

EXPERIMENT NO.: 07

AIM: To design and simulate the environment for Dynamic routing using Cisco packet tracer.

THEORY:

Dynamic routing is a networking technique that provides optimal data routing. Unlike static routing, dynamic routing enables routers to select paths according to real-time logical network layout changes. In dynamic routing, the routing protocol operating on the router is responsible for the creation, maintenance and updating of the dynamic routing table. In static routing, all these jobs are manually done by the system administrator. Dynamic routing uses multiple algorithms and protocols. The most popular are Routing Information Protocol (RIP) and Open Shortest Path First (OSPF). The cost of routing is a critical factor for all organizations. The least expensive routing technology is provided by dynamic routing, which automates table changes and provides the best paths for data transmission.

Typically, dynamic routing protocol operations can be explained as follows:

1. The router delivers and receives the routing messages on the router interfaces.
2. The routing messages and information are shared with other routers, which use exactly the same routing protocol.
3. Routers swap the routing information to discover data about remote networks.
4. Whenever a router finds a change in topology, the routing protocol advertises this topology change to other routers.

Dynamic routing is easy to configure on large networks and is more intuitive at selecting the best route, detecting route changes and discovering remote networks. However, because routers share updates, they consume more bandwidth than in static routing; the routers' CPUs and RAM may also face additional loads as a result of routing protocols. Finally, dynamic routing is less secure than static routing.

- **Advantages:**

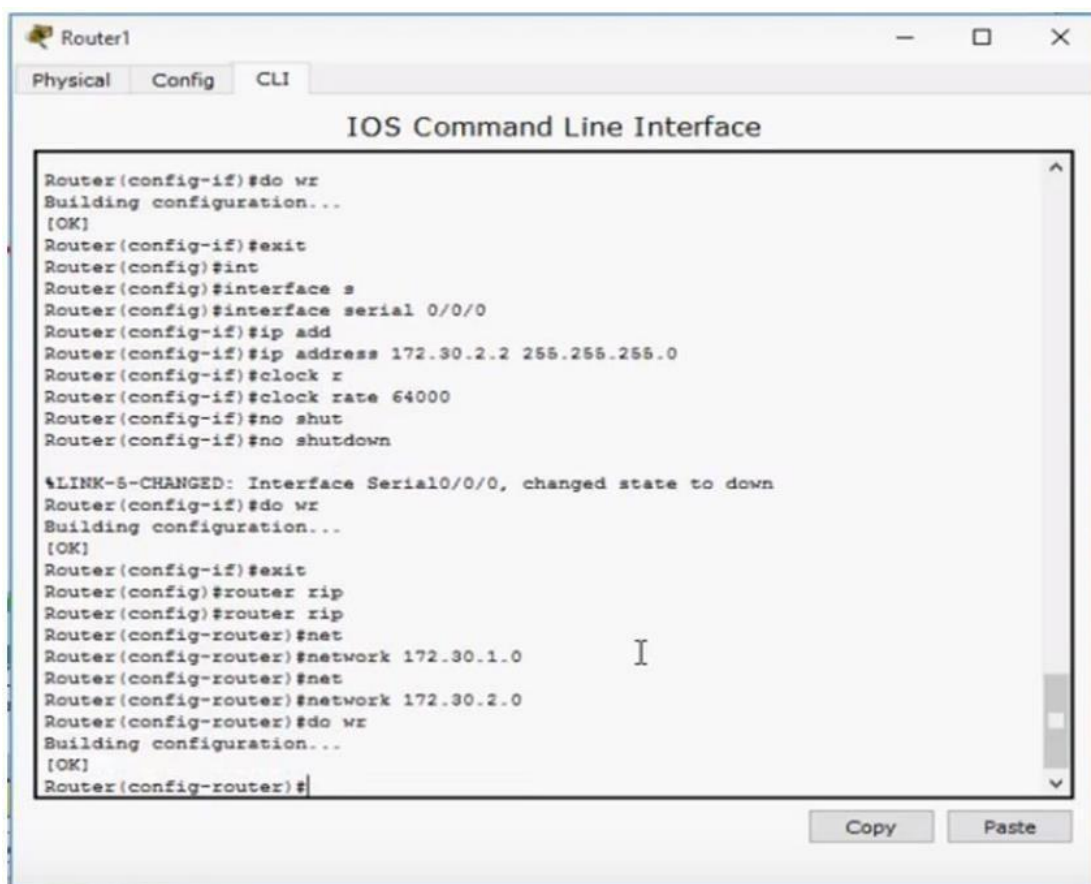
- The chief advantages of dynamic routing over static routing are scalability and adaptability. A dynamically routed network can grow more quickly and larger, and is able to adapt to changes in the network topology brought about by this growth or by the failure of one or more network components.
- With a dynamic router protocol, routers learn about the network topology by communicating with other routers. Each router announces its presence, and the routes it has available, to the other routers on the network. Therefore, if you add a new router, or add an additional segment to an existing router, the other routers

will hear about the addition and adjust their routing tables accordingly. You don't have to reconfigure the routers to tell them that the network has changes. Similarly, if you move a network segment, the other routers will hear about the change. You only need to change the configuration of the router (or routers) that connect the segment that moved. This reduces the chance that errors will occur.

