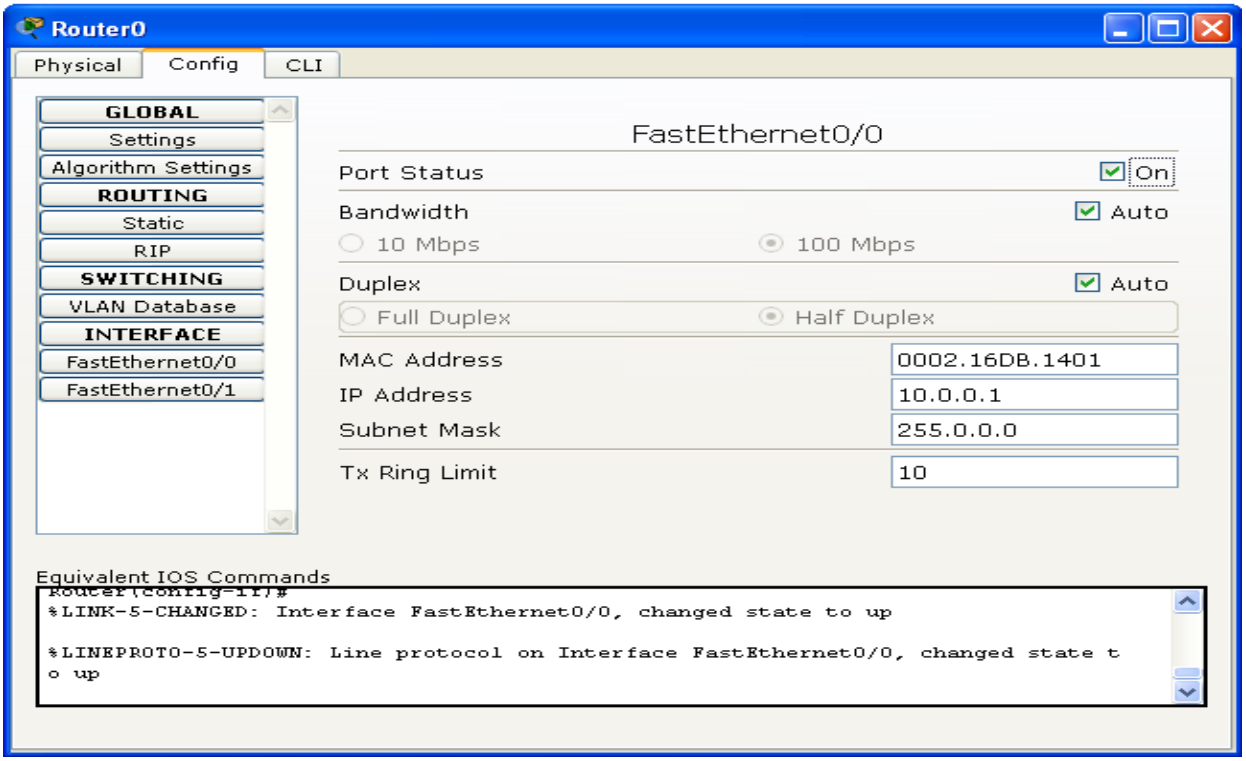

**IP configuration in Server:**




**DHCP configuration in Server:**




**Router's Gateway Configuration:**




**DHCP configuration in Router:**

Router>en

Router#conf t

Router(config)#ip dhcp pool CISCO Router(dhcp-config)#network 10.0.0.0 255.0.0.0

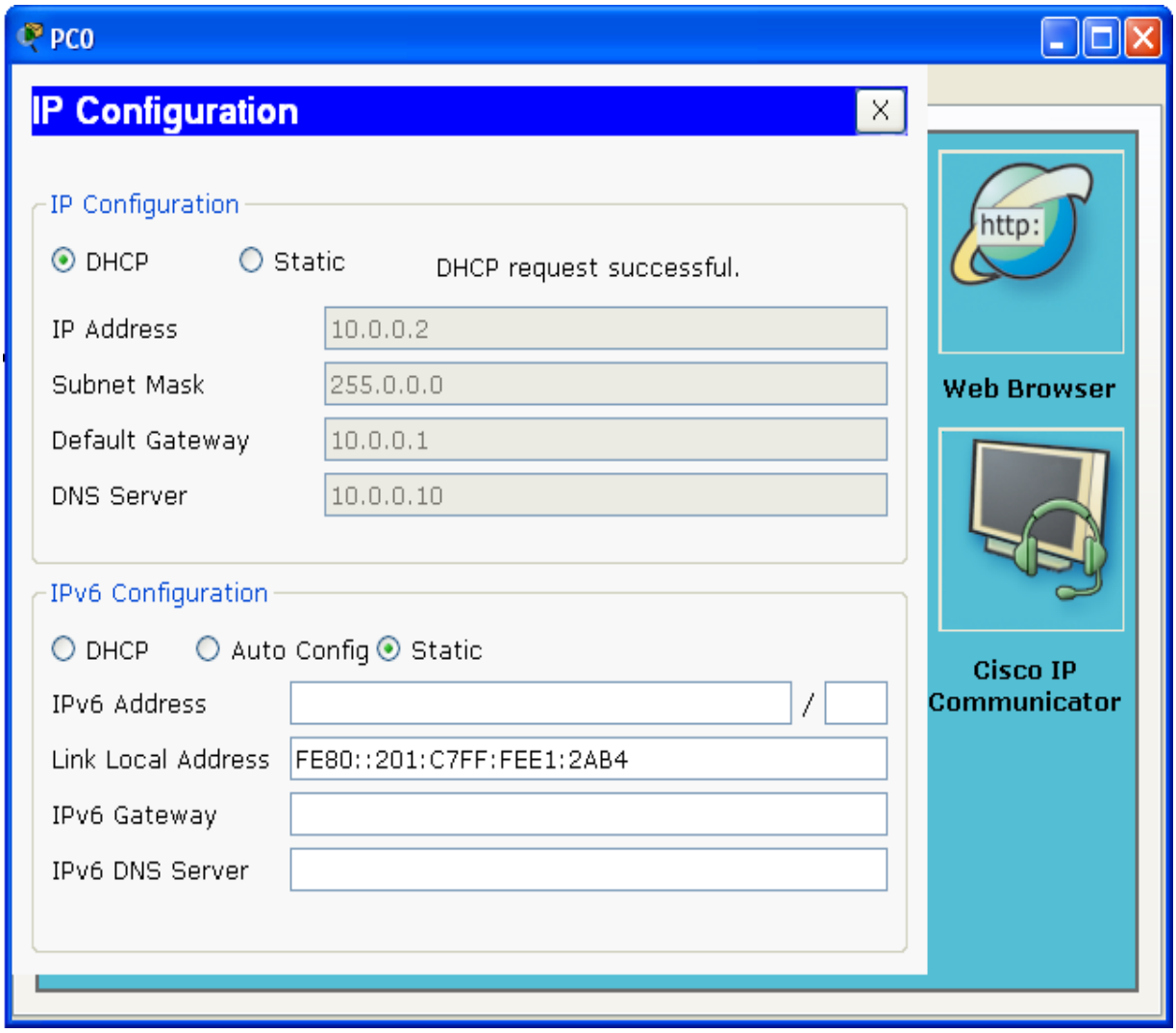
Router(dhcp-config)#default-router 10.0.0.1

Router(dhcp-config)#dns-server 10.0.0.10

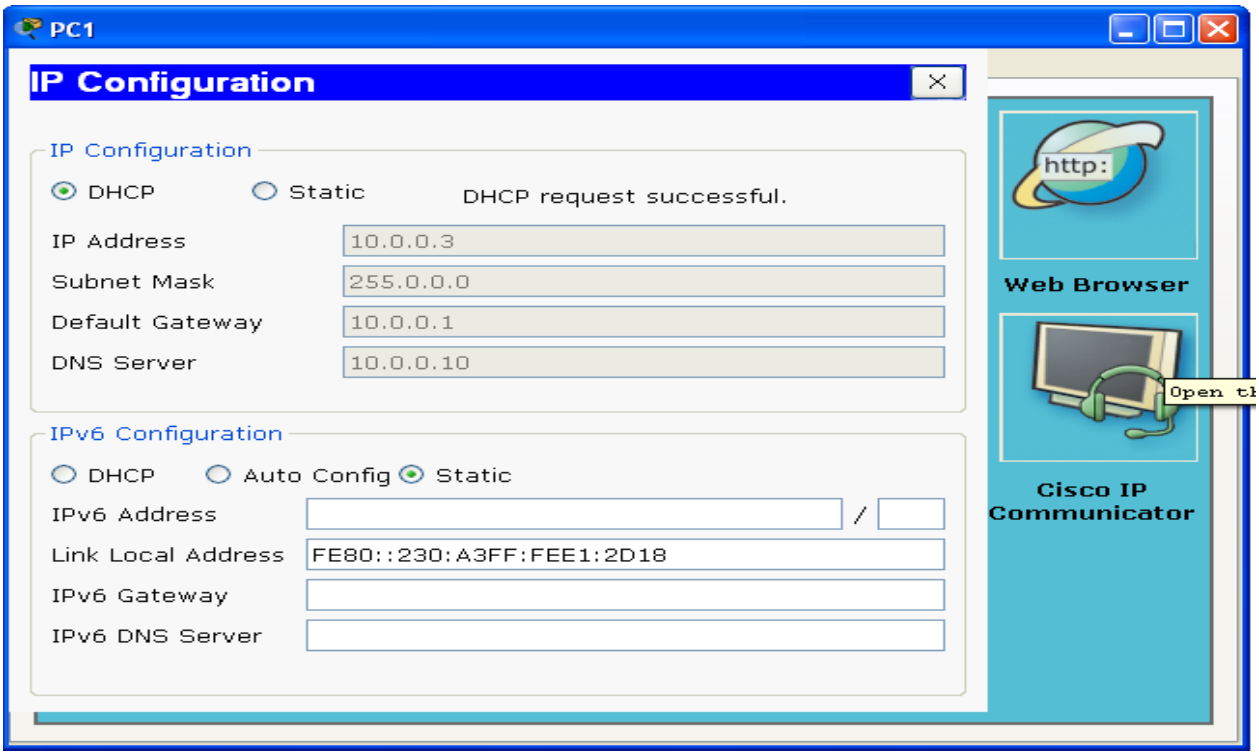
Router(dhcp-config)# end

**PC's getting IPs using Router Configuration of DHCP:**

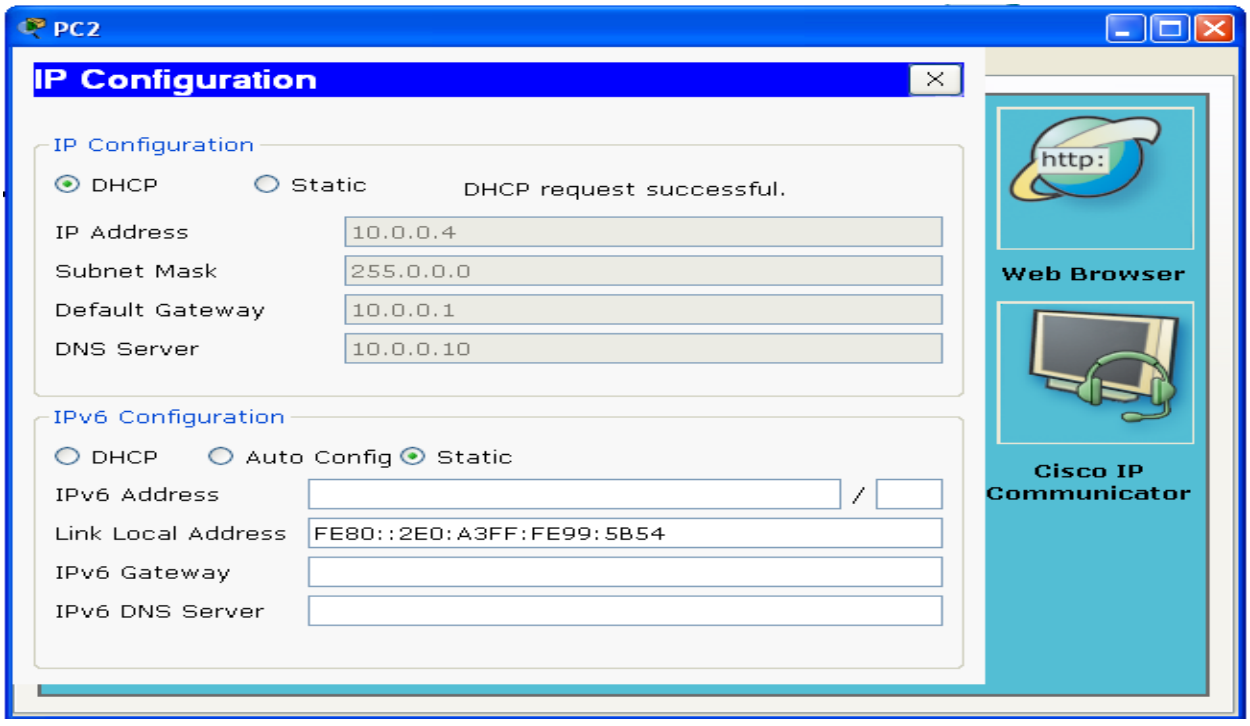
**PC-1:**


PC0
IP Configuration
IP Configuration
DHCP
Static
DHCP request successful.
IP Address
10.0.0.2
Subnet Mask
255.0.0.0
Default Gateway
10.0.0.1
DNS Server
10.0.0.10
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address
FE80::201:C7FF:FEE1:2AB4
IPv6 Gateway
IPv6 DNS Server
http:
Web Browser
Cisco IP Communicator

**PC-2:**




**PC-3:**




## 6. Implement Firewall configurations using Cisco Packet Tracer.

**Procedure:**

To implement Firewall configurations using Cisco Packet Tracer, follow these steps:

Step 1: Design the Network Topology

Open Cisco Packet Tracer and create a network topology that represents your desired network with firewall functionality.

Include the relevant network devices, such as routers, switches, and firewalls.

Ensure that the devices are appropriately connected and configured with IP addresses.

Step 2: Configure Access Control Lists (ACLs)

Determine the access control policies you want to enforce on the firewall.

Access the command line interface (CLI) of the firewall device.

Configure the appropriate access control lists (ACLs) to define the desired traffic flow restrictions. Use commands such as access-list or ip access-group to create and apply ACLs to interfaces.

Step 3: Configure Firewall Rules

Identify the specific firewall rules you want to implement to control traffic flow.

Access the CLI of the firewall device and configure the desired firewall rules. This may involve commands such as access-group, class-map, policy-map, or service-policy to define traffic classes, policies, and actions.

Step 4: Set Up NAT (Network Address Translation)

Determine if you need to configure Network Address Translation (NAT) on the firewall.

Access the CLI of the firewall device and configure NAT settings using commands such as ip nat inside, ip nat outside, or ip nat pool to define NAT translation rules.

Step 5: Apply Firewall Configuration to Interfaces

Identify the specific interfaces on the firewall where you want to apply the firewall configuration.

Access the CLI of the firewall device and apply the firewall configuration to the appropriate interfaces. Use commands such as interface and ip access-group to bind ACLs or firewall policies to the desired interfaces.

Step 6: Save the Configuration

After configuring the firewall, save the configuration using the appropriate command, such as write memory or copy running-config startup-config.

Step 7: Test and Verify

Generate network traffic or simulate scenarios in Packet Tracer to test the effectiveness of the firewall configuration.

Monitor the traffic flow and observe if the firewall is correctly filtering and allowing/blocking traffic based on the configured policies.

Adjust the configuration as needed to optimize firewall performance.

Please note that the specific commands and options for configuring firewalls may vary depending on the Cisco firewall model and software version used in Cisco Packet Tracer. It's always a good practice to consult the documentation and resources specific to your firewall model for detailed instructions on firewall configuration.

**Requirements:**

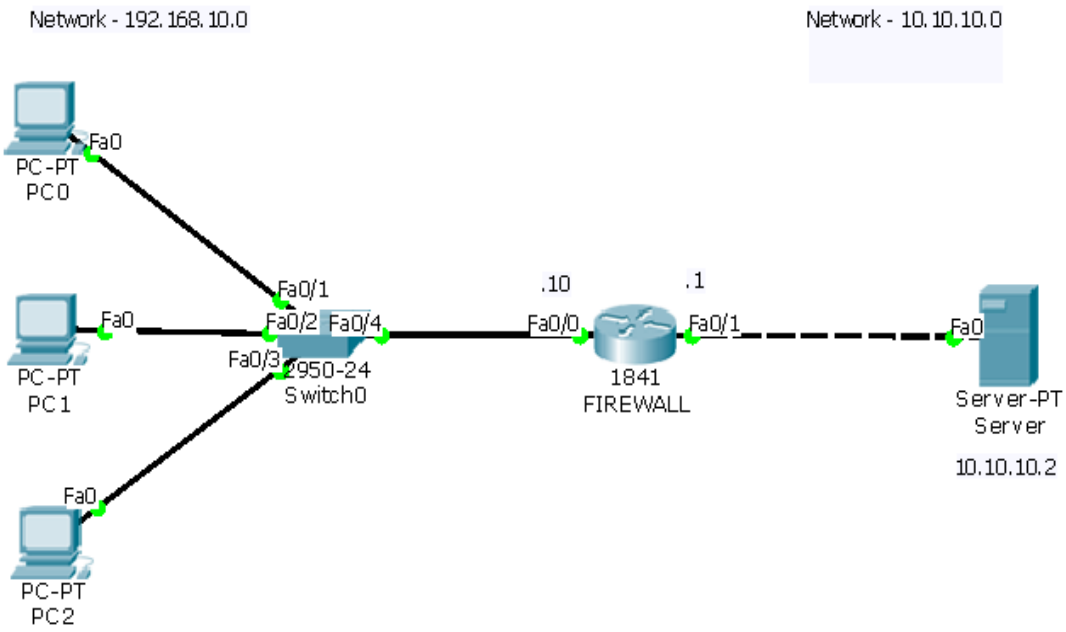
**Tools:**

Cisco Packet Tracer 6.0.1 or higher version

**Topology Constructions Requirements:**

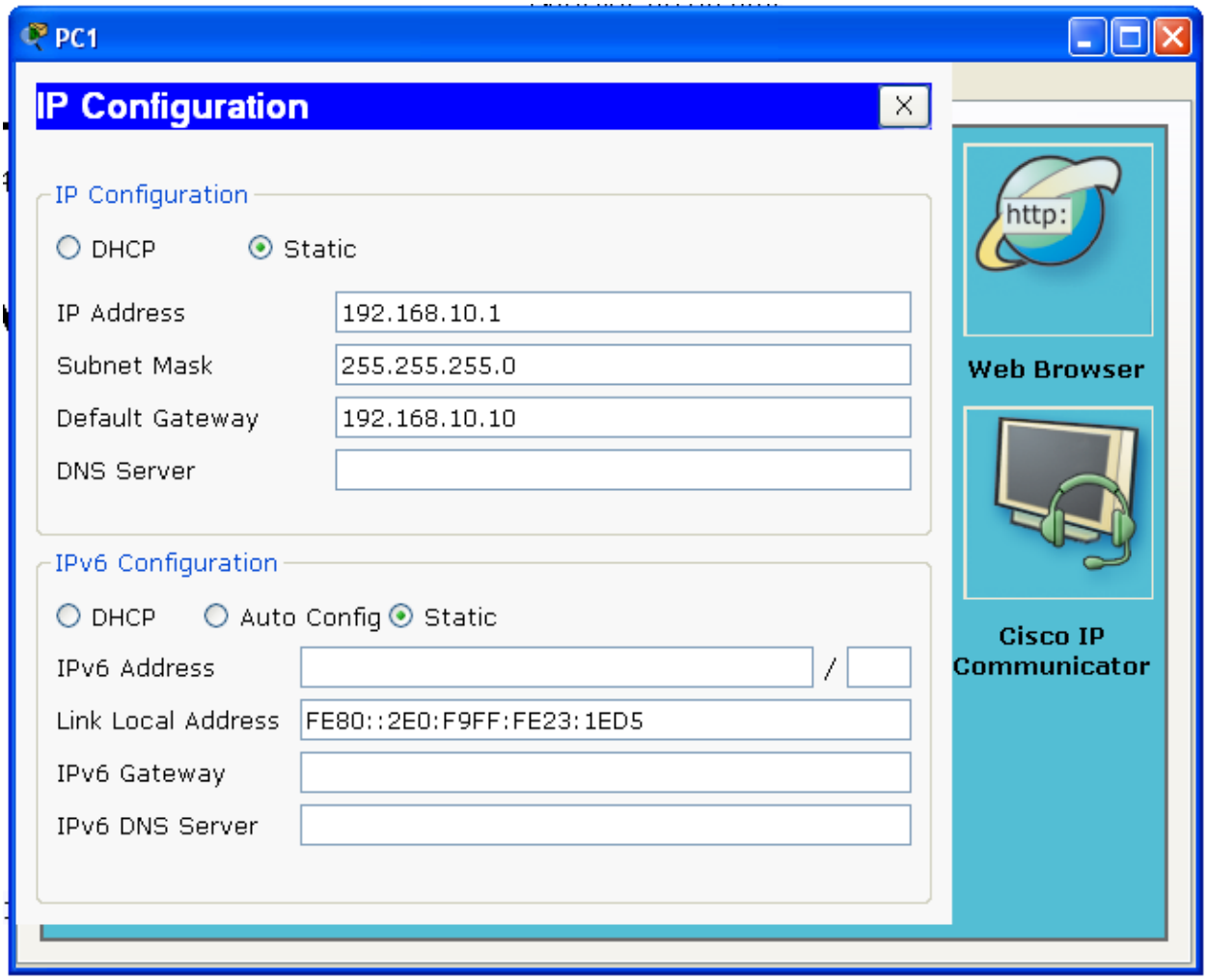
- Three Windows PC or Linux PC for each LAN, Each PC must Have OneNIC cards
- One Switch (24 ports)
- One Router-1841
- One Server
- Straight Line LAN (cat-5) Cables with RJ-45 Sockets.
- Class A- IP Address and Class C-IP address using Static IP configuration.

**Network Topology:**

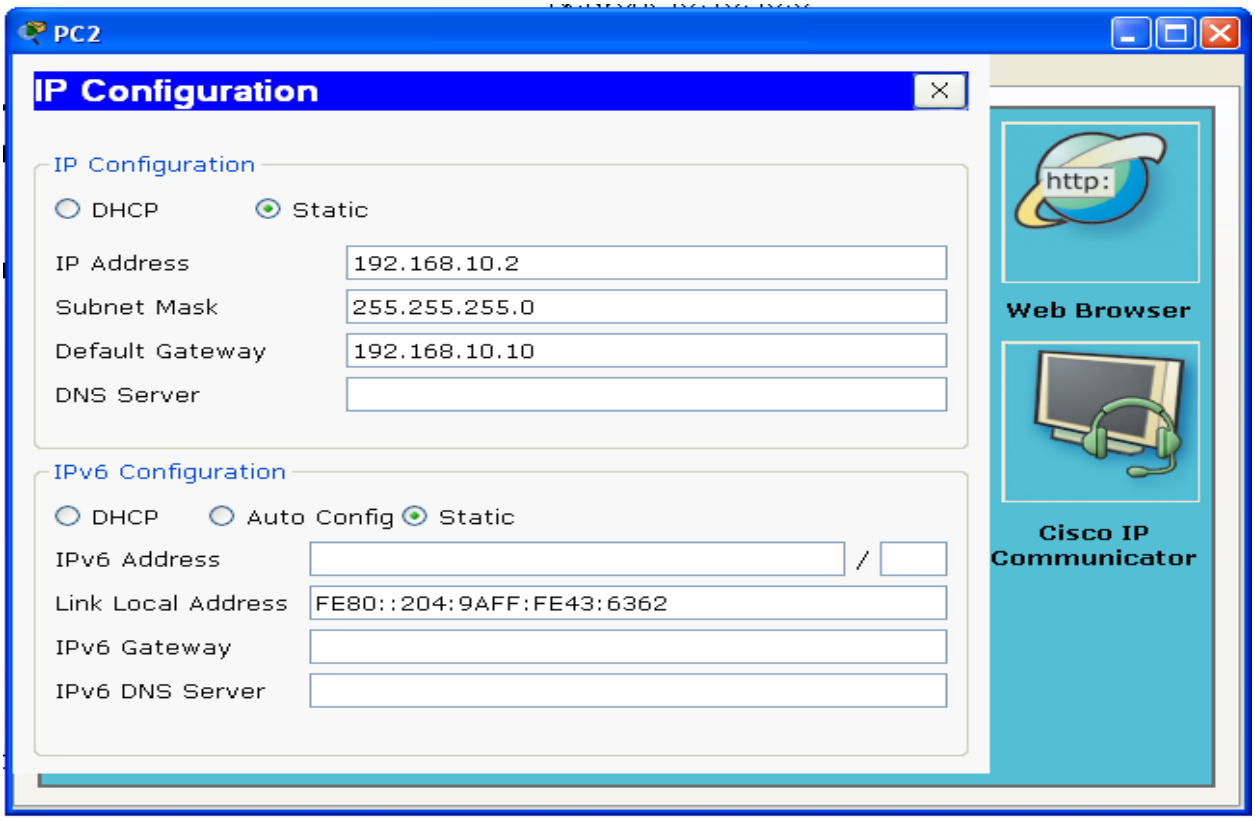



**Configuring PCs in 192.168.10.0 Network:**

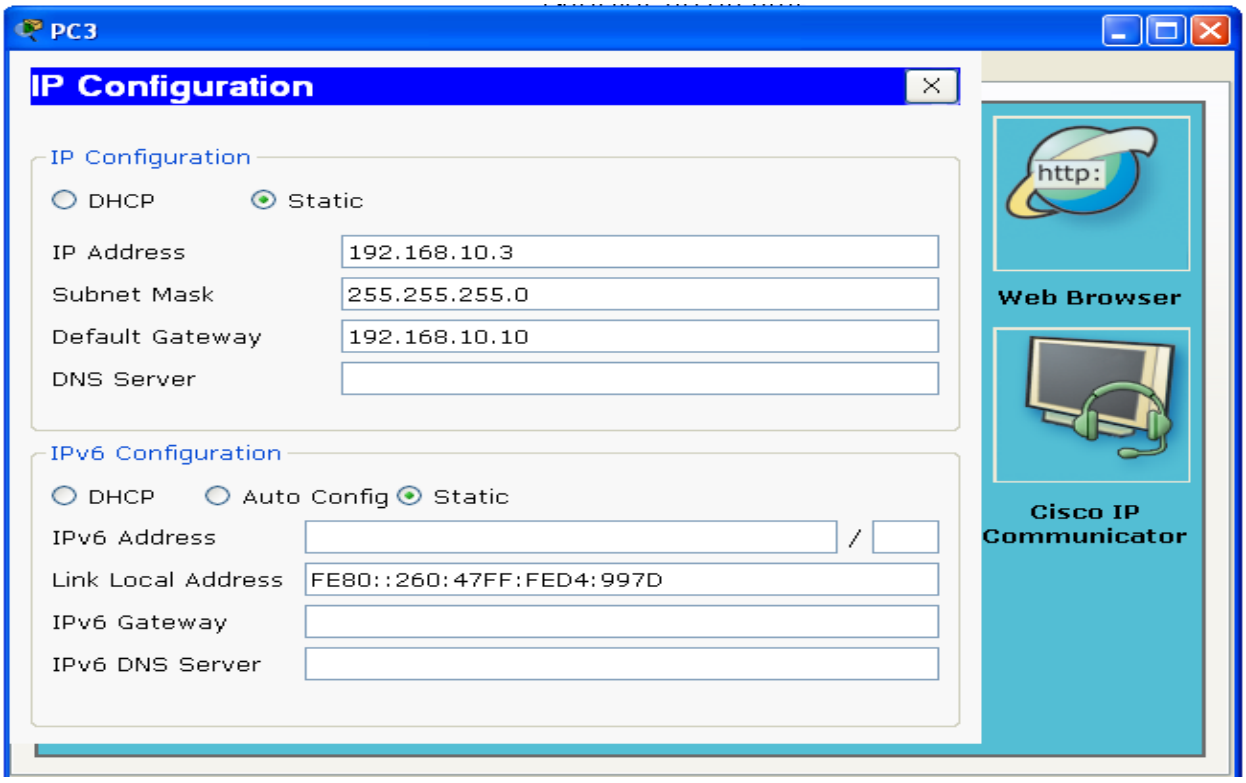
**PC-1:**


PC1
IP Configuration
IP Configuration
DHCP
Static
IP Address
192.168.10.1
Subnet Mask
255.255.255.0
Default Gateway
192.168.10.10
DNS Server
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
/
Link Local Address
FE80::2E0:F9FF:FE23:1ED5
IPv6 Gateway
IPv6 DNS Server
http:
Web Browser
Cisco IP Communicator

**PC-2:**


PC2
IP Configuration
IP Configuration
DHCP
Static
IP Address
192.168.10.2
Subnet Mask
255.255.255.0
Default Gateway
192.168.10.10
DNS Server
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address
FE80::204:9AFF:FE43:6362
IPv6 Gateway
IPv6 DNS Server
http:
Web Browser
Cisco IP Communicator

**PC-3:**

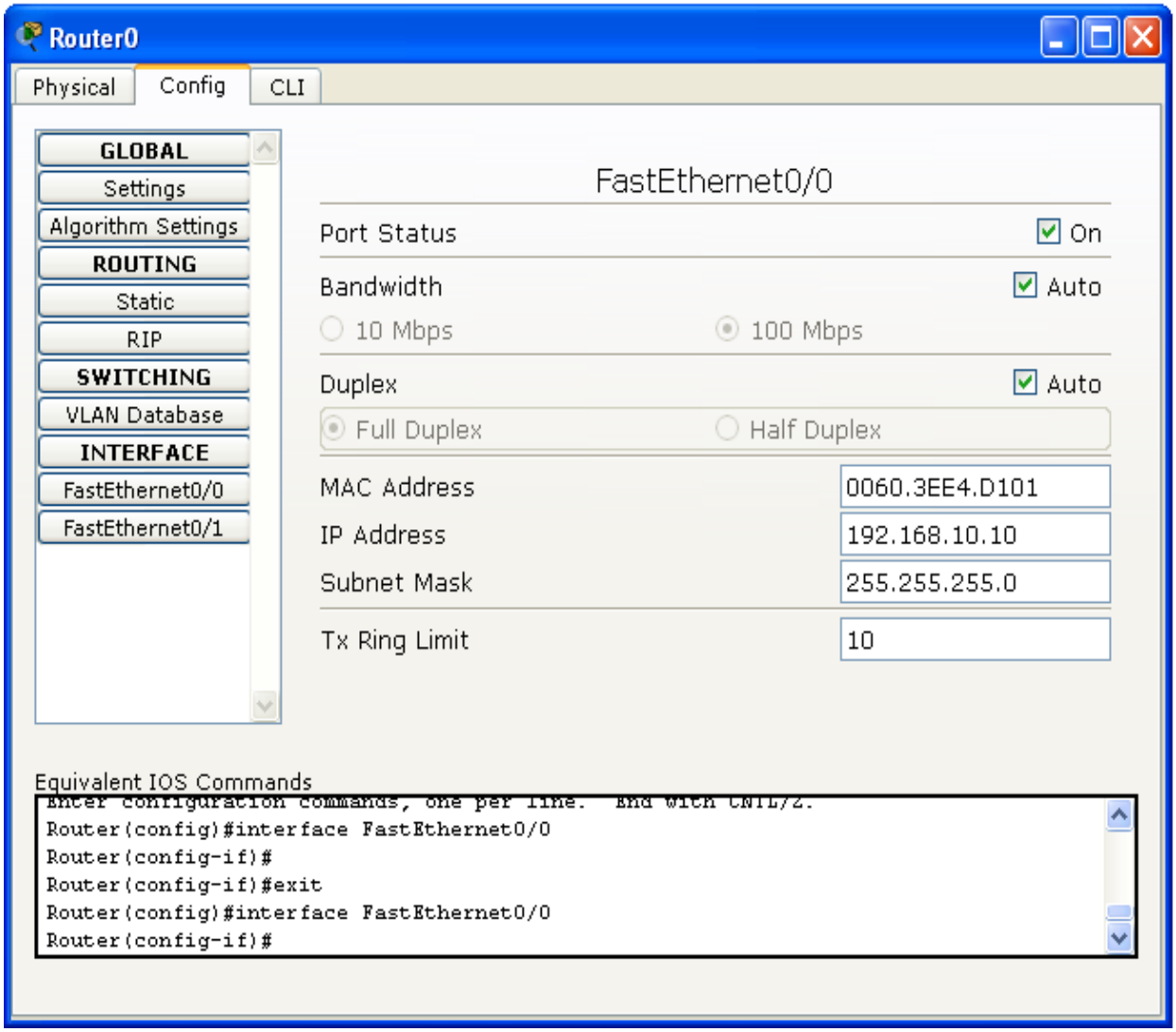

PC3
IP Configuration
IP Configuration
DHCP
Static
IP Address
192.168.10.3
Subnet Mask
255.255.255.0
Default Gateway
192.168.10.10
DNS Server
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address
FE80::260:47FF:FED4:997D
IPv6 Gateway
IPv6 DNS Server
http:
Web Browser
Cisco IP Communicator

**Router (Firewall) Configuration:**

**Gateway for 192.168.10.0 Network:**

**CLI Mode:**

```
Router>  enable
Router# config t
Router(config)# interface f0/0
Router(config-if)# ip address 192.168.10.10 255.255.255.0
Router(config-if)# no shutdown
```



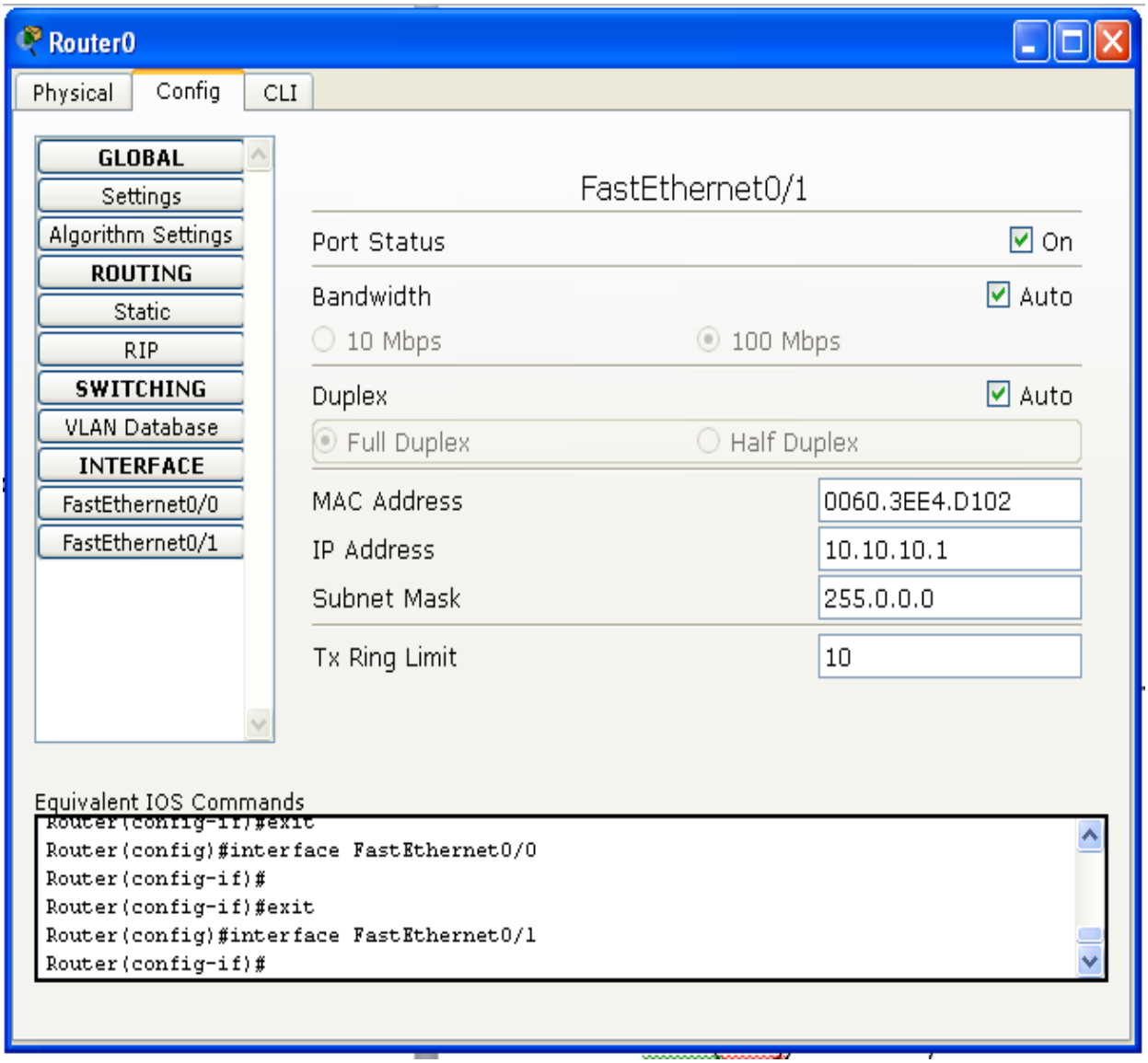

**GUI Mode:**

**Gateway for 10.10.10.0 Network:**

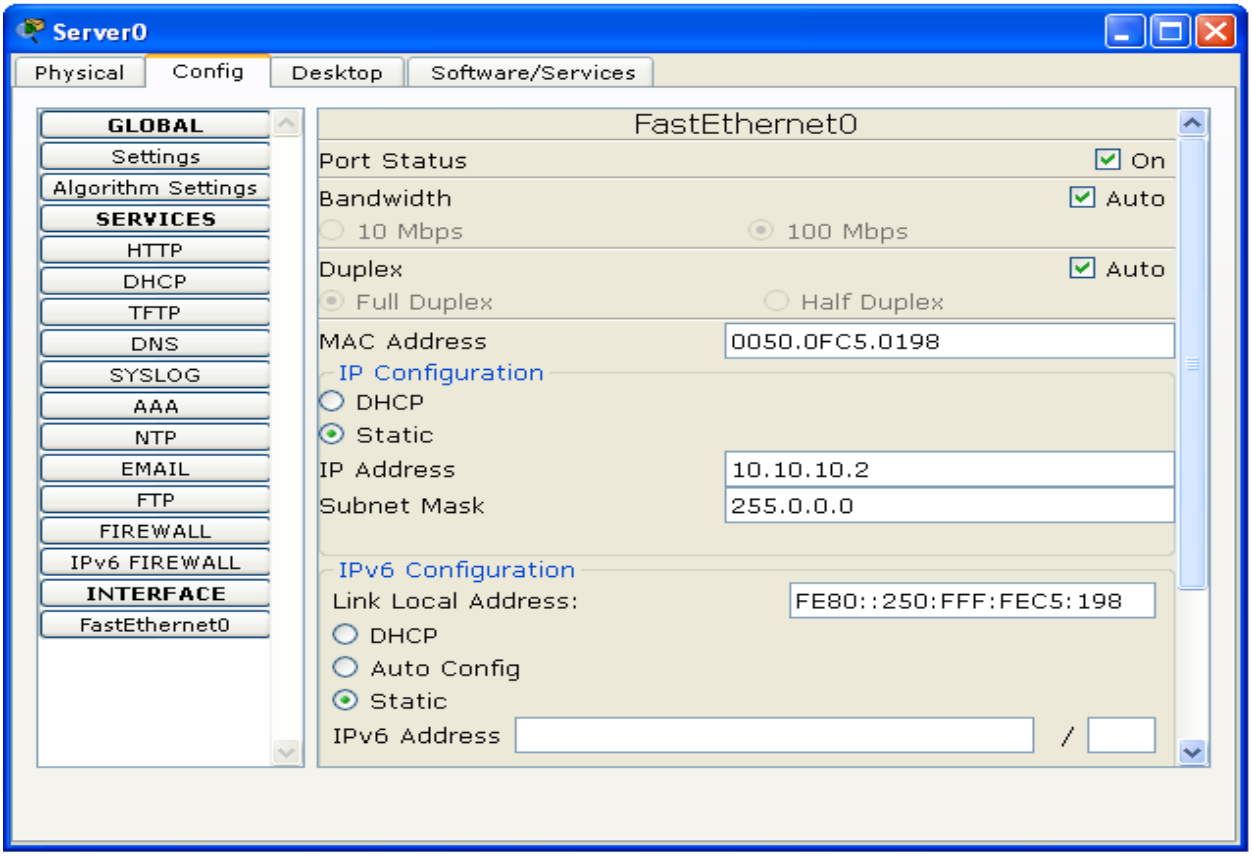
**CLI Mode:**

```
Router>     enable
Router# config t
Router(config)# interface f0/1
Router(config-if)#   ip   address   10.10.10.1   255.0.0.0
Router(config-if)# no shutdown
```

**GUI Mode:**



**Server Configuration:**




**PCs Ping its Gateway:**

```
Packet Tracer PC Command Line 1.0
PC>ping 192.168.10.10

Pinging 192.168.10.10 with 32 bytes of data:

Reply from 192.168.10.10: bytes=32 time=16ms TTL=255
Reply from 192.168.10.10: bytes=32 time=0ms TTL=255
Reply from 192.168.10.10: bytes=32 time=0ms TTL=255
Reply from 192.168.10.10: bytes=32 time=0ms TTL=255

Ping statistics for 192.168.10.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 16ms, Average = 4ms
```

**PCs Ping the Gateway of 10.10.10.0 Network:**

```
PC>ping 10.10.10.1

Pinging 10.10.10.1 with 32 bytes of data:

Reply from 10.10.10.1: bytes=32 time=16ms TTL=255
Reply from 10.10.10.1: bytes=32 time=0ms TTL=255
Reply from 10.10.10.1: bytes=32 time=0ms TTL=255
Reply from 10.10.10.1: bytes=32 time=0ms TTL=255

Ping statistics for 10.10.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 16ms, Average = 4ms
```

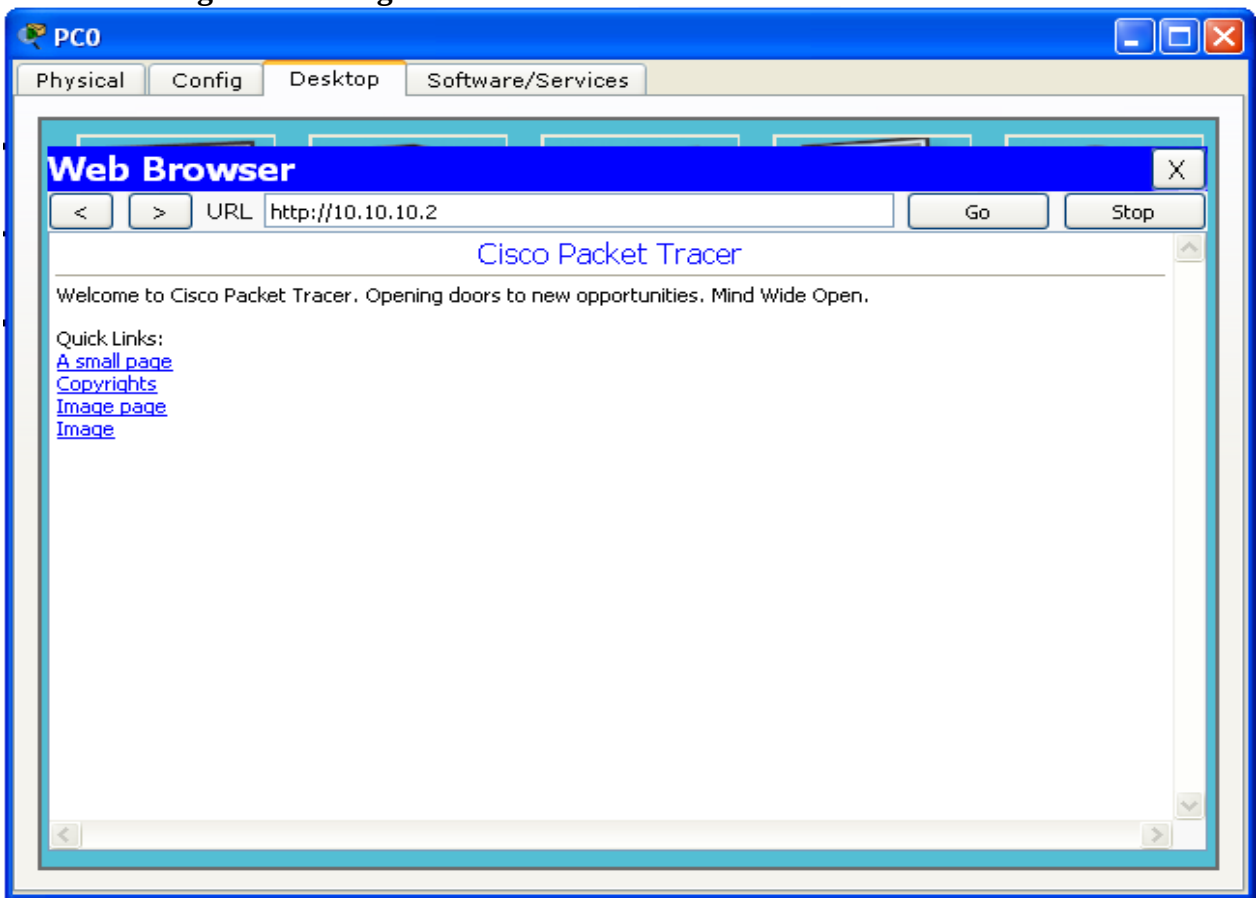
**PCs Ping the Server of 10.10.10.0 Network:**

```
PC>ping 10.10.10.2

Pinging 10.10.10.2 with 32 bytes of data:

Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=16ms TTL=127
Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=16ms TTL=127

Ping statistics for 10.10.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 16ms, Average = 8ms
```

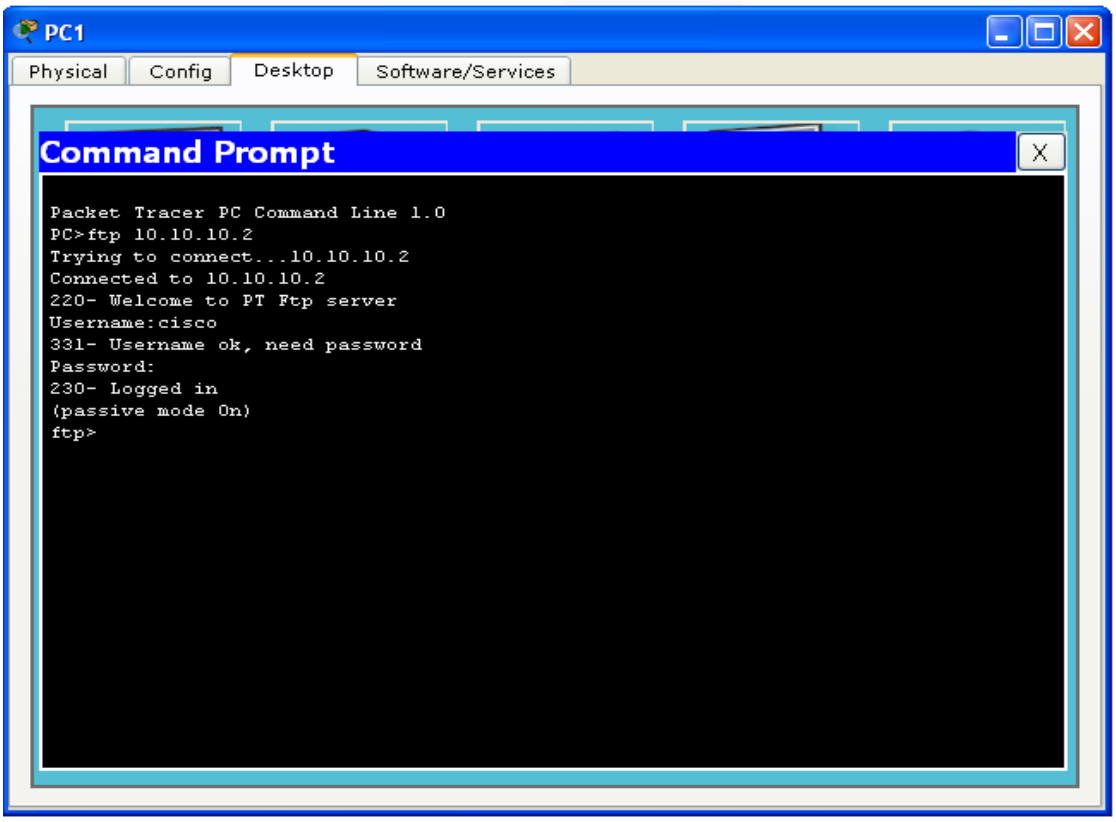
**PCs connecting Server:**

```
PC>ping 10.10.10.2

Pinging 10.10.10.2 with 32 bytes of data:

Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=0ms TTL=127

Ping statistics for 10.10.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

**PCs connecting Server using HTTP:**




**PCs connecting Server using FTP:**




**Configuring Router (Firewall) for denying PING incoming from PCs.**

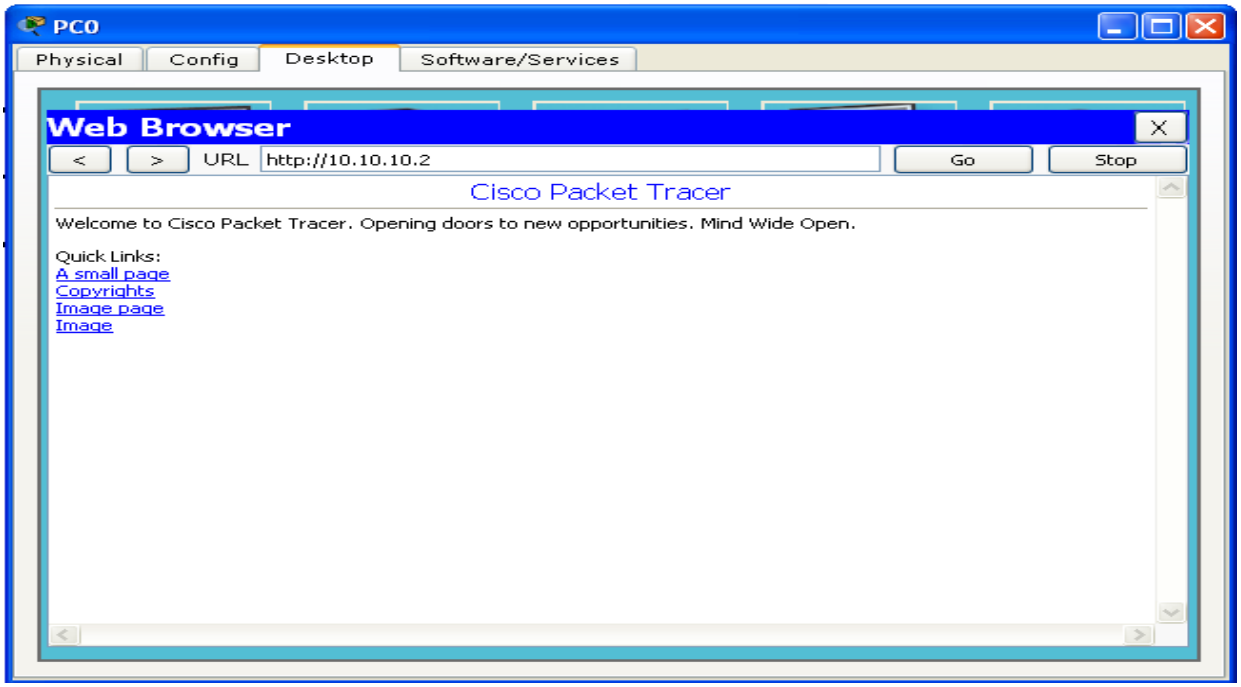
```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#access-list 101 deny tcp any any eq ftp
Router(config)#access-list 101 deny tcp any any eq telnet
Router(config)#access-list 101 permit tcp any any eq www
Router(config)#int
Router(config)#interface f0/0
Router(config-if)#ip ac
Router(config-if)#ip access-group 101 in
```

**PCs attempt to connect Server using PING:**

```
Packet Tracer PC Command Line 1.0
PC>ping 10.10.10.2

Pinging 10.10.10.2 with 32 bytes of data:

Reply from 192.168.10.10: Destination host unreachable.
Reply from 192.168.10.10: Destination host unreachable.
Reply from 192.168.10.10: Destination host unreachable.
Reply from 192.168.10.10: Destination host unreachable.