- The ability to learn about changes to the network's configuration has implications beyond adding new segments or moving old ones. It also means that the network can adjust to failures. If a network has redundant paths, then a partial network failure appears to the routers as if some segments got moved (they are now reached via alternate paths), and some segments have been removed from the network (they are now unreachable). In short, there's no real difference between a network failure and a configuration change. Dynamic routing allows the network to continue functioning, perhaps in a degraded fashion, when partial failure occurs.

- Disadvantages:

- Routers resources are used (CPU cycles, Memory and Link bandwidth)



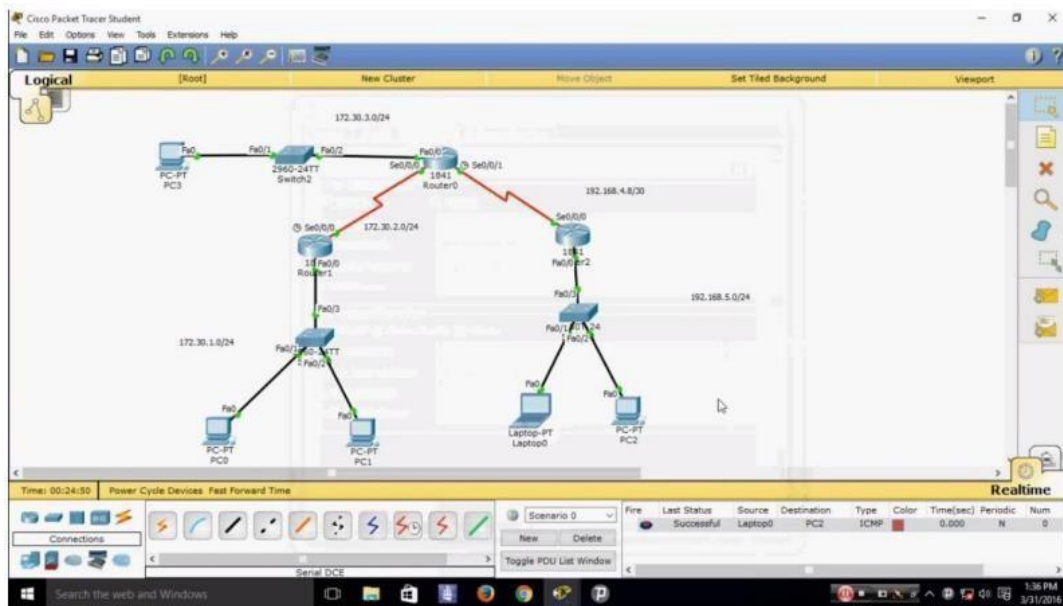
```
Router1
Physical Config CLI
IOS Command Line Interface

Router(config-if)#do wr
Building configuration...
[OK]
Router(config-if)#exit
Router(config)#int
Router(config)#interface s
Router(config)#interface serial 0/0/0
Router(config-if)#ip add
Router(config-if)#ip address 172.30.2.2 255.255.255.0
Router(config-if)#clock r
Router(config-if)#clock rate 64000
Router(config-if)#no shut
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
Router(config-if)#do wr
Building configuration...
[OK]
Router(config-if)#exit
Router(config)#router rip
Router(config)#router rip
Router(config-router)#net
Router(config-router)#network 172.30.1.0
Router(config-router)#net
Router(config-router)#network 172.30.2.0
Router(config-router)#do wr
Building configuration...
[OK]
Router(config-router)#
```

- More administrator knowledge is required for configuration, verification and troubleshooting

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Laptop0

Physical Config Desktop Software/Services

IP Configuration

IP Configuration

☐ DHCP ☒ Static

IP Address: 192.168.5.3

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.5.1

DNS Server:

IPv6 Configuration

☐ DHCP ☐ Auto Config ☒ Static

IPv6 Address: /

Link Local Address: FE80::204:9AFF:FE77:D1B9

IPv6 Gateway:

IPv6 DNS Server:

PROGRAM:

- Topology Using Hub:
 1. Add the components: 3 PC-PT, 1 Hub Generic.
 2. Connect the PCs to the Hub using the Copper straight through wire using FastEthernet.
 3. Configure the IP addresses of each PCs in the topology.
 4. Pass the file from one PC to another and check if the file is getting successfully transferred.
 5. It may take some time for the connection to be established, therefore if it shows failure, wait for a while or recheck your configuration.