Ping statistics for 10.10.10.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Observed that the reply message is **Destination Host Unreachable**.

**PCs attempt to connect Server using HTTP:**




**Observed that the server can accessed through HTTP**

**PCs attempt to connect server using FTP:**

```
PC>ftp 10.10.10.2
Trying to connect...10.10.10.2

%Error opening ftp://10.10.10.2/ (Timed out)
.



Packet Tracer PC Command Line 1.0
PC>(Disconnecting from ftp server)



Packet Tracer PC Command Line 1.0
```

## 7. Implement VLAN (Virtual Local Area Network) using Cisco Packet Tracer.

**Procedure:**
VLANs allow you to logically divide a switch into multiple broadcast domains, improving network efficiency and security.

Here's a step-by-step guide to configuring VLANs:

Step 1: Create a network topology in Cisco Packet Tracer with a switch and multiple devices (e.g., PCs) connected to it. Use the "Switch" device from the "Switches" category and "Generic PC" devices from the "End Devices" category.

Step 2: Double-click on the switch to access its command line interface (CLI).

Step 3: Enter privileged EXEC mode by entering the following command:

Enable

Step 4: Enter global configuration mode by entering the following command:

configure terminal

Step 5: Create VLANs on the switch using the following command:

vlan vlan_id

Replace vlan_id with the desired VLAN number. Repeat this command for each VLAN you want to create.

Step 6: Assign VLANs to switch ports. Use the following command to access the interface configuration mode for a specific port:

interface interface_id

Replace interface_id with the name or number of the switch port (e.g., FastEthernet0/1, GigabitEthernet0/1, etc.).

Step 7: Assign the VLAN to the port using the following command in interface configuration mode:

switchport mode access
switchport access vlan vlan_id

Replace vlan_id with the VLAN number you want to assign to the port.

Step 8: Repeat Steps 6-7 for each switch port, assigning them to the appropriate VLANs.

Step 9: Exit interface configuration mode by entering exit.

Step 10: Save the configuration changes by entering the copy running-config startup-config command.

Step 11: Test the VLAN configuration by connecting devices (e.g., PCs) to the switch ports and configuring them to be part of specific VLANs. Devices within the same VLAN should be able to communicate with each other, while devices in different VLANs should be isolated.

VLANs should now be configured in your network, allowing you to segregate network traffic and improve network performance and security.

**Tools:**

1. Cisco Packet Tracer 6.0 or higher version.

**Topology Constructions Requirements:**

6. 10 Windows PC or Linux PC for each LAN, Each PC must Have One NIC cards
7. Two Switch (2960- 24 ports)
8. One Router 2811
9. Straight Line LAN (cat-5) Cables with RJ-45 Sockets
10. Class C- IP Address using Static IP configuration

**Steps for Designing VLAN:**

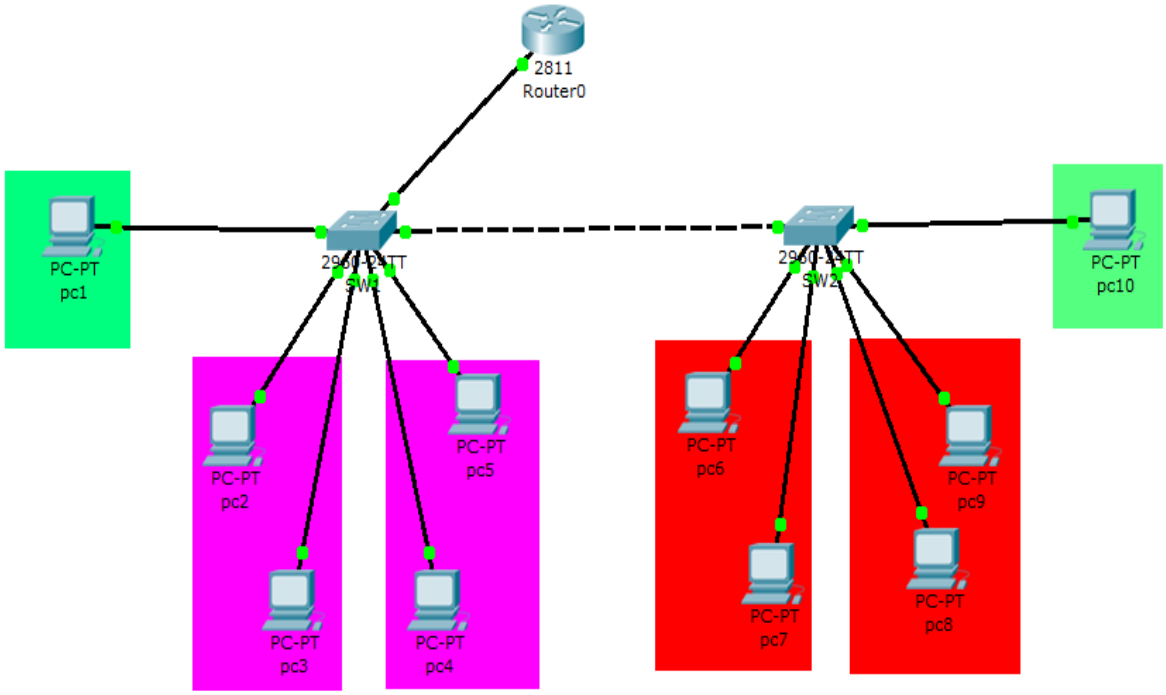
1. Configure the switch1.
2. Create VLAN database there.
3. Assign network and name to create VLAN.
4. Add PCs to VLAN.
5. Make the switch port access mode when connected to PC.
6. Make switch port to trunk mode when any device other than PC is connected to that port.
7. We have to add a command of encapsulation when any other device other than PC isconnected to trunk port of a switch.
8. Two types of Encapsulation we can give:

*i.* ISL (inter switch Link)

*ii.* IEEE 802 1Q (open for all).

9. Assign IP address to specific VLAN including VLAN1.
10. Configure the router.
11. Give network to different VLANs created in the port of router which is connected to switch.
12. Assign IP default gateway to the switch to which router is connected.
13. Similarly configure other switches participating in VLAN.
14. Manually give IP address to each and every PC with Gateway.
15. After following above steps successfully VLAN will be ready to implement.

**Network Topology:**




**Commands for Switch:**

Switch is used to connect a no of PCs and group them in different VLANs.

**Commands for Configuring First Switch:**

Press enter after every single command.

- Switch> enable
- Switch # configure terminal
- Switch (config) # hostname sw1
- Sw1(config) # exit
- Sw1 # vlan database
- Sw1(vlan) # vlan 10 name student
- Sw1(vlan) # vlan 20 name faculty
- Sw1(vlan )# exit
- Sw1 # configure terminal
- Sw1(config) # interface fastethernet 0/1
- Sw1(config-if) # switchport mode access
- Sw1(config-if) # switchport access vlan 10
- Sw1(config-if) # exit
- Sw1(config-if) # interface fastethernet 0/2
- Sw1(config-if) # switchport access vlan 10
- Sw1(config-if) # exit
- Sw1(config) # interface fastethernet 0/3
- Sw1(config-if) # switchport mode access
- Sw1(config-if) # switchport access vlan 20

- Sw1(config-if)exit
- Sw1(config) # interface fastethernet 0/4
- Sw1(congfig-if) # switch port mode access
- Sw1(config-if) # switchport acess vlan 20
- Sw1(config-if) # exit
- Sw1(config) # interface fastethernet 0/5
- Sw1(config-if) # switchport mode access
- Sw1(config-if) # switchport access vlan 1
- Sw1(config-if) # exit
- Sw1(config) # interface fastethernet 0/6
- Sw1(config-if) # switchport mode trunk
- Sw1(config-if) # switchport trunk encapsulation dot 1q
- Sw1(config-if) # exit
- Sw1(config) # interface vlan 1
- Sw1(config-if) # ip address 192.168.1.2 255.255.255.0
- Sw1(config-if) no shutdown
- Sw1(config-if) # interface vlan 10
- Sw1(config-if) # ip address 192.168.10.2 255.255.255.0
- Sw1(config-if) # no shutdown
- Sw1(config-if) # exit
- Sw1(config) # interface vlan 20
- Sw1(config-if) # ip address 192.168.20.2 255.255.255.0
- Sw1(config-if) # no shutdown
- Sw1(config-if) # ctrl/z

*As the Router is connected to this switch. We have to give an additional command IP default-gateway after configuring router.

- Sw1#configure terminal
- Sw1(config) # ip default-gateway 192.168.1.1
- Sw1(config) # ctrl/z
- Sw1 # write

**Commands for Configuring Second Switch:**

Press enter after every single command. We have to manually give IP address to each and every pc with gateway. After these steps VLAN Design completes.

- Switch>enable
- Switch # configure terminal
- Switch(config) # hostname sw2
- Sw2(config) # exit
- Sw2 # vlan database
- Sw2(vlan) # vlan 10 name student
- Sw2(vlan) # vlan 20 name faculty

- Sw2(vlan) # exit
- Sw2 # configure terminal
- Sw2(config) # interface fastethernet 0/1
- Sw2(config-if) # switchport mode access
- Sw2(config-if) # switchport access vlan 10
- Sw2(config-if) # exit
- Sw2(config-if) # interface fastethernet0/2
- Sw2(config-if) # switchport mode access
- Sw2(config-if) # switchport access vlan 10
- Sw2(config-if) # exit
- Sw2(config) # interface fastethernet0/3
- Sw2(config-if) # switchport mode access
- Sw2(config-if) # switchport access vlan 20
- Sw2(config-if) # exit
- Sw2(config) # interface fastethernet0/4
- Sw2(config-if) # switchport mode access
- Sw2(config-if) # switchport access vlan 20
- Sw2(config-if) # exit
- Sw2(config) # interface fastethernet 0/5
- Sw2(config-if) # switchport mode access
- Sw2(config-if) # switchport access vlan 1
- Sw2(config-if) # exit
- Sw2(config) # interface fastethernet 0/6
- Sw2(config-if) # switchport mode trunk
- Sw2(config-if) # switchport trunk encapsulation dot 1q
- Sw2(config-if) # exit

**Commands for Router:**

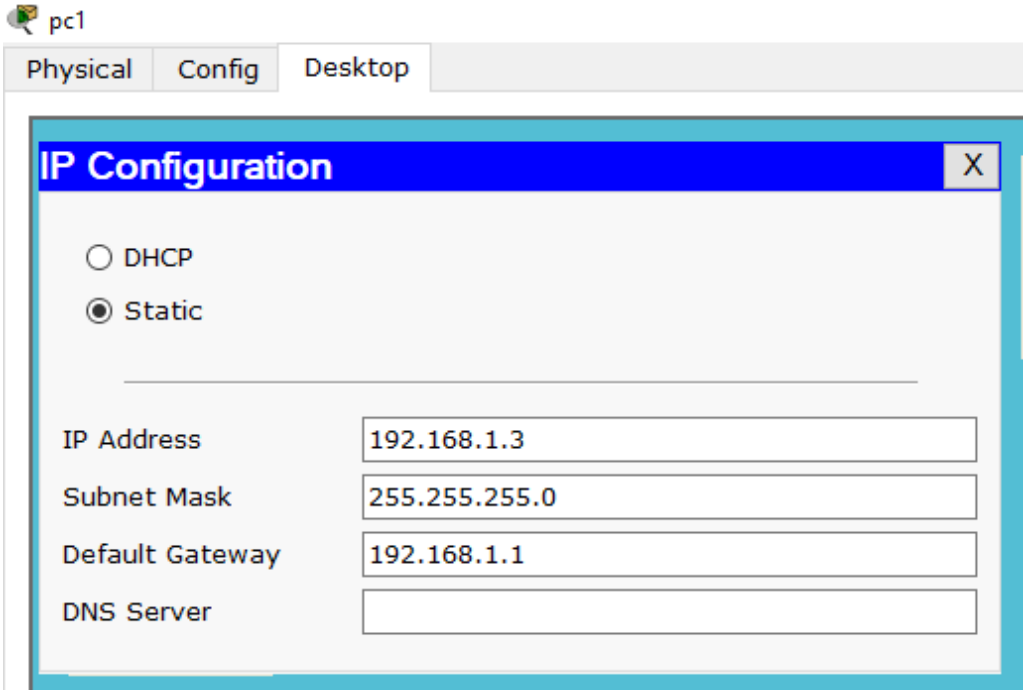
Press Enter after every single command.

- Router>enable
- Router # configure terminal
- Router(config) # interface fastethernet0/0
- Router(config-if) # no shutdown
- Router(config-if) # exit
- Router(config) # interface fastethernet0/0.1
- Router(config-subif) # encapsulation dot1q 1
- Router(config-subif) # ip address 192.168.1.1 255.255.255.0
- Router(config-subif) # exit
- Router(config) # interface fastethernet0/0.10
- Router(config-subif) # encapsulation dot1q 10
- Router(config-subif) # ip address 192.168.10.1 255.255.255.0

- Router(config-subif) # exit
- Router(config) # interface fastethernet0/0.20
- Router(config-subif) # encapsulation dot 1q 20
- Router(config-subif) # ip address 192.168.20.1 255.255.255.0
- Router(config-subif) # exit
- Router(config-if) # ctrl/z
- Router # write

*After router configuration we have to go for command ip default-gateway in the switch to which router is connected
*And after that we have to configure other participating switches.
*IP address 192.168.20.1 255.255.255.0 for this type of command use space between the ip address and subnet mask.

**Each PC Configurations:**



pc2

Physical | Config | Desktop

**IP Configuration** X

- ○ DHCP
- ◉ Static

| | |
|---|---|
| IP Address | 192.168.10.3 |
| Subnet Mask | 255.255.255.0 |
| Default Gateway | 192.168.1.1 |
| DNS Server | |

pc3

Physical | Config | Desktop

**IP Configuration** X

- ○ DHCP
- ◉ Static

| | |
|---|---|
| IP Address | 192.168.10.4 |
| Subnet Mask | 255.255.255.0 |
| Default Gateway | 192.168.1.1 |
| DNS Server | |

pc4

Physical | Config | Desktop

**IP Configuration** X

- ○ DHCP
- ◉ Static

| | |
|---|---|
| IP Address | 192.168.20.3 |
| Subnet Mask | 255.255.255.0 |
| Default Gateway | 192.168.1.1 |
| DNS Server | |

pc5

Physical | Config | Desktop

**IP Configuration** X

- ○ DHCP
- ◉ Static

| | |
|---|---|
| IP Address | 192.168.20.4 |
| Subnet Mask | 255.255.255.0 |
| Default Gateway | 192.168.1.1 |
| DNS Server | |

pc6

Physical | Config | Desktop

IP Configuration

DHCP
Static

IP Address: 192.168.10.11
Subnet Mask: 255.255.255.0
Default Gateway: 192.168.1.1
DNS Server:

pc7

Physical | Config | Desktop

IP Configuration

DHCP
Static

IP Address: 192.168.10.12
Subnet Mask: 255.255.255.0
Default Gateway: 192.168.1.1
DNS Server:

pc8

Physical | Config | Desktop

**IP Configuration**

- DHCP
- Static (selected)

| | |
|---|---|
| IP Address | 192.168.20.13 |
| Subnet Mask | 255.255.255.0 |
| Default Gateway | 192.168.1.1 |
| DNS Server | |

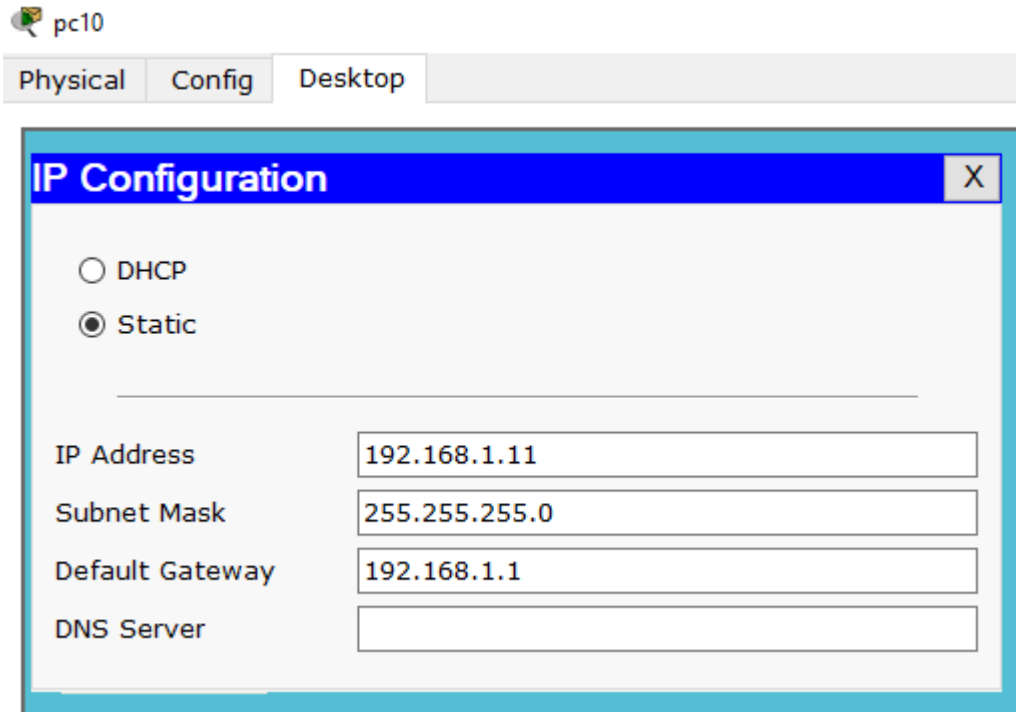
pc9

Physical | Config | Desktop

**IP Configuration**

- DHCP
- Static (selected)

| | |
|---|---|
| IP Address | 192.168.20.14 |
| Subnet Mask | 255.255.255.0 |
| Default Gateway | 192.168.1.1 |
| DNS Server | |




**8. Analyze the performance of various configurations and protocols in LAN using Cisco Packet Tracer.**

**Establishing a Local Area Network (LAN):**

The main objective is to set up a Local Area Network, concepts involved in this network are IP addressing and the Address Resolution Protocol (ARP). The required equipments are 192.168.1.1 ,192.168.1.2, 192.168.1.3, Host A Host B Host C, Switch/HUB, three PC`s equipped with at least one NIC, one HUB or Switch and the necessary cables. Once the physical LAN is set up the hosts need to be configured using the ifconfig command. To verify communication among the machines the ping command is used. Next, to manipulate the routing tables at the hosts to understand how machines know where to send packets. Since the ifconfig command places a default route into the routing tables this route must be deleted. To ´blindfoldˇ the machine. The ping command is used again to show that communication is no longer available. To re- establish communication the routes are put back into the routing table one host at atime. Communication is once again verified using the ping command.

**Requirements:**

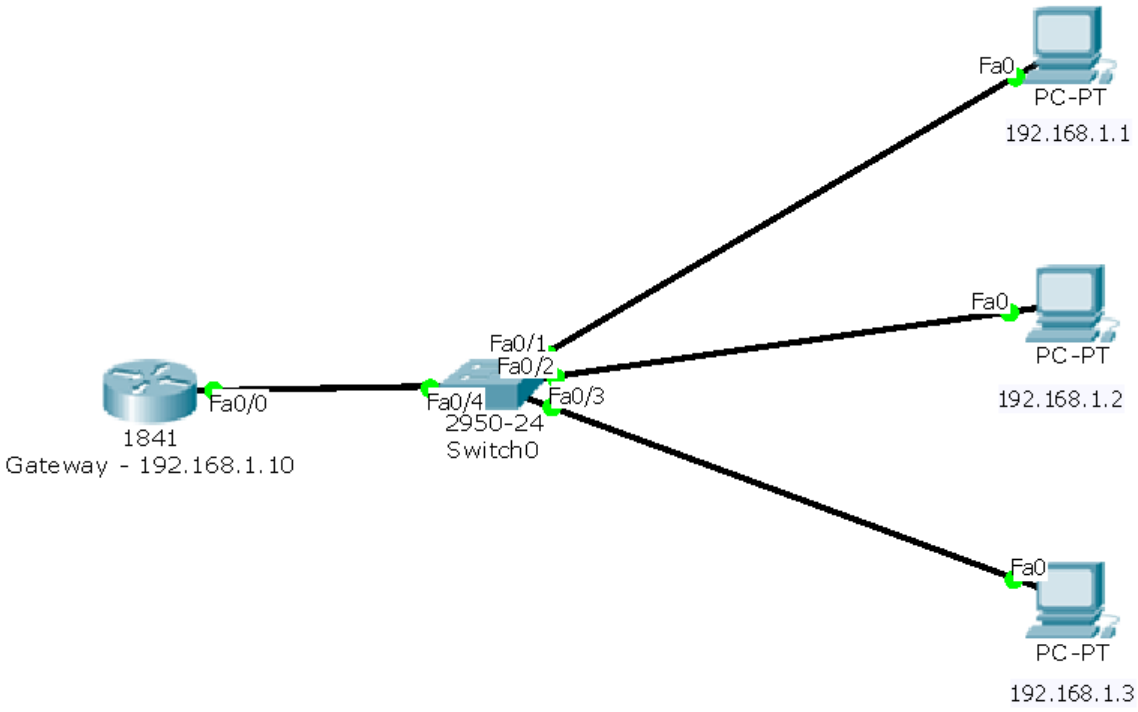
**Tools:**

1. Cisco Packet Tracer 6.0.1 or higher version

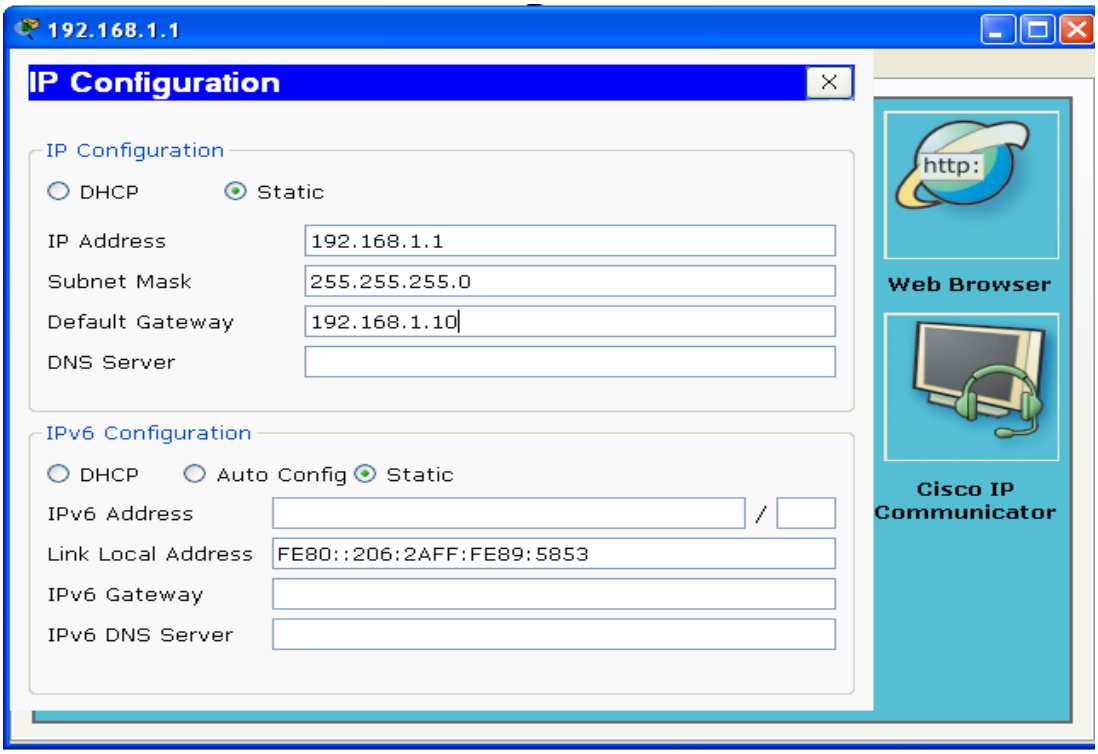
**Topology Constructions Requirements:**

1. Windows PC or 3 Linux PC, Each PC must Have One NIC cards
2. Switch (24 port)
3. Router 1841
4. Straight Line LAN (cat-5) Cables with RJ-45 Sockets
5. Class C IP Address using Static IP configuration

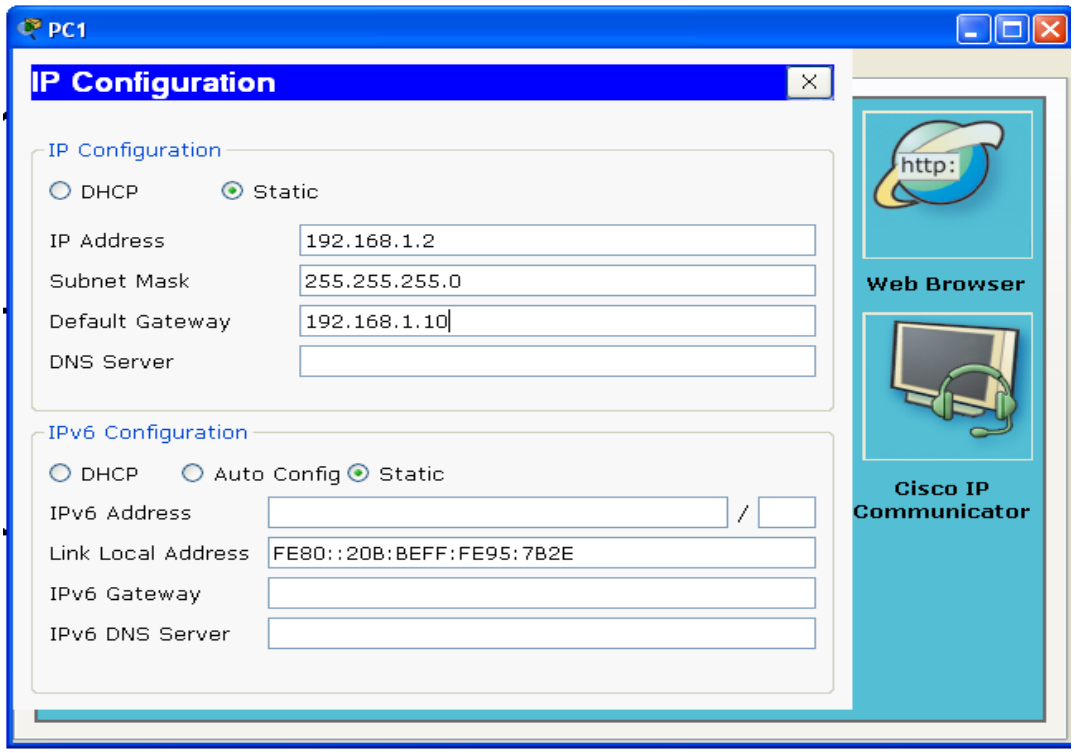
**LAN Topology – Physical View:**



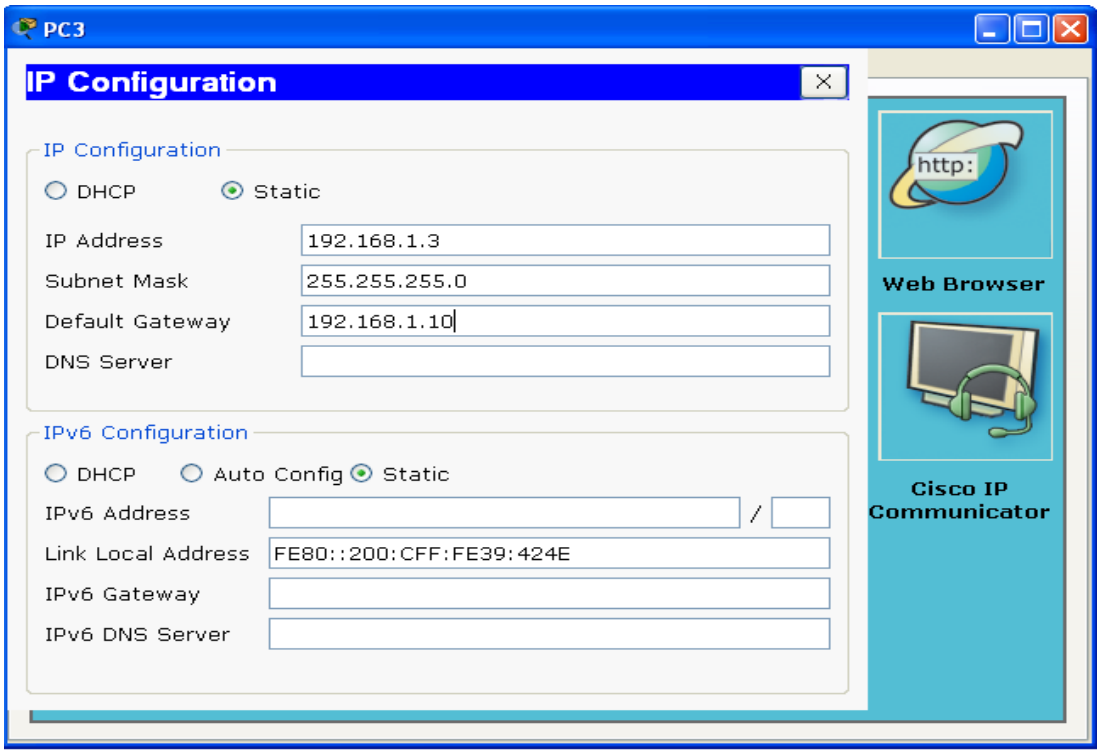

**PC – 1 Configuration:**



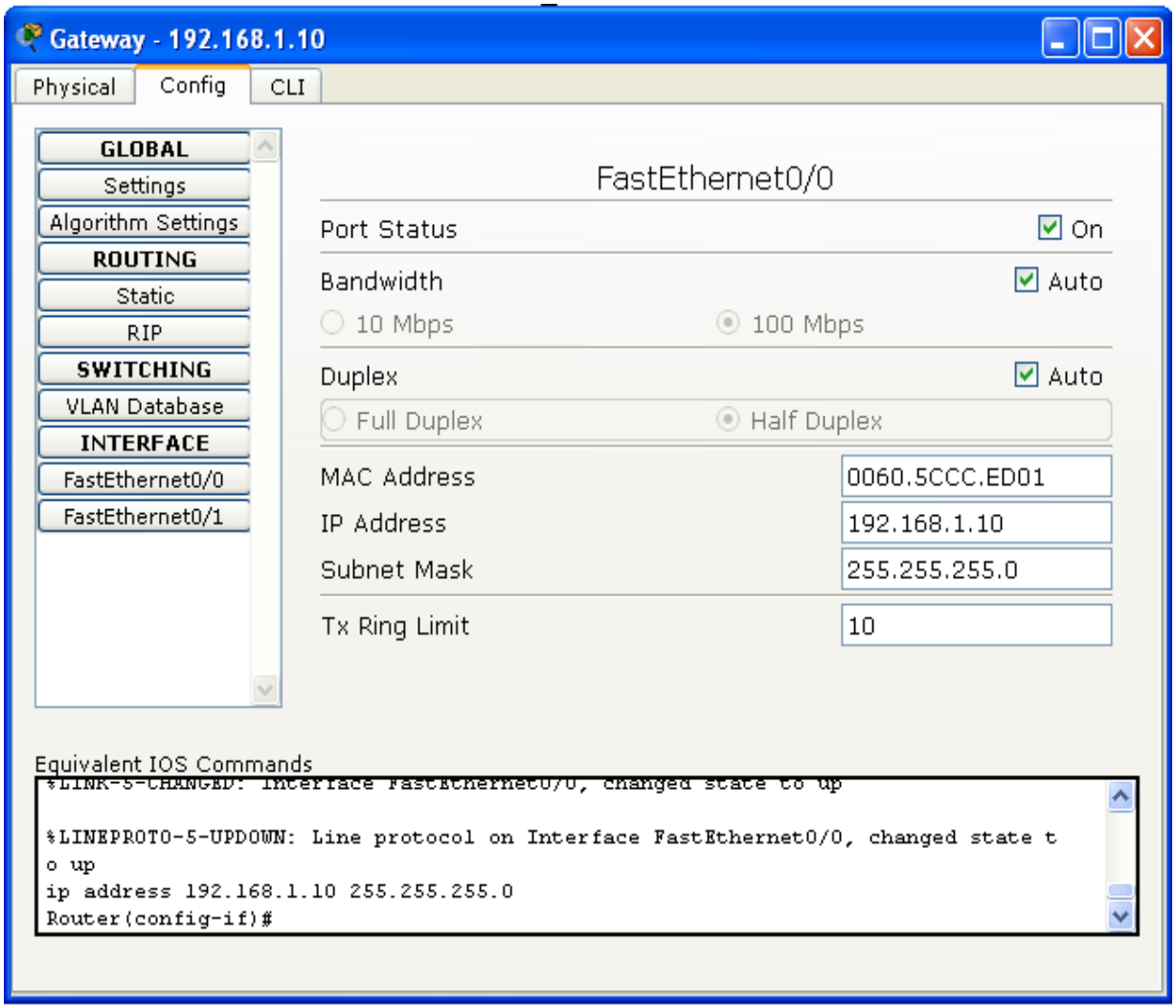

**PC – 2 Configuration:**




**PC – 3 Configuration:**




**Router (Gateway) Configuration (GUI Mode):**




**Router (Gateway) Configuration (CLI Mode):**

Router> enable Router#

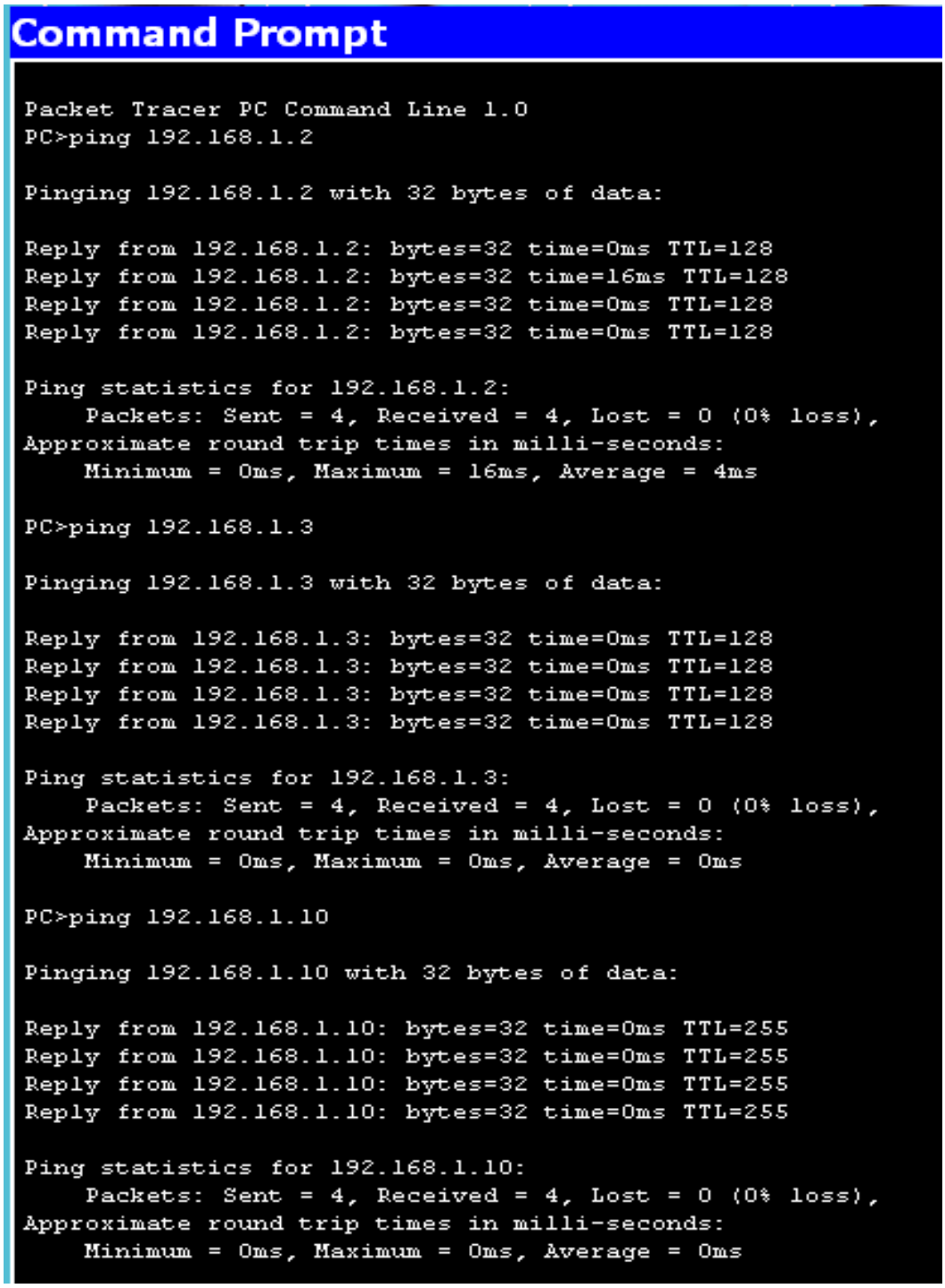
config terminal

Router(config)# interface f0/0

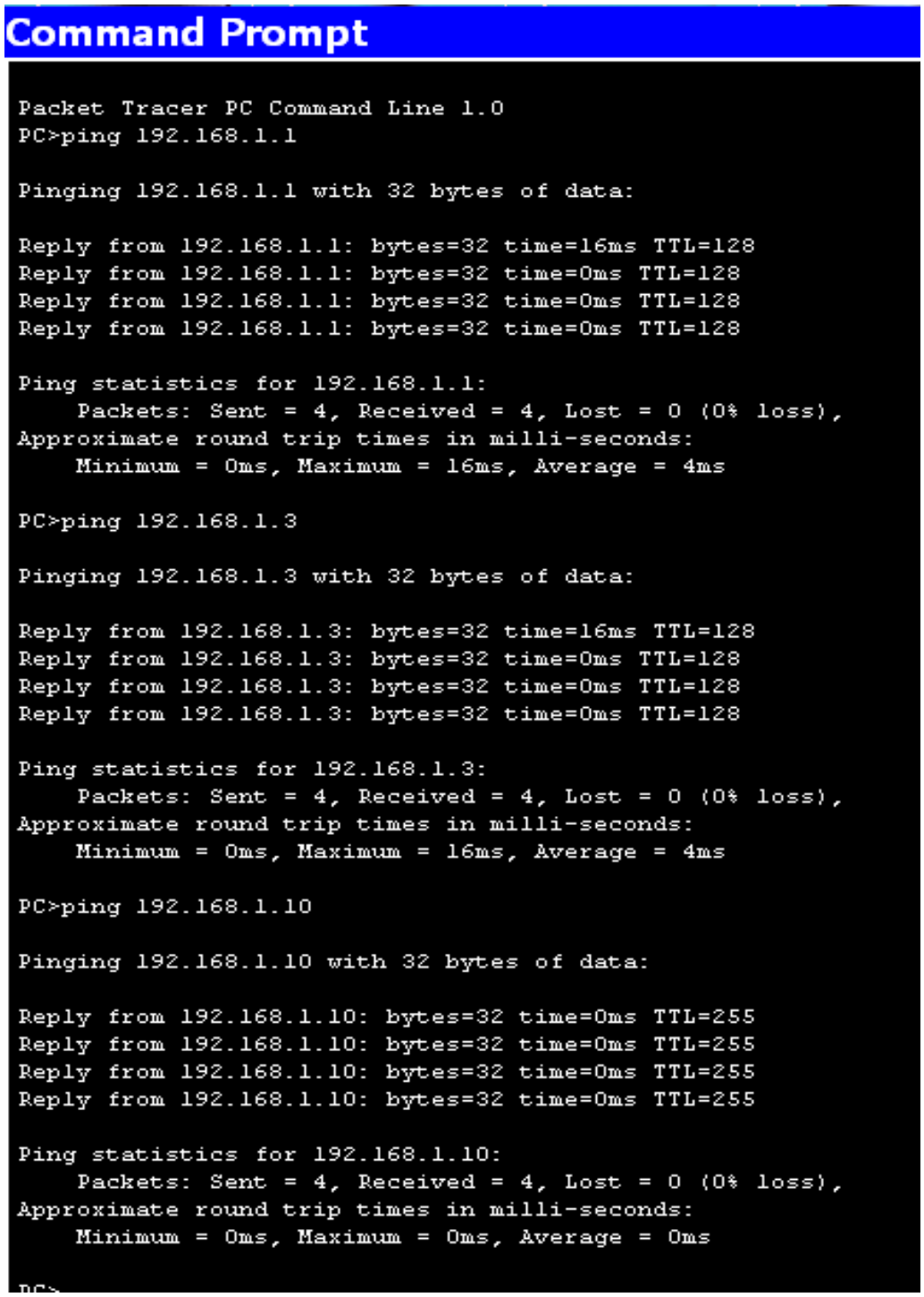
Router(config-if) # ip address 192.168.1.10 255.255.255.0

Router(config –if)# no shutdown

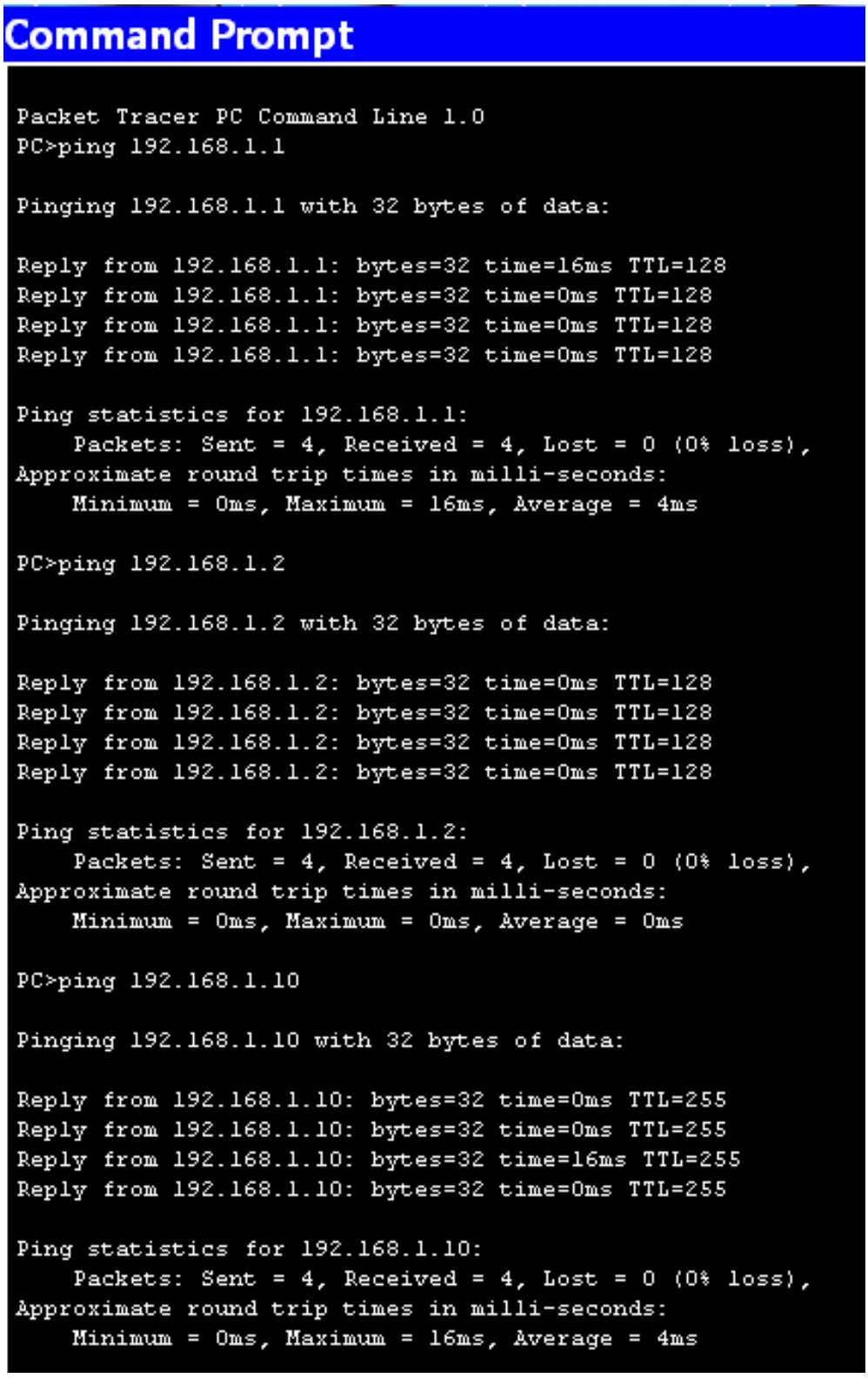
**Verifying Communication among the PCs:**
**From PC 1:**


Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 192.168.1.2
Pinging 192.168.1.2 with 32 bytes of data:
Reply from 192.168.1.2: bytes=32 time=0ms TTL=128
Reply from 192.168.1.2: bytes=32 time=16ms TTL=128
Reply from 192.168.1.2: bytes=32 time=0ms TTL=128
Reply from 192.168.1.2: bytes=32 time=0ms TTL=128
Ping statistics for 192.168.1.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 16ms, Average = 4ms
PC>ping 192.168.1.3
Pinging 192.168.1.3 with 32 bytes of data:
Reply from 192.168.1.3: bytes=32 time=0ms TTL=128
Reply from 192.168.1.3: bytes=32 time=0ms TTL=128
Reply from 192.168.1.3: bytes=32 time=0ms TTL=128
Reply from 192.168.1.3: bytes=32 time=0ms TTL=128
Ping statistics for 192.168.1.3:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
PC>ping 192.168.1.10
Pinging 192.168.1.10 with 32 bytes of data:
Reply from 192.168.1.10: bytes=32 time=0ms TTL=255
Reply from 192.168.1.10: bytes=32 time=0ms TTL=255
Reply from 192.168.1.10: bytes=32 time=0ms TTL=255
Reply from 192.168.1.10: bytes=32 time=0ms TTL=255
Ping statistics for 192.168.1.10:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms

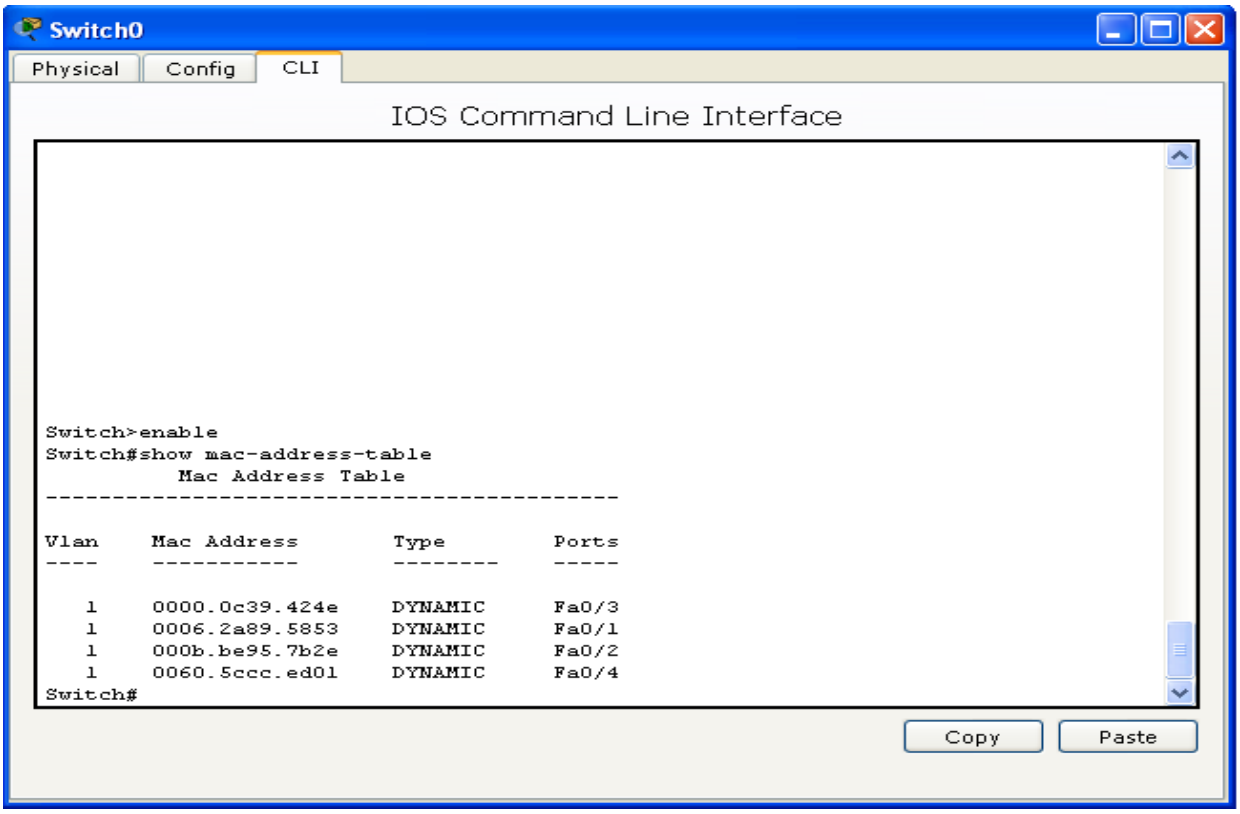
**From PC 2:**


Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 192.168.1.1
Pinging 192.168.1.1 with 32 bytes of data:
Reply from 192.168.1.1: bytes=32 time=16ms TTL=128
Reply from 192.168.1.1: bytes=32 time=0ms TTL=128
Reply from 192.168.1.1: bytes=32 time=0ms TTL=128
Reply from 192.168.1.1: bytes=32 time=0ms TTL=128
Ping statistics for 192.168.1.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 16ms, Average = 4ms
PC>ping 192.168.1.3
Pinging 192.168.1.3 with 32 bytes of data:
Reply from 192.168.1.3: bytes=32 time=16ms TTL=128
Reply from 192.168.1.3: bytes=32 time=0ms TTL=128
Reply from 192.168.1.3: bytes=32 time=0ms TTL=128
Reply from 192.168.1.3: bytes=32 time=0ms TTL=128
Ping statistics for 192.168.1.3:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 16ms, Average = 4ms
PC>ping 192.168.1.10
Pinging 192.168.1.10 with 32 bytes of data:
Reply from 192.168.1.10: bytes=32 time=0ms TTL=255
Reply from 192.168.1.10: bytes=32 time=0ms TTL=255
Reply from 192.168.1.10: bytes=32 time=0ms TTL=255
Reply from 192.168.1.10: bytes=32 time=0ms TTL=255
Ping statistics for 192.168.1.10:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
PC>

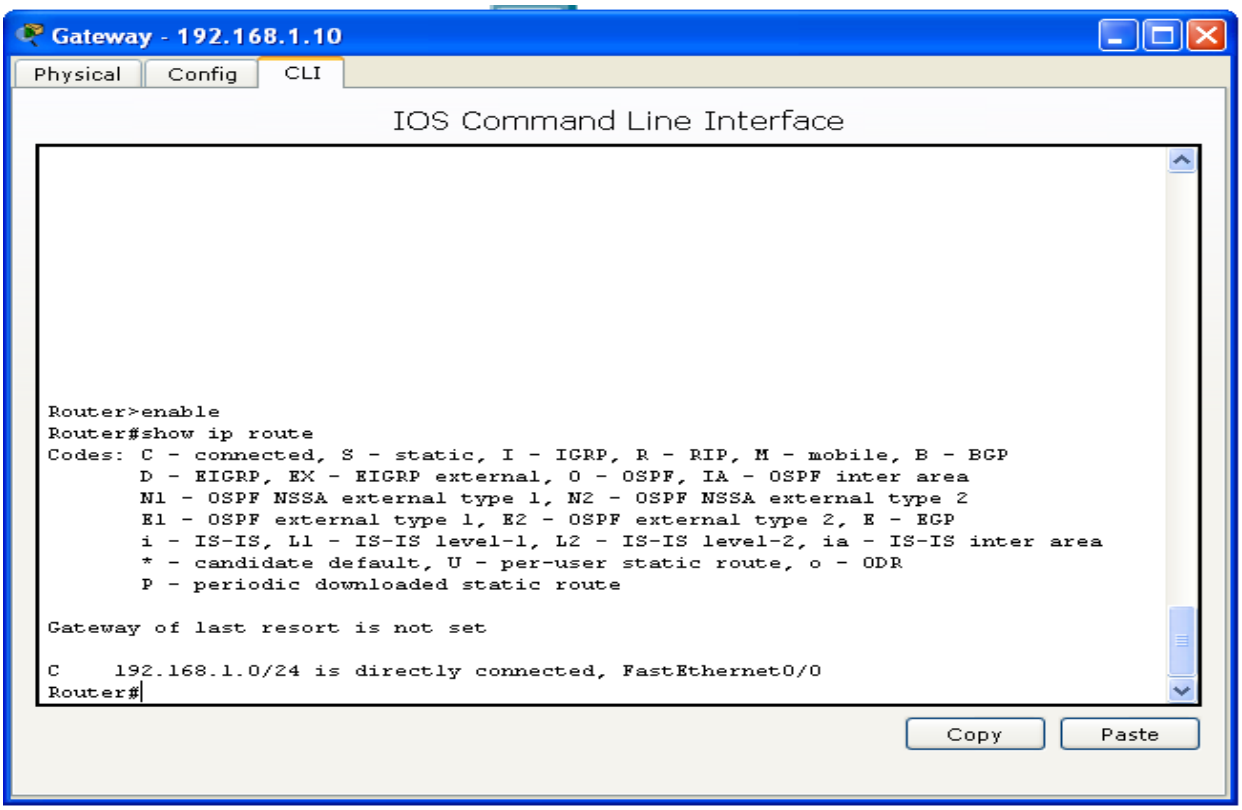
**From PC 3:**



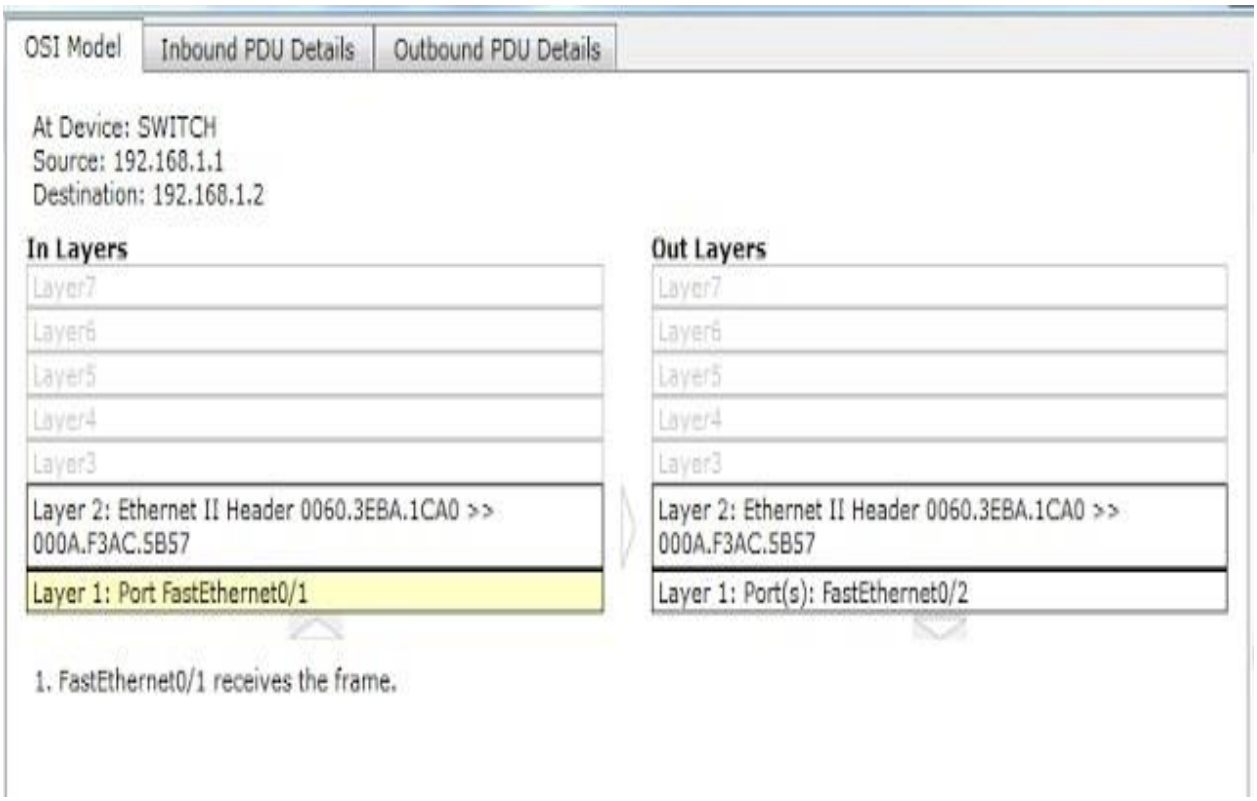

**Switch's Mac Table Details:**



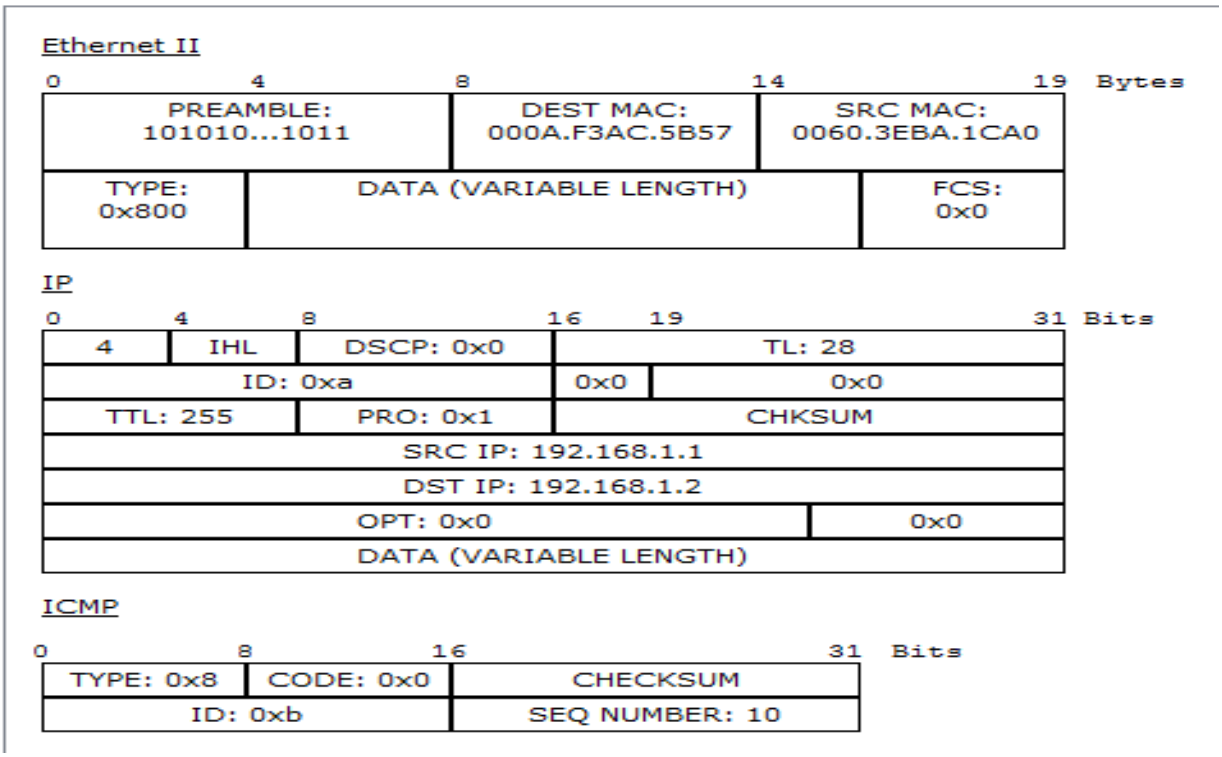

**Router's Routing Table Details:**



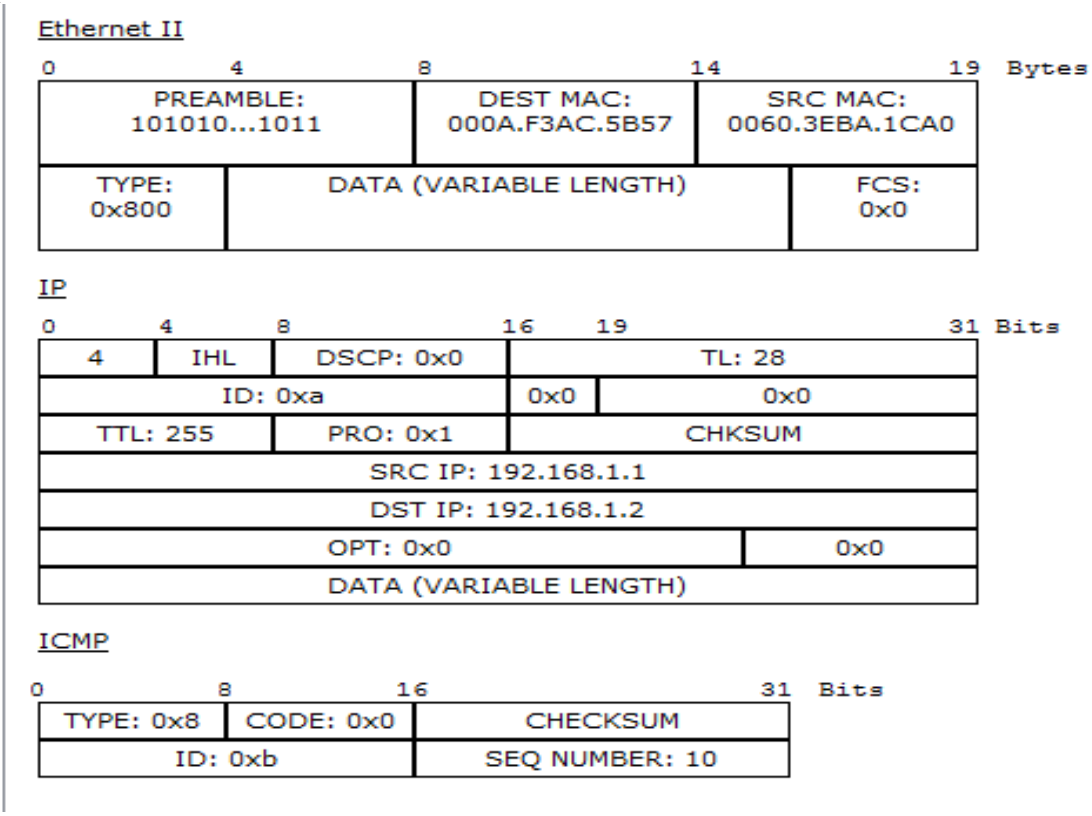

**OSI Model Layer's View:**



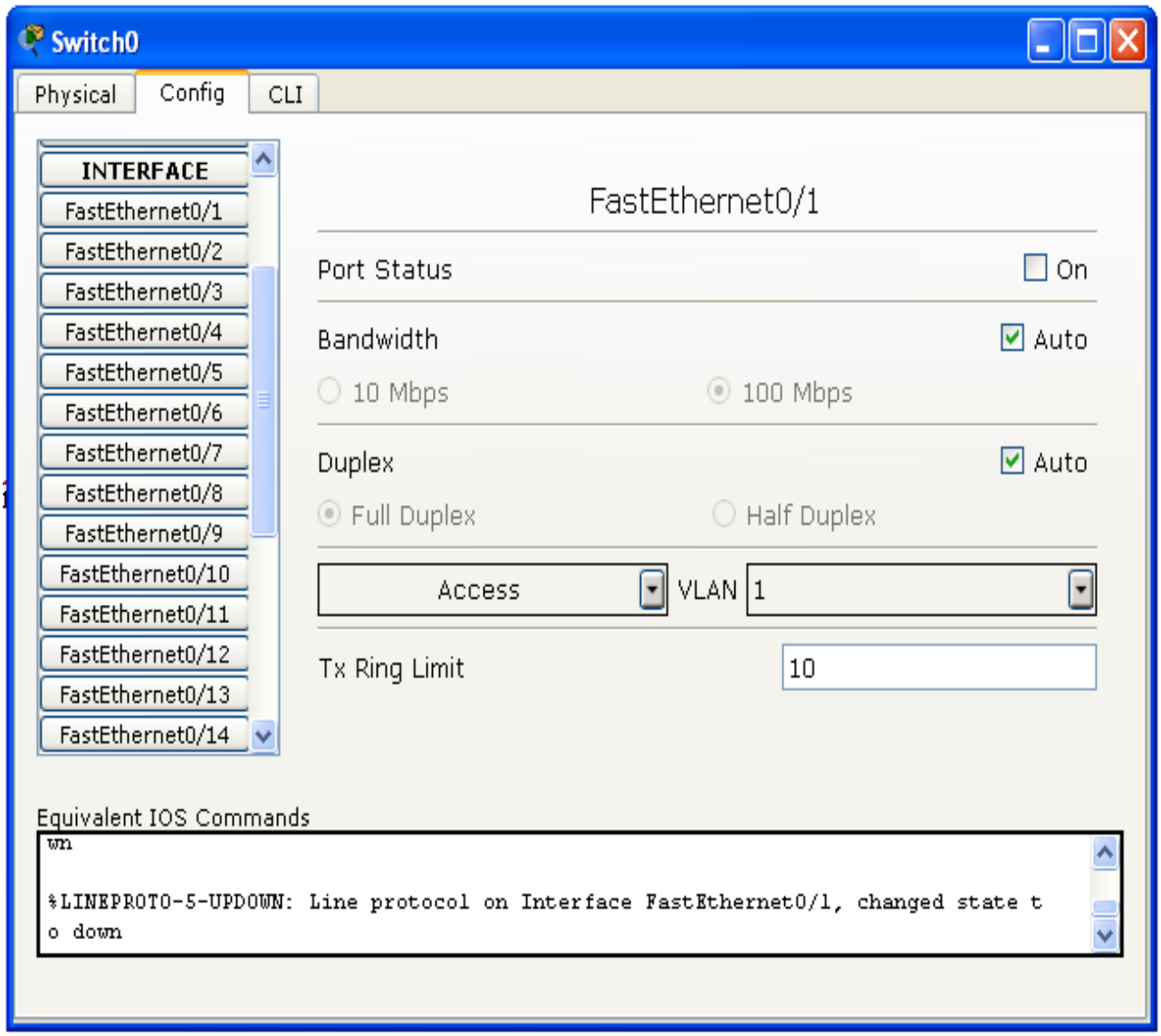

**Sending PDU Format:**




**Response PDU Format:**




**Manipulate the Mac-Table Entry for PC1 (GUI Mode):**




**Manipulate the Mac-Table Entry for PC1 (CLI Mode):**

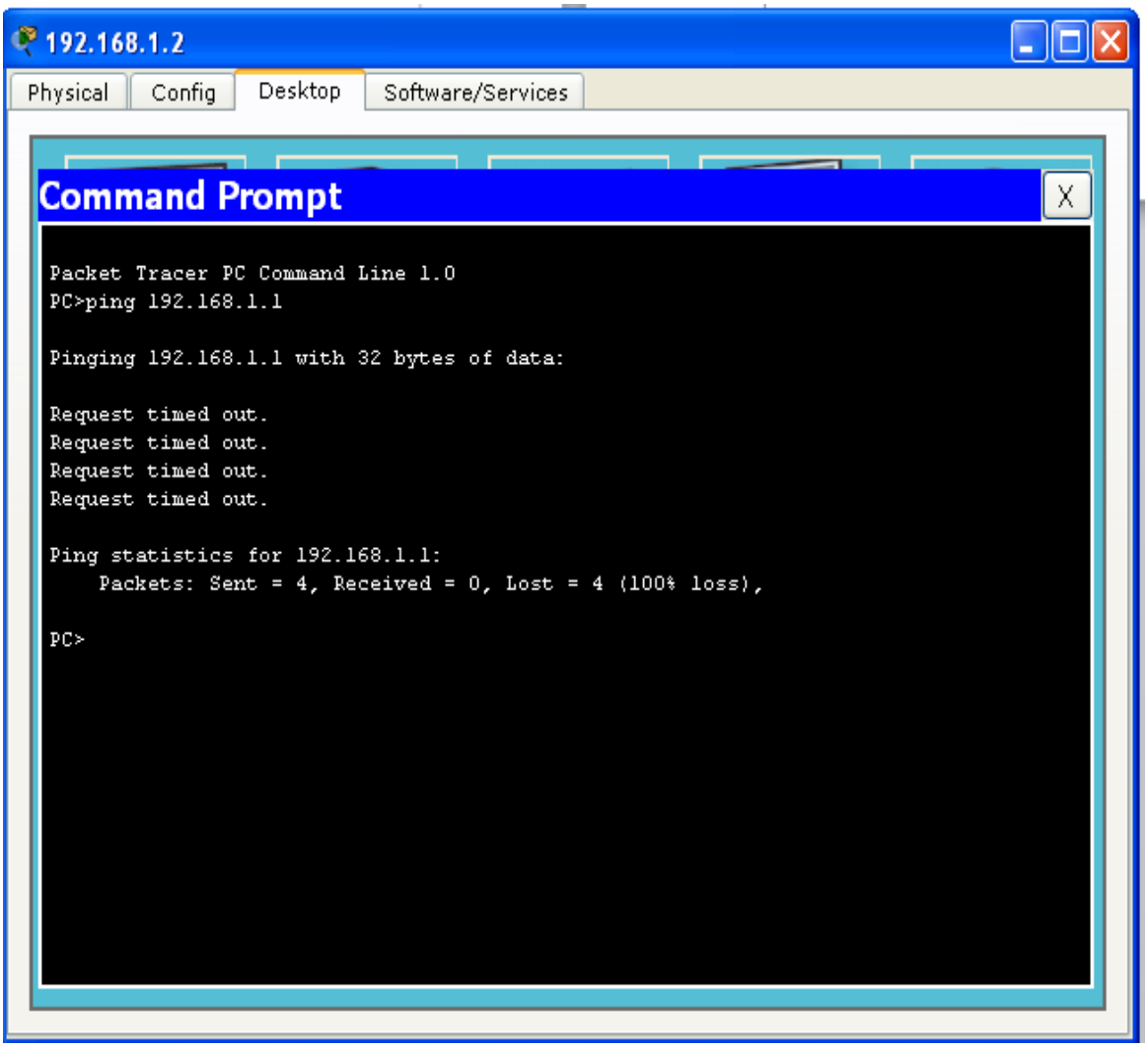
Switch> enable Switch#

config terminal

Switch(config) # interface f0/1

Switch(config –if)# shutdown

**PC-2 Pinging PC1:**
**The Connection is no longer available for Pc1.**




**9. Using Cisco Packet Tracer connect two LANs using multi-router topology with static routes.**

The main objective is to extend routing connection by using multiple routers. The concepts include IP addressing and basic network routing principles. Connect two LANstopology. During router configuration attention is paid to the types of interfaces as additional issues are involved with set-up. For example, the serial interfaces require clocking mechanisms to be set correctly. Once the interfaces are working the ping command is used to check for communication between LANs. The failure of communication illustrates the need for routes to be established inside the routing infrastructure. Static routes are used to show how packets can be transported through

any reasonable route. It is run trace route on two different configurations to demonstrate the implementation of different routes.

**Procedures:**
Step 1: Launch Cisco Packet Tracer and create a new network topology.

Step 2: Add three routers to the topology. You can select the "Router" device from the "Routers" category.

Step 3: Connect the routers using appropriate cable connections. Use Ethernet cables and connect the router interfaces.

Step 4: Configure IP addresses on the interfaces of each router. Double-click on each router, access the command line interface (CLI), and configure the IP addresses as follows:

Router 1:
enable
configure terminal
interface interface_name
ip address ip_address subnet_mask
no shutdown

Replace interface_name with the name or number of the interface (e.g., FastEthernet0/0, GigabitEthernet0/0) and ip_address with the IP address you want to assign to the interface. Repeat this step for all interfaces on Router 1.

Router 2:
enable
configure terminal
interface interface_name
ip address ip_address subnet_mask
no shutdown
Replace interface_name with the name or number of the interface on Router 2, and ip_address with the IP address you want to assign. Repeat this step for all interfaces on Router 2.

Step 5: Configure static routes on the routers to connect the LANs. Use the following commands:

Router 1:
configure terminal
ip route destination_network subnet_mask next_hop_ip_address
Replace destination_network with the network address of the LAN connected to Router 2, subnet_mask with the subnet mask of that network, and next_hop_ip_address with the IP address of the interface on Router 2 that connects to the LAN.

Router 2:
configure terminal
ip route destination_network subnet_mask next_hop_ip_address
Replace destination_network with the network address of the LAN connected to Router 1, subnet_mask with the subnet mask of that network, and next_hop_ip_address with the IP address of the interface on Router 1 that connects to the LAN.

Step 6: Save the configuration changes on each router using the copy running-config startup-config command.

Step 7: Test connectivity between the LANs by pinging devices on each LAN from devices on the other LANs. Use the ping command followed by the IP address of the destination device.

The static routes configured on the routers will allow packets to be forwarded between the LANs.

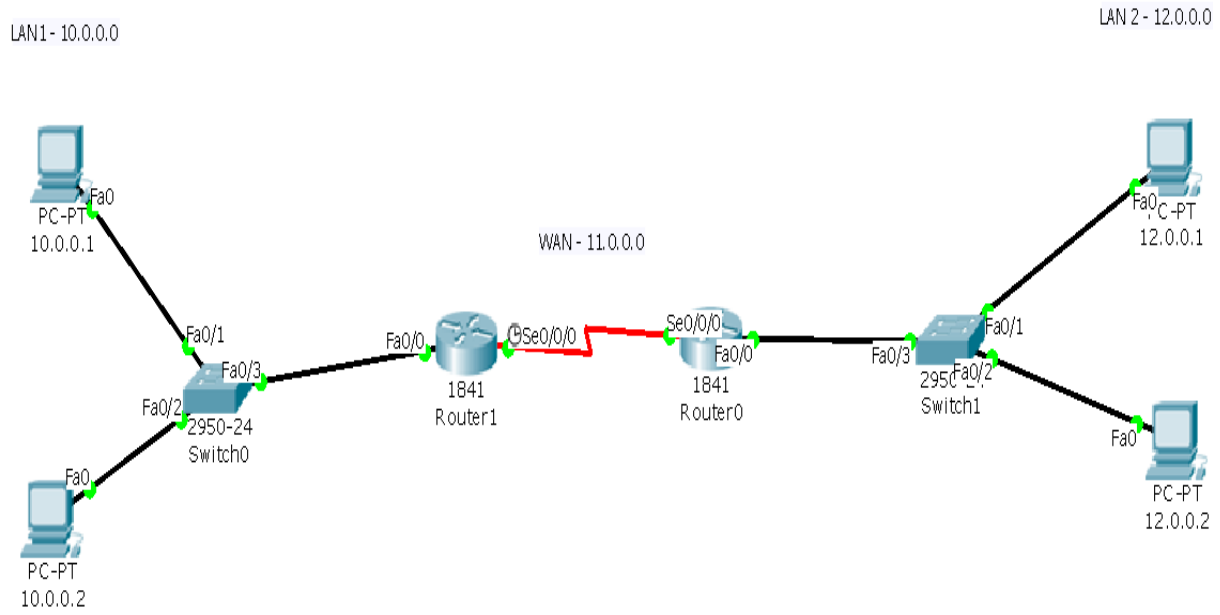
**Requirements:**
**Tools:**

1. Cisco Packet Tracer 6.0.1 or higher version

**Topology Constructions Requirements:**

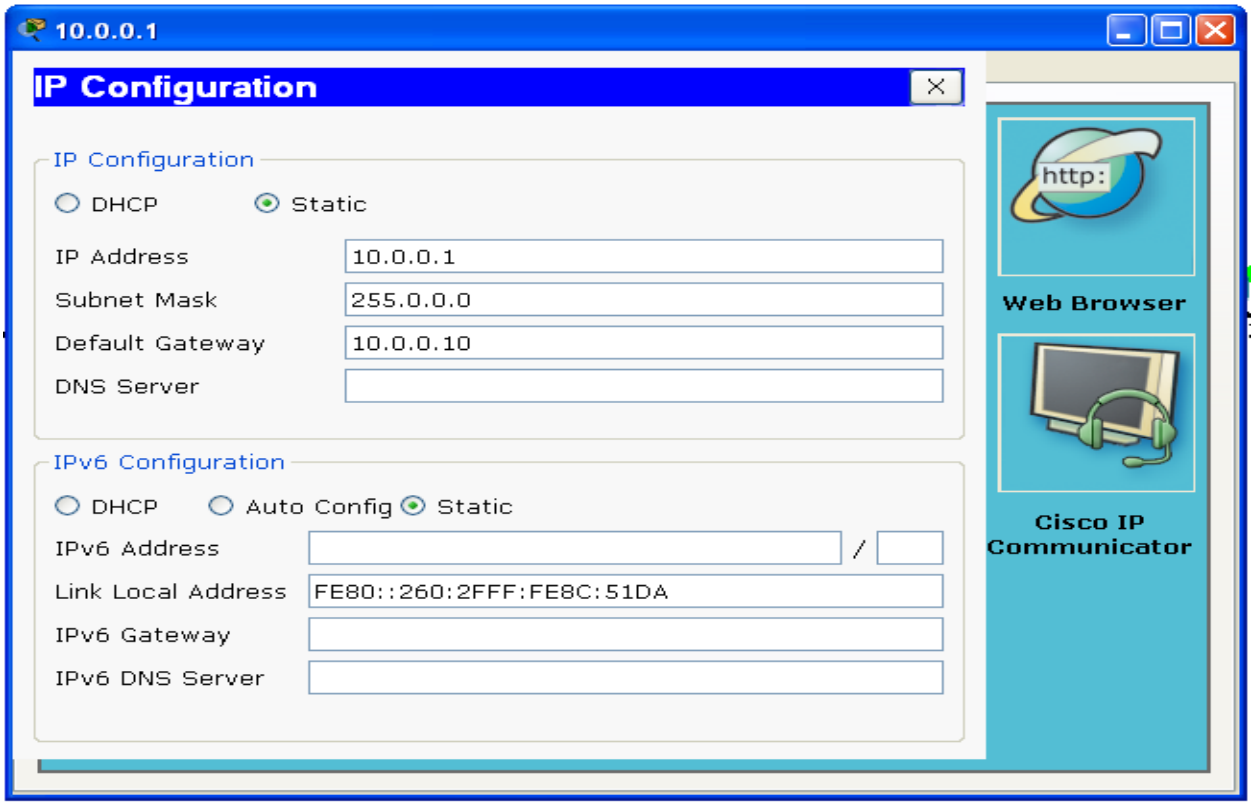
1. Two Windows PC or Linux PC for each LAN, Each PC must Have One NICcards
2. Two Switch (24 port)
3. Two Routers 1841
4. Straight Line LAN (cat-5) Cables with RJ-45 Sockets
5. Class A- IP Address using Static IP configuration

**LAN Topology – Physical View:**

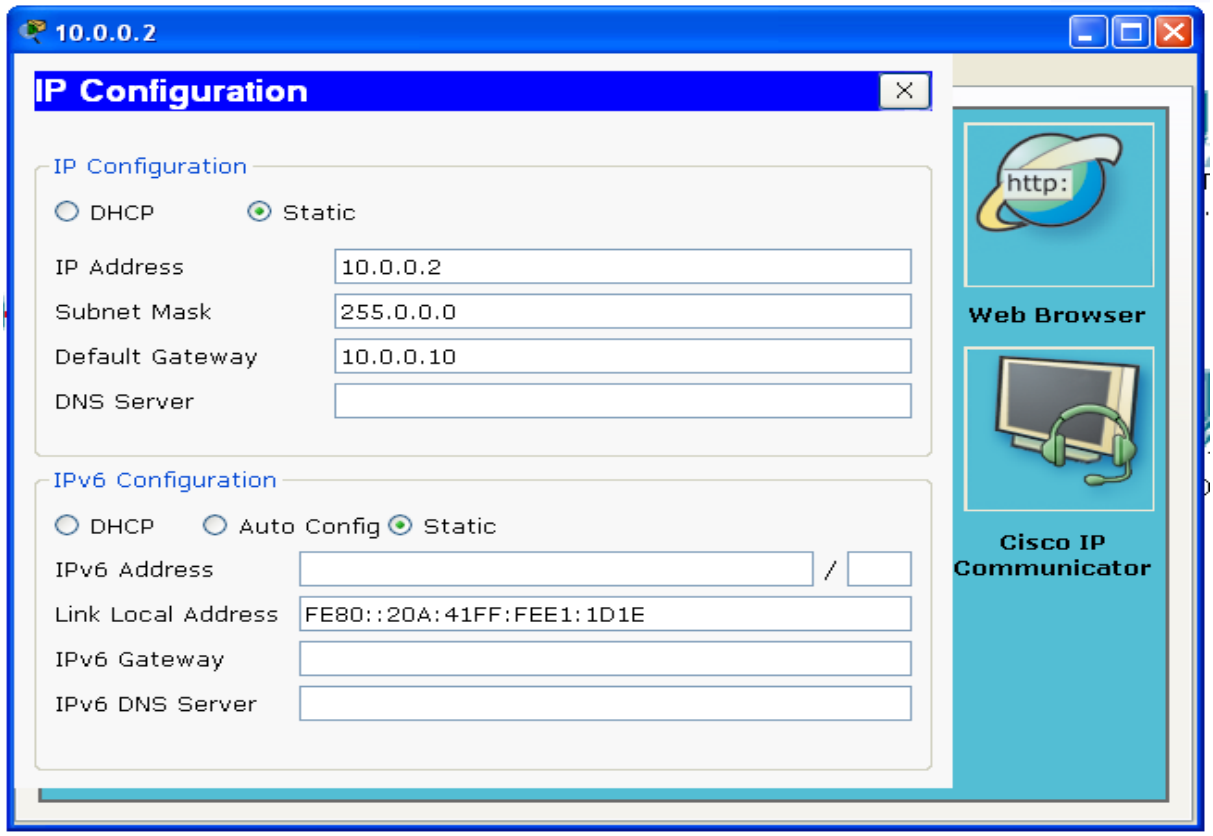



**LAN 1 PCs Configurations:**

**PC1:**

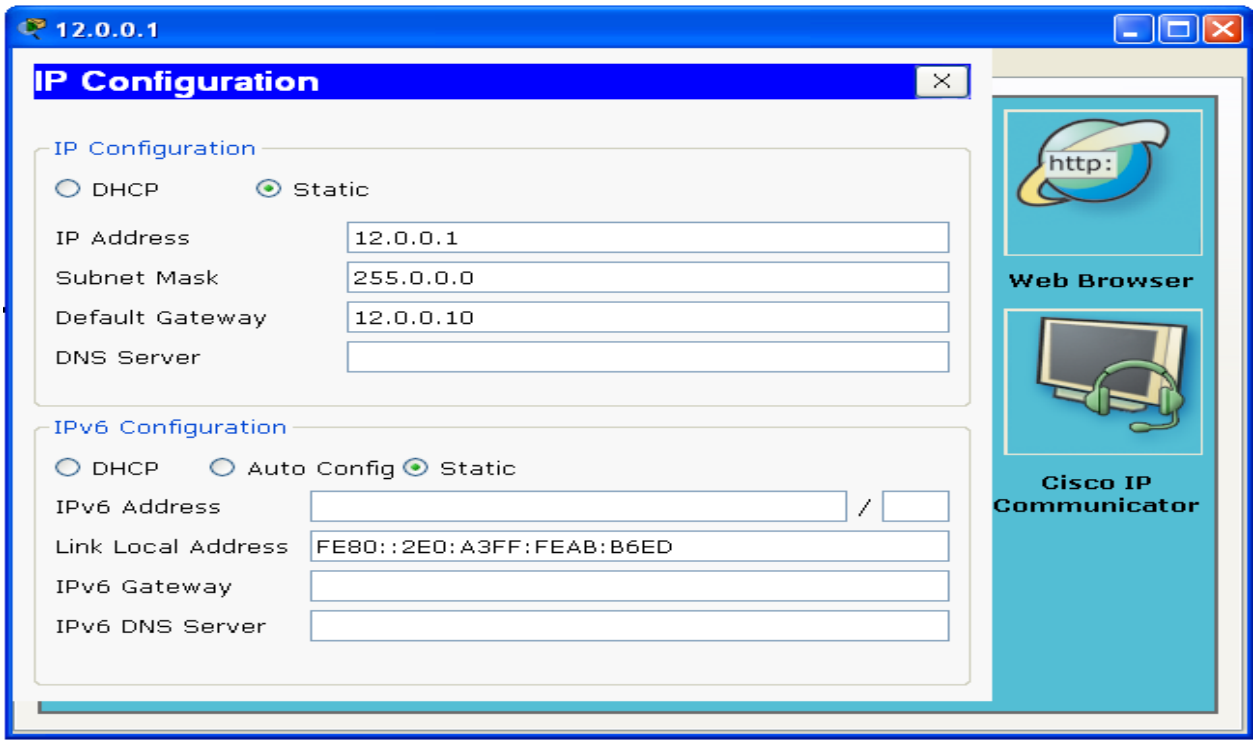



**PC 2:**

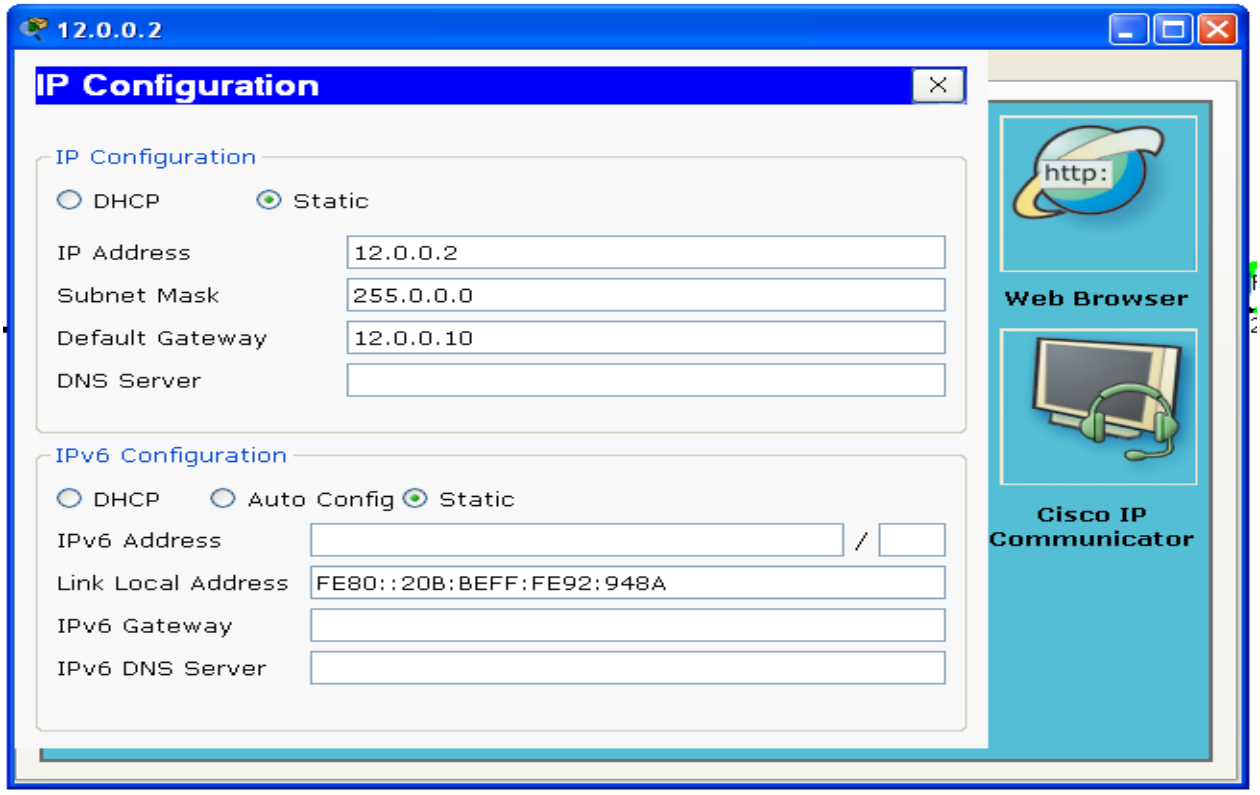



**LAN 2 PCs Configurations:**

**PC1:**




**PC 2:**




**WAN Configuration:**

**Procedures:**

1. Switch off the Routers and Placed the WIC-2T cards in it.
2. Use the Serial DCE Connection to establish the link between the Routers.
3. Make one End of the WAN as DCE and another end as DTE.
4. DCE (Data Circuit-Terminating Equipment) must be set with Clock Rate.
5. DTE (Date Terminal Equipment) does not require Clock rate.