- Topology Using Switch:
 1. Add the components: 3 PC-PT, 1 Switch Generic.
 2. Connect the PCs to the Switch using the Copper straight through wire using FastEthernet.
 3. Configure the IP addresses of each PCs in the topology.
 4. Pass the file from one PC to another and check if the file is getting successfully transferred.
 5. It may take some time for the connection to be established, therefore if it shows failure, wait for a while or recheck your configuration.

- Static Routing:
 1. Add the components: 4 PC-PT, 2 Switch Generic, 2 Router Generic.
 2. Connect the PCs 1 and 2 to Switch 1 using a copper straight through wire using FastEthernet and do the same for PCs 3 and 4 to Switch 2.
 3. Connect the Switches 1 and 2 to the Routers 1 and 2 respectively using a copper straight through wire using FastEthernet.
 4. Connect the Routers 1 and 2 to each other using a Serial cable using Serial.
 5. Now configure the IP addresses of each PC.
 6. Configure FastEthernet and Serial interface IP addresses.
 7. Pass the file from one PC from a Router to another PC of another Router and check if the file is getting successfully transferred.
 8. It may take some time for the connection to be established, therefore if it shows failure, wait for a while or recheck your configuration.

- Dynamic Routing:
 1. You can perform dynamic routing for two or more PCs.
 2. Add the components: 4 PC-PT, 2 Switch Generic, 2 Router Generic.
 3. Connect the PCs 1 and 2 to Switch 1 using a copper straight through wire using FastEthernet and do the same for PCs 3 and 4 to Switch 2.
 4. Connect the Switches 1 and 2 to the Routers 1 and 2 respectively using a copper straight through wire using FastEthernet.

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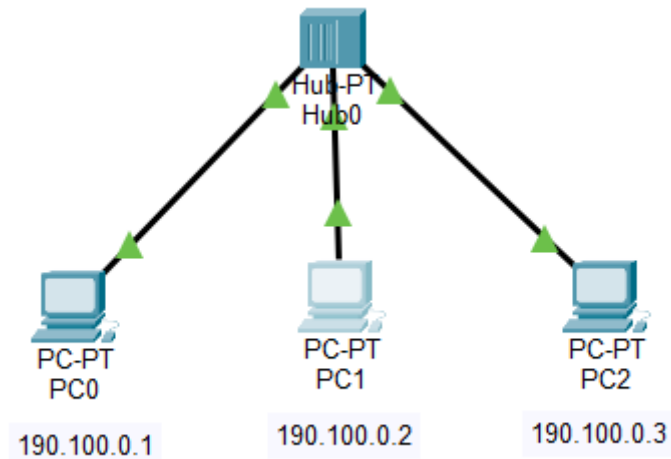
5. Connect the Routers 1 and 2 to each other using a Serial cable using Serial.
6. Now configure the IP addresses of each PC
7. Configure FastEthernet and Serial interface IP addresses.
8. Now another step here is to configure the RIP routing in the configuration of each Router. Put the network addresses of all the other connections in the topology.
9. Pass the file from one PC from a Router to another PC of another Router and check if the file is getting successfully transferred.
10. It may take some time for the connection to be established, therefore if it shows failure, wait for a while or recheck your configuration.

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OUTPUT AND FINDINGS:

- Topology Using

Hub: Topology:



Configuration:

The screenshot shows the configuration window for PC0. The 'Desktop' tab is selected, and the 'IP Configuration' section is expanded. The 'Interface' is set to 'FastEthernet0'. The 'IP Configuration' section shows 'Static' selected, with the following settings:

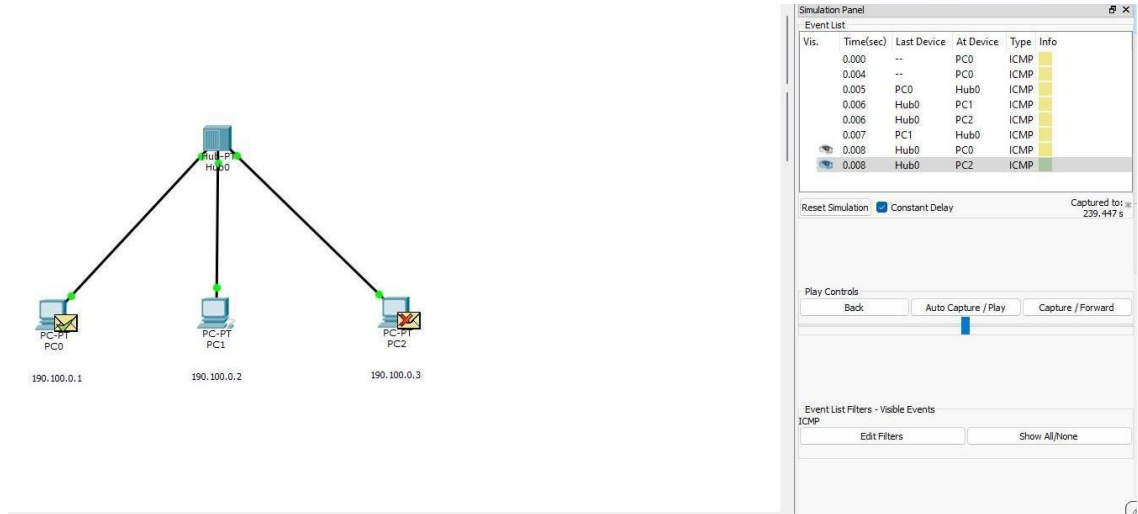
Field	Value
IP4 Address	190.100.0.1
Subnet Mask	255.255.0.0
Default Gateway	
DNS Server	