**LAN 1 SIDE:**

**Router- 1 Configuration (CLI Mode):**

**Gateway for PC1:**

Router> enable

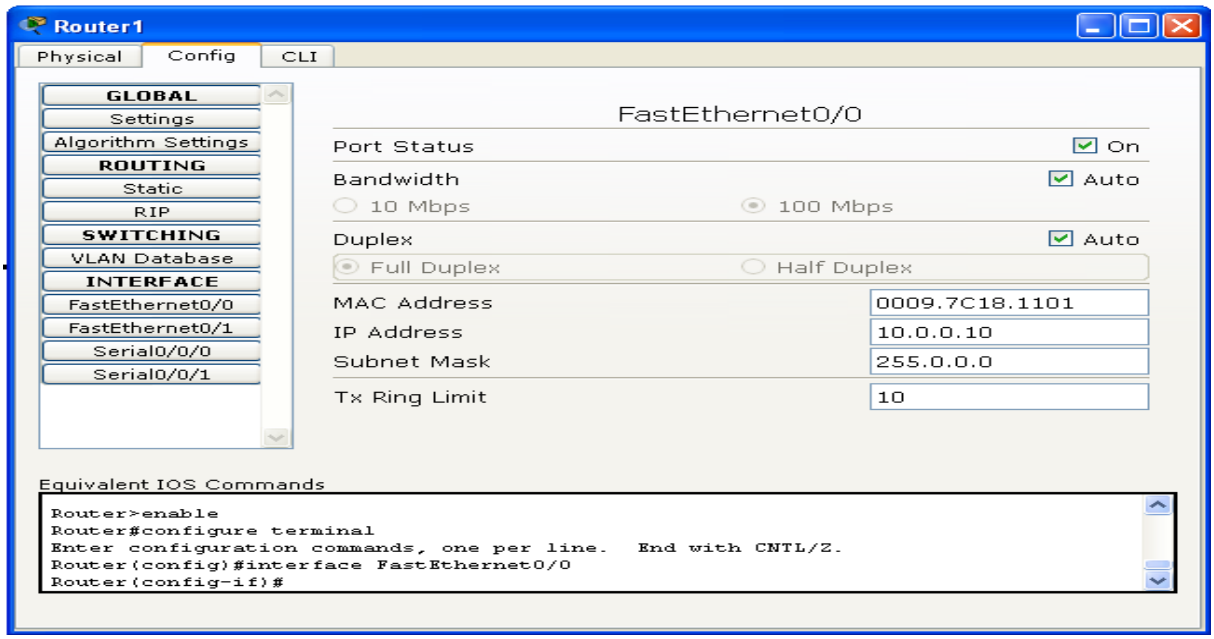
Router# config t

Router(config)# interface f0/0

Router(config-if)# ip address 10.0.0.10 255.0.0.0

Router(config-if)# no shutdown

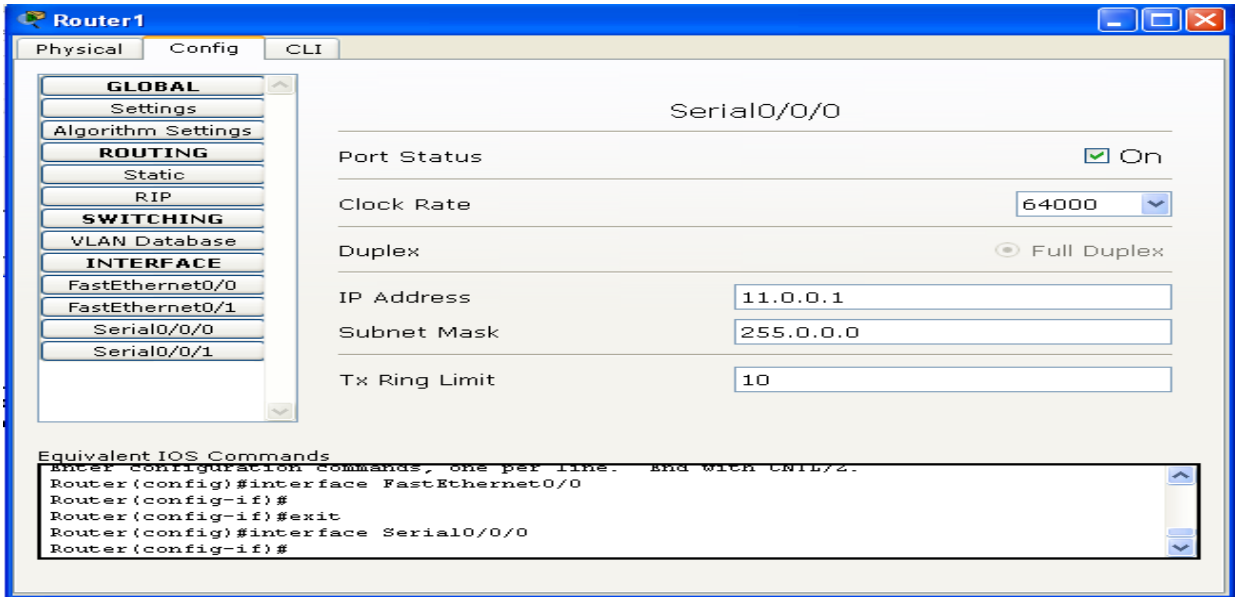
**GUI Mode for Fast Ethernet:**




**Serial Port for WAN:**

Router> enable
Router# config t
Router(config)# interface S0/0/0
Router(config-if)# ip address 11.0.0.1 255.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)# no shutdown

**GUI Mode for Serial Port:**




**LAN 2 SIDE:**

**Router- 2 Configuration (CLI Mode):**

**Gateway for PC1:**

Router> enable

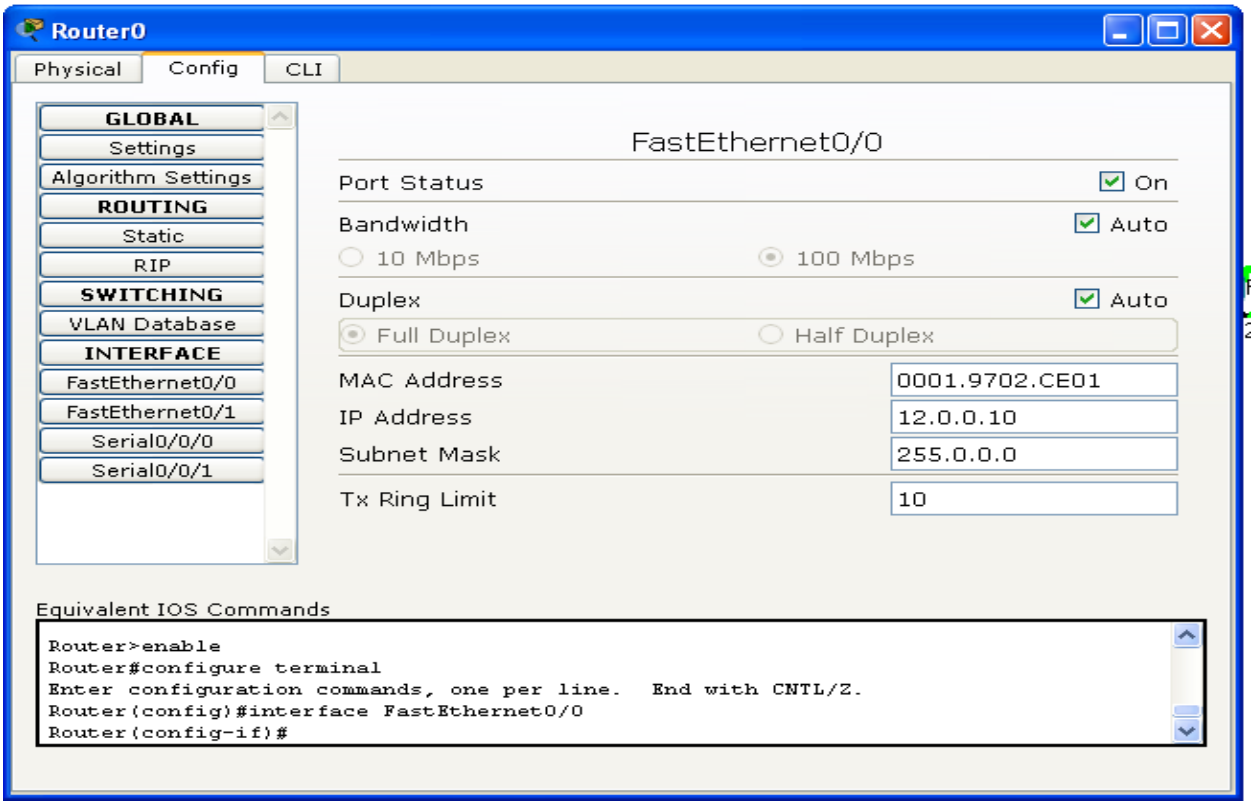
Router# config t

Router(config)# interface f0/0

Router(config-if)# ip address 10.0.0.10 255.0.0.0

Router(config-if)# no shutdown

**GUI Mode for Fast Ethernet:**




**Serial Port for WAN:**

Router> enable

Router# config t

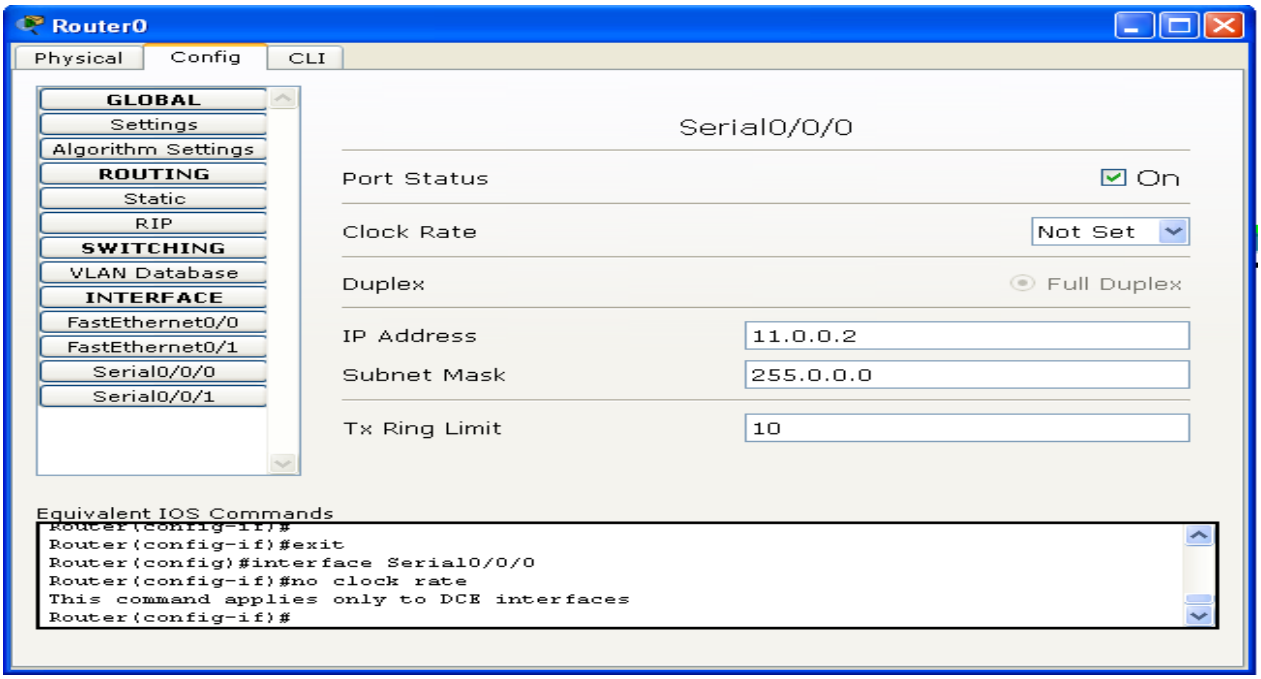
Router(config)# interface S0/0/0

Router(config-if)# ip address 11.0.0.1 255.0.0.0

Router(config-if)#clock rate 64000

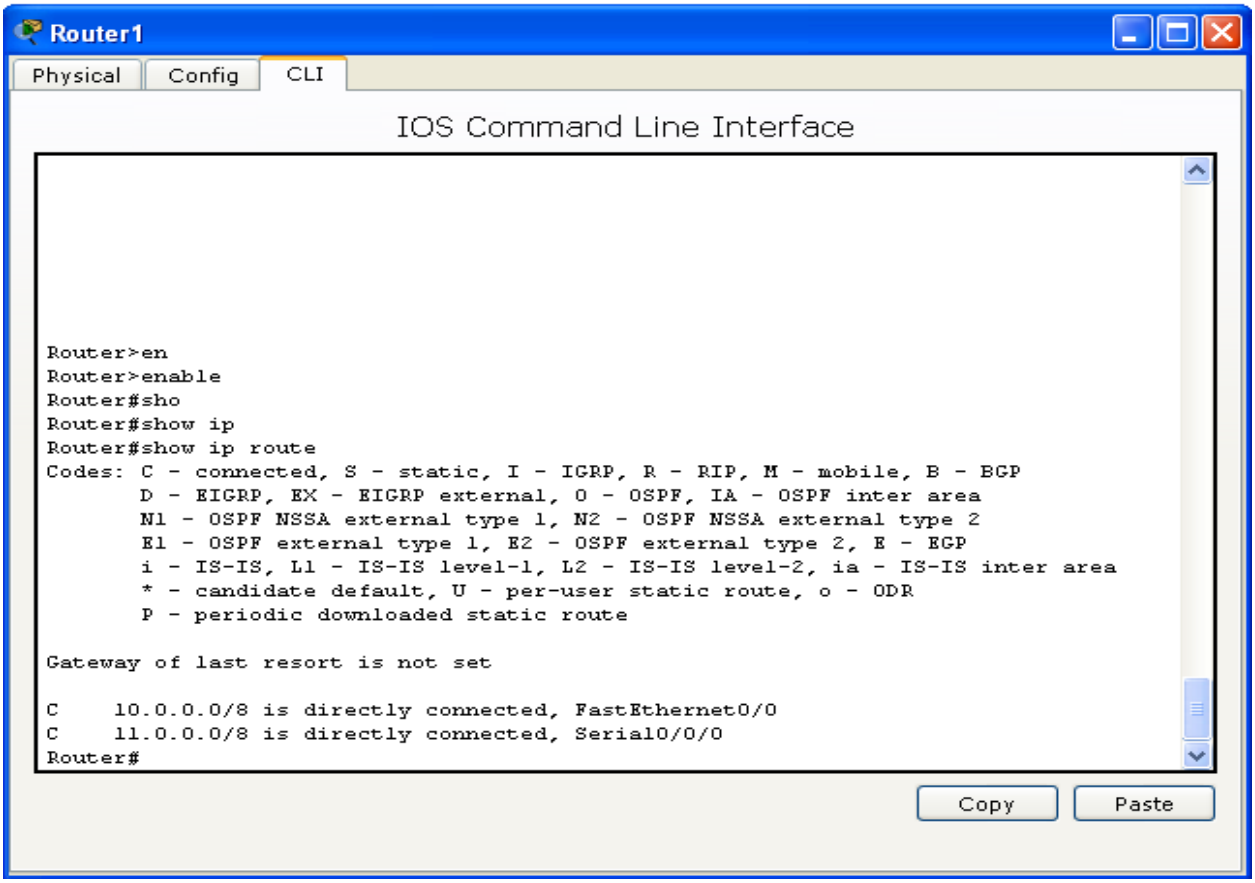
Router(config-if)# no shutdown

**GUI Mode for Serial Port:**

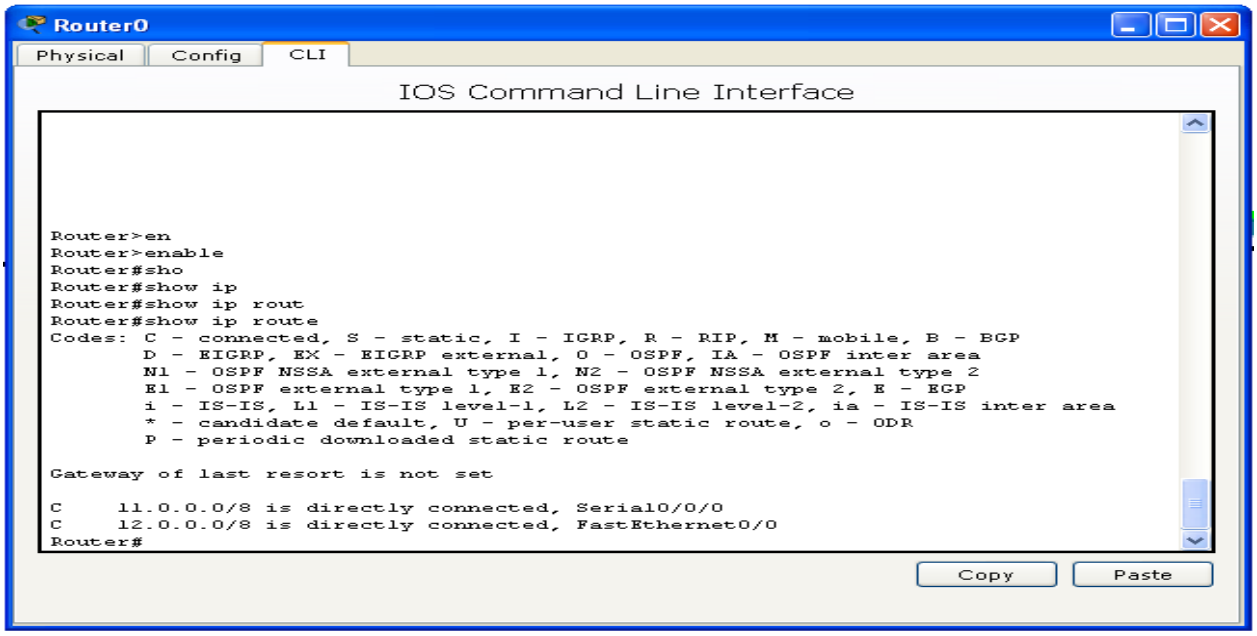



**Routing Table Info:**

**LAN 1 Router's Info:**

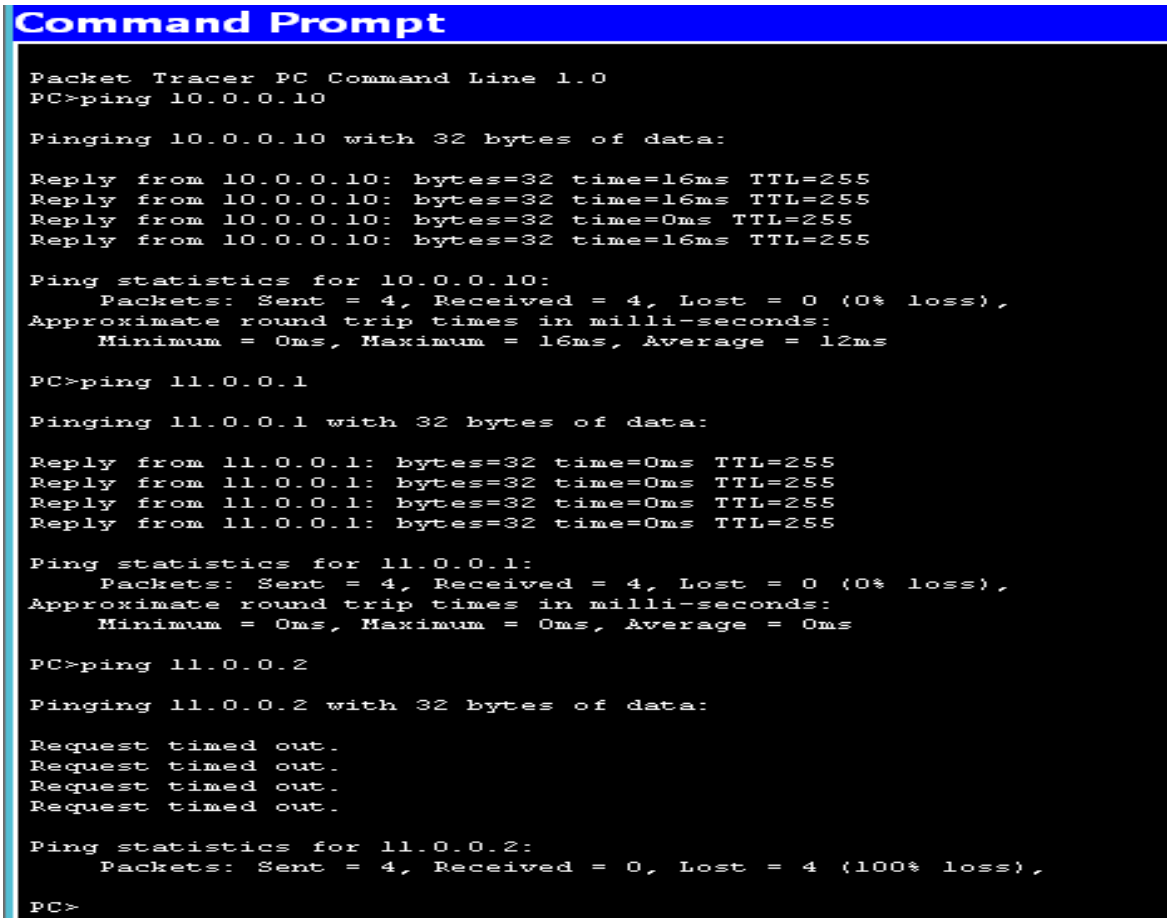



**LAN 2 Router's Info:**

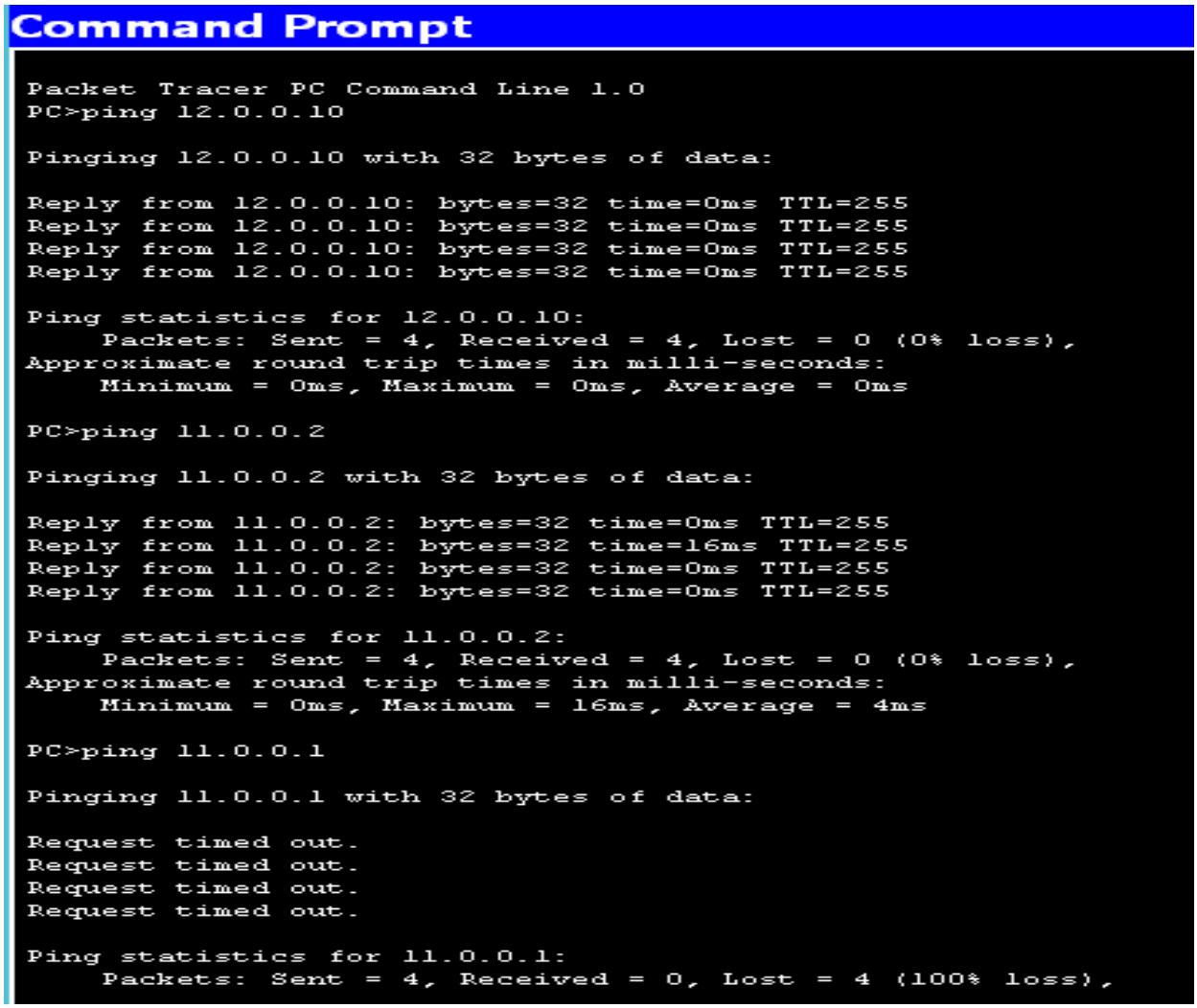



**Verifying Communications:**

**From LAN-1 PCs:**

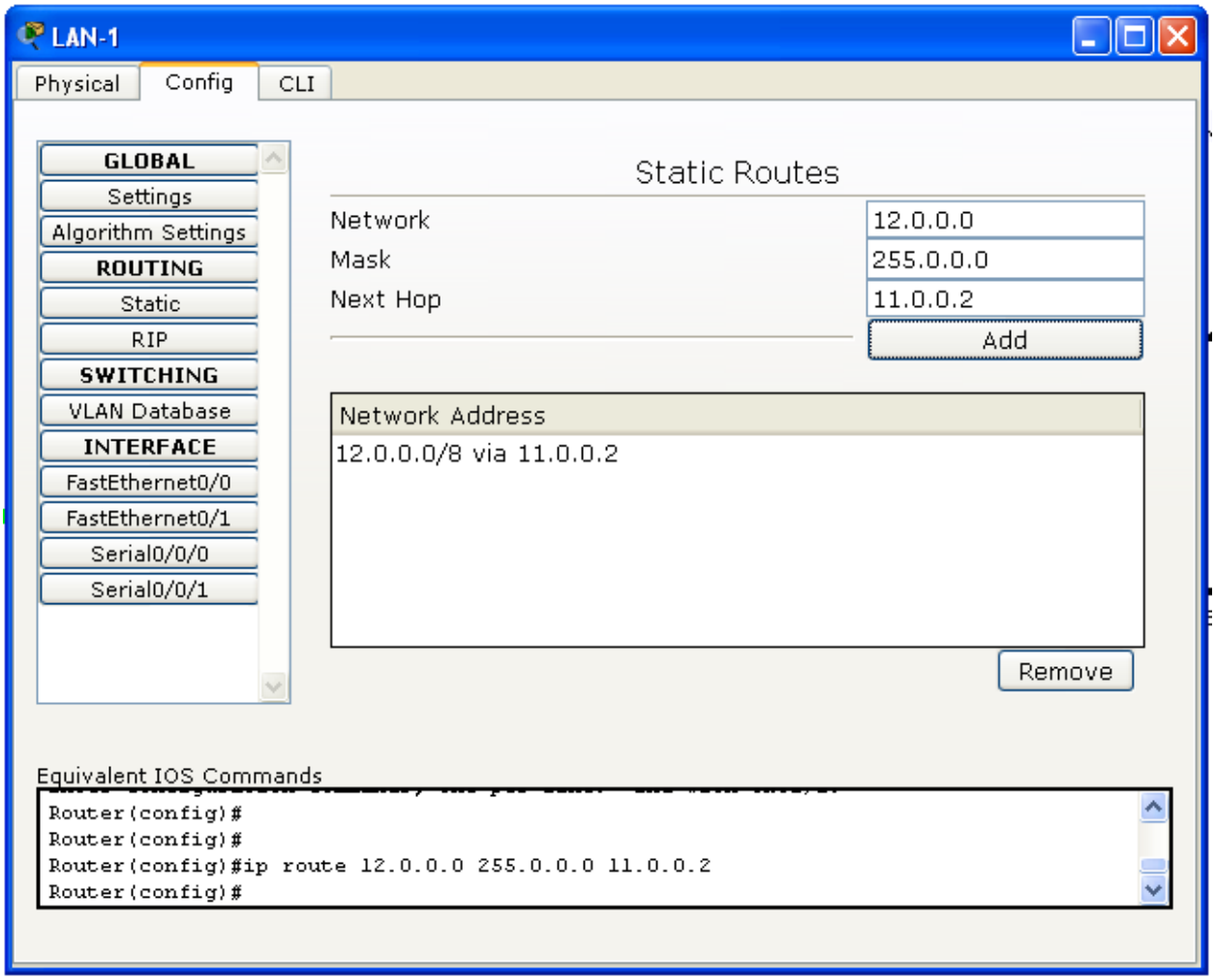



**From LAN-2 PCs:**




- It has been observed that the PCs from both the LANs can be pinged upto their directly connected network addresses only.
- If they attempt to ping the address which is remote to their LAN cannot be pinged.
- For example, PC 1 from LAN-1 can ping the ip address like 10.0.0.10 (Gateway) and 11.0.0.1, but for 11.0.0.2 which is not directly connected to it, so it receive **"Request Time Out"** message.
- To make the Routers to know about all the LANs, we can use Static or Dynamic Routing concept.
- Here in Static Routing, make the LAN-1's Router to know about the LAN- 12.0.0.0, similarly make the LAN-2's Router to know about the LAN-10.0.0.0.

**Static Route Configuration in LAN-1's Router ( GUI Mode):**




**Static Route Configuration in LAN-1's Router (CLI Mode):**

Router> enable

Router# config t

Router(config)# ip route 12.0.0.0 255.0.0.0 11.0.0.2

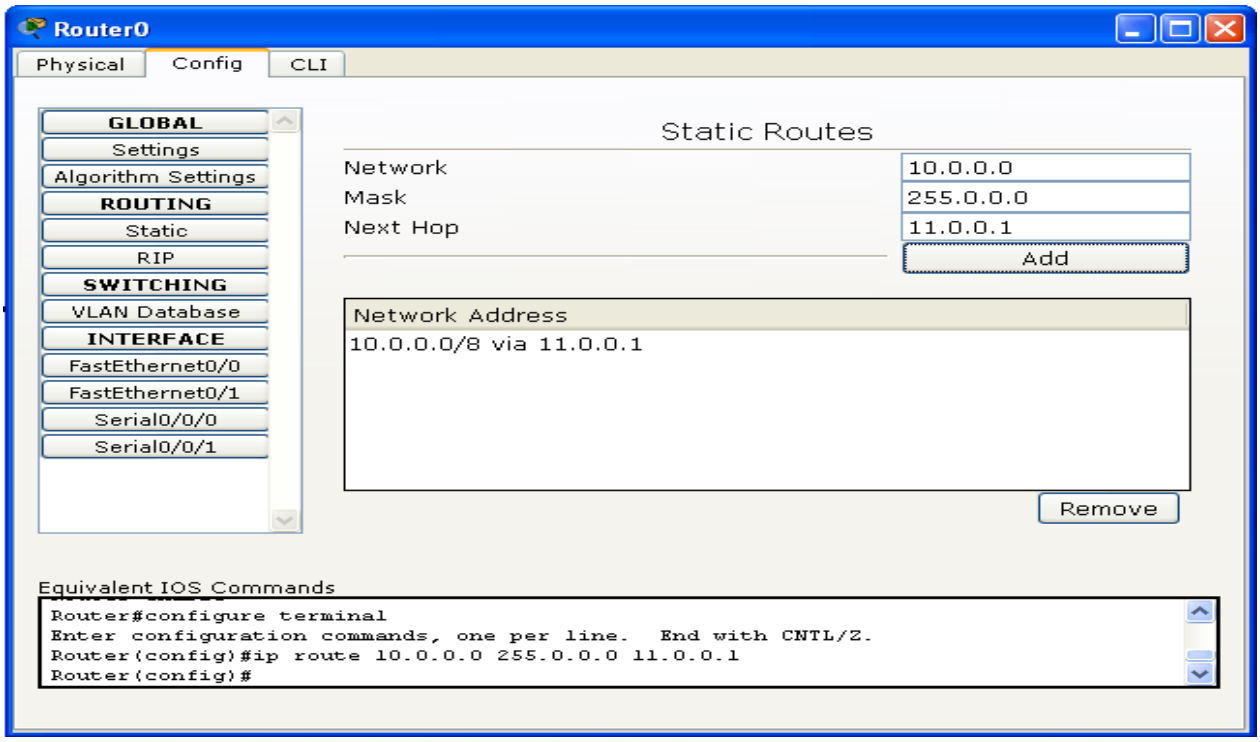
**Static Route Configuration in LAN-2's Router (CLI Mode):**

Router> enable

Router# config t

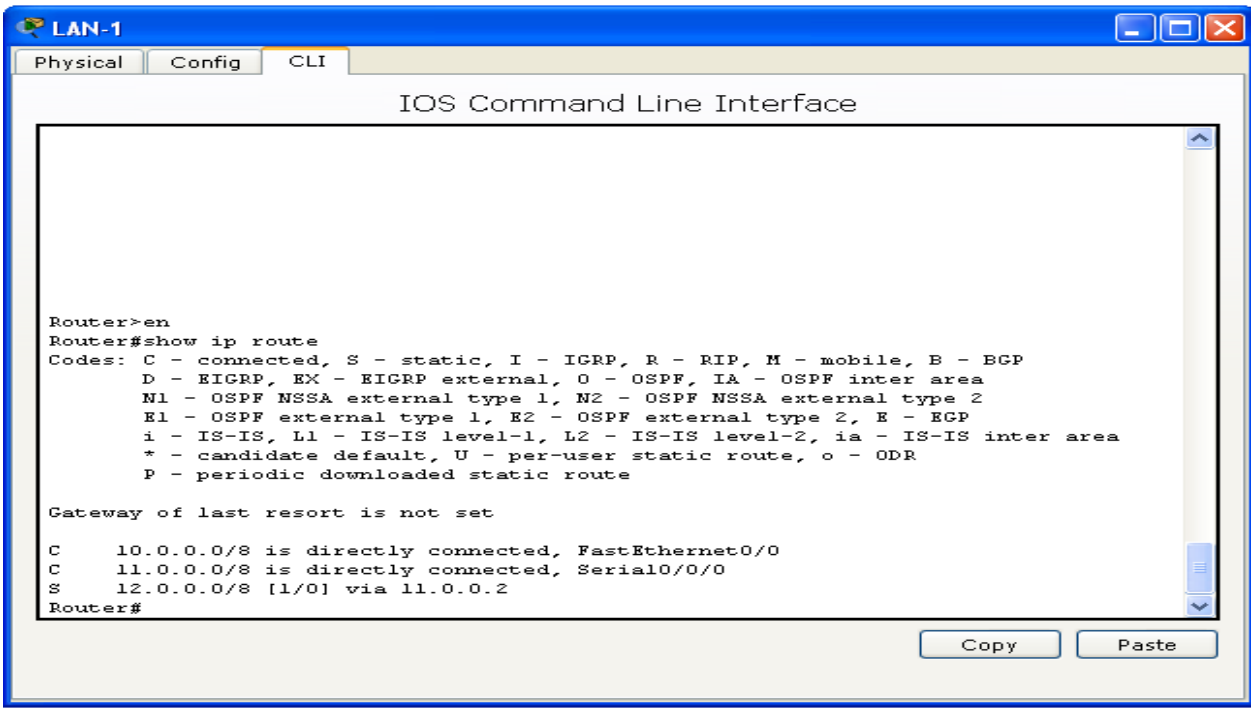
Router(config)# ip route 10.0.0.0 255.0.0.0 11.0.0.1

**Static Route Configuration in LAN-2's Router (GUI Mode):**

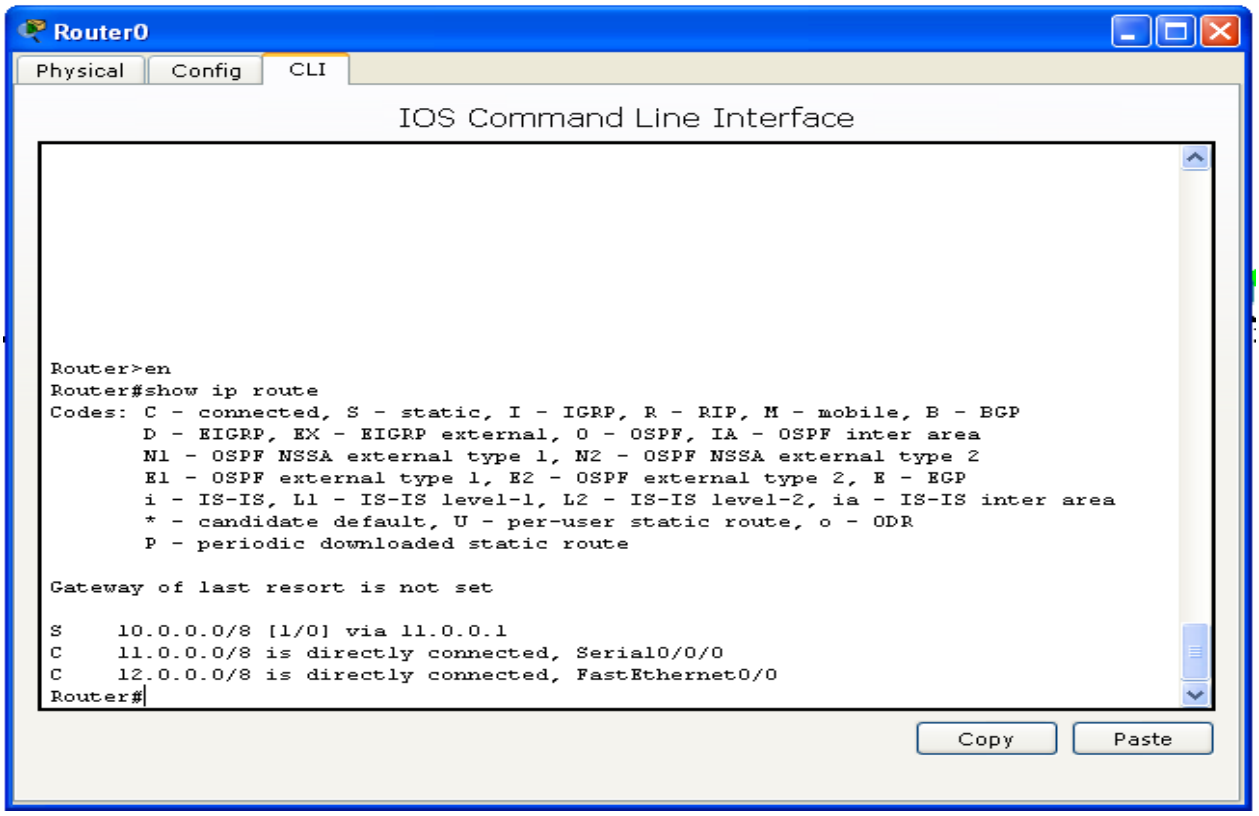



**Routing Info After Static Routing:**

**LAN-1's Router:**




**LAN-2's Router:**




**Verifying Communications after Static Routing:**

**From LAN-1 PCs:**

```
PC>ping 11.0.0.2

Pinging 11.0.0.2 with 32 bytes of data:

Reply from 11.0.0.2: bytes=32 time=2ms TTL=254
Reply from 11.0.0.2: bytes=32 time=31ms TTL=254
Reply from 11.0.0.2: bytes=32 time=16ms TTL=254
Reply from 11.0.0.2: bytes=32 time=28ms TTL=254

Ping statistics for 11.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 31ms, Average = 19ms

PC>ping 12.0.0.1

Pinging 12.0.0.1 with 32 bytes of data:

Reply from 12.0.0.1: bytes=32 time=32ms TTL=126
Reply from 12.0.0.1: bytes=32 time=28ms TTL=126
Reply from 12.0.0.1: bytes=32 time=16ms TTL=126
Reply from 12.0.0.1: bytes=32 time=31ms TTL=126

Ping statistics for 12.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 16ms, Maximum = 32ms, Average = 26ms
```

**From LAN-2 PCs:**

```
PC>ping 11.0.0.1

Pinging 11.0.0.1 with 32 bytes of data:

Reply from 11.0.0.1: bytes=32 time=32ms TTL=254
Reply from 11.0.0.1: bytes=32 time=31ms TTL=254
Reply from 11.0.0.1: bytes=32 time=46ms TTL=254
Reply from 11.0.0.1: bytes=32 time=28ms TTL=254

Ping statistics for 11.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 28ms, Maximum = 46ms, Average = 34ms

PC>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time=31ms TTL=126
Reply from 10.0.0.1: bytes=32 time=47ms TTL=126
Reply from 10.0.0.1: bytes=32 time=32ms TTL=126
Reply from 10.0.0.1: bytes=32 time=32ms TTL=126

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 31ms, Maximum = 47ms, Average = 35ms
```

**10. Analyze the performance of various configurations and protocols using Cisco Packet Tracer.**

Original TCP versus the above modified one: To compare the performance between theoperation of TCP with congestion control and the operation of TCP as implemented. The main objective is to examine how TCP responds to a congested network. The concepts involved in the lab include network congestion and the host responsibilities for communicating over a network. This lab requires three PC's connected to a switch. One PC is designated as the target host and the other two PC's will transfer a file from the target host using FTP. A load is placed on the network to simulate congestion and the file is transferred, first by the host using the normal TCP and then by the host using the modified version. This procedure is performed multiple times to determine average statistics. The students are then asked to summarize the results and draw conclusions about the performance differences and the underlying implications for hosts operating in a network environment.

**Requirements:**

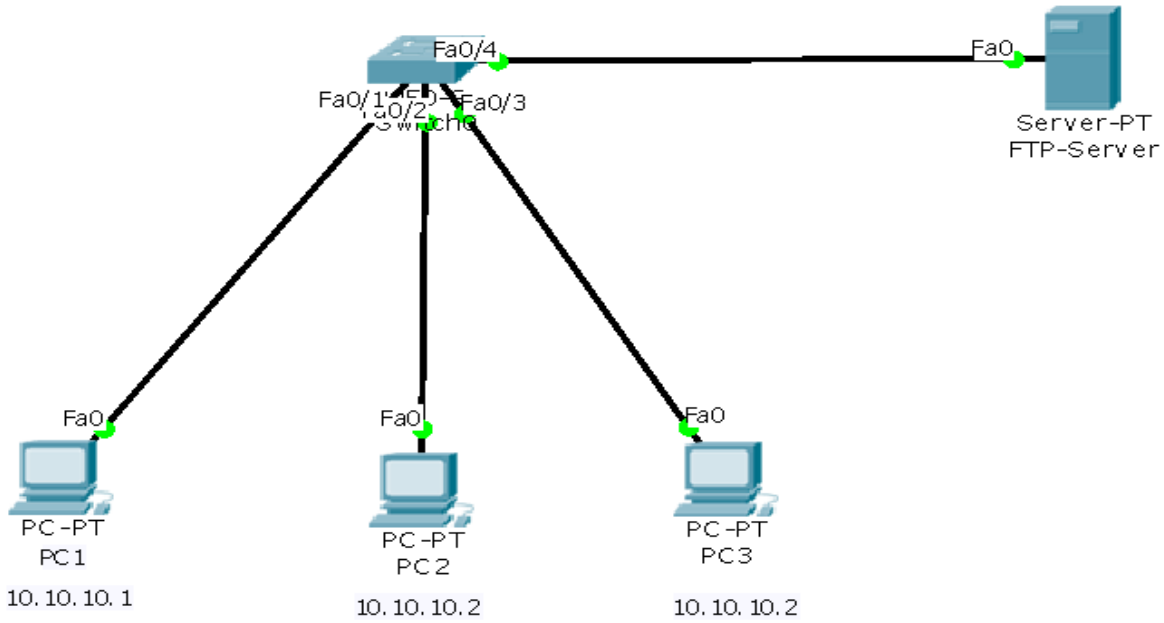
**Tools:**

- Cisco Packet Tracer 6.0.1 or higher version

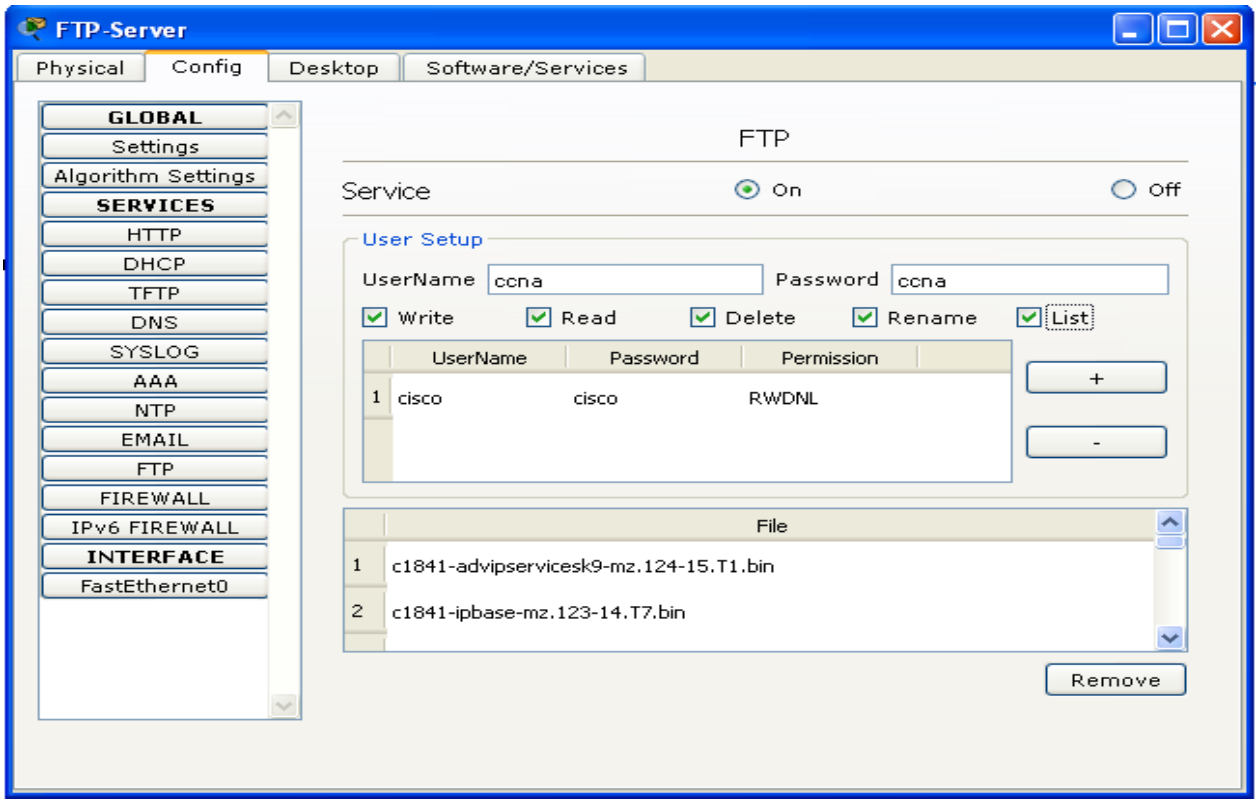
**Topology Constructions Requirements:**

1. Three Windows PC or Linux PC for each LAN, Each PC must Have One NICcards
2. One Switch (24 ports)
3. Straight Line LAN (cat-5) Cables with RJ-45 Sockets
4. Class A- IP Address using Static IP configuration

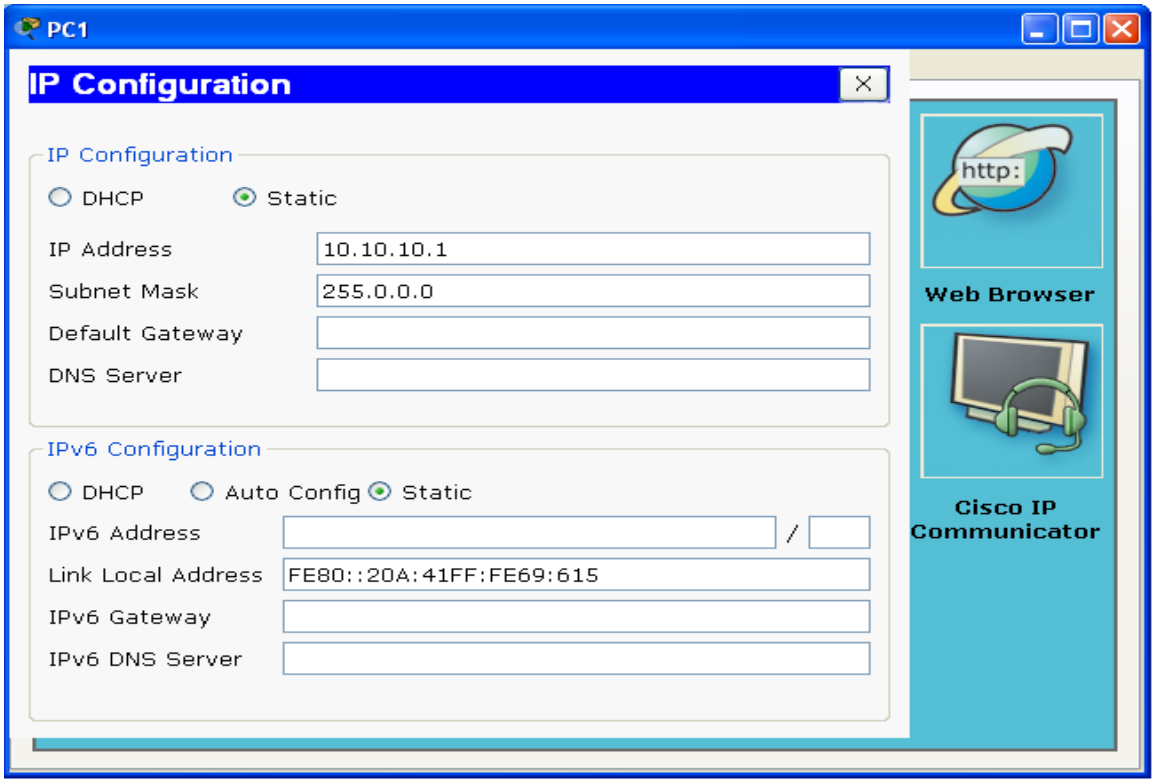
**LAN Topology – Physical View:**



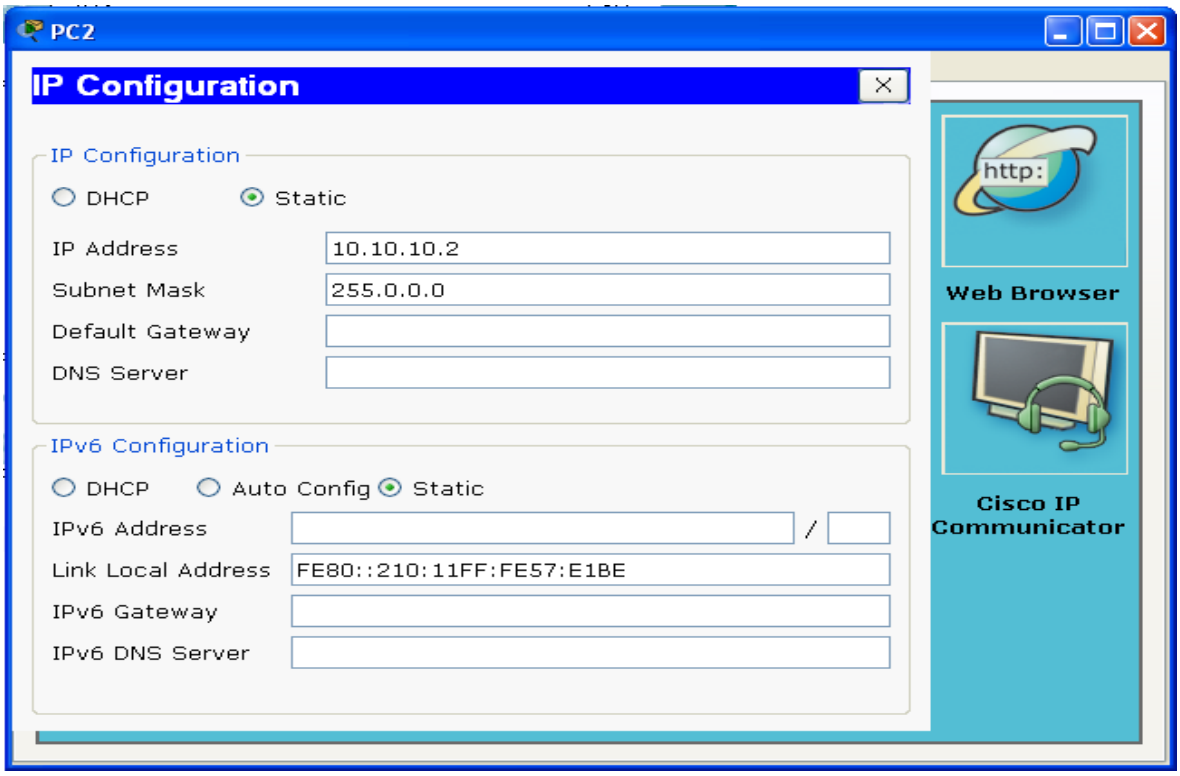

**FTP Server Configuration:**



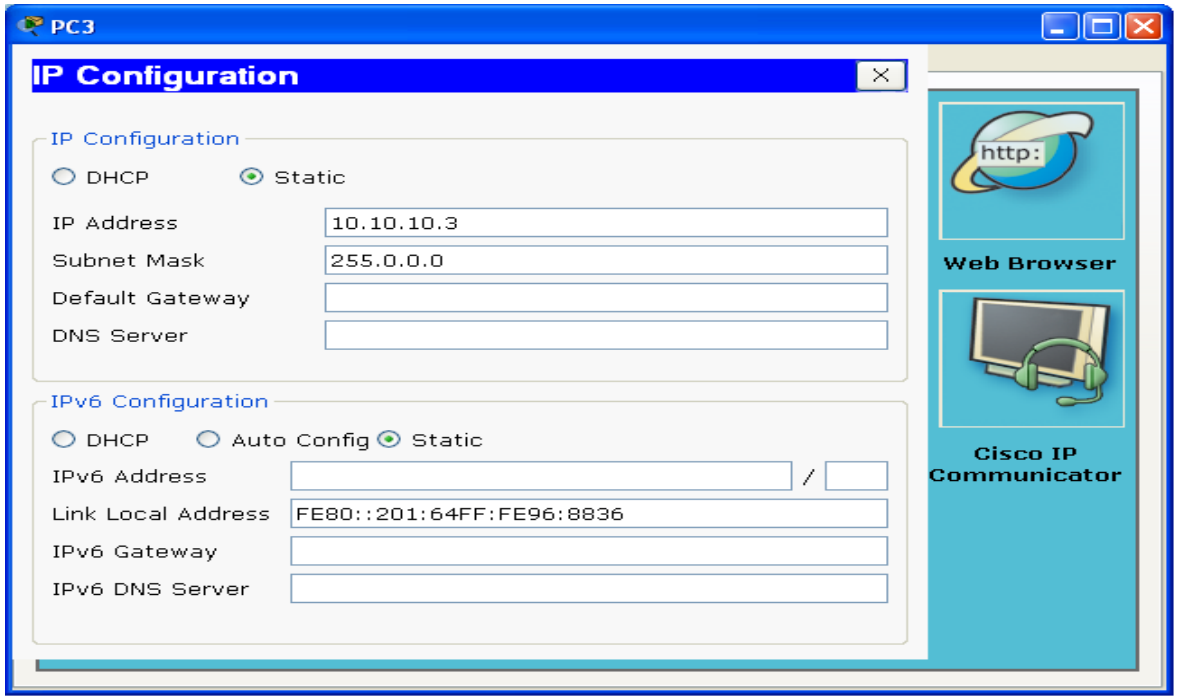

**PC-1 Configuration:**



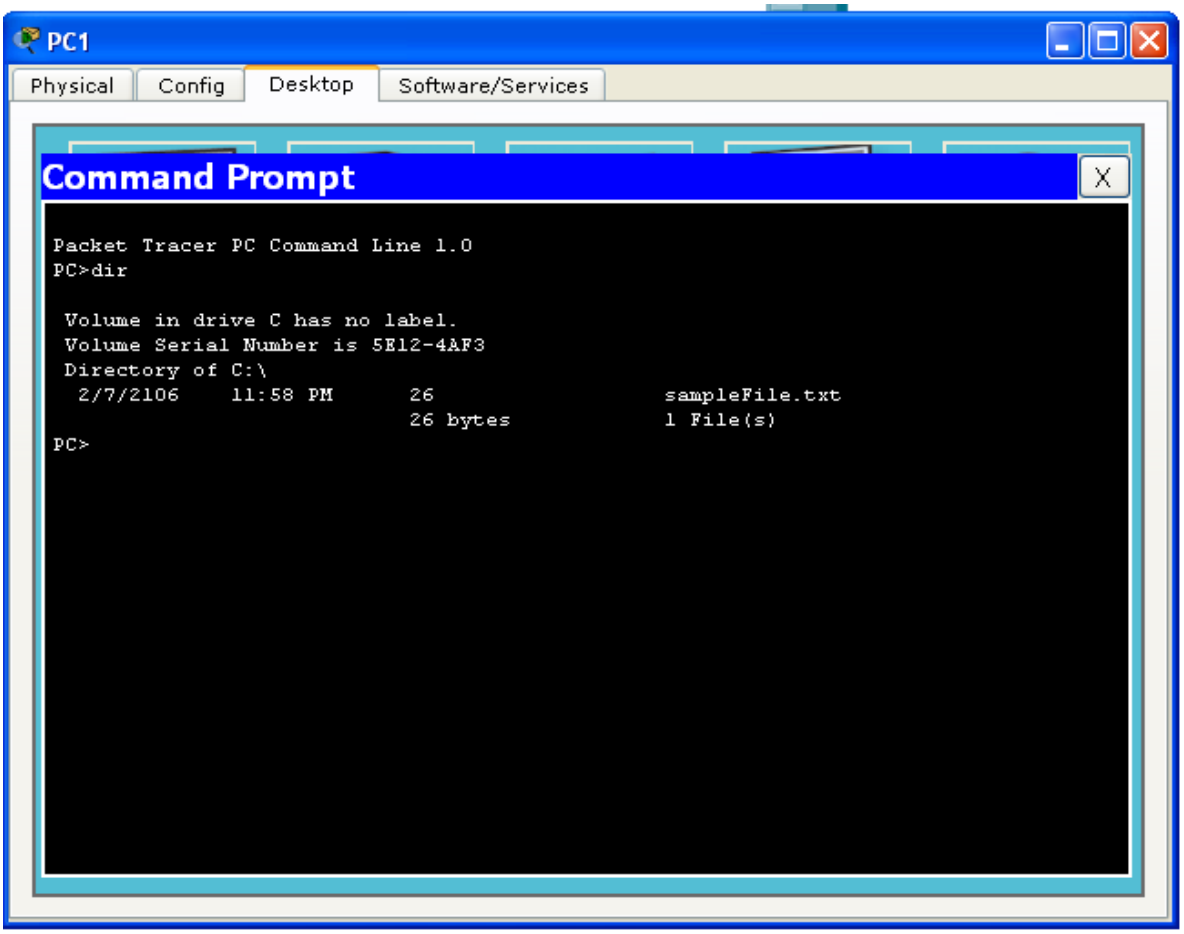

**PC-2 Configuration:**




**PC-3 Configuration:**




**List the Files in the Local PC-1:**




**Connecting FTP Server and transferring the Files from Server to PC-1:**

```
Command Prompt

Packet Tracer PC Command Line 1.0
PC>ftp 10.10.10.10
Trying to connect...10.10.10.10
Connected to 10.10.10.10
220- Welcome to PT Ftp server
Username:ccna
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>dir

Listing /ftp directory from 10.10.10.10:
0    : c1841-advipservicesk9-mz.124-15.T1.bin              33591768
1    : c1841-ipbase-mz.123-14.T7.bin                       13832032
2    : c1841-ipbasek9-mz.124-12.bin                        16599160
3    : c2600-advipservicesk9-mz.124-15.T1.bin              33591768
4    : c2600-i-mz.122-28.bin                               5571584
5    : c2600-ipbasek9-mz.124-8.bin                         13169700
6    : c2800nm-advipservicesk9-mz.124-15.T1.bin            50938004
7    : c2800nm-advipservicesk9-mz.151-4.M4.bin             33591768
8    : c2800nm-ipbase-mz.123-14.T7.bin                     5571584
9    : c2800nm-ipbasek9-mz.124-8.bin                       15522644
10   : c2950-i6q412-mz.121-22.EA4.bin                      3058048
11   : c2950-i6q412-mz.121-22.EA8.bin                      3117390
12   : c2960-lanbase-mz.122-25.FX.bin                      4414921
13   : c2960-lanbase-mz.122-25.SEE1.bin                    4670455
14   : c3560-advipservicesk9-mz.122-37.SE1.bin             8662192
15   : pt1000-i-mz.122-28.bin                              5571584
16   : pt3000-i6q412-mz.121-22.EA4.bin                     3117390
ftp>get pt3000-i6q412-mz.121-22.EA4.bin

Reading file pt3000-i6q412-mz.121-22.EA4.bin from 10.10.10.10:
File transfer in progress...

[Transfer complete - 3117390 bytes]

3117390 bytes copied in 30.926 secs (100801 bytes/sec)
ftp>
```

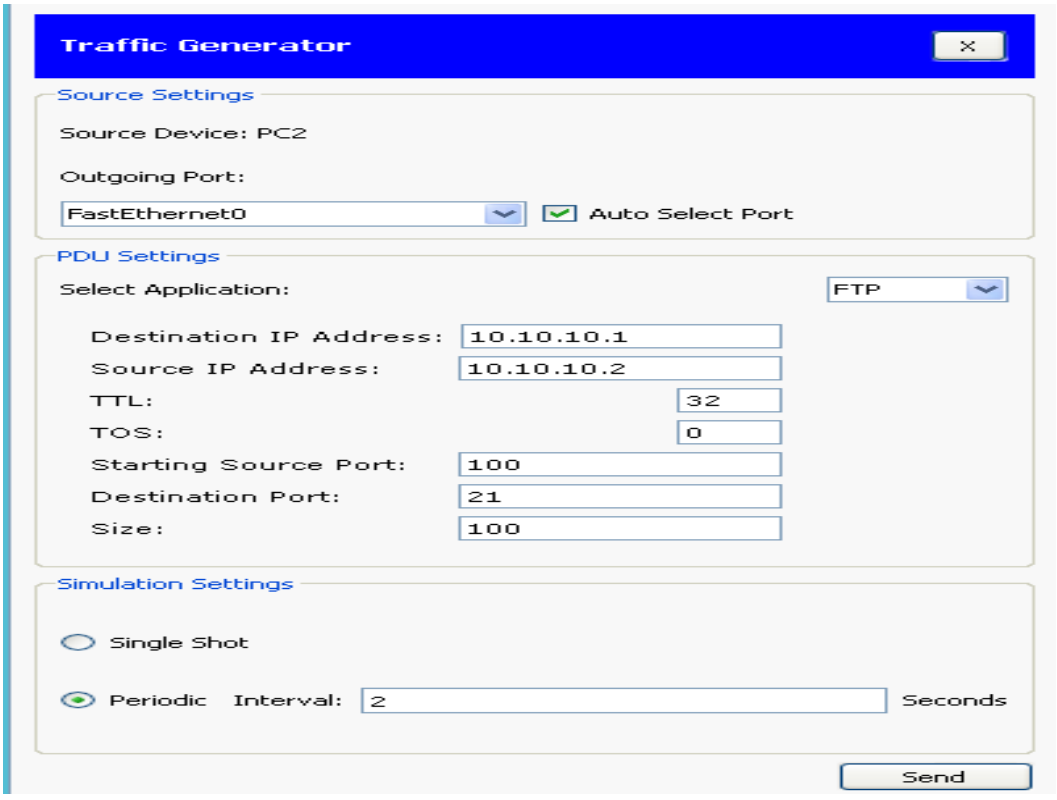
**List the Files after transferred:**

```
PC>dir

 Volume in drive C has no label.
 Volume Serial Number is 5E12-4AF3
 Directory of C:\
  1/1/1970    5:30 PM       3117390            pt3000-i6q412-mz.121-22.EA4.bin
  2/7/2106    11:58 PM      26                 sampleFile.txt
                            3117416 bytes      2 File(s)
```

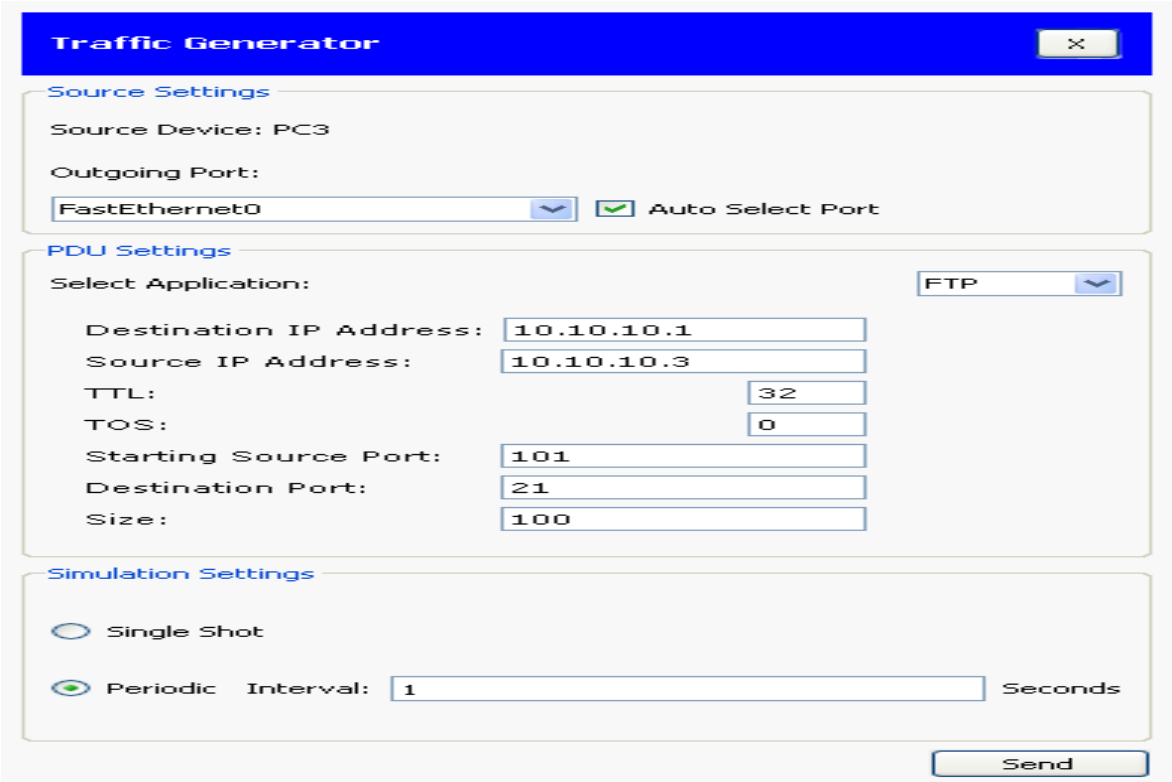
**Generating FTP Traffic targeted to PC-1 from PC-2 and PC-3:**

**From PC-2:**

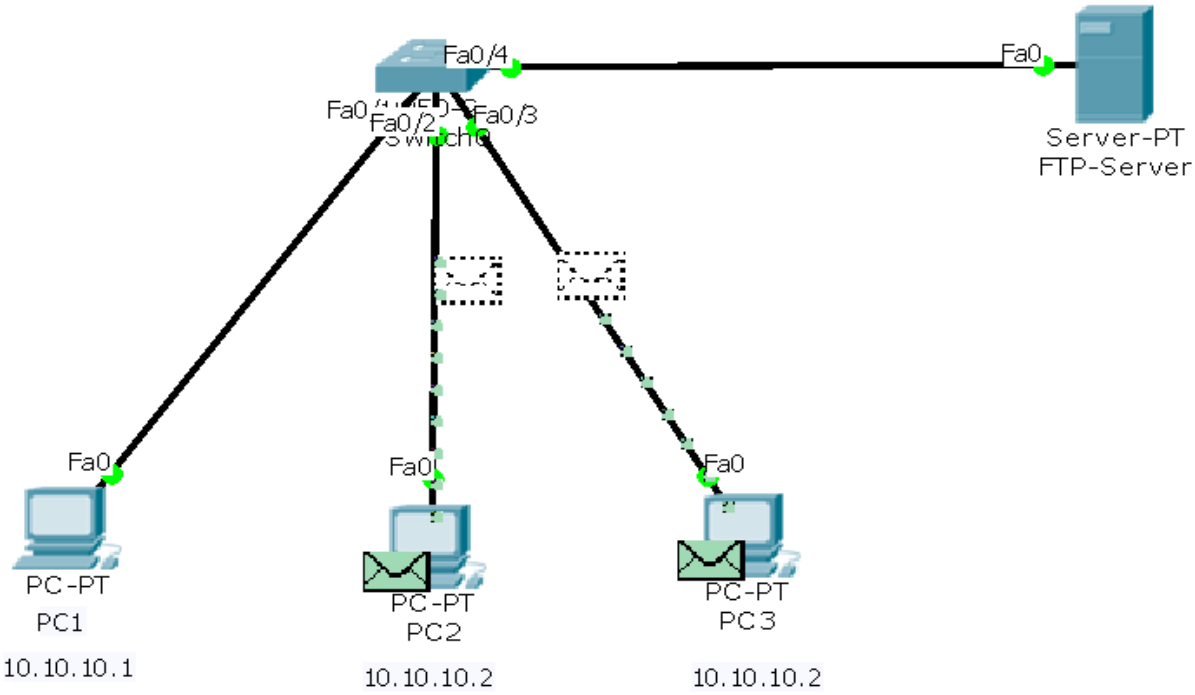

PC2
Physical
Config
Desktop
Software/Services
IP Configuration
Dial-up
Terminal
Command Prompt
Web Browser
PC Wireless
VPN
Traffic Generator
MIB Browser
Cisco IP Communicator
E Mail
PPPoE Dialer
Text Editor
Open the Traffic Generator application.


Traffic Generator
Source Settings
Source Device: PC2
Outgoing Port:
FastEthernet0
Auto Select Port
PDU Settings
Select Application:
FTP
Destination IP Address: 10.10.10.1
Source IP Address: 10.10.10.2
TTL: 32
TOS: 0
Starting Source Port: 100
Destination Port: 21
Size: 100
Simulation Settings
Single Shot
Periodic Interval: 2 Seconds
Send

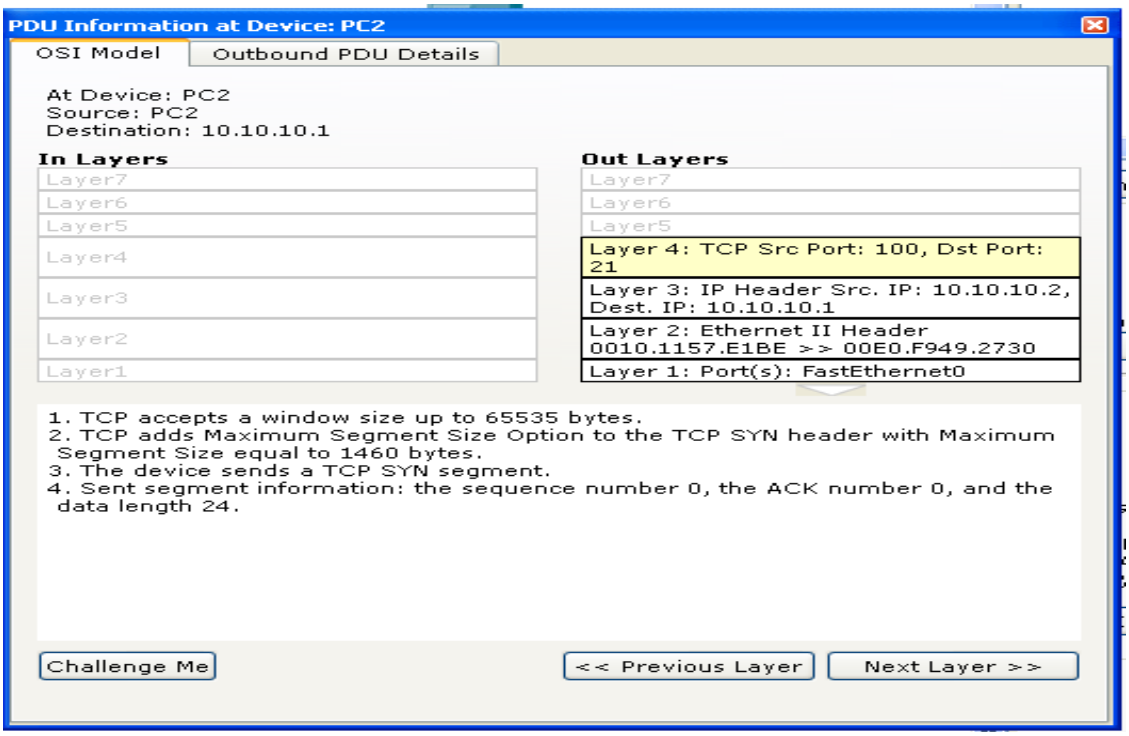
**From PC-3:**

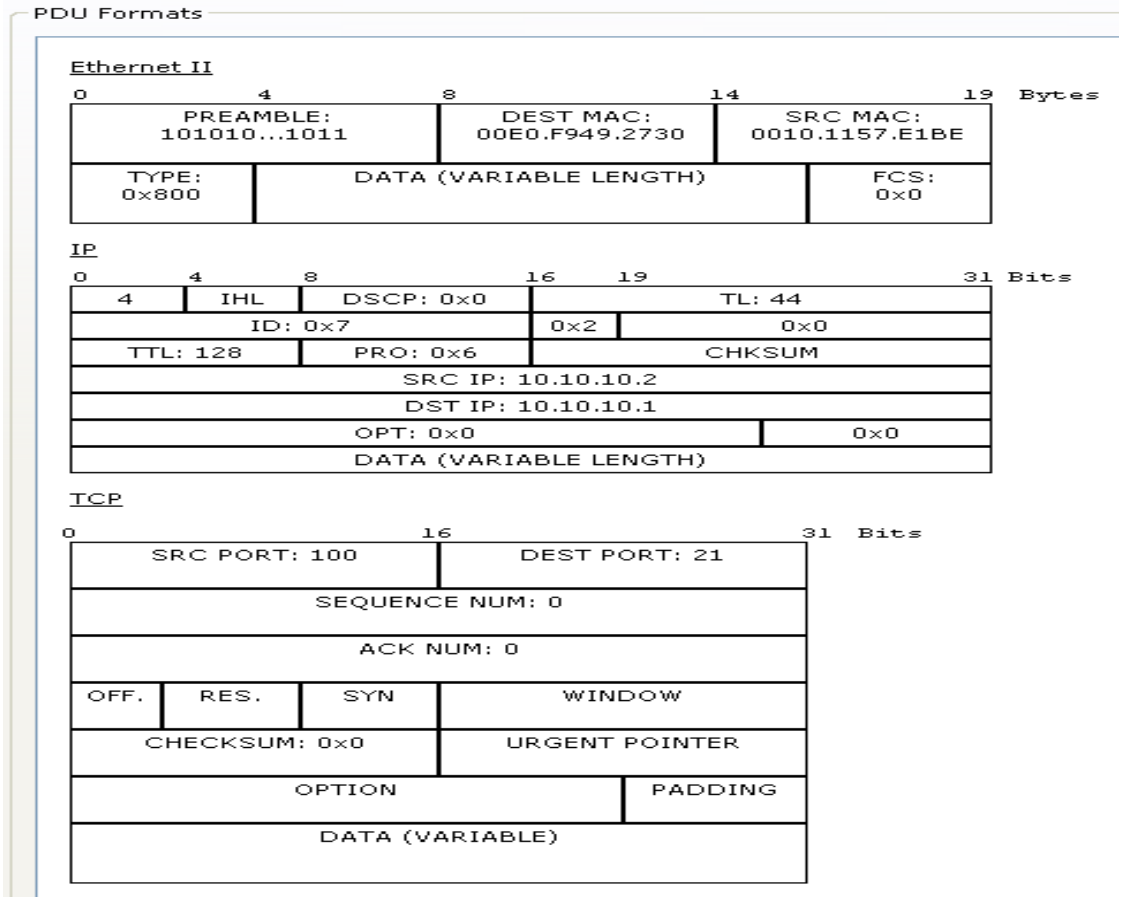



**Traffic Generated Topology:**

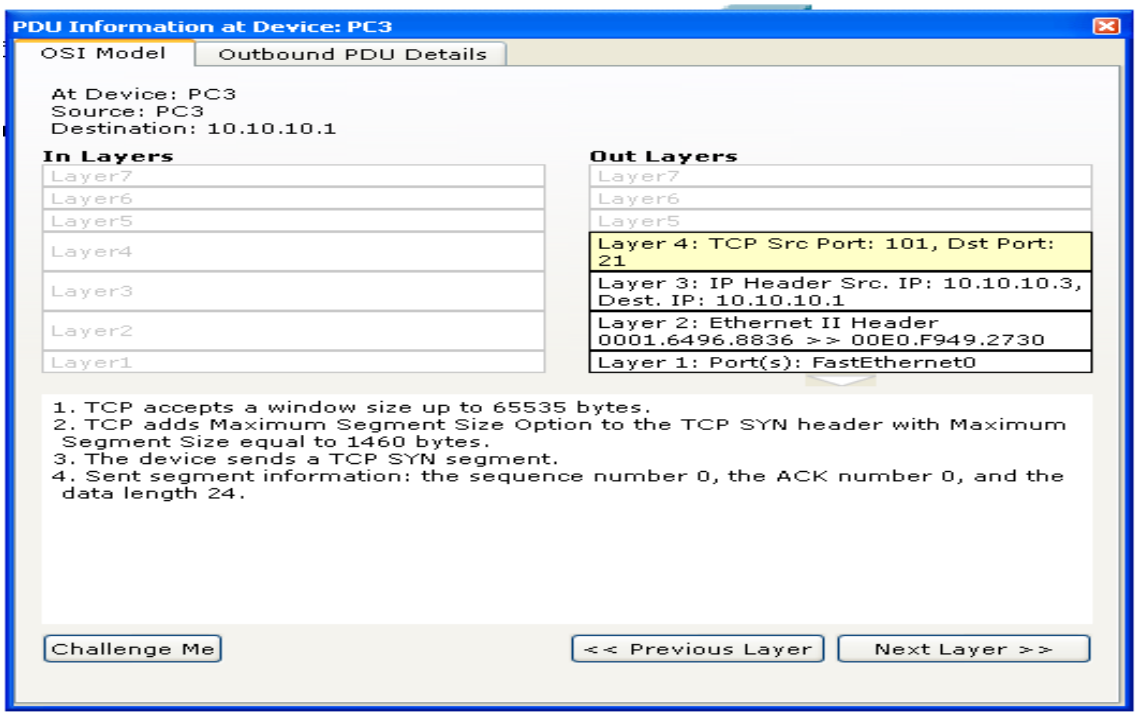


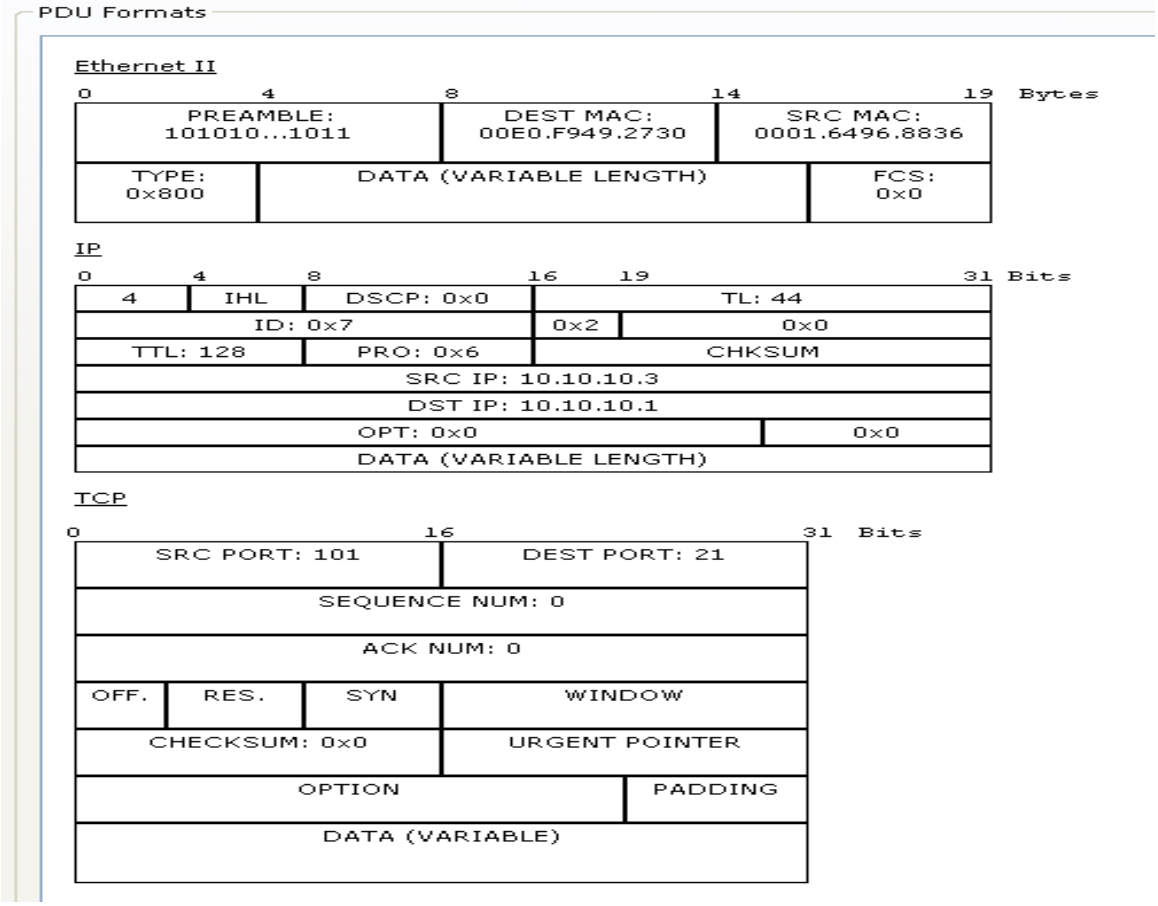

**PDU Information at Device PC2 and Analyzing the Headers Info:**



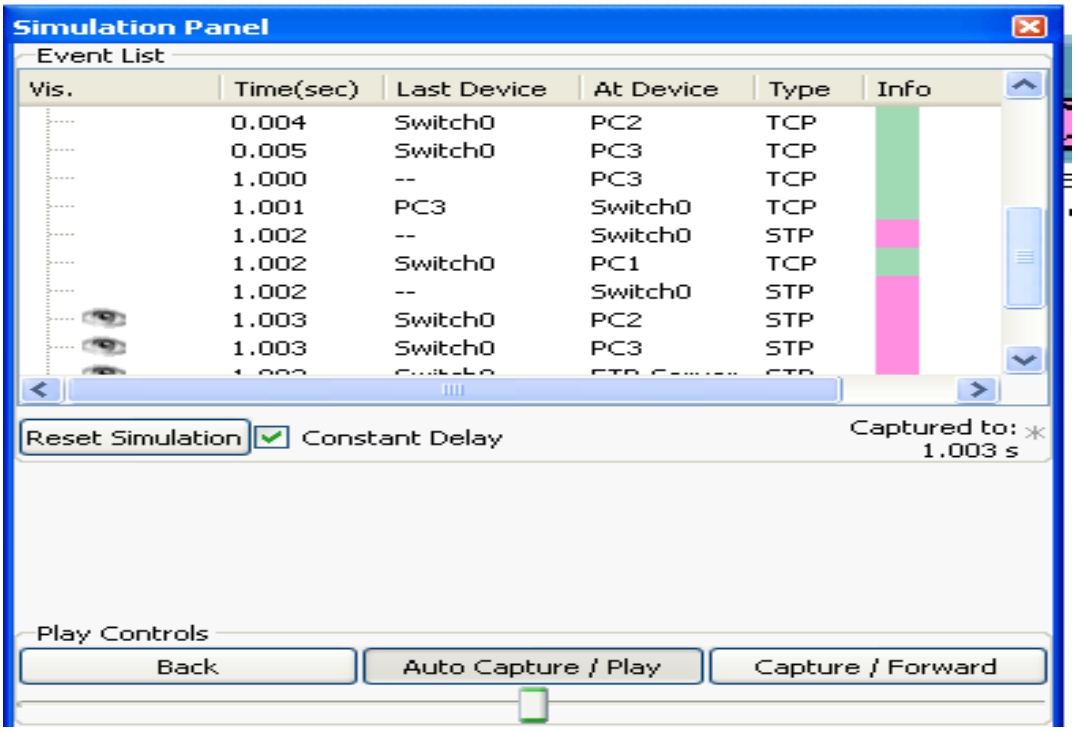




**PDU Information at Device PC3 and Analyzing the Headers Info:**




**Simulation Panel of Various Protocol's Result:**




**11. Demonstrate how to control traffic flow using Cisco Packet Tracer.**

In this case study, the firewall router allows incoming new connections to one or more communication servers or hosts. Having a designated router act as a firewall is desirable because it clearly identifies the router's purpose as the external gateway and avoids encumbering other routers with this task. In the event that the internal network needs to isolate itself, the firewall router provides the point of isolation so that the rest of the internal network structure is not affected. Connections to the hosts are restricted to incoming file transfer protocol (FTP) requests and email services. The incoming Telnet, or modem connections to the communication server are screened by the communication server running TACACS username authentication.

**Requirements:**

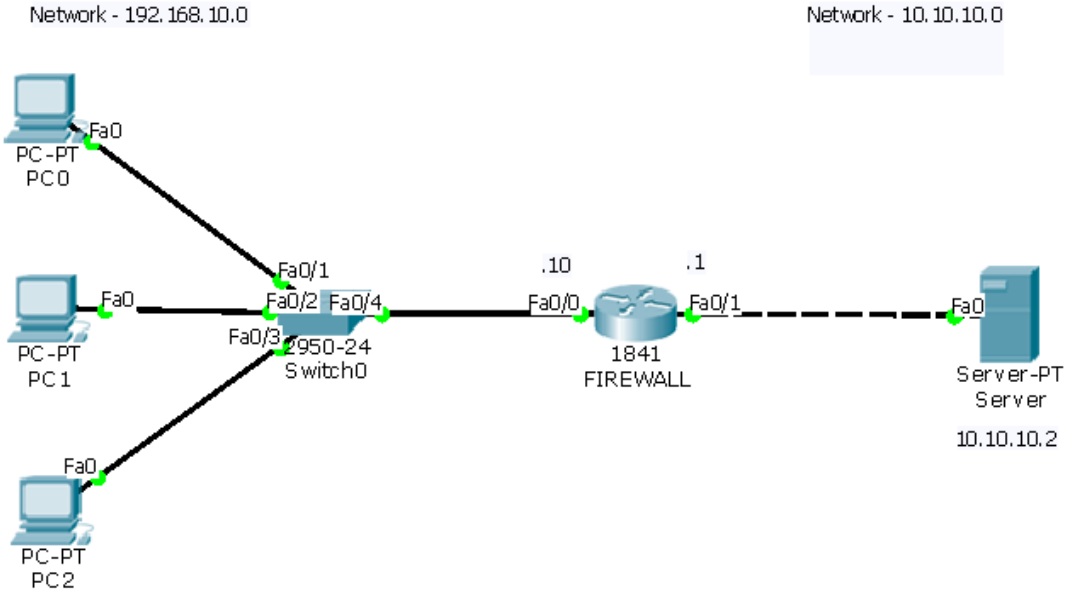
**Tools:**

Cisco Packet Tracer 6.0.1 or higher version

**Topology Constructions Requirements:**

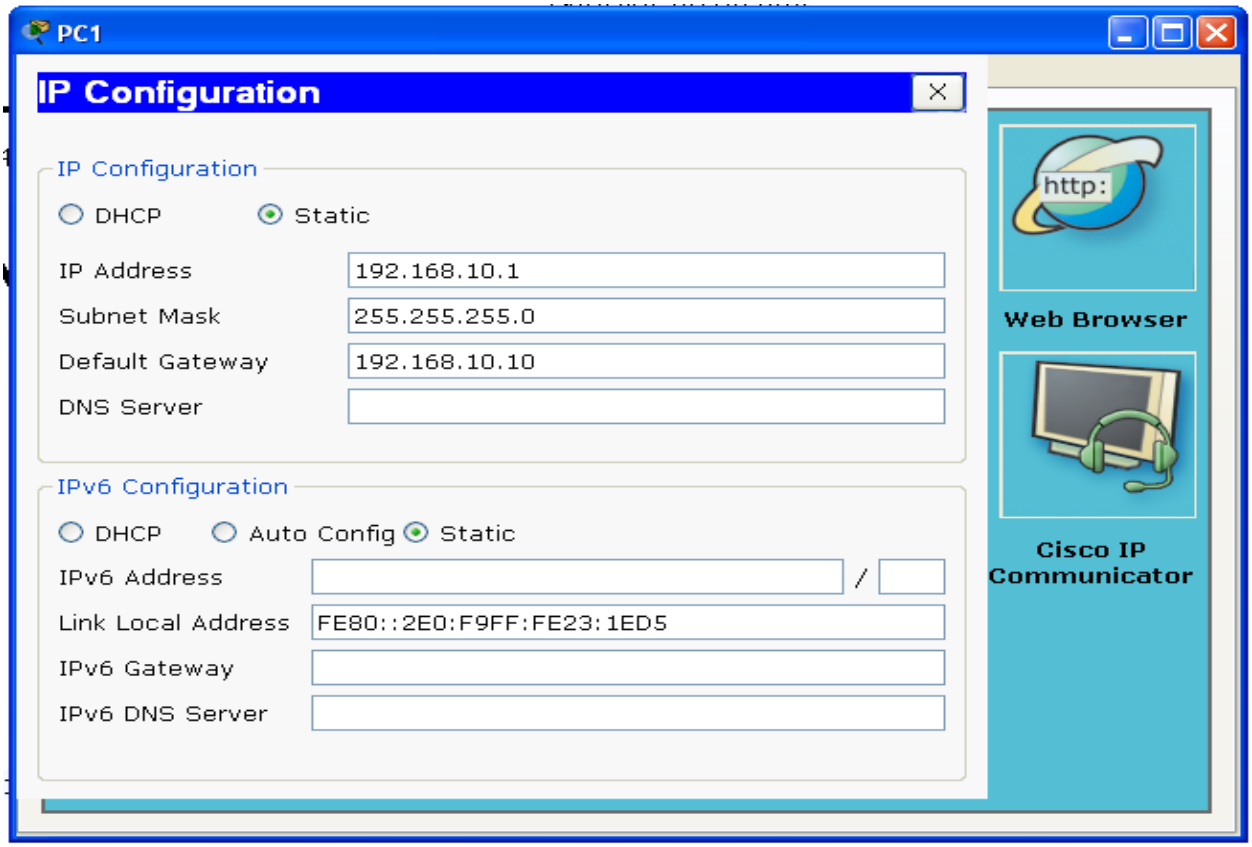
1. Three Windows PC or Linux PC for each LAN, Each PC must Have OneNIC cards
2. One Switch (24 ports)
3. One Router-1841
4. One Server
5. Straight Line LAN (cat-5) Cables with RJ-45 Sockets
6. Class A- IP Address and Class C-IP address using Static IP configuration

**Network Topology:**

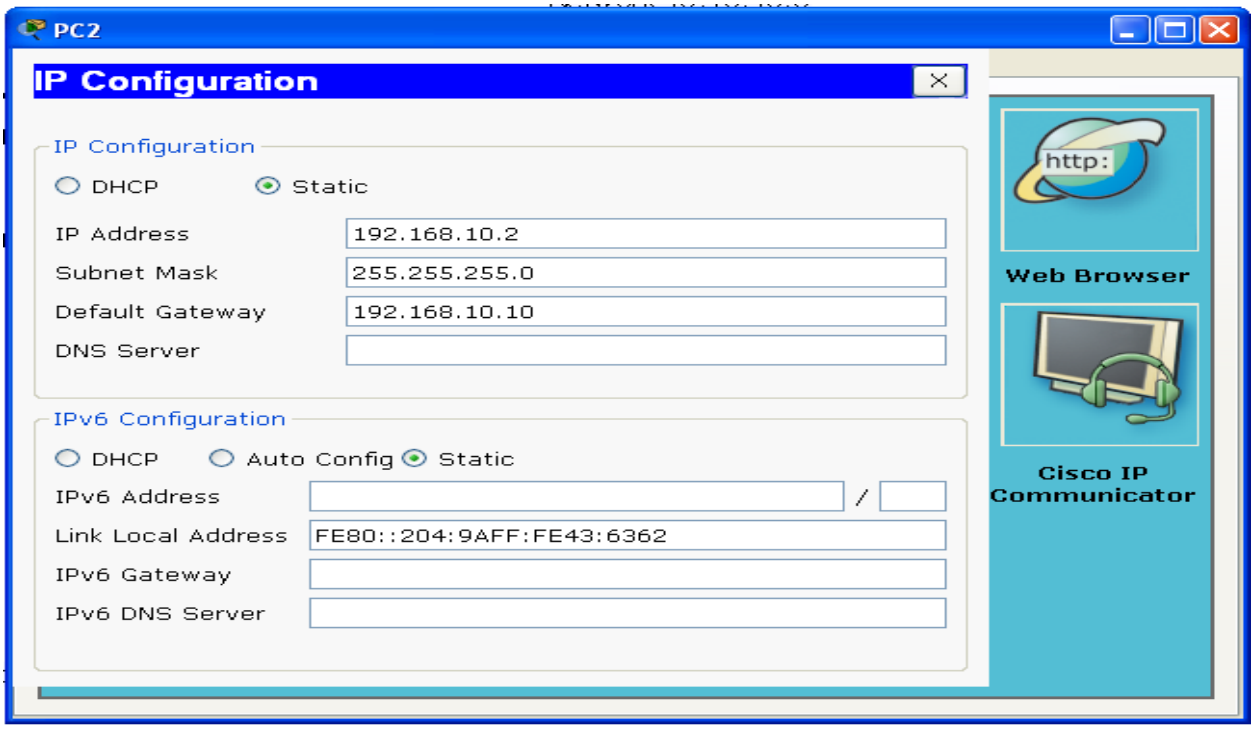



**Configuring PCs in 192.168.10.0 Network:**

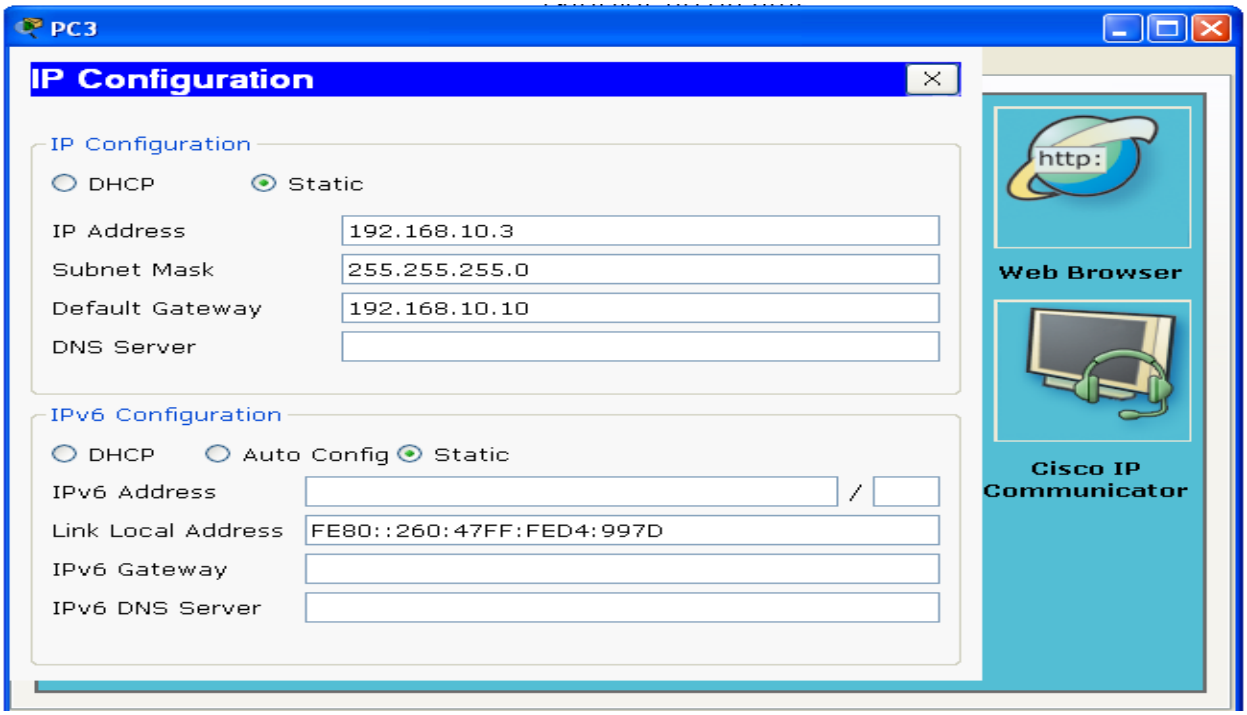
**PC-1:**


PC1
IP Configuration
IP Configuration
DHCP
Static
IP Address
192.168.10.1
Subnet Mask
255.255.255.0
Default Gateway
192.168.10.10
DNS Server
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address
FE80::2E0:F9FF:FE23:1ED5
IPv6 Gateway
IPv6 DNS Server
http:
Web Browser
Cisco IP Communicator

**PC-2:**


PC2
IP Configuration
IP Configuration
DHCP
Static
IP Address
192.168.10.2
Subnet Mask
255.255.255.0
Default Gateway
192.168.10.10
DNS Server
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address
FE80::204:9AFF:FE43:6362
IPv6 Gateway
IPv6 DNS Server
http:
Web Browser
Cisco IP Communicator

**PC-3:**




**Router (Firewall) Configuration:**

**Gateway for 192.168.10.0 Network:**

**CLI Mode:**

Router> enable

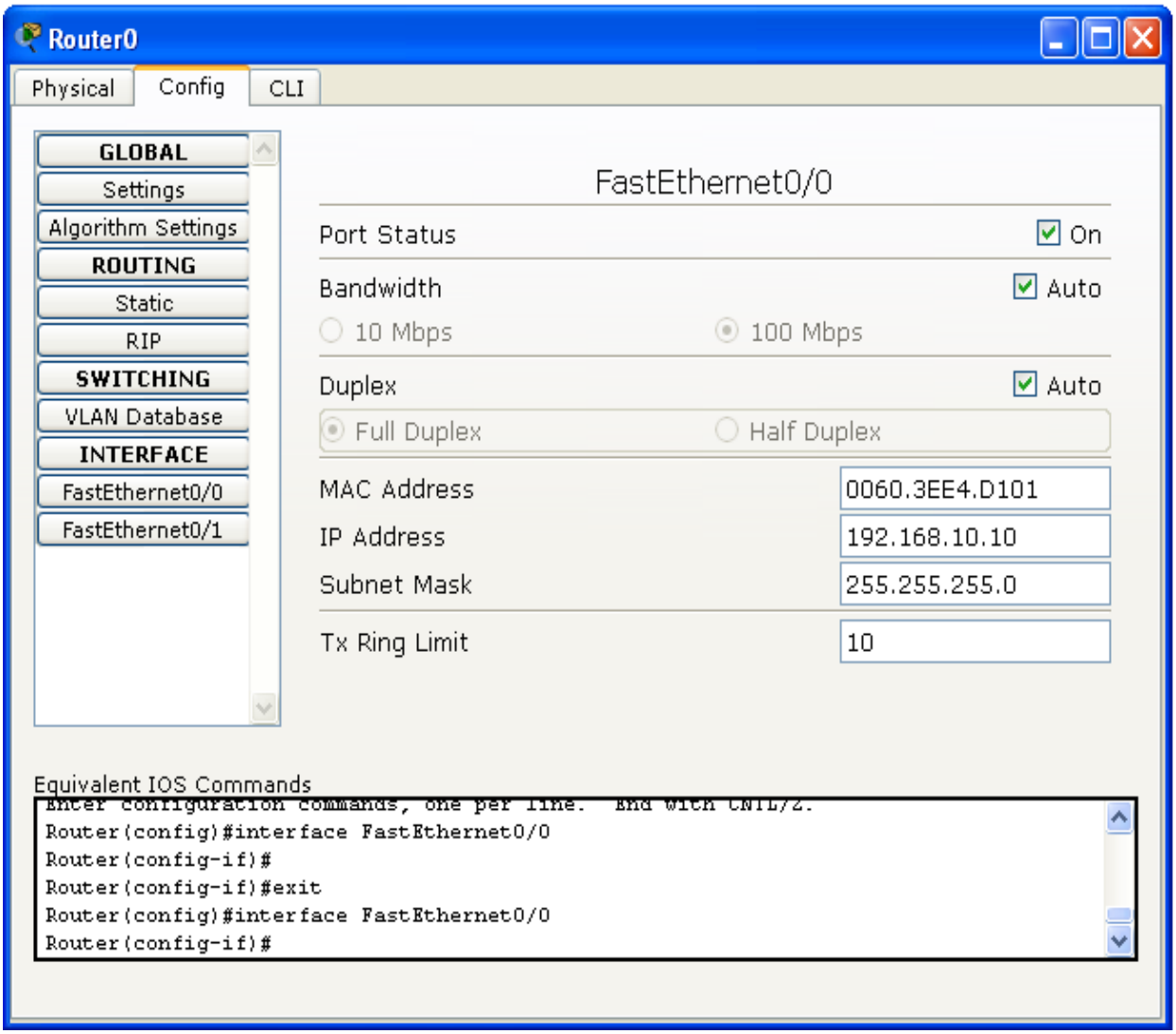
Router# config t

Router(config)# interface f0/0

Router(config-if)# ip address 192.168.10.10 255.255.255.0

Router(config-if)# no shutdown

**GUI Mode:**




**Gateway for 10.10.10.0 Network:**

**CLI Mode:**

Router> enable

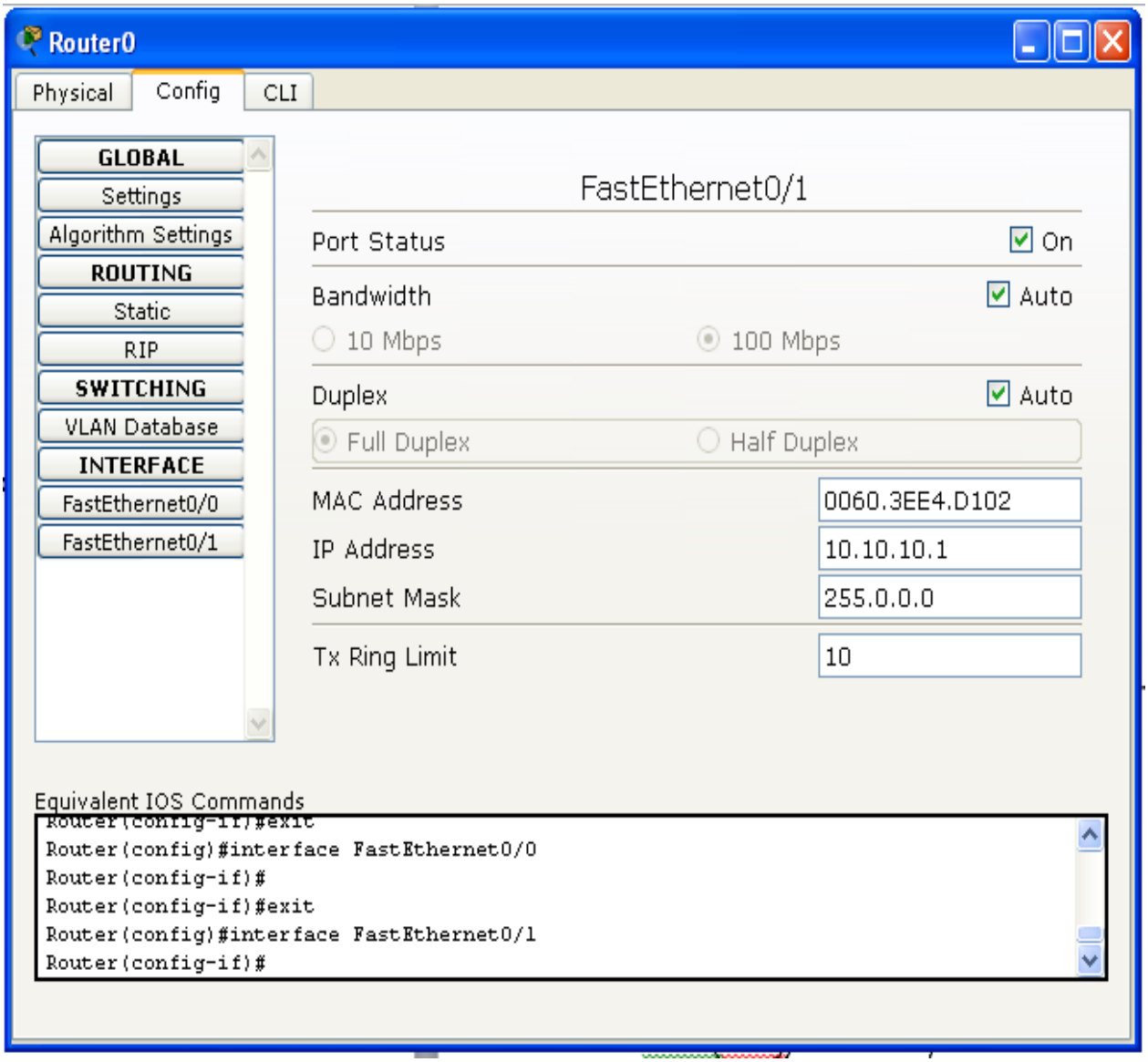
Router# config t

Router(config)# interface f0/1

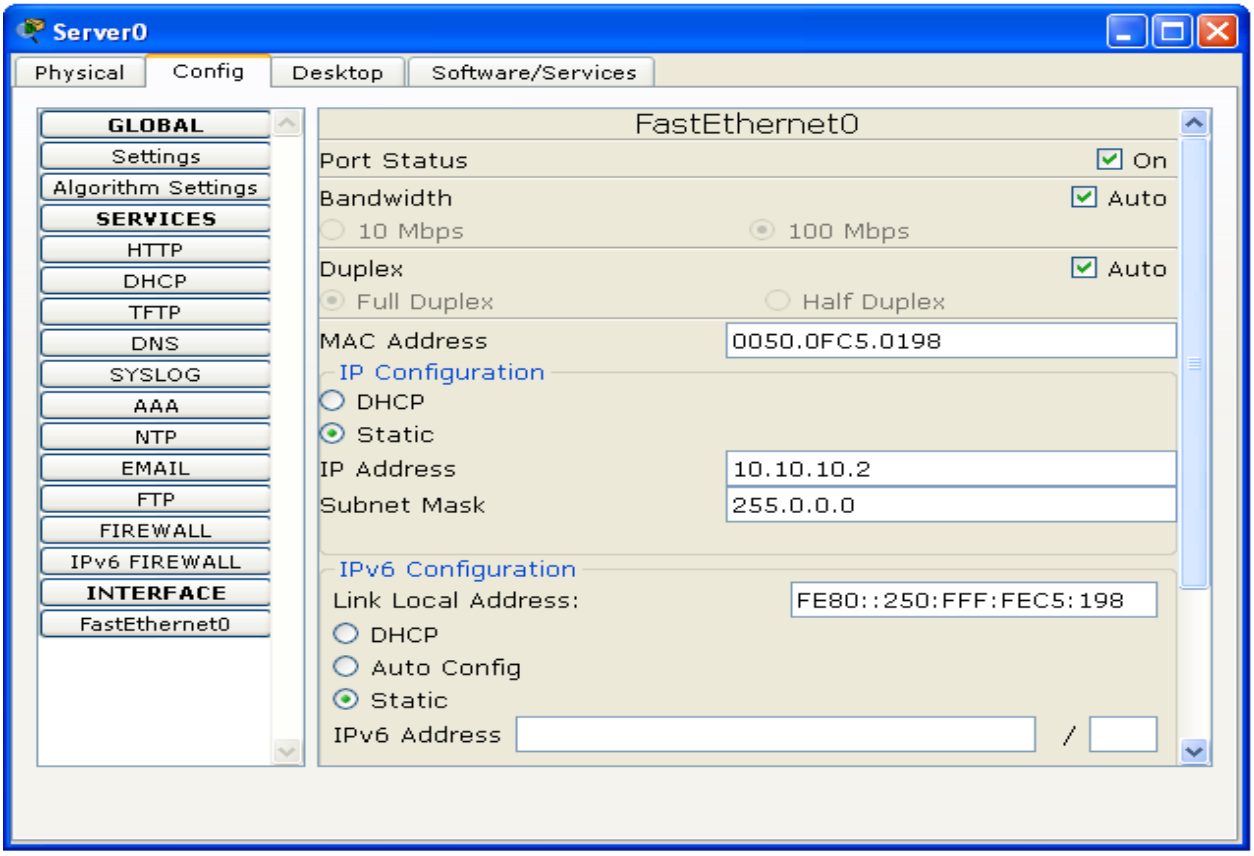
Router(config-if)# ip address 10.10.10.1 255.0.0.0

Router(config-if)# no shutdown

**GUI Mode:**




**Server Configuration:**




**PCs Ping its Gateway:**

```
Packet Tracer PC Command Line 1.0
PC>ping 192.168.10.10

Pinging 192.168.10.10 with 32 bytes of data:

Reply from 192.168.10.10: bytes=32 time=16ms TTL=255
Reply from 192.168.10.10: bytes=32 time=0ms TTL=255
Reply from 192.168.10.10: bytes=32 time=0ms TTL=255
Reply from 192.168.10.10: bytes=32 time=0ms TTL=255

Ping statistics for 192.168.10.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 16ms, Average = 4ms
```

**PCs Ping the Gateway of 10.10.10.0 Network:**

```
PC>ping 10.10.10.1

Pinging 10.10.10.1 with 32 bytes of data:

Reply from 10.10.10.1: bytes=32 time=16ms TTL=255
Reply from 10.10.10.1: bytes=32 time=0ms TTL=255
Reply from 10.10.10.1: bytes=32 time=0ms TTL=255
Reply from 10.10.10.1: bytes=32 time=0ms TTL=255

Ping statistics for 10.10.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 16ms, Average = 4ms
```

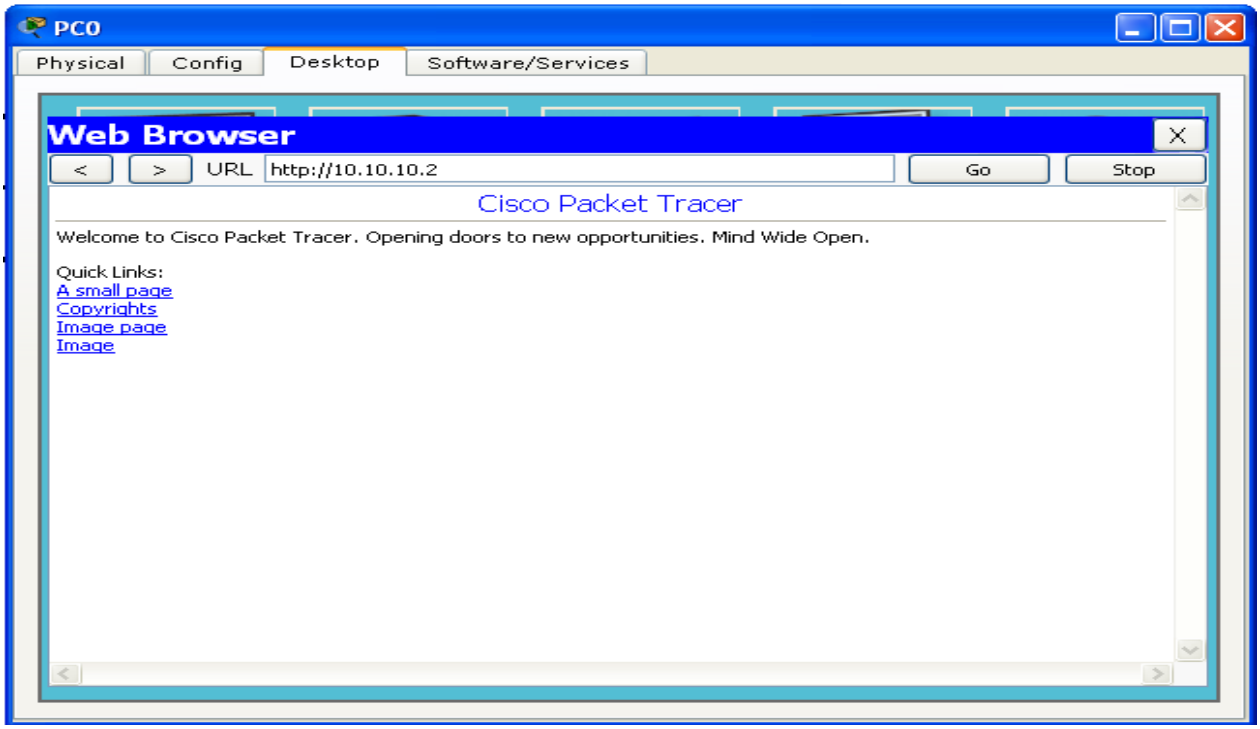
**PCs Ping the Server of 10.10.10.0 Network:**

```
PC>ping 10.10.10.2

Pinging 10.10.10.2 with 32 bytes of data:

Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=16ms TTL=127
Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=16ms TTL=127

Ping statistics for 10.10.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 16ms, Average = 8ms
```

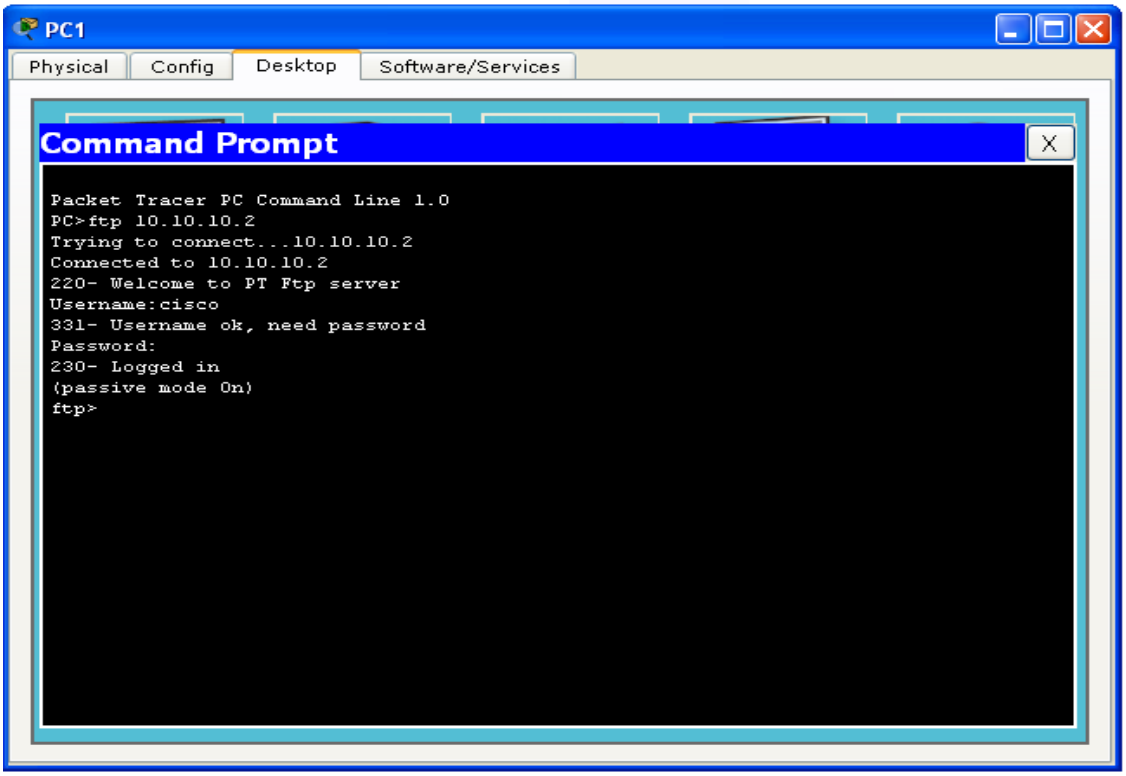
**PCs connecting Server:**

```
PC>ping 10.10.10.2

Pinging 10.10.10.2 with 32 bytes of data:

Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=0ms TTL=127

Ping statistics for 10.10.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

**PCs connecting Server using HTTP:**




**PCs connecting Server using FTP:**




**Configuring Router (Firewall) for denying PING incoming from PCs.**

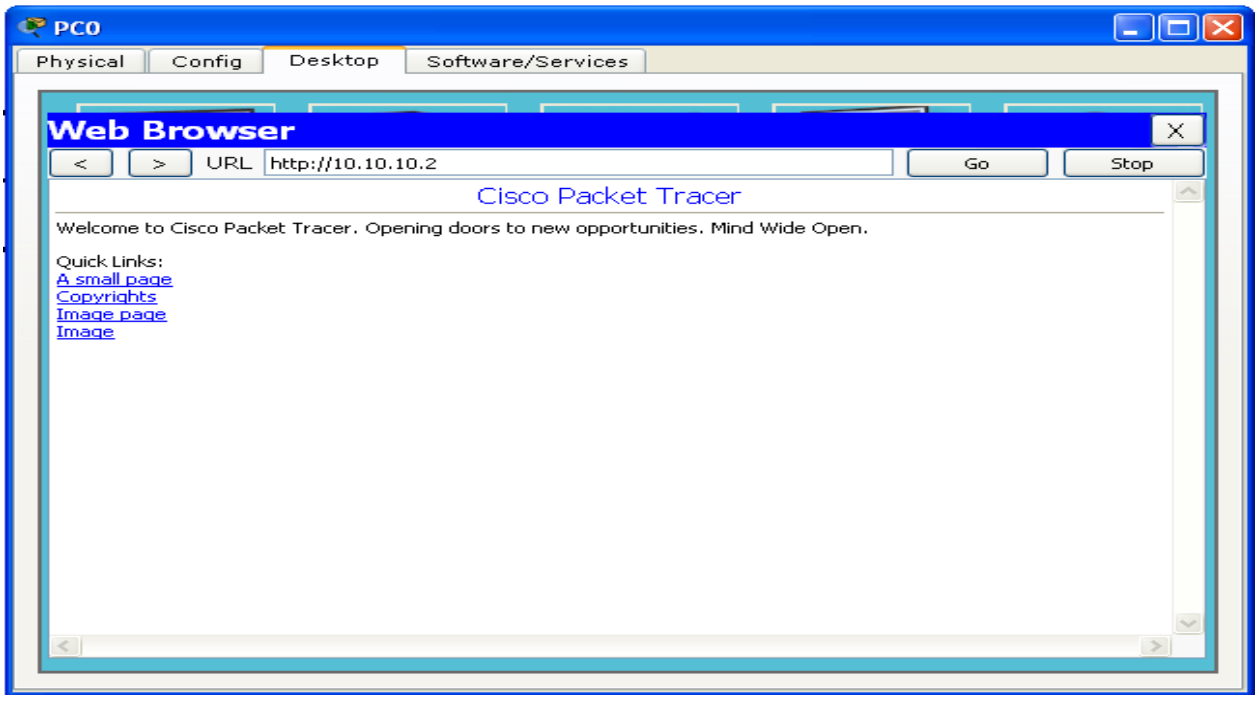
Router>en
Router#conf t

```
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#access-list 101 deny tcp any any eq ftp
Router(config)#access-list 101 deny tcp any any eq telnet
Router(config)#access-list 101 permit tcp any any eq www
Router(config)#int
Router(config)#interface f0/0
Router(config-if)#ip ac
Router(config-if)#ip access-group 101 in
```

**PCs attempt to connect Server using PING:**

```
Packet Tracer PC Command Line 1.0
PC>ping 10.10.10.2

Pinging 10.10.10.2 with 32 bytes of data:

Reply from 192.168.10.10: Destination host unreachable.
Reply from 192.168.10.10: Destination host unreachable.
Reply from 192.168.10.10: Destination host unreachable.
Reply from 192.168.10.10: Destination host unreachable.

Ping statistics for 10.10.10.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Observed that the reply message is Destination Host Unreachable.
PCs attempt to connect Server using HTTP:




Observed that the server can accessed through HTTP
PCs attempt to connect server using FTP:

```
PC>ftp 10.10.10.2
Trying to connect...10.10.10.2

%Error opening ftp://10.10.10.2/ (Timed out)
.



Packet Tracer PC Command Line 1.0
PC>(Disconnecting from ftp server)



Packet Tracer PC Command Line 1.0
```

**12. Implement Access Control Lists (ACLs) using Cisco Packet Tracer.**

Access lists define the actual traffic that will be permitted or denied, whereas an access group applies an access list definition to an interface. Access lists can be used to deny connections that are known to be a security risk and then permit all other connections, or to permit those connections that are considered acceptable and deny all the rest. For firewall implementation, the latter is the more secure method. In this case study, incoming email and news are permitted for a few hosts, but FTP, Telnet, and login services are permitted only to hosts on the firewall subnet. IP extended access lists (range 100 to 199) and transmission control protocol (TCP) or user datagram protocol (UDP) port numbers are used to filter traffic. When a connection is to be established for email, Telnet, FTP, and so forth, the connection will attempt to open a service on a specified port number. You can, therefore, filter out selected types of connections by denying packets that are attempting to use that service. An access list is invoked after a routing decision has been made but before the packet is sent out on an interface. The best place to define an access list is on a preferred host using your favorite text editor. You can create a file that contains the access-list commands, place the file (marked readable) in the default TFTP directory, and then network load the file onto the router.

**Requirements:**
**Tools:**
Cisco Packet Tracer 6.0.1 or higher version

**Topology Constructions Requirements:**

1. Three Windows PC or Linux PC for each LAN, Each PC must Have One NICcards.
2. One Switch (24 ports)

3. One Router-1841
4. One Server
5. Straight Line LAN (cat-5) Cables with RJ-45 Sockets
6. Class A- IP Address using Static IP configuration

**Procedures:**

To implement Access Control Lists (ACLs) using Cisco Packet Tracer, follow these steps:

Step 1: Design the Network Topology

Create a network topology in Cisco Packet Tracer that represents the network where you want to implement ACLs.
Include the relevant network devices, such as routers, switches, and end devices.
Configure the devices with appropriate IP addresses, subnet masks, and other necessary parameters.

Step 2: Access the Router's Command Line Interface (CLI)

Double-click on the router in your network topology to access its CLI.

Step 3: Configure Standard or Extended ACLs

Decide whether you want to configure a standard or extended ACL. Standard ACLs match traffic based on source IP addresses only, while extended ACLs can match on various criteria such as source/destination IP addresses, port numbers, protocols, etc.
To configure a standard ACL, use the following command:

access-list {acl_number} {permit|deny} source [source-wildcard]
To configure an extended ACL, use the following command:

access-list {acl_number} {permit|deny} protocol source source-wildcard [operator port] destination destination-wildcard [operator port]

Replace {acl_number} with the desired ACL number (e.g., 1, 10), and configure the matching criteria according to your requirements.

Step 4: Apply ACLs to Interfaces

Determine the interfaces on the router to which you want to apply the ACLs.
Use the following command in interface configuration mode to apply an ACL as an inbound filter:

ip access-group {acl_number} {in|out}

Replace {acl_number} with the ACL number you want to apply, and specify whether the ACL should be applied inbound or outbound on the interface.

Step 5: Save the Configuration

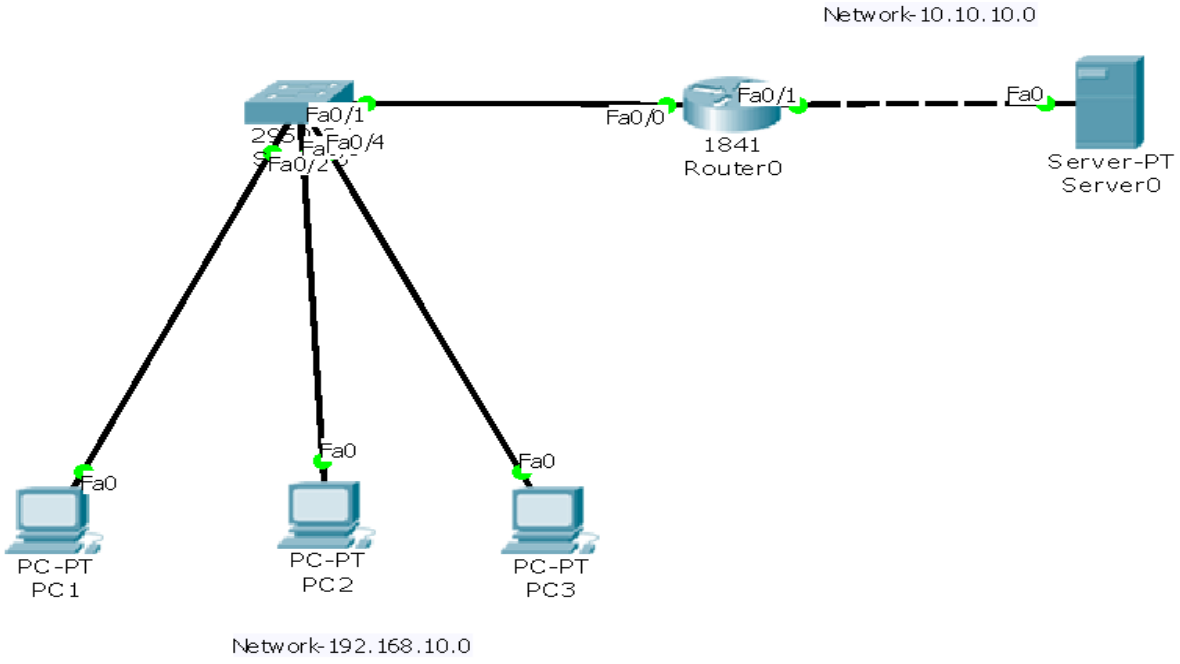
After configuring the ACLs and applying them to interfaces, save the router's configuration using the following command:

copy running-config startup-config

Please note that ACLs should be carefully planned and configured to avoid unintended consequences. Ensure that you thoroughly understand the impact of the ACLs you implement on the network traffic and apply them selectively to achieve the desired security or traffic control objectives.

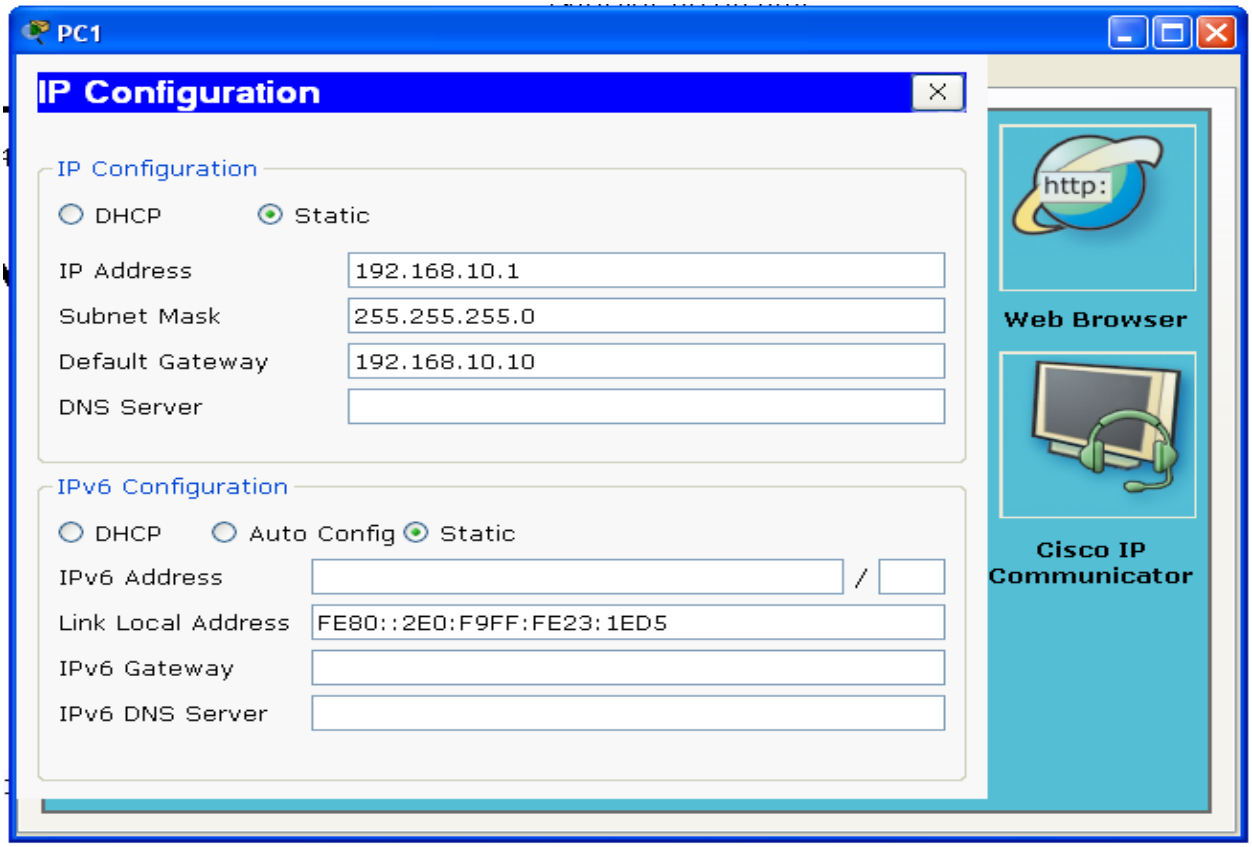
Also, keep in mind that the specific commands and options for configuring ACLs may vary depending on the Cisco router model and software version used in Cisco Packet Tracer. It's always a good practice to consult the documentation and resources specific to your router model for detailed instructions on ACL configuration.

**Network Topology:**

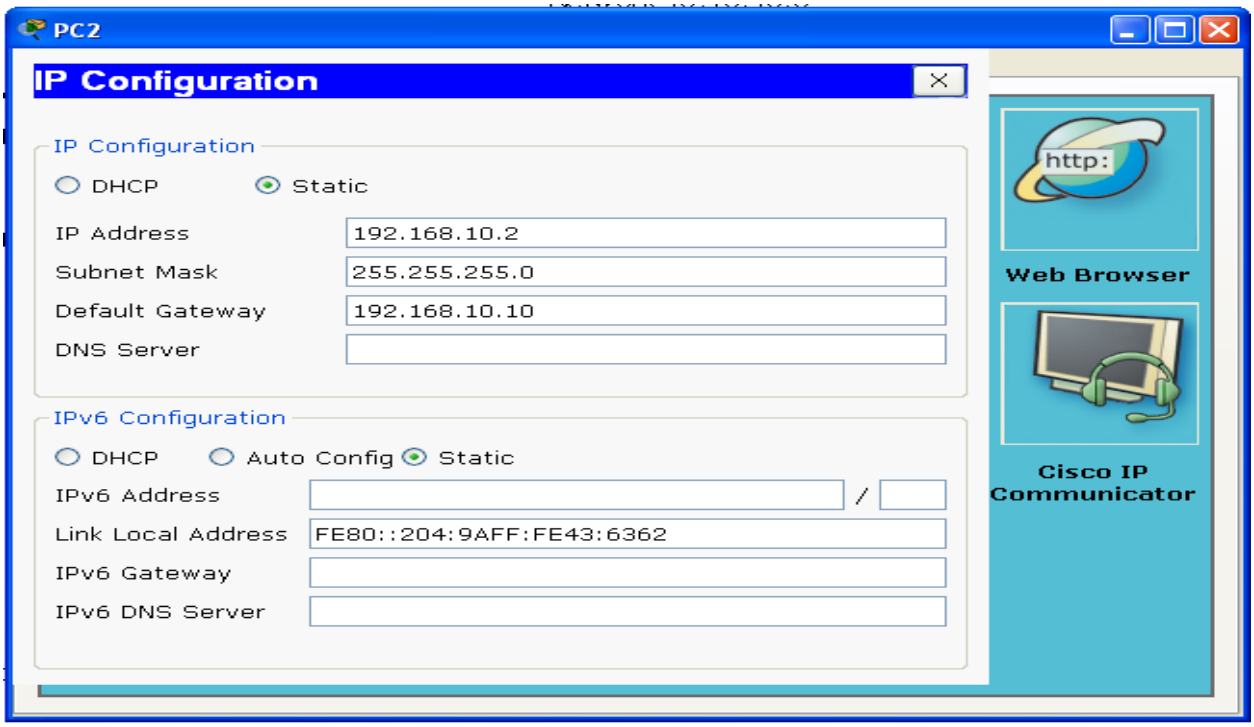



**Configuring PCs in 192.168.10.0 Network:**

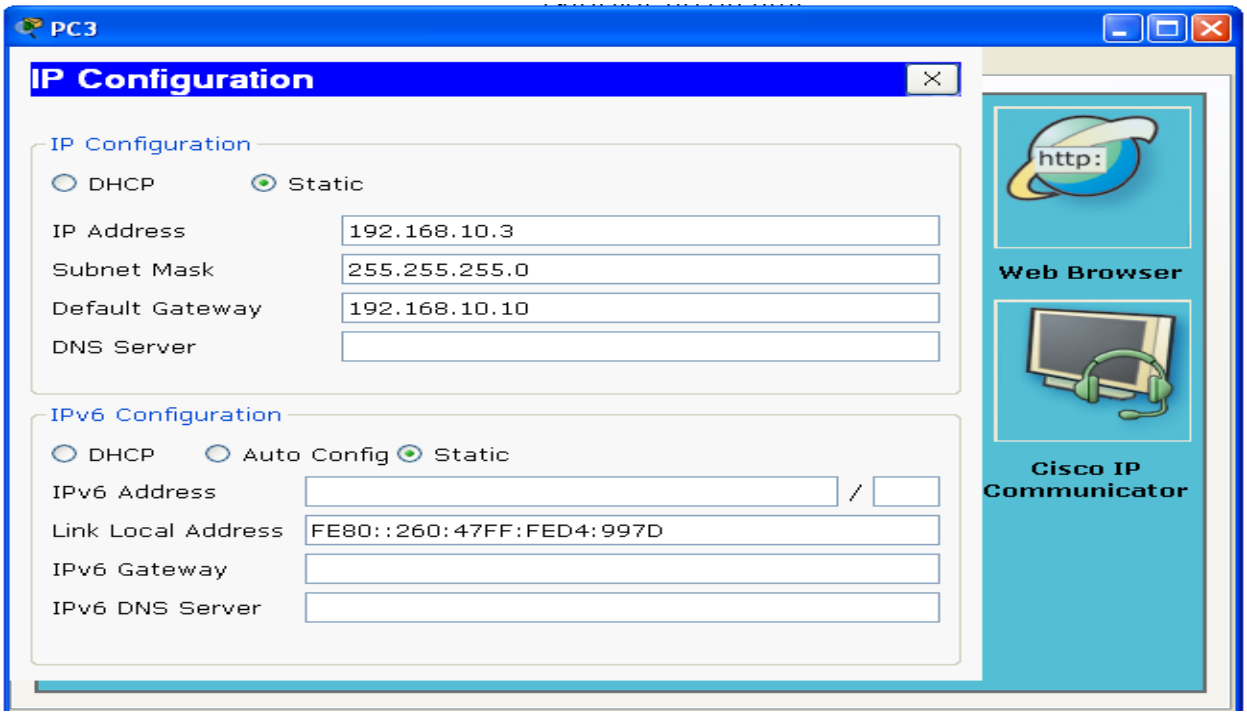
**PC-1:**


PC1
IP Configuration
IP Configuration
DHCP
Static
IP Address
192.168.10.1
Subnet Mask
255.255.255.0
Default Gateway
192.168.10.10
DNS Server
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address
FE80::2E0:F9FF:FE23:1ED5
IPv6 Gateway
IPv6 DNS Server
http:
Web Browser
Cisco IP Communicator

**PC-2:**


PC2
IP Configuration
IP Configuration
DHCP
Static
IP Address
192.168.10.2
Subnet Mask
255.255.255.0
Default Gateway
192.168.10.10
DNS Server
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address
FE80::204:9AFF:FE43:6362
IPv6 Gateway
IPv6 DNS Server
http:
Web Browser
Cisco IP Communicator

**PC-3:**




**Router Configuration:**

**Gateway for 192.168.10.0 Network:**

**CLI Mode:**

Router> enable

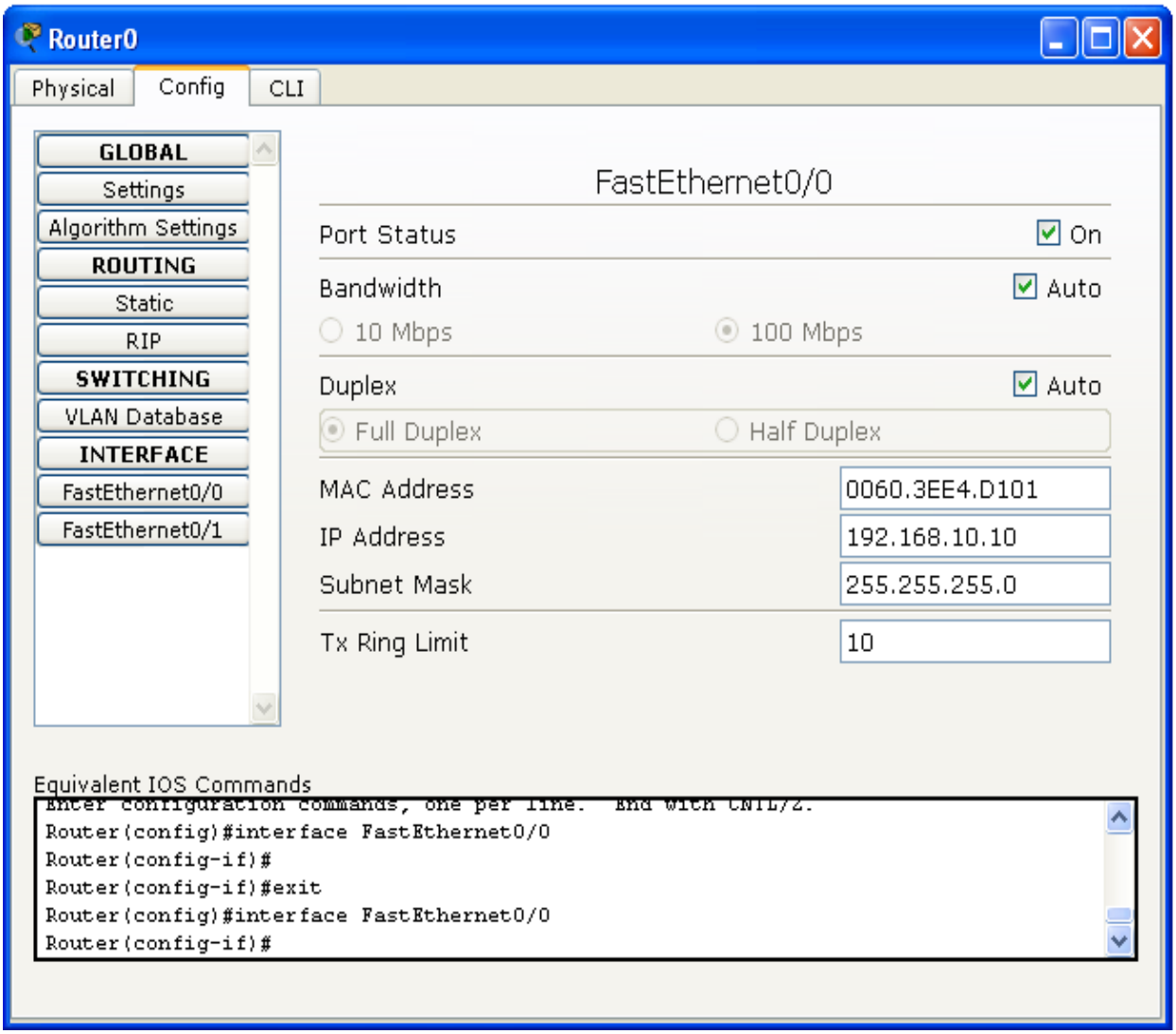
Router# config t

Router(config)# interface f0/0

Router(config-if)# ip address 192.168.10.10 255.255.255.0

Router(config-if)# no shutdown

**GUI Mode:**




**Gateway for 10.10.10.0 Network:**

**CLI Mode:**

Router> enable

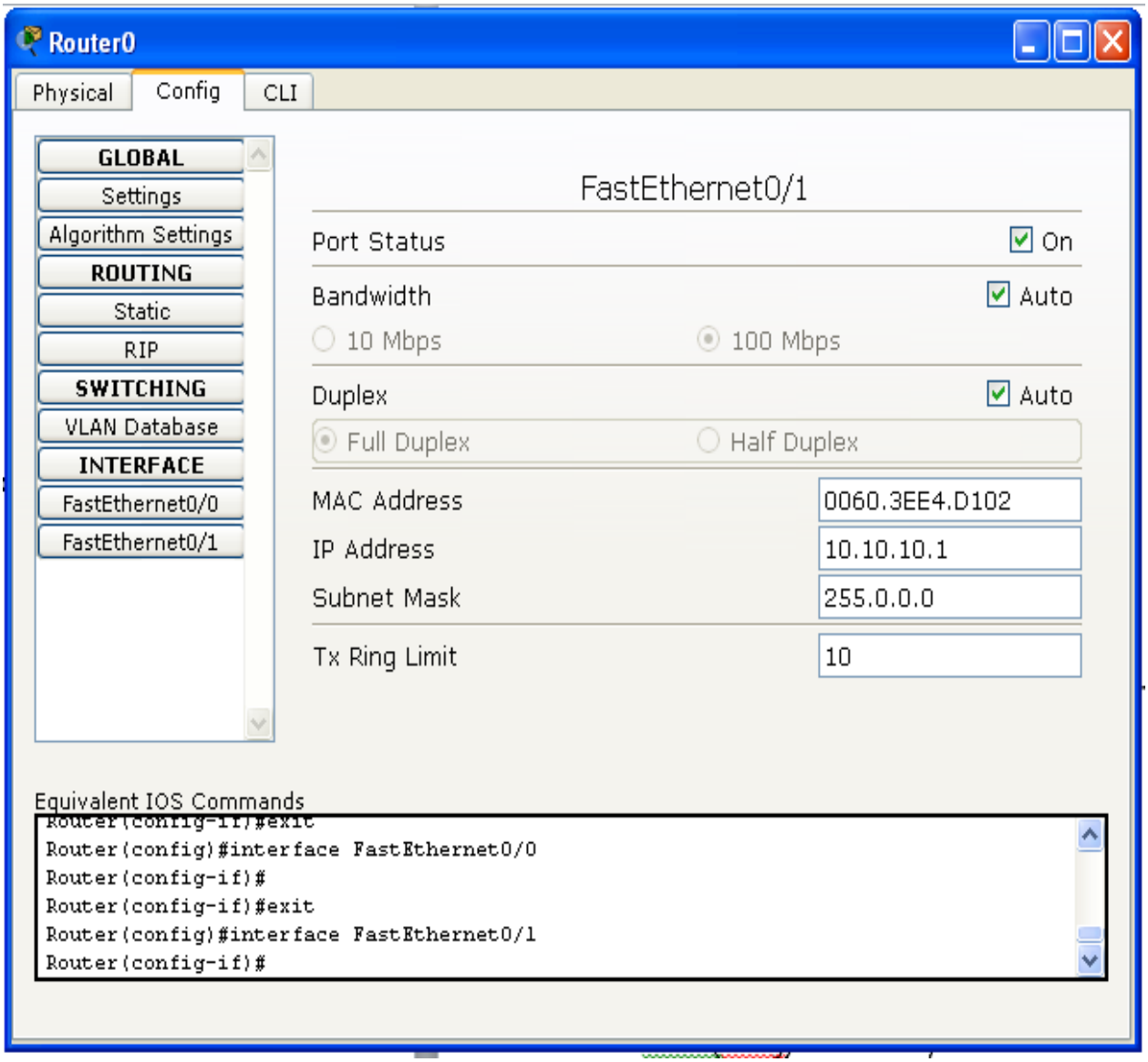
Router# config t

Router(config)# interface f0/1

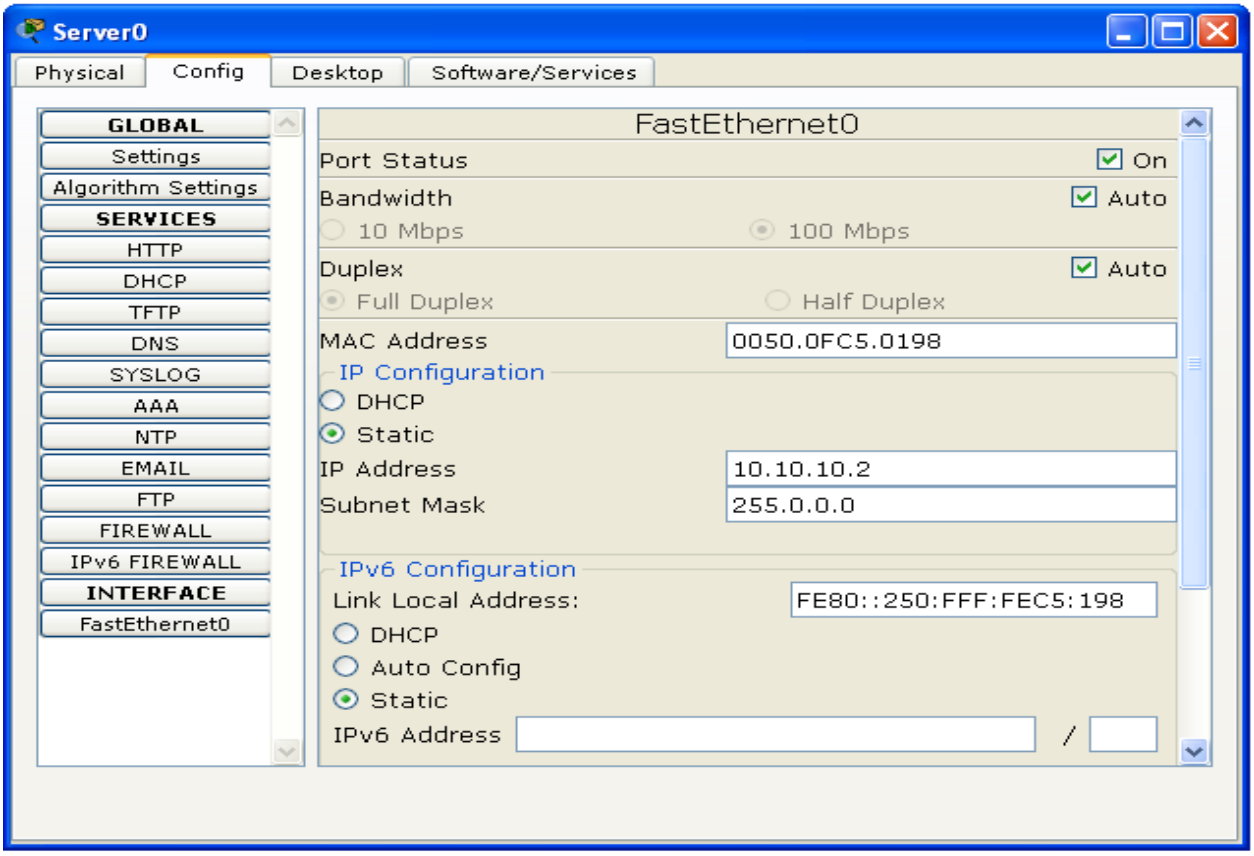
Router(config-if)# ip address 10.10.10.1 255.0.0.0

Router(config-if)# no shutdown

**GUI Mode:**




**Server Configuration:**




**PCs Ping its Gateway:**

```
Packet Tracer PC Command Line 1.0
PC>ping 192.168.10.10

Pinging 192.168.10.10 with 32 bytes of data:

Reply from 192.168.10.10: bytes=32 time=16ms TTL=255
Reply from 192.168.10.10: bytes=32 time=0ms TTL=255
Reply from 192.168.10.10: bytes=32 time=0ms TTL=255
Reply from 192.168.10.10: bytes=32 time=0ms TTL=255

Ping statistics for 192.168.10.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 16ms, Average = 4ms
```

**PCs Ping the Gateway of 10.10.10.0 Network:**

```
PC>ping 10.10.10.1

Pinging 10.10.10.1 with 32 bytes of data:

Reply from 10.10.10.1: bytes=32 time=16ms TTL=255
Reply from 10.10.10.1: bytes=32 time=0ms TTL=255
Reply from 10.10.10.1: bytes=32 time=0ms TTL=255
Reply from 10.10.10.1: bytes=32 time=0ms TTL=255

Ping statistics for 10.10.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 16ms, Average = 4ms
```

**PCs Ping the Server of 10.10.10.0 Network:**

```
PC>ping 10.10.10.2

Pinging 10.10.10.2 with 32 bytes of data:

Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=16ms TTL=127
Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=16ms TTL=127

Ping statistics for 10.10.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 16ms, Average = 8ms
```

**Standard Access – List (ACL) Creation in Router:**

1. **Denying the PC-1 (192.168.10.1) and Permit the other PCs to connectServer:**

   Router>enable

   Router# conf t

   Router(config)# ip access-list standard 10

   Router(config-std-nacl)#deny host 192.168.10.1

   Router(config-std-nacl)#permit any Router(config-std-nacl)#exit

2. **Assigning the ACL to the Router's Port as Inbound Packets:**

   Router(config)#interface fastEthernet 0/0

   Router(config-if)#ip access-group 10 in

   Router(config-if)#end

   Router#wr

**PC-1 PING the Server:**

```
PC>ping 10.10.10.2

Pinging 10.10.10.2 with 32 bytes of data:

Reply from 192.168.10.10: Destination host unreachable.
Reply from 192.168.10.10: Destination host unreachable.
Reply from 192.168.10.10: Destination host unreachable.
Reply from 192.168.10.10: Destination host unreachable.

Ping statistics for 10.10.10.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

**PC-2 PING the Server:**

```
Packet Tracer PC Command Line 1.0
PC>ping 10.10.10.2

Pinging 10.10.10.2 with 32 bytes of data:

Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=0ms TTL=127

Ping statistics for 10.10.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

**PC-3 PING the Server:**

```
Packet Tracer PC Command Line 1.0
PC>ping 10.10.10.2

Pinging 10.10.10.2 with 32 bytes of data:

Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=0ms TTL=127
Reply from 10.10.10.2: bytes=32 time=0ms TTL=127

Ping statistics for 10.10.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

**PCs Connecting the Server using FTP:**

**PC-1:**

```
PC>ftp 10.10.10.2
Trying to connect...10.10.10.2

%Error opening ftp://10.10.10.2/ (Timed out)
.



Packet Tracer PC Command Line 1.0
PC>(Disconnecting from ftp server)
```

**PC-2:**

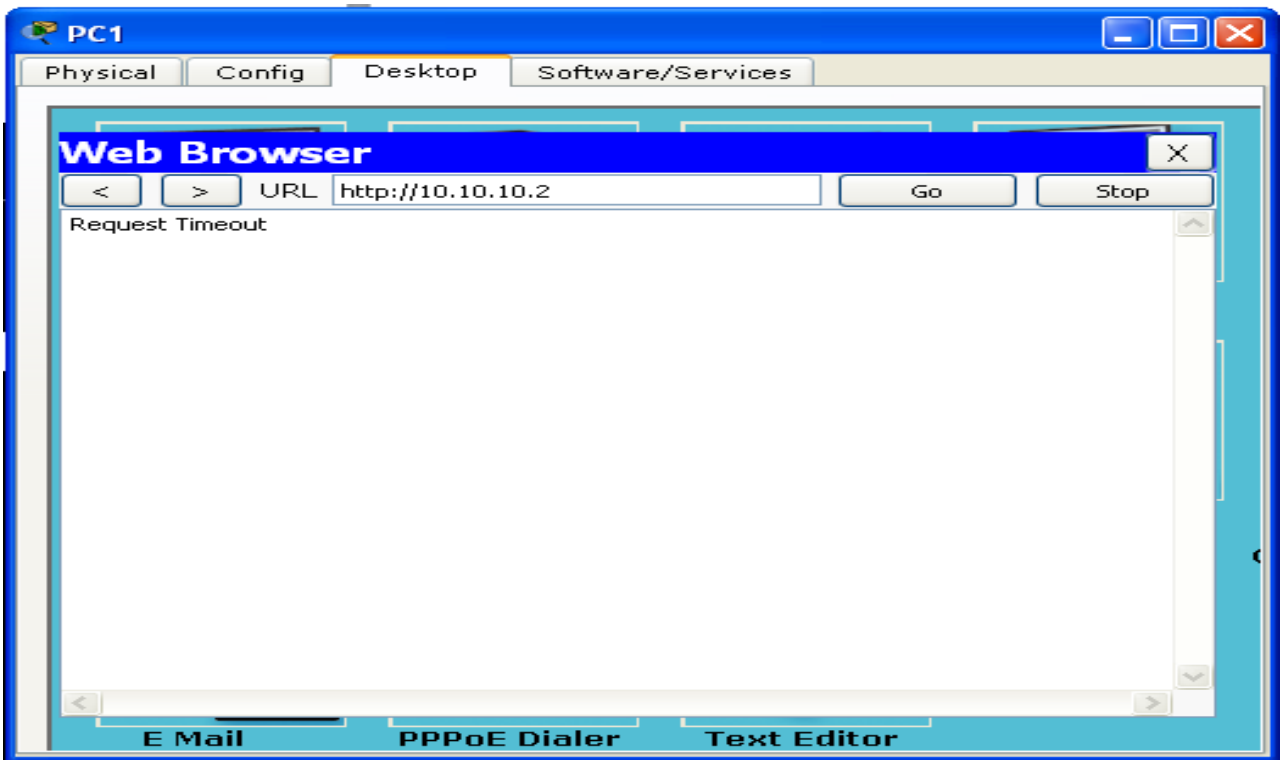
```
Packet Tracer PC Command Line 1.0
PC>ftp 10.10.10.2
Trying to connect...10.10.10.2
Connected to 10.10.10.2
220- Welcome to PT Ftp server
Username:cisco
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>dir

Listing /ftp directory from 10.10.10.2:
0    : c1841-advipservicesk9-mz.124-15.T1.bin          33591768
1    : c1841-ipbase-mz.123-14.T7.bin                   13832032
2    : c1841-ipbasek9-mz.124-12.bin                    16599160
3    : c2600-advipservicesk9-mz.124-15.T1.bin          33591768
4    : c2600-i-mz.122-28.bin                           5571584
5    : c2600-ipbasek9-mz.124-8.bin                     13169700
6    : c2800nm-advipservicesk9-mz.124-15.T1.bin        50938004
7    : c2800nm-advipservicesk9-mz.151-4.M4.bin         33591768
8    : c2800nm-ipbase-mz.123-14.T7.bin                 5571584
9    : c2800nm-ipbasek9-mz.124-8.bin                   15522644
10   : c2950-i6q412-mz.121-22.EA4.bin                  3058048
11   : c2950-i6q412-mz.121-22.EA8.bin                  3117390
12   : c2960-lanbase-mz.122-25.FX.bin                  4414921
13   : c2960-lanbase-mz.122-25.SEE1.bin                4670455
14   : c3560-advipservicesk9-mz.122-37.SE1.bin         8662192
15   : pt1000-i-mz.122-28.bin                          5571584
16   : pt3000-i6q412-mz.121-22.EA4.bin                 3117390
ftp>
```

**PC-3:**

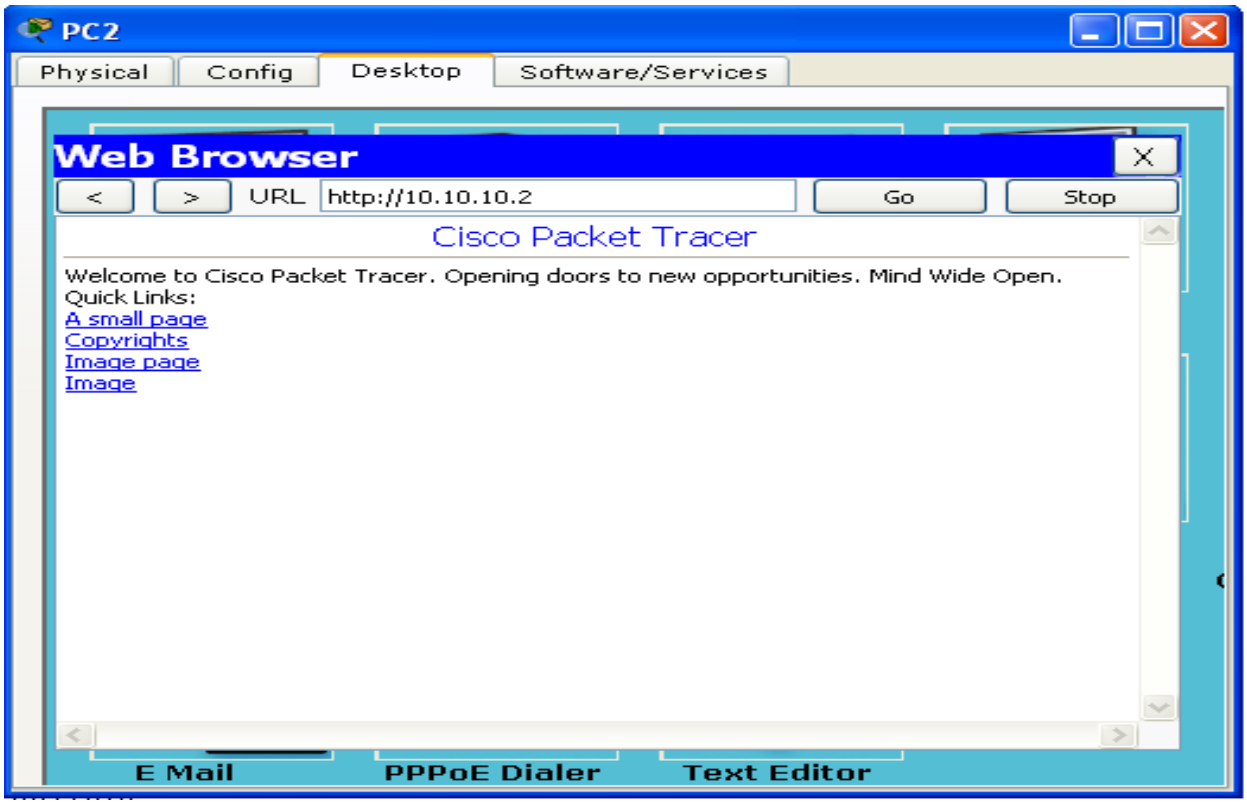
```
PC>ftp 10.10.10.2
Trying to connect...10.10.10.2
Connected to 10.10.10.2
220- Welcome to PT Ftp server
Username:cisco
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>dir

Listing /ftp directory from 10.10.10.2:
0    : c1841-advipservicesk9-mz.124-15.T1.bin                33591768
1    : c1841-ipbase-mz.123-14.T7.bin                         13832032
2    : c1841-ipbasek9-mz.124-12.bin                          16599160
3    : c2600-advipservicesk9-mz.124-15.T1.bin                33591768
4    : c2600-i-mz.122-28.bin                                 5571584
5    : c2600-ipbasek9-mz.124-8.bin                           13169700
6    : c2800nm-advipservicesk9-mz.124-15.T1.bin              50938004
7    : c2800nm-advipservicesk9-mz.151-4.M4.bin               33591768
8    : c2800nm-ipbase-mz.123-14.T7.bin                       5571584
9    : c2800nm-ipbasek9-mz.124-8.bin                         15522644
10   : c2950-i6q4l2-mz.121-22.EA4.bin                        3058048
11   : c2950-i6q4l2-mz.121-22.EA8.bin                        3117390
12   : c2960-lanbase-mz.122-25.FX.bin                        4414921
13   : c2960-lanbase-mz.122-25.SEE1.bin                      4670455
14   : c3560-advipservicesk9-mz.122-37.SE1.bin               8662192
15   : pt1000-i-mz.122-28.bin                                5571584
16   : pt3000-i6q4l2-mz.121-22.EA4.bin                       3117390
ftp>
```

**PCs Connecting Server using HTTP:PC**

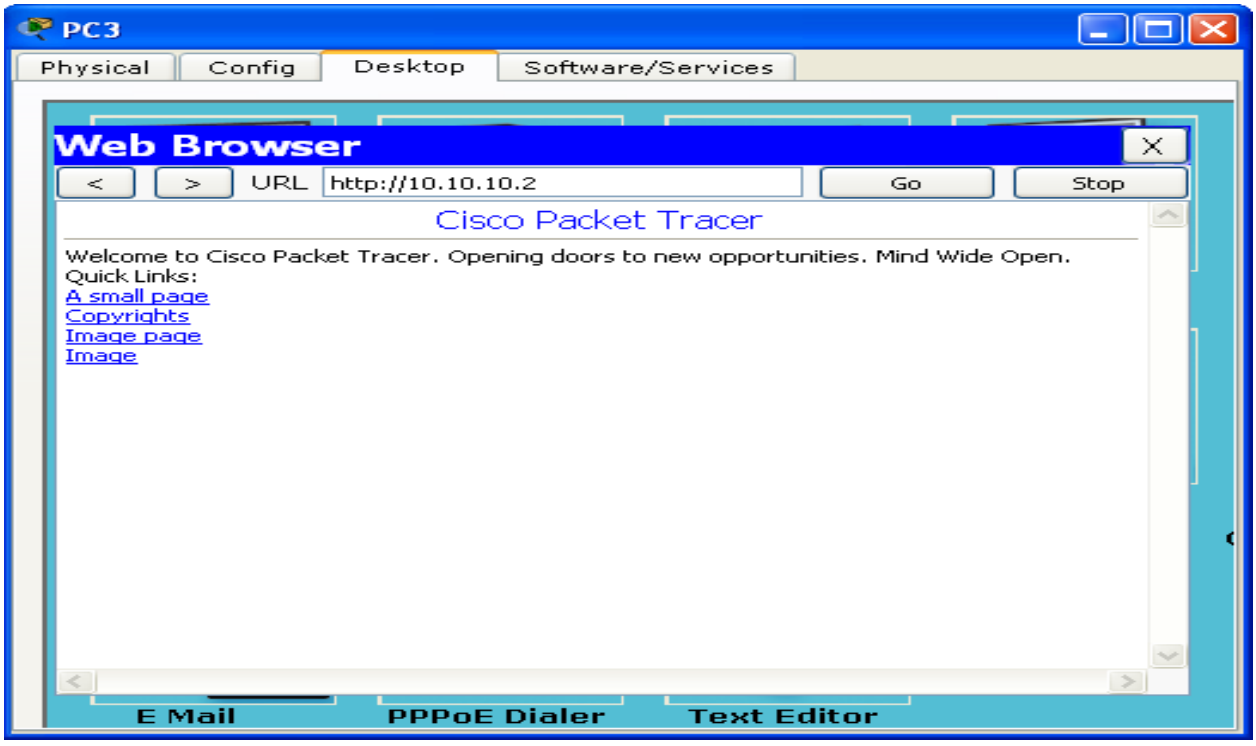
**-1 :**




**PC-2:**




**PC-3:**




**Configuring the Extended ACL:**

1. **Denying the PC-2(192.168.10.2) for FTP access to Server and Permit it forwww**

Router>enable

Router# conf t

Router(config)# ip access-list extended 101

Router(config-std-nacl)#deny tcp host 192.168.10.2 eq ftp 10.0.0.0 0.255.255.255

Router(config-ext-nacl)# permit ip host 192.168.10.2 host 10.10.10.2

Router(config-std-nacl)#end

Router# wr

**2. Assigning the ACL to the Router's Port as Inbound Packets:**

Router(config)#interface fastEthernet 0/0

Router(config-if)#ip access-group 101 in

Router(config-if)#end

Router#wr

**Viewing the ACLs configuration in Router:**

Router#show access-lists Standard

IP access list 10

deny host 192.168.10.1

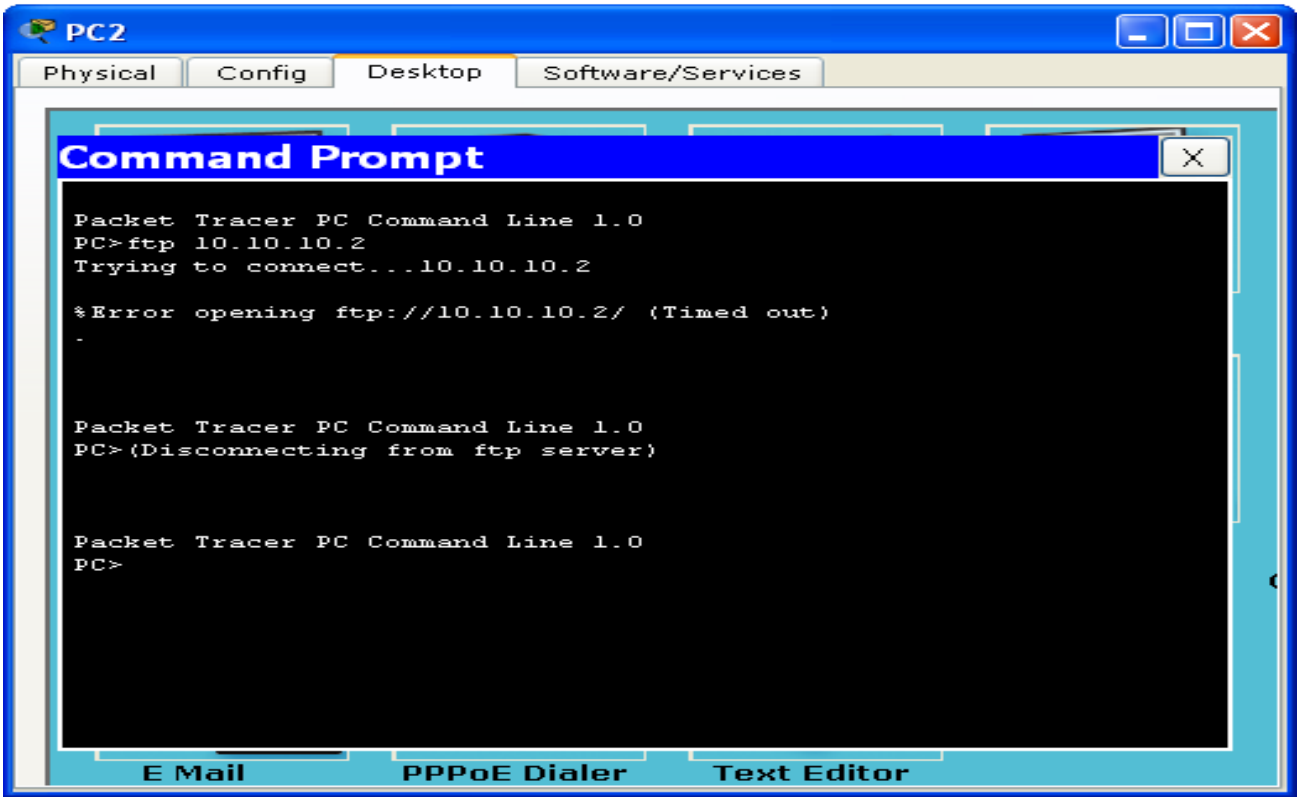
permit any

Extended IP access list 101

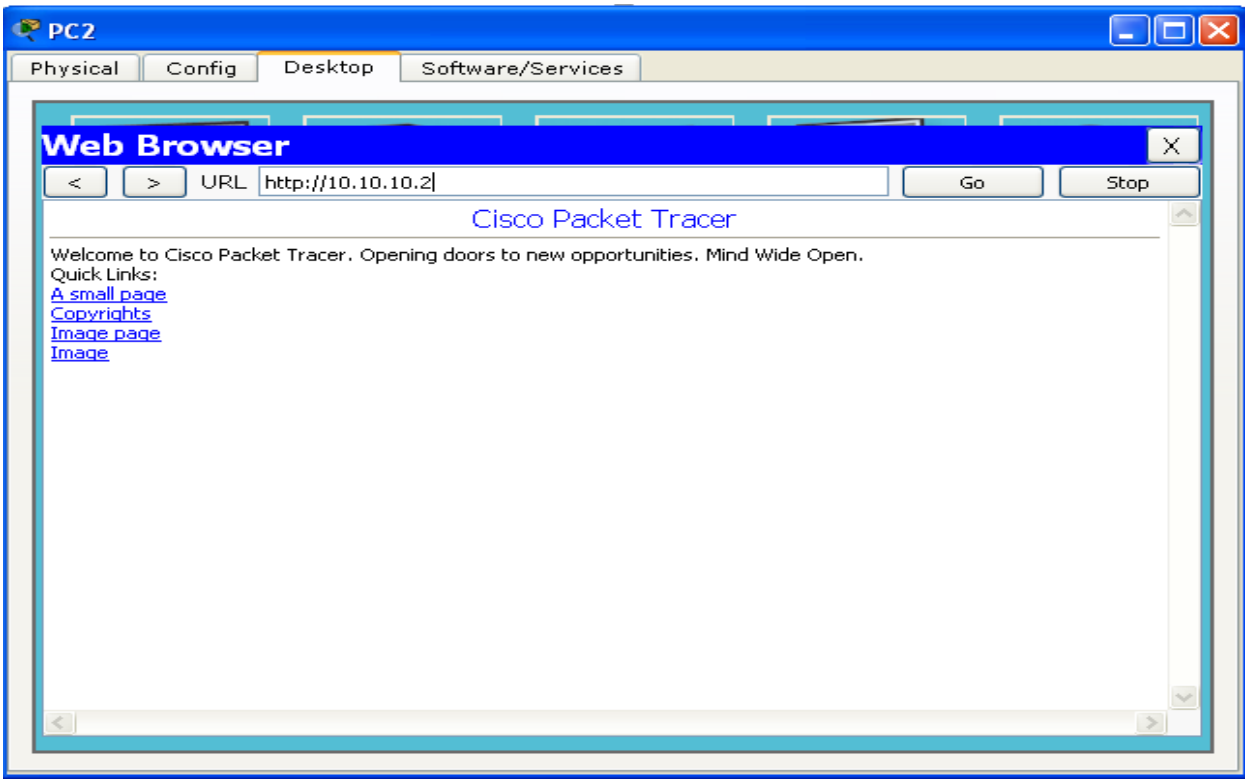
deny tcp host 192.168.10.2 eq ftp 10.0.0.0 0.255.255.255

permit ip host 192.168.10.2 host 10.10.10.2

**PC-2 is not having FTP access to Server:**




**PC-2 having HTTP access to Server:**




**Copying the Start-up Configuration of Router to the Server's TFTP:**

Router# copy startup-config tftp:

Address or name of remote host []? 10.10.10.2

Destination filename [Router-confg]? acl.conf

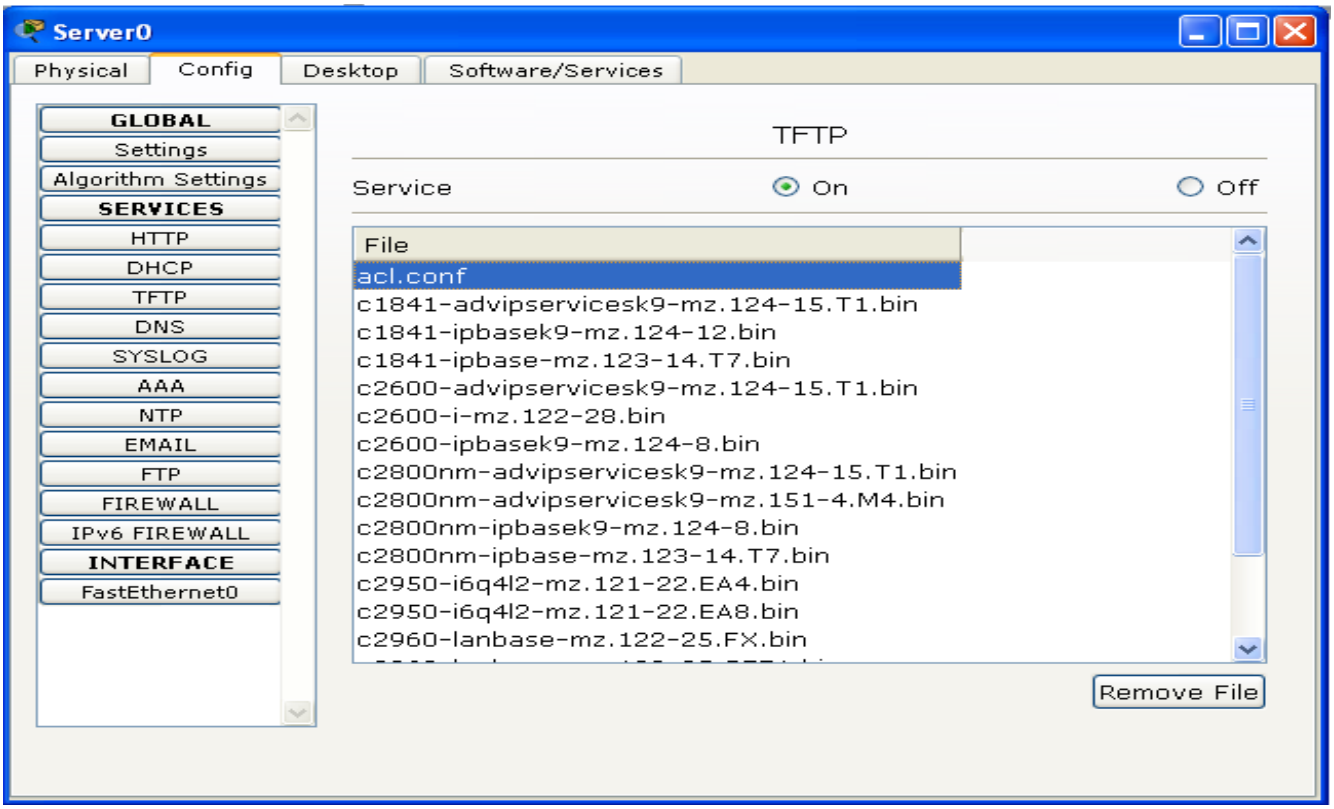
Writing startup-config.....!!

[OK - 673 bytes]

673 bytes copied in 3.016 secs (0 bytes/sec)

Router# exit

**Ensuring the Server's TFTP files:**



**13. Using Cisco Packet Tracer implement EIGRP (Enhanced Interior Gateway Routing Protocol) into existing networks.**

This experiment provide the benefits and considerations involved in integrating Enhanced IGRP into the following types of internetworks:

- IP—The existing IP network is running IGRP
- Novell IPX—The existing IPX network is running RIP and SAP
- AppleTalk—The existing AppleTalk network is running the Routing Table Maintenance Protocol (RTMP)

When integrating Enhanced IGRP into existing networks, plan a phased implementation. Add Enhanced IGRP at the periphery of the network by configuring Enhanced IGRP on a boundary router on the backbone off the core network. Then integrate Enhanced IGRP into the core network.

**Procedure:**

To implement EIGRP (Enhanced Interior Gateway Routing Protocol) in an existing network using Cisco Packet Tracer, follow these steps:

Step 1: Design the Network Topology

Open Cisco Packet Tracer and create a network topology that represents your existing network.
Include the relevant network devices, such as routers and switches.
Ensure that the routers have appropriate IP addresses assigned to their interfaces.

Step 2: Access the Router's Command Line Interface (CLI)

Double-click on a router in your network topology to access its CLI.

Step 3: Enable EIGRP Routing Protocol

Enter privileged EXEC mode by entering the following command:

enable

Enter global configuration mode by entering the following command:

configure terminal
Enable EIGRP on the router by entering the following command:

router eigrp {AS_number}

Replace {AS_number} with the desired Autonomous System (AS) number for EIGRP. It should be the same on all routers within the network.

Step 4: Configure EIGRP Network Statements
To configure EIGRP network statements, enter the following command:
network {network_address} {wildcard_mask}

Replace {network_address} with the network address of the directly connected network that you want to include in EIGRP.
Replace {wildcard_mask} with the inverse of the subnet mask of the network.

Step 5: Adjust EIGRP Metrics (Optional)

By default, EIGRP uses bandwidth and delay as metrics for route calculation. If desired, you can adjust the metric weights.
Enter the following command to adjust the metric weights:

metric weights {k1} {k2} {k3} {k4} {k5}
Replace {k1}, {k2}, {k3}, {k4}, and {k5} with the desired values for each metric weight. The default values are 1, 0, 1, 0, and 0, respectively.

Step 6: Save the Configuration

After configuring EIGRP on the router, save the configuration using the following command:

copy running-config startup-config
Step 7: Repeat Steps 2-6 for all Routers

Repeat Steps 2-6 for each router in your network topology that you want to participate in EIGRP.

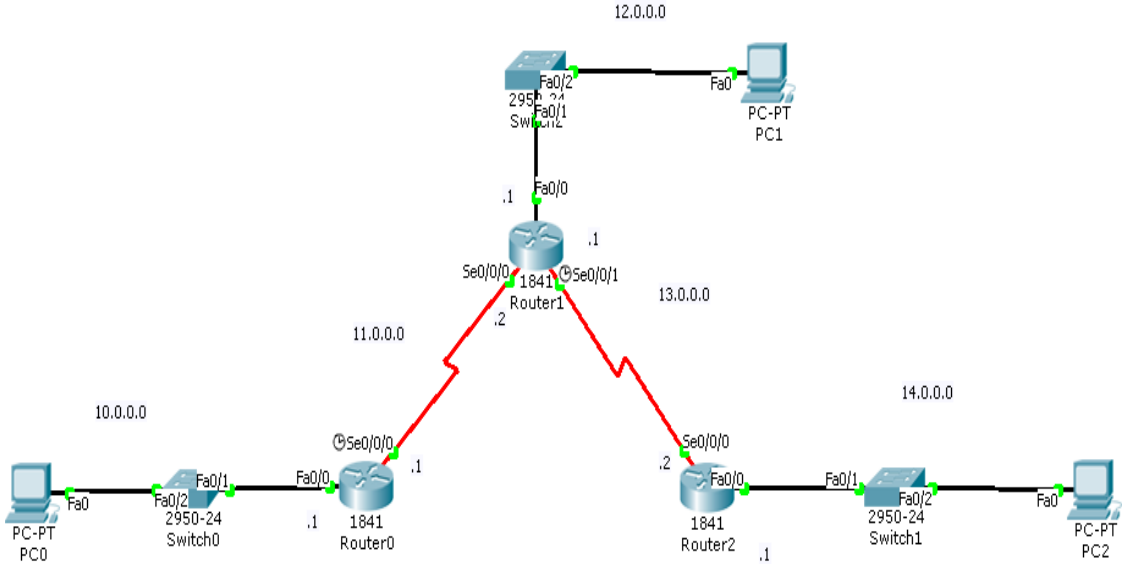
Step 8: Verify EIGRP Configuration

Use the show ip route command on each router to view the routing table and ensure that EIGRP routes are being learned and propagated correctly.
By following these steps, you can successfully implement EIGRP into your existing network using Cisco Packet Tracer. Remember to ensure that all routers within the network have the same AS number configured for EIGRP to establish neighbor relationships and exchange routing information.

**Requirements:**
**Tools:**
- Cisco Packet Tracer 6.0.1 or higher vesion

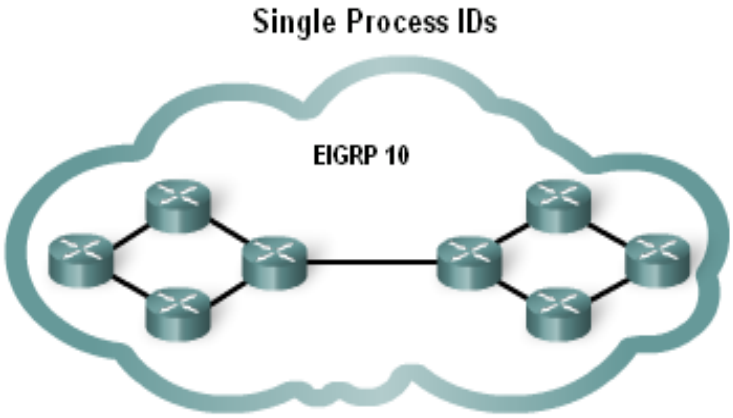
**Topology Constructions Requirements:**
1. Two Windows PC or Linux PC for each LAN, Each PC must Have One NICcards
2. Three Switch (24 port)
3. Three Routers 1841
4. Straight Line LAN (cat-5) Cables with RJ-45 Sockets
5. Class A- IP Address using Static IP configuration

**Network Topology:**



**Syntax:**

**Router(config)#router eigrp *autonomous-system***




```
R1(config)#router eigrp ?
  <1-65535>  Autonomous system number
R1(config)#router eigrp 10
```

Although the Cisco IOS refers to the router eigrp parameter as an "Autonomous system number", this parameter configures an EIGRP process-an instance of EIGRP running on the router-and has nothing to do with AS configurations in ISP routers.

**Note: All routers in the EIGRP routing domain must use the same process IDnumber (autonomous-system number)**

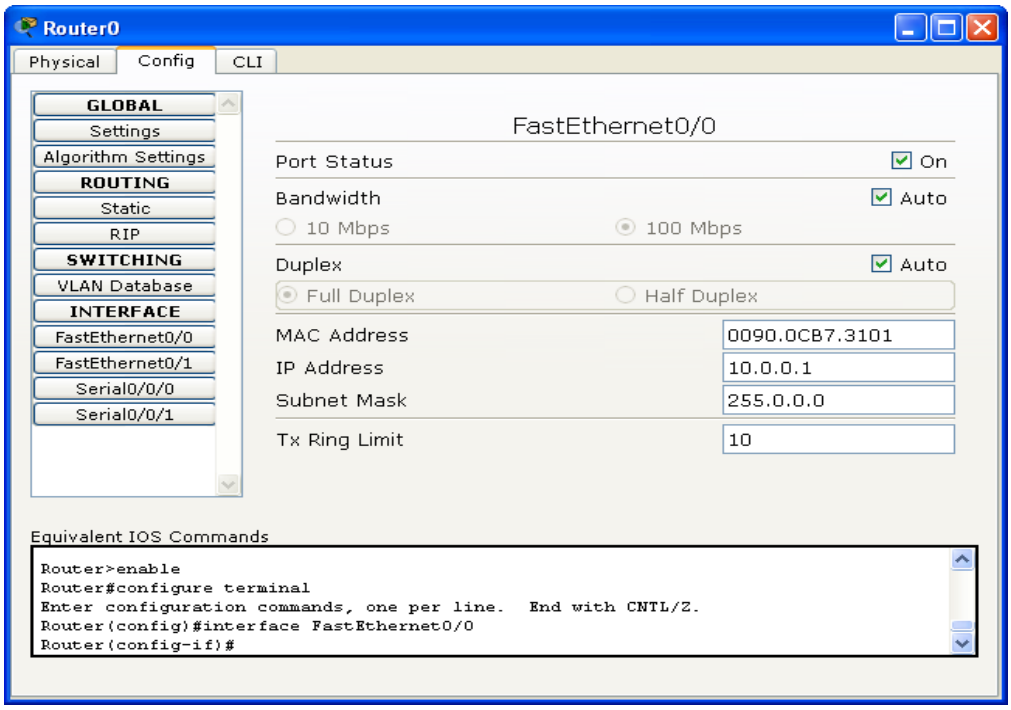
**Metrics used by IGRP:**

- bandwidth (used by default)
- Delay (used by default)

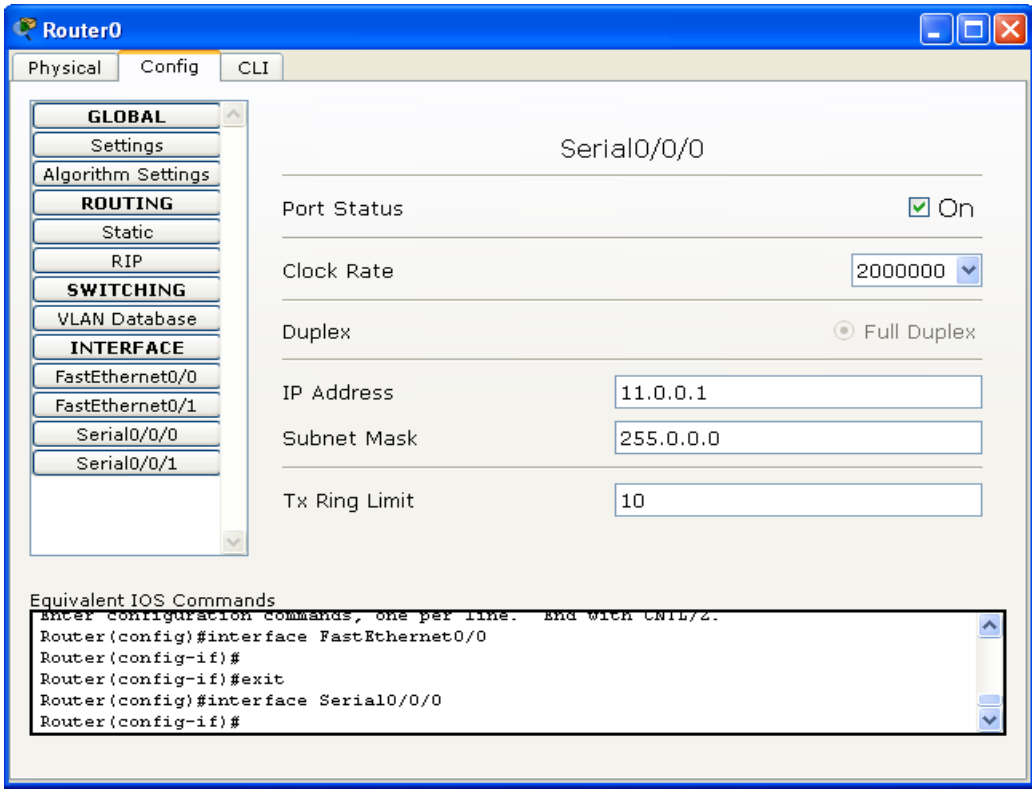
**Updates:**

- Partial Update
- Bounded Update

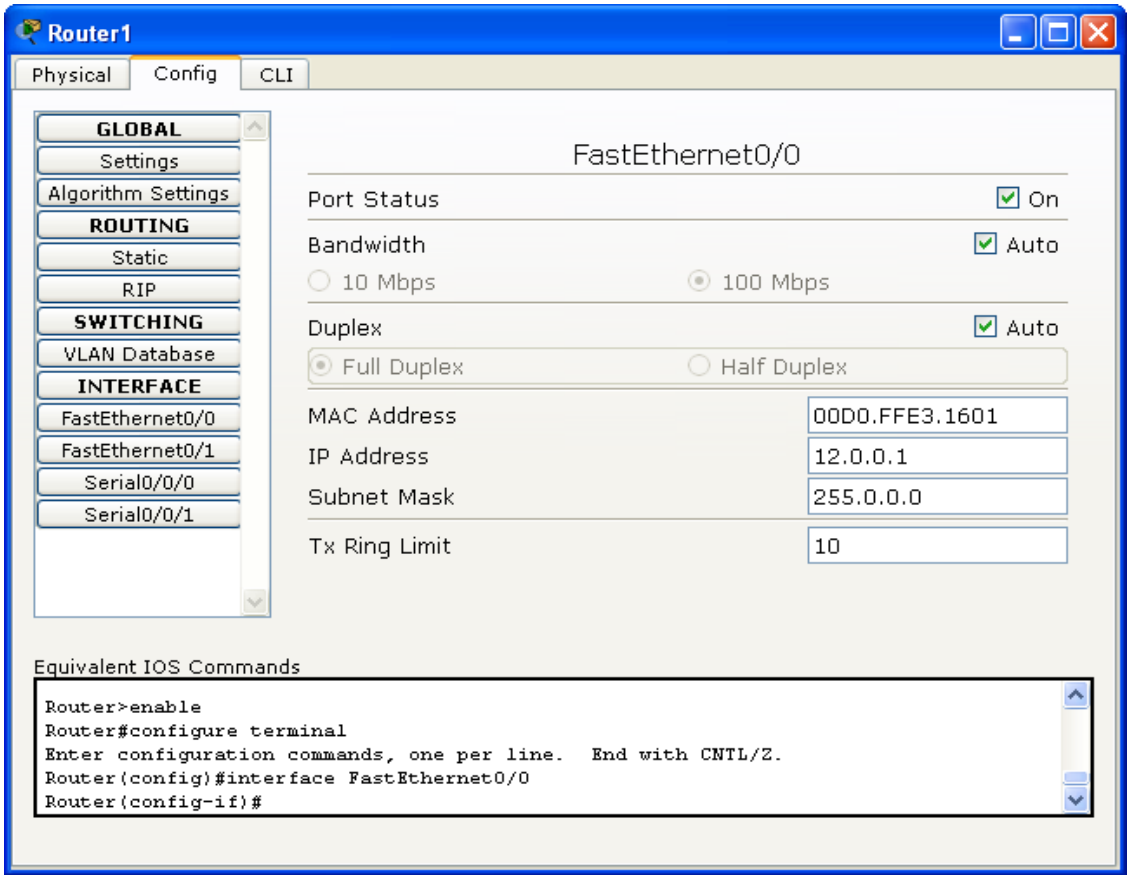
**Interface Configuration in Router-1:**
**FastEthernet0/0:**



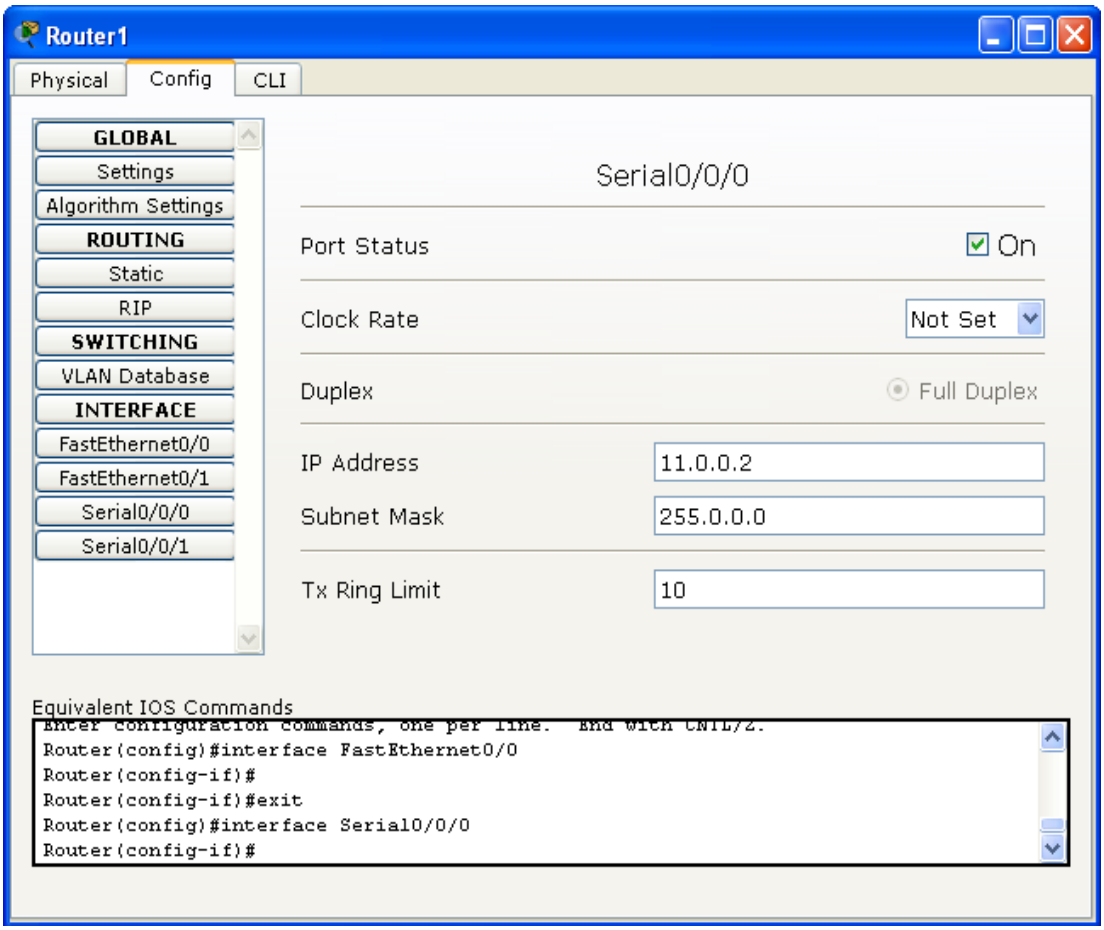

**Serial 0/0/0:**



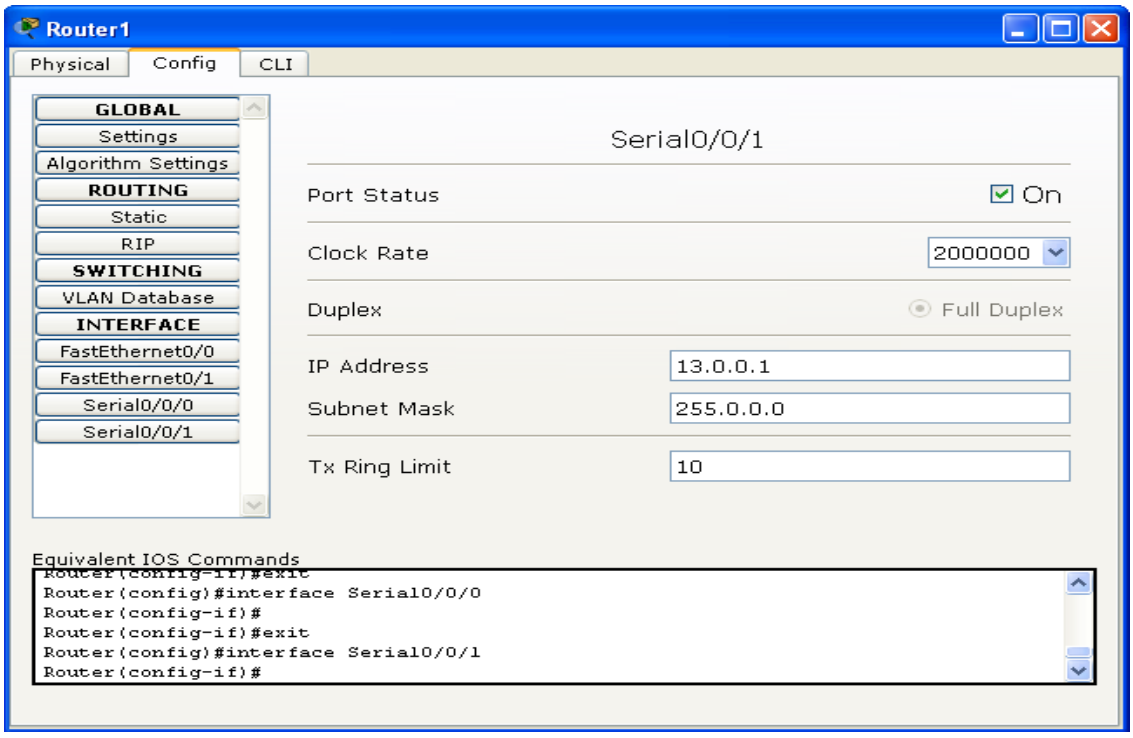

**Interface Configuration in Router-2 (Center):**
**FastEthernet 0/0:**


Router1
Physical
Config
CLI
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/0/0
Serial0/0/1
FastEthernet0/0
Port Status
On
Bandwidth
Auto
10 Mbps
100 Mbps
Duplex
Auto
Full Duplex
Half Duplex
MAC Address
00D0.FFE3.1601
IP Address
12.0.0.1
Subnet Mask
255.0.0.0
Tx Ring Limit
10
Equivalent IOS Commands
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#

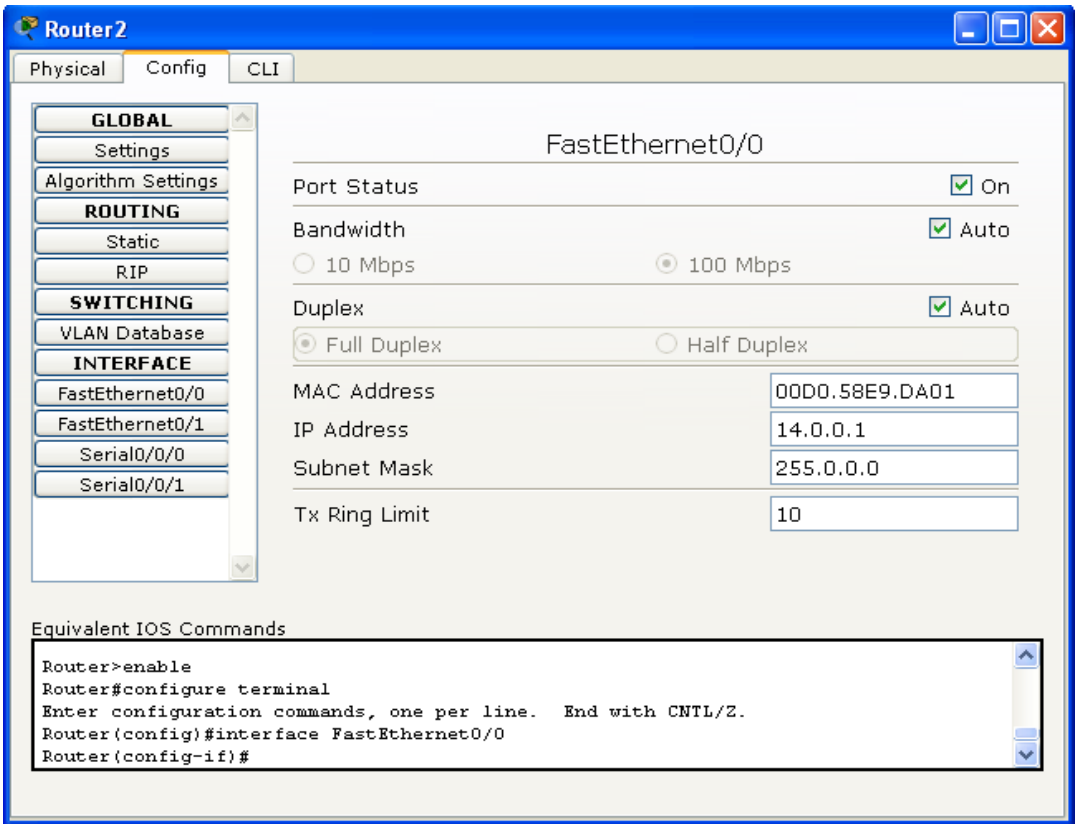
**Serial 0/0/0:**



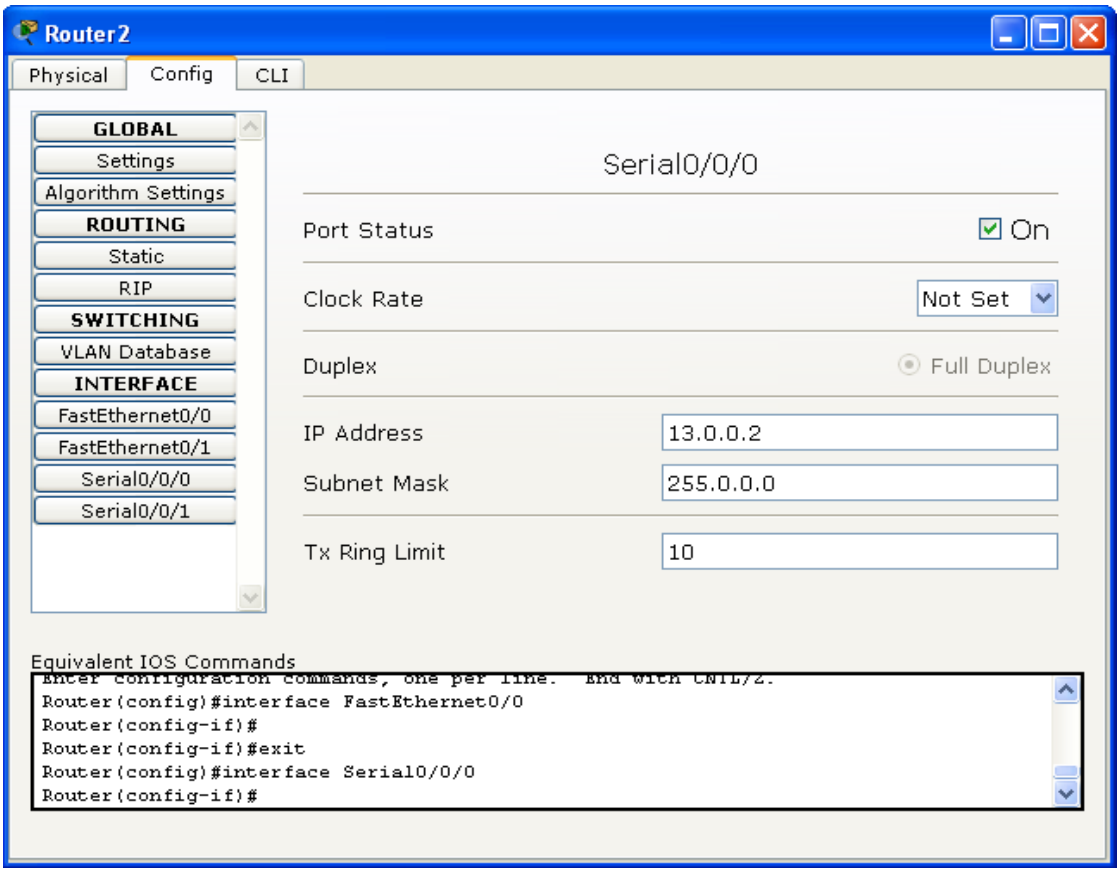

**Serial 0/0/1:**




**Interface Configuration in Router-3:**
**FastEthernet 0/0:**


Router2
Physical
Config
CLI
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/0/0
Serial0/0/1
FastEthernet0/0
Port Status
On
Bandwidth
Auto
10 Mbps
100 Mbps
Duplex
Auto
Full Duplex
Half Duplex
MAC Address
00D0.58E9.DA01
IP Address
14.0.0.1
Subnet Mask
255.0.0.0
Tx Ring Limit
10
Equivalent IOS Commands
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#

**Serial 0/0/0:**




**Configuring EIGRP in all Routers:**

**Router-1:**

Router(config)#router eigrp ?

<1-65535> Autonomous system number

Router(config)#router eigrp 1

Router(config-router)#net Router(config-router)#network 10.0.0.0

Router(config-router)#network 11.0.0.0

**Router-2:**

Router(config)#router Eigrp 1

Router(config-router)#network 11.0.0.0

Router(config-router)#network 12.0.0.0

Router(config-router)#network 13.0.0.0

**Router-3:**

Router(config)#router eigrp 1

Router(config-router)#network 13.0.0.0

Router(config-router)#network 14.0.0.0

**Routing Table Entries:**

**Router-1:**

Router#sh ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGPD - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODRP - periodic downloaded static route

Gateway of last resort is not set

C 10.0.0.0/8 is directly connected, FastEthernet0/0 C 11.0.0.0/8 is directly connected, Serial0/0/0
D 12.0.0.0/8 [90/2172416] via 11.0.0.2, 00:03:11, Serial0/0/0 D 13.0.0.0/8 [90/2681856] via 11.0.0.2, 00:03:07, Serial0/0/0 D 14.0.0.0/8 [90/2684416] via 11.0.0.2, 00:02:10, Serial0/0/0

**Router-2:**

Router#show ip route

Gateway of last resort is not set

D 10.0.0.0/8 [90/2172416] via 11.0.0.1, 00:04:32, Serial0/0/0
C 11.0.0.0/8 is directly connected, Serial0/0/0
C 12.0.0.0/8 is directly connected, FastEthernet0/0 C
13.0.0.0/8 is directly connected, Serial0/0/1
D 14.0.0.0/8 [90/2172416] via 13.0.0.2, 00:03:26, Serial0/0/1

**Router-3:**

Router#show ip route

Gateway of last resort is not set

D 10.0.0.0/8 [90/2684416] via 13.0.0.1, 00:04:30, Serial0/0/0 D 11.0.0.0/8 [90/2681856] via 13.0.0.1, 00:04:30, Serial0/0/0 D 12.0.0.0/8 [90/2172416] via 13.0.0.1, 00:04:30, Serial0/0/0
C 13.0.0.0/8 is directly connected, Serial0/0/0
C 14.0.0.0/8 is directly connected, FastEthernet0/0

**Shutdown the Network-10.0.0.0 in Router-1:**

Router(config)# interface f0/0
Router(config-if)#shutdown
Router(config-if)#
**%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to dministratively down**
**%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to down**

**Routing Table in Router-1:**

Router#sh ip route
Gateway of last resort is not set

C 11.0.0.0/8 is directly connected, Serial0/0/0
D 12.0.0.0/8 [90/2172416] via 11.0.0.2, 00:10:19, Serial0/0/0 D 13.0.0.0/8 [90/2681856] via 11.0.0.2, 00:10:16, Serial0/0/0 D 14.0.0.0/8 [90/2684416] via 11.0.0.2, 00:09:19, Serial0/0/0

**Note: Observed that the Network 10.0.0.0 has been removed.**

**Routing Table in Router-2:**

Router#sh ip route
Gateway of last resort is not set

C 11.0.0.0/8 is directly connected, Serial0/0/0
C 12.0.0.0/8 is directly connected, FastEthernet0/0 C
13.0.0.0/8 is directly connected, Serial0/0/1
D 14.0.0.0/8 [90/2172416] via 13.0.0.2, 00:10:46, Serial0/0/1

**Note: Observed that the Network 10.0.0.0 has been removed immediately by triggered updates.**

**Routing Table in Router-3:**

```
Router#show ip route
Gateway of last resort is not set
     D   11.0.0.0/8 [90/2681856] via 13.0.0.1, 00:11:54, Serial0/0/0 D
         12.0.0.0/8 [90/2172416] via 13.0.0.1, 00:11:54, Serial0/0/0
     C   13.0.0.0/8 is directly connected, Serial0/0/0
     C   14.0.0.0/8 is directly connected, FastEthernet0/0
```

**Note: Observed that the Network 10.0.0.0 has been removed immediately by triggered updates.**

**Knowing the EIGRP neighbors:**

**Router-1:**

```
Router#show ip eigrp neighbors
IP-EIGRP neighbors for process 1
H   Address         Interface      Hold Uptime    SRTT   RTO   Q   Seq
                                   (sec)          (ms)       Cnt Num
0   11.0.0.2        Se0/0/0        10   00:18:54  40     1000  0   16
```

**Router-2:**

```
Router#sh ip eigrp neighbors
IP-EIGRP neighbors for process 1
H   Address         Interface      Hold Uptime    SRTT   RTO   Q   Seq
                                   (sec)          (ms)       Cnt Num
0   11.0.0.1        Se0/0/0        12   00:14:30  40     1000  0   8
1   13.0.0.2        Se0/0/1        11   00:13:28  40     1000  0   10
```

**Router-3:**

```
Router#show ip eigrp neighbors
IP-EIGRP neighbors for process 1
H   Address         Interface      Hold Uptime    SRTT   RTO   Q   Seq
                                   (sec)          (ms)       Cnt Num
0   13.0.0.1        Se0/0/0        11   00:20:48  40     1000  0   15
```

**14. Implement RIP and OSPF Redistribution using Cisco Packet Tracer.**

This experiment addresses the issue of integrating Routing Information Protocol (RIP) networks with Open Shortest Path First (OSPF) networks. Most OSPF networks also use
RIP to communicate with hosts or to communicate with portions of the internetwork that do not use OSPF. This case study should provide examples of how to complete the following phases in redistributing information between RIP and OSPF networks, including the following topics:

*i.* Configuring a RIP Network
*ii.* Adding OSPF to the Center of a RIP Network
*iii.* Adding OSPF Areas
*iv.* Setting Up Mutual Redistribution

**Requirement:**

**Tools:**

Cisco Packet Tracer 6.0.1 or higher version

**Topology Constructions Requirements :**

1. Two Windows PC or Linux PC for each LAN, Each PC must Have One NIC cards
2. Two Switch (24 port)
3. Three Routers 1841
4. Straight Line LAN (cat-5) Cables with RJ-45 Sockets
5. Class A- IP Address using Static IP configuration

**Procedure:**

To configure Redistribution between Routing Information Protocol (RIP) and Open Shortest Path First (OSPF) using Cisco Packet Tracer, follow these steps:

Step 1: Design the Network Topology
Create a network topology in Cisco Packet Tracer by adding routers and connecting them using appropriate interfaces. Include at least one router running RIP and another running OSPF.

Step 2: Configure IP Addresses
Assign IP addresses to the interfaces of each router in the network. Make sure that interfaces connecting routers running RIP and OSPF are in the same subnet.

Step 3: Enable Routing Protocols
Enable RIP on the router that will run RIP by entering the following commands in the router's CLI:

Router> enable
Router# configure terminal
Router(config)# router rip
Router(config-router)# version 2
Router(config-router)# network <network_address>
Replace <network_address> with the network address you want to advertise via RIP.

Enable OSPF on the router that will run OSPF by entering the following commands:

Router> enable
Router# configure terminal
Router(config)# router ospf <process_id>
Router(config-router)# network <network_address> <wildcard_mask> area <area_id>
Replace <process_id> with a unique numeric identifier for OSPF process, <network_address> with the network address you want to advertise via OSPF, <wildcard_mask> with the appropriate wildcard mask, and <area_id> with the OSPF area ID.

Step 4: Configure Redistribution
On the router running RIP, enter the following command in the CLI to redistribute OSPF routes into RIP:

Router> enable
Router# configure terminal
Router(config)# router rip
Router(config-router)# redistribute ospf <process_id> metric <metric>
Replace <process_id> with the OSPF process ID and <metric> with a metric value.

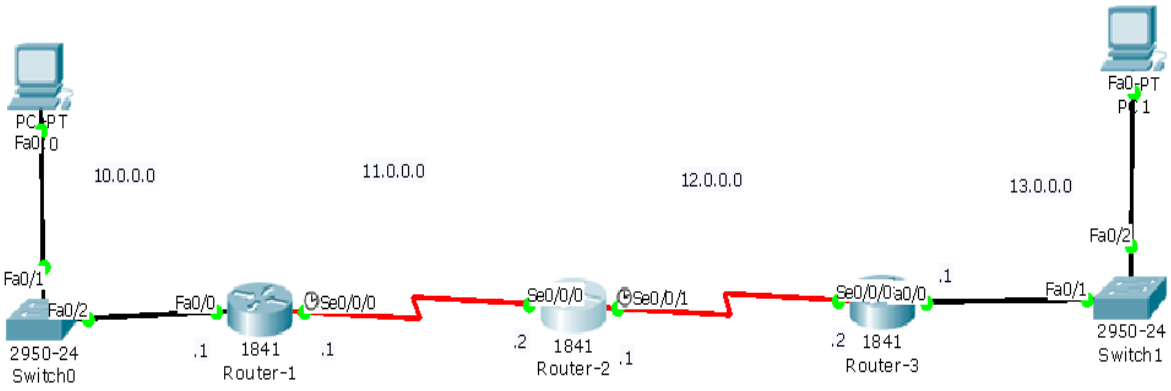
On the router running OSPF, enter the following command to redistribute RIP routes into OSPF:

Router> enable
Router# configure terminal
Router(config)# router ospf <process_id>
Router(config-router)# redistribute rip subnets
Replace <process_id> with the OSPF process ID.

Step 5: Verify Redistribution
Use the show ip route command on both routers to verify that routes from the other protocol are being redistributed correctly.

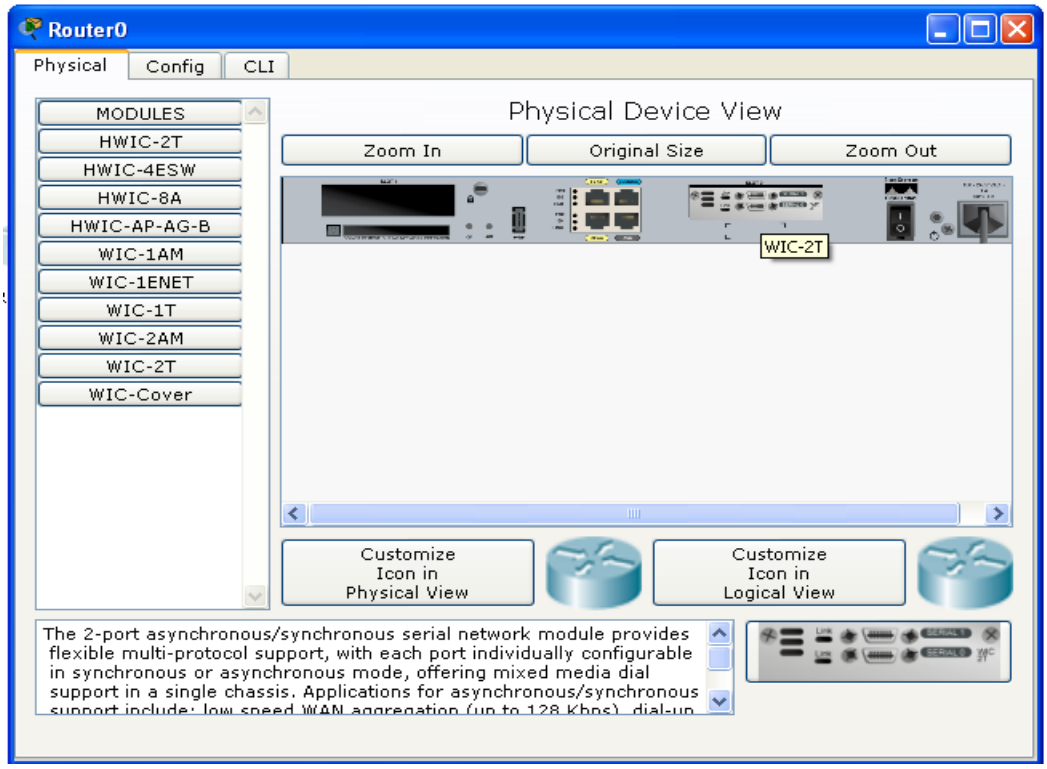
That's it! You have configured Redistribution between RIP and OSPF using Cisco Packet Tracer. Remember to save your configuration using the copy running-config startup-config command to persist the changes after a reboot.

**Network Topology:**



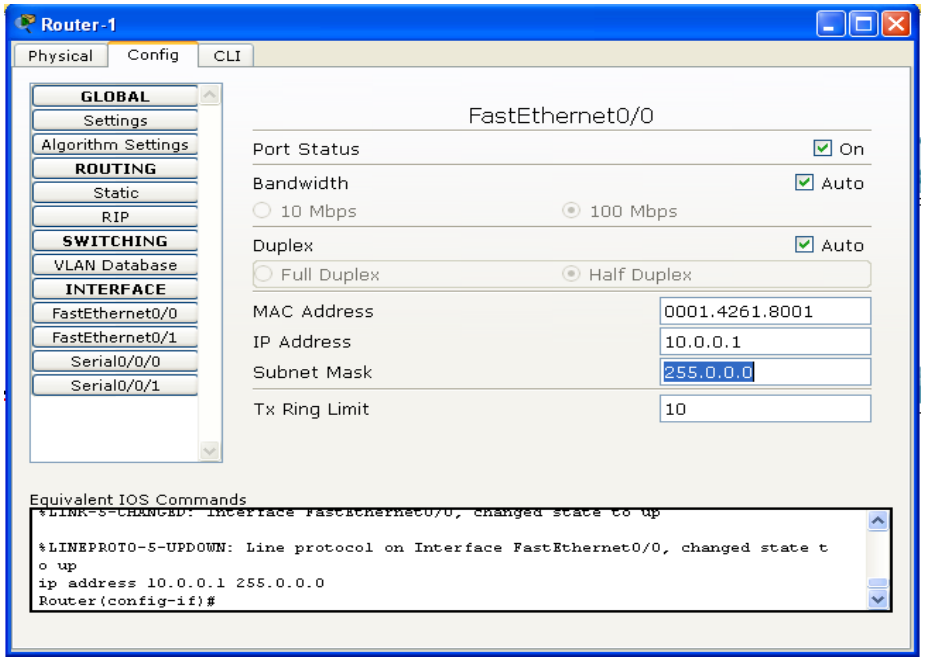

**Router-to-Router Connectivity:**

1. For connecting LAN to LAN Serial Port should be used.
2. By default, Router should not have a serial port. To have it, first switch off the Router and drag the WIC-2T interface into the Serial port Space and then switch on it.

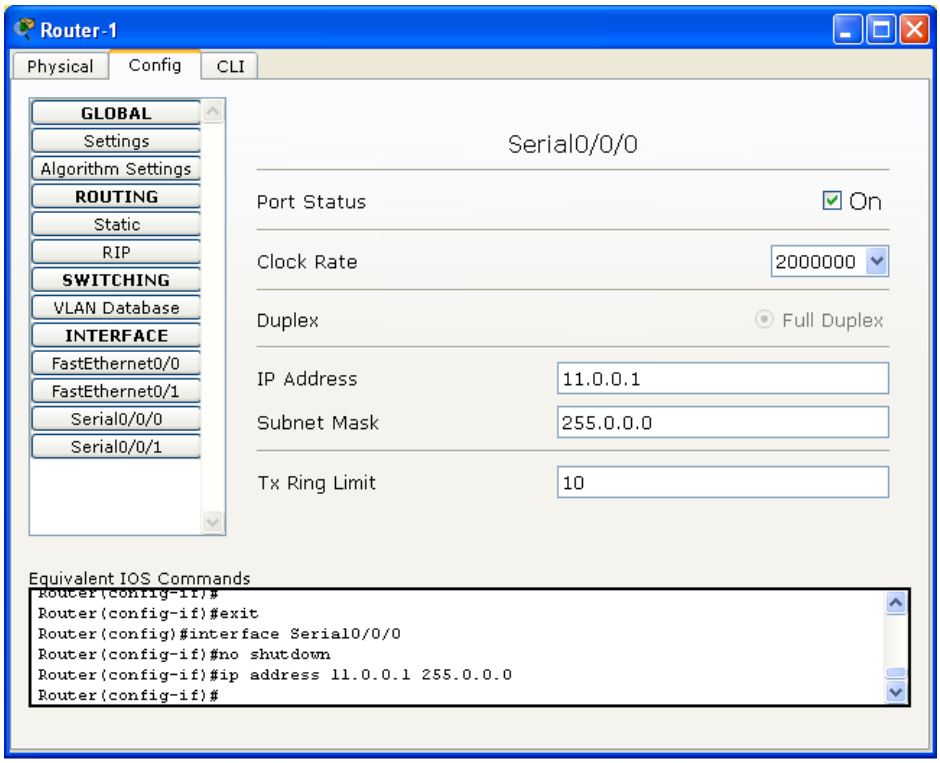



3. One side of the Serial port is DCE (Data Circuit Terminal Equipment) which requires Clock rate setup.
4. Another side of serial port is DTE (Data Terminating Equipment) which doesn't requires clock rate.

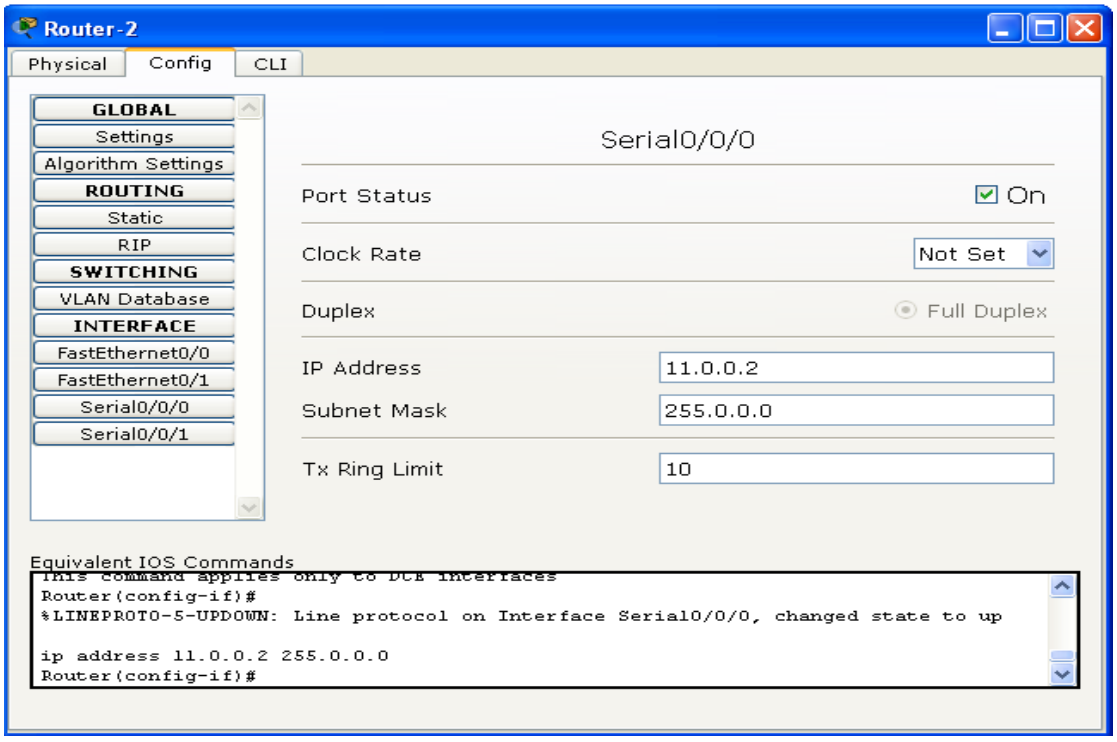
**Configuring Router-1's interface:**
**Fast-Ethernet 0/0:**



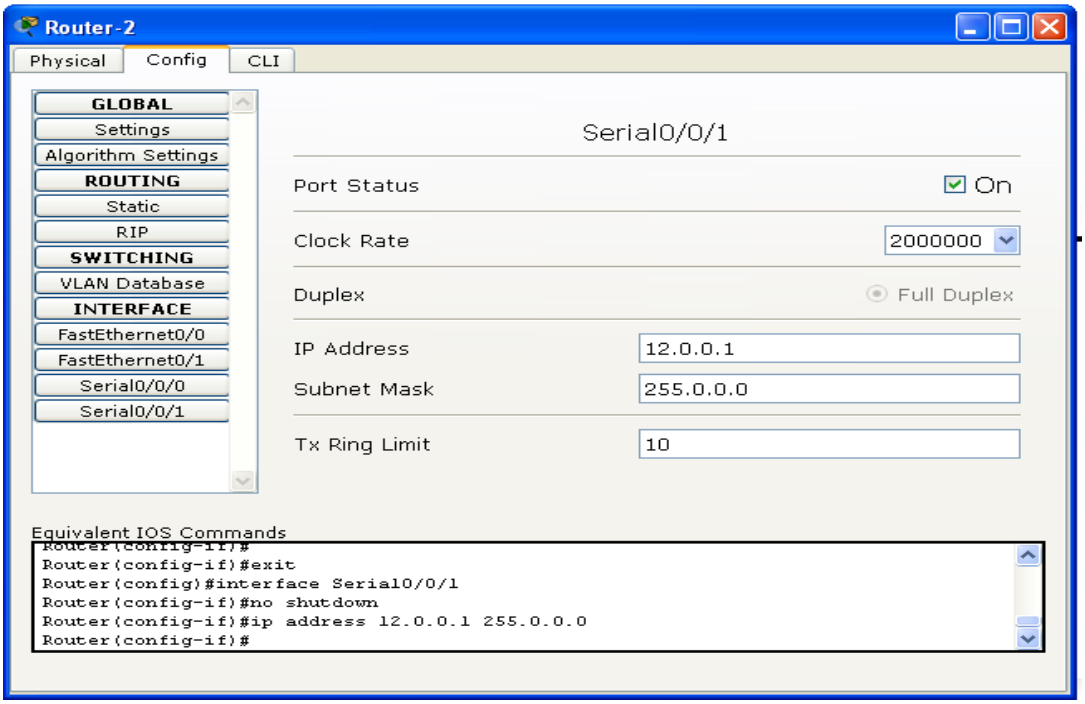
**Serial Port 0/0/0 (DCE – set Clock rate):**



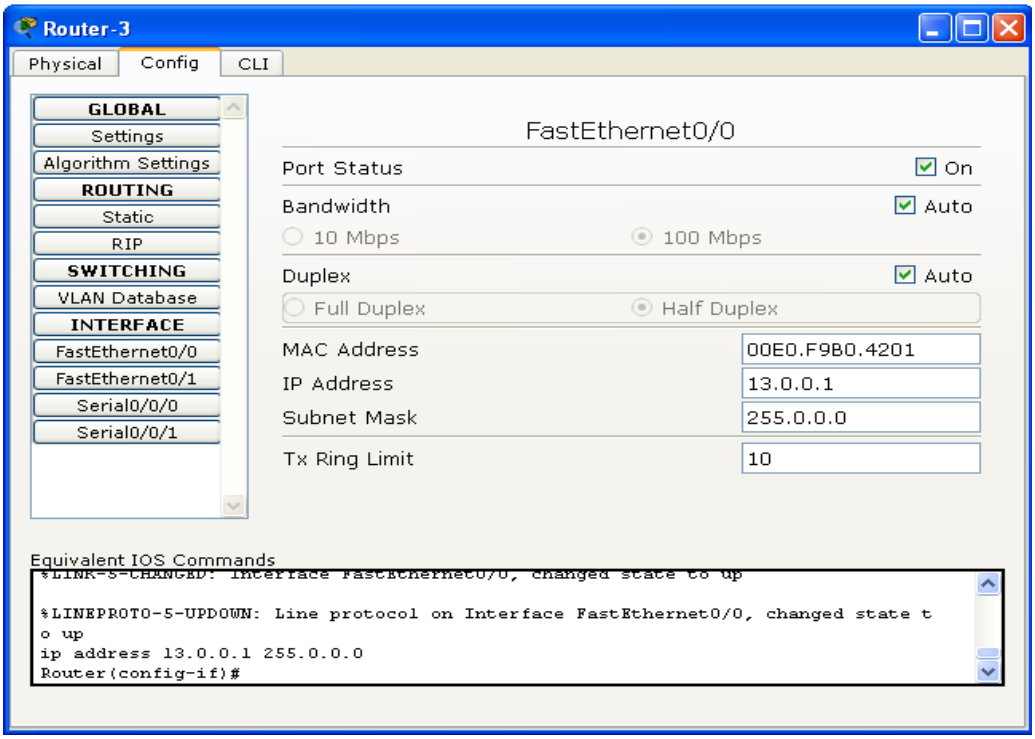

**Configuring Router-2's interface:**
**Serial Port 0/ 0/0 (DTE end):**



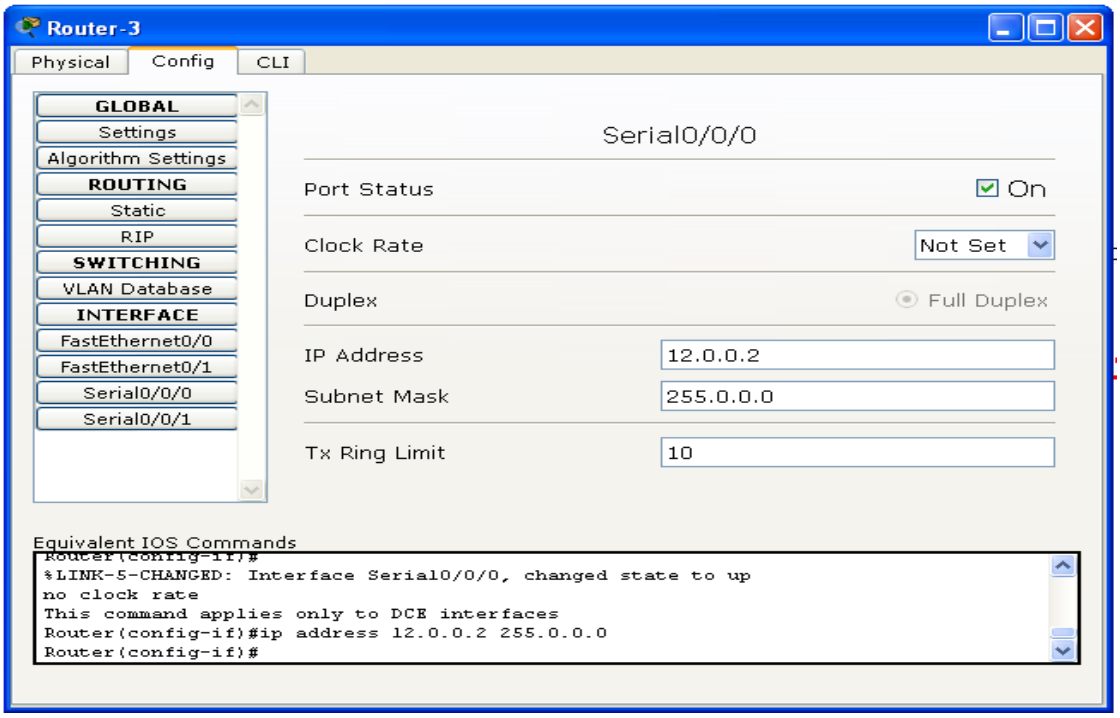
**Serial Port 0/0/1 (DCE – set Clock rate):**



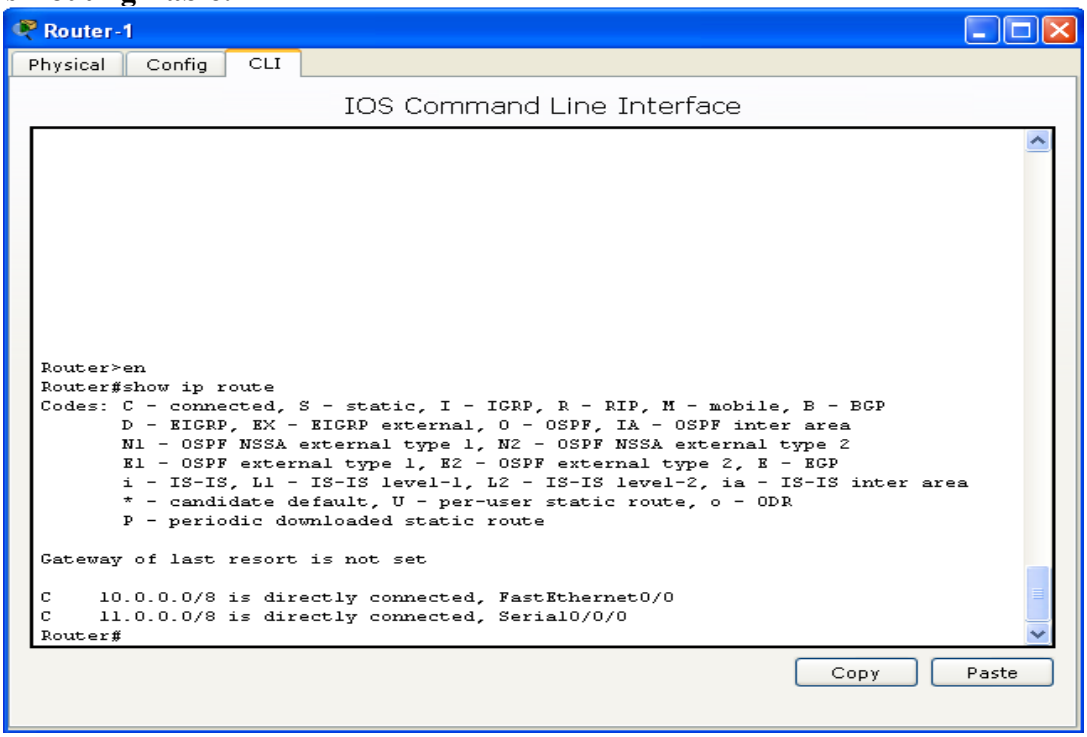

**Configuring Router-3's interface:**
**Fast-Ethernet 0/0:**



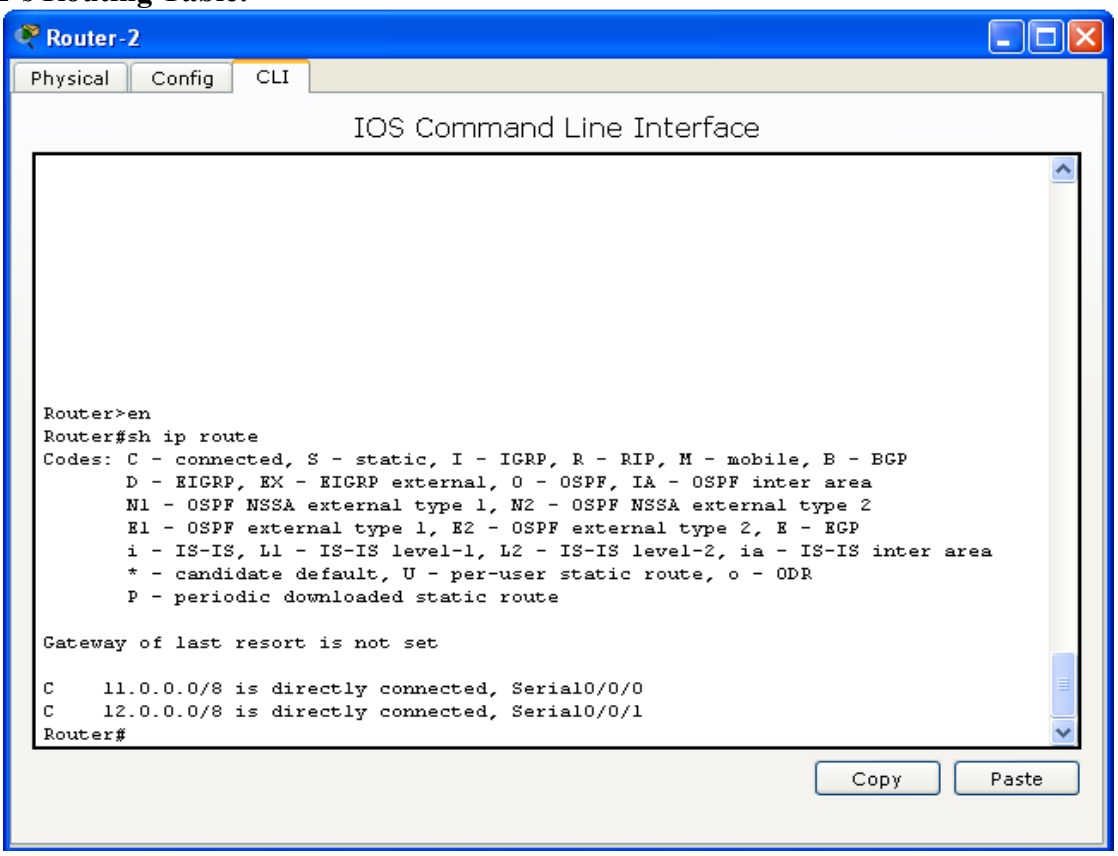
**Serial Port 0/0/0 (DTE – End):**



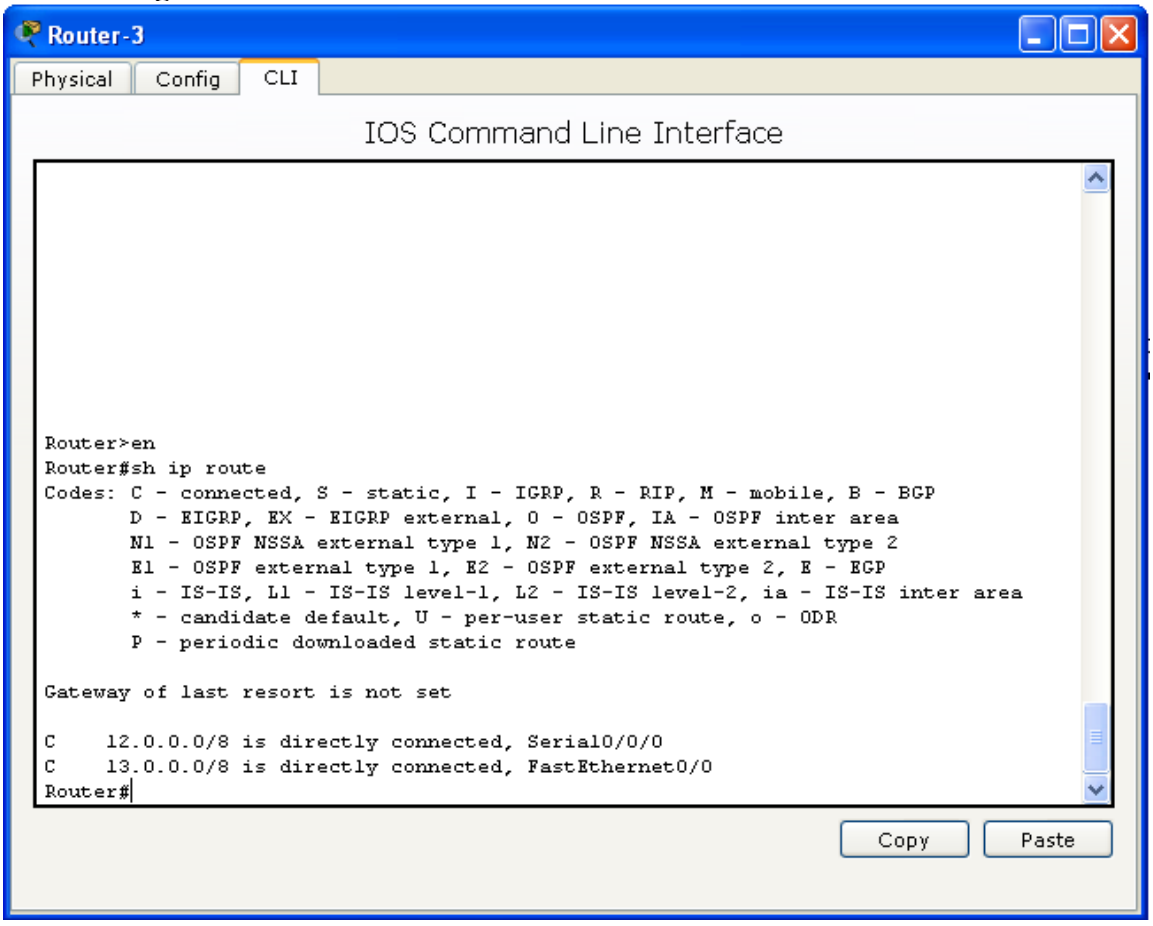

**Router-1's Routing Table:**



**Router-2's Routing Table:**




**Router-3's Routing Table:**



**Configuring all Routers for RIP:**

**Router-1:**

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 10.0.0.0
Router(config-router)#network 11.0.0.0
Router(config-router)#
```

**Router-2:**

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 11.0.0.0
Router(config-router)#network 12.0.0.0
Router(config-router)#
```

**Router-3:**

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 12.0.0.0
Router(config-router)#network 13.0.0.0
Router(config-router)#
```

**Routing Tables in Routers after RIP configuration:**

**Router-1:**

```
Router#sh ip route
        Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
         N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
        i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
        * - candidate default, U - per-user static route, o - ODR
        P - periodic downloaded static route
Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
C    11.0.0.0/8 is directly connected, Serial0/0/0
R    12.0.0.0/8 [120/1] via 11.0.0.2, 00:00:05, Serial0/0/0
R    13.0.0.0/8 [120/2] via 11.0.0.2, 00:00:05, Serial0/0/0
```

**Router-2:**

```
Router#sh ip route
    Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
    D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
    N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
    E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
    i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
    * - candidate default, U - per-user static route, o - ODR
    P - periodic downloaded static route
```

Gateway of last resort is not set

R 10.0.0.0/8 [120/1] via 11.0.0.1, 00:00:12, Serial0/0/0
C 11.0.0.0/8 is directly connected, Serial0/0/0
C 12.0.0.0/8 is directly connected, Serial0/0/1
R 13.0.0.0/8 [120/1] via 12.0.0.2, 00:00:13, Serial0/0/1

**Router-3:**

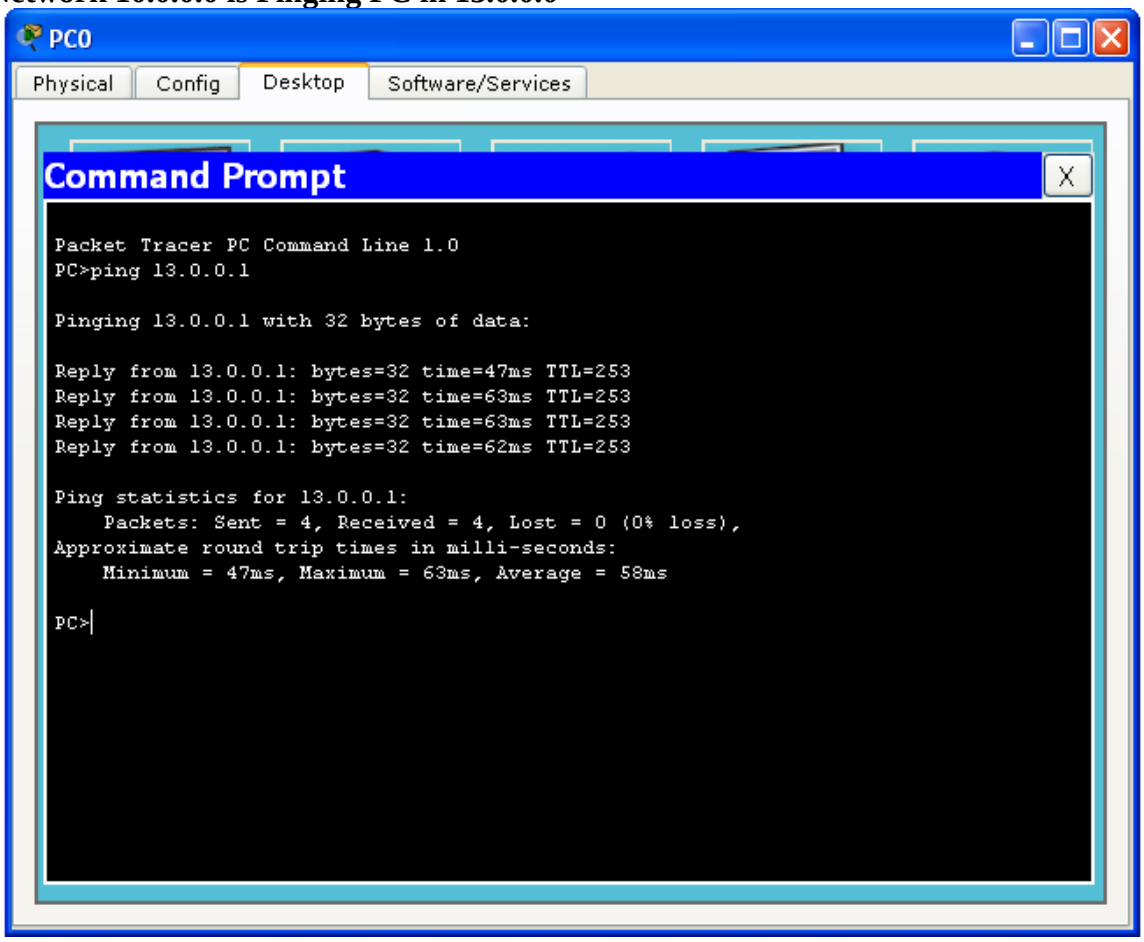
Router#sh ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

R 10.0.0.0/8 [120/2] via 12.0.0.1, 00:00:07, Serial0/0/0
R 11.0.0.0/8 [120/1] via 12.0.0.1, 00:00:07, Serial0/0/0
C 12.0.0.0/8 is directly connected, Serial0/0/0
C 13.0.0.0/8 is directly connected, FastEthernet0/0

**PC in Network 10.0.0.0 is Pinging PC in 13.0.0.0**



**To know the Protocols Configured in Router:**

```
Router#sh ip protocols
    Routing Protocol is "rip"
    Sending updates every 30 seconds, next due in 13 seconds
    Invalid after 180 seconds, hold down 180, flushed after 240
    Outgoing update filter list for all interfaces is not set
    Incoming update filter list for all interfaces is not set
    Redistributing: rip
    Default version control: send version 1, receive any version
      Interface          Send  Recv  Triggered RIP  Key-chain
      FastEthernet0/0    1     2 1
      Serial0/0/0        1     2 1
    Automatic network summarization is in effect
    Maximum path: 4
    Routing for Networks:
        10.0.0.0
        11.0.0.0
    Passive Interface(s):
    Routing Information Sources:
        Gateway         Distance      Last Update
        11.0.0.2             120      00:00:04
    Distance: (default is 120)
```

**To Know the RIP Updates in Router:**

```
Router#debug ip rip
    RIP protocol debugging is on
    Router#RIP: received v1 update from 11.0.0.2 on Serial0/0/0
        12.0.0.0 in 1 hops
        13.0.0.0 in 2 hops
    RIP: sending  v1 update to 255.255.255.255 via FastEthernet0/0 (10.0.0.1)
    RIP: build update entries
        network 11.0.0.0 metric 1
        network 12.0.0.0 metric 2
        network 13.0.0.0 metric 3
    RIP: sending  v1 update to 255.255.255.255 via Serial0/0/0 (11.0.0.1)
    RIP: build update entries
        network 10.0.0.0 metric 1
```

**RIP: Periodic Updates. Every 30 seconds the entire Routing Table will broadcast to the other Routers those are configured with RIP protocols.**

**Now remove the RIP protocol in the center Router:**

```
Router(config)#no router rip
```

**Configure the center Router for OSPF:**

**Syntax: Router(config)# router ospf process-ID**

```
Router(config)#router ospf 1
```

**Syntax: Router(config-router)# network address wild-card area no.**

```
Router(config-router)#network 11.0.0.0 0.255.255.255 area 1
Router(config-router)#network 12.0.0.0 0.255.255.255 area 1
```

**Note: The updates will send to the network those are in the same area group.**

**Ensuring the Routing Table of Router-2 (center):**

```
Router#sh ip route
    Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
    D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
    N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
    E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
    i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
    * - candidate default, U - per-user static route, o - ODR
    P - periodic downloaded static route
Gateway of last resort is not set
        C   11.0.0.0/8 is directly connected, Serial0/0/0
        C   12.0.0.0/8 is directly connected, Serial0/0/1
```

**Note: The RIP updated routes were removed because of OSPF configuration in Router-2.**

**Ensuring the Routing Table of Router-1:**

```
Router#sh ip route
    Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
    D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
    N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
    E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
    i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
    * - candidate default, U - per-user static route, o - ODR
    P - periodic downloaded static route
Gateway of last resort is not set
        C   10.0.0.0/8 is directly connected, FastEthernet0/0
```

**Note: The Network 11.0.0.0 has been removed because it was configured in OSPF router.**

**Ensuring the Routing Table of Router-3:**

```
Router#sh ip route
    Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
    D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
    N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
    E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
    i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
    * - candidate default, U - per-user static route, o - ODR
    P - periodic downloaded static route
Gateway of last resort is not set
        C   13.0.0.0/8 is directly connected, FastEthernet0/0
```

**Note:**

- **The Network 12.0.0.0 has been removed because it was configured in OSPF router.**
- **OSPF Router will send the updates only to the Routers those are configured with OSPF.**
- **OSPF: Triggered Updates means whenever changes in the network happens, it will send an updates to the neighbor router of OSPF.**

**For Routing Details Distribution Configure OSPF in Router-1 & 3 also. So these Routers are running RIP and OSPF protocols..**

**OSPF in Router-1:**

```
Router(config)#router ospf 1
Router(config-router)#network 10.0.0.0 0.255.255.255 area 1
Router(config-router)#network 11.0.0.0 0.255.255.255 area 1
```

**OSPF in Router-3:**

```
Router(config)#router ospf 1
Router(config-router)#network 13.0.0.0 0.255.255.255 area 1
Router(config-router)#network 12.0.0.0 0.255.255.255 area 1
```

**After Configuration Routing table in Router-1:**

```
Router#sh ip route
    Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
    D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
    N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
    E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
    i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
    * - candidate default, U - per-user static route, o - ODR
    P - periodic downloaded static route
Gateway of last resort is not set
C   10.0.0.0/8 is directly connected, FastEthernet0/0
C   11.0.0.0/8 is directly connected, Serial0/0/0
O   12.0.0.0/8 [110/128] via 11.0.0.2, 00:09:42, Serial0/0/0
O   13.0.0.0/8 [110/129] via 11.0.0.2, 00:09:42, Serial0/0/0
```

**Routing Table in Router-3:**

```
Router#sh ip route
   Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
    D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
    N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
    E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
    i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
    * - candidate default, U - per-user static route, o - ODR
    P - periodic downloaded static route
Gateway of last resort is not set
O   10.0.0.0/8 [110/129] via 12.0.0.1, 00:11:17, Serial0/0/0
O   11.0.0.0/8 [110/128] via 12.0.0.1, 00:11:17, Serial0/0/0
C   12.0.0.0/8 is directly connected, Serial0/0/0
C   13.0.0.0/8 is directly connected, FastEthernet0/0
```

**Routing Table in Router-2:**

```
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
    D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
    N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
    E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
    i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
    * - candidate default, U - per-user static route, o - ODR
    P - periodic downloaded static route
Gateway of last resort is not set
O   10.0.0.0/8 [110/65] via 11.0.0.1, 00:11:57, Serial0/0/0
```

C 11.0.0.0/8 is directly connected, Serial0/0/0
C 12.0.0.0/8 is directly connected, Serial0/0/1
O 13.0.0.0/8 [110/65] via 12.0.0.2, 00:11:57, Serial0/0/1

**Case Study: Implement Dial on Demand Routing (DDR) using Cisco Packet Tracer.**

This case study should describe the use of DDR to connect a worldwide network that consists of a central site located in Mumbai and remote sites located in Chennai, Bangalore, and Hyderabad. The following scenarios should be considered:

**A. Having the Central Site Dial Out**

Describe the central and remote site configurations for three setups: a central site with one interface per remote site, a single interface for multiple remote sites, and multiple interfaces for multiple remote sites. Include examples of the usage of rotary groups and access lists.

**B. Having the Central and Remote Sites Dial in and Dial Out**

Describe the central and remote site configurations for three setups: central site with one interface per remote site, a single interface for multiple remote sites, and multiple interfaces for multiple remote sites. Also describes the usage of Point-to-Point Protocol (PPP) encapsulation and the Challenge Handshake Authentication Protocol (CHAP).

**C. Having Remote Sites Dial Out**

A common configuration is one in which the remote sites place calls to the central site but the central site does not dial out. In a “star” topology, it is possible for all of the remote routers to have their serial interfaces on the same subnet as the central site serial interface.

**D. Using DDR as a Backup to Leased Lines**

Describes the use of DDR as a backup method to leased lines and provides examples of how to use floating static routes on single and shared interfaces.

**E. Using Leased Lines and Dial Backup**

Describes the use of Data Terminal Ready (DTR) dialing and V.25bis dialing with leased lines.

**Procedure:**

To configure Dial-on-Demand Routing (DDR) using Cisco Packet Tracer, follow these steps:

Step 1: Design the Network Topology

Create a network topology in Cisco Packet Tracer by adding routers and connecting them using appropriate interfaces. Include at least two routers that will establish a DDR connection.

Step 2: Configure IP Addresses

Assign IP addresses to the interfaces of each router in the network. Make sure the interfaces that will be used for DDR have unique IP addresses.

Step 3: Configure DDR Parameters

On the router that will initiate the DDR connection, enter the following commands in the router's CLI:

Router> enable

Router# configure terminal
Router(config)# interface <interface_name>
Router(config-if)# encapsulation ppp
Router(config-if)# dialer pool-member <pool_number>
Router(config-if)# dialer-group <group_number>
Router(config-if)# dialer idle-timeout <timeout_value>
Replace <interface_name> with the name of the interface you want to use for DDR, <pool_number> with the pool number you want to associate the interface with, <group_number> with the dialer group number, and <timeout_value> with the number of seconds of inactivity before disconnecting the DDR link.

Step 4: Configure Dialer Interface Parameters
On the same router, enter the following commands to configure the dialer interface parameters:

Router(config)# interface dialer <dialer_number>
Router(config-if)# ip address negotiated
Router(config-if)# encapsulation ppp
Router(config-if)# dialer pool <pool_number>
Replace <dialer_number> with the dialer number you want to assign, and <pool_number> with the pool number associated with the interface.

Step 5: Configure Dialer Map
On the same router, enter the following command to configure the dialer map that specifies the destination IP address:

Router(config-if)# dialer map <protocol> <destination_address> name <name>
Replace <protocol> with the protocol to be used for DDR (e.g., IP), <destination_address> with the IP address of the remote router, and <name> with a name for the dialer map.

Step 6: Configure Dialer Pool
On the router that will be on the receiving end of the DDR connection, enter the following commands in the CLI:

Router> enable
Router# configure terminal
Router(config)# interface serial <interface_number>
Router(config-if)# encapsulation ppp
Router(config-if)# dialer pool-member <pool_number>
Router(config-if)# dialer-group <group_number>
Router(config-if)# dialer idle-timeout <timeout_value>
Replace <interface_number> with the interface number you want to use for DDR, <pool_number> with the pool number you want to associate the interface with, <group_number> with the dialer group number, and <timeout_value> with the number of seconds of inactivity before disconnecting the DDR link.

Step 7: Save Configuration and Test DDR
Save the configuration of both routers using the copy running-config startup-config command. Then, initiate traffic from the initiating router to trigger the DDR connection. Monitor the status of the DDR connection using the show interface dialer <dialer_number> command.

Well by this we have configured Dial-on-Demand Routing (DDR) using Cisco Packet Tracer.

# CISCO PACKET TRACER IMPLEMENTATION BUILDING AND CONFIGURING NETWORKS

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