The 'IPv6 Configuration' section shows 'Static' selected, with the following settings:

Field	Value
IPv6 Address	
Link Local Address	FE80::201:97FF:FEC7:AC8C
Default Gateway	
DNS Server	

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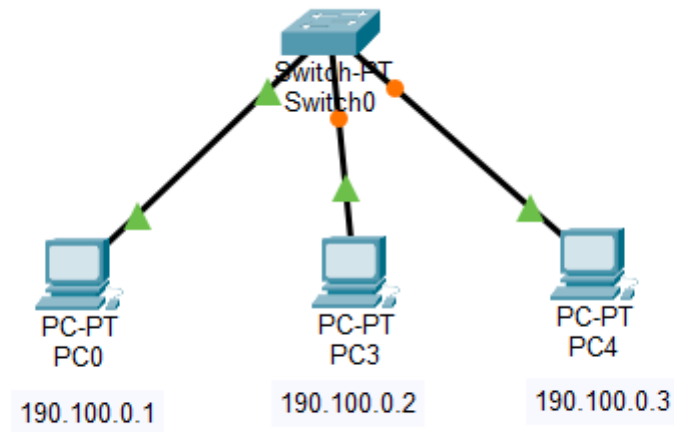
File Transfer:



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- Topology Using

Switch: Topology:

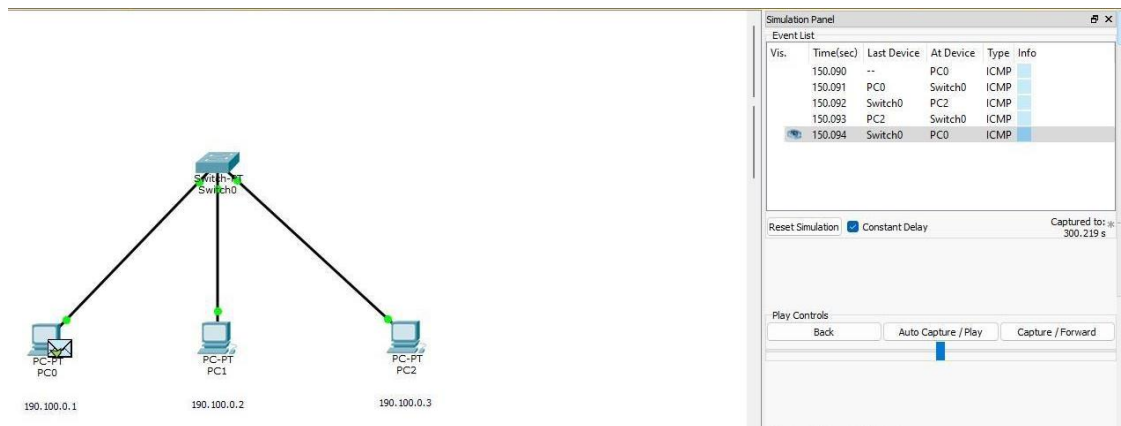


Configuration:

The screenshot shows the configuration window for PC0 in a network simulator. The window has tabs for Physical, Config, Desktop, Programming, and Attributes. The 'Config' tab is active, and the 'IP Configuration' section is expanded. The 'Interface' is set to 'FastEthernet0'. The 'IP Configuration' section shows the 'Static' radio button selected. The 'IPv4 Address' is set to 190.100.0.1, the 'Subnet Mask' is 255.255.0.0, the 'Default Gateway' is 0.0.0.0, and the 'DNS Server' is 0.0.0.0. The 'IPv6 Configuration' section shows the 'Static' radio button selected. The 'IPv6 Address' is empty, the 'Link Local Address' is FE80::201:97FF:FEC7:AC8C, the 'Default Gateway' is empty, and the 'DNS Server' is empty. The '802.1X' section shows the 'Use 802.1X Security' checkbox unchecked, the 'Authentication' dropdown set to MD5, and the 'Authentication Key' field empty. The 'Top' checkbox is also unchecked.

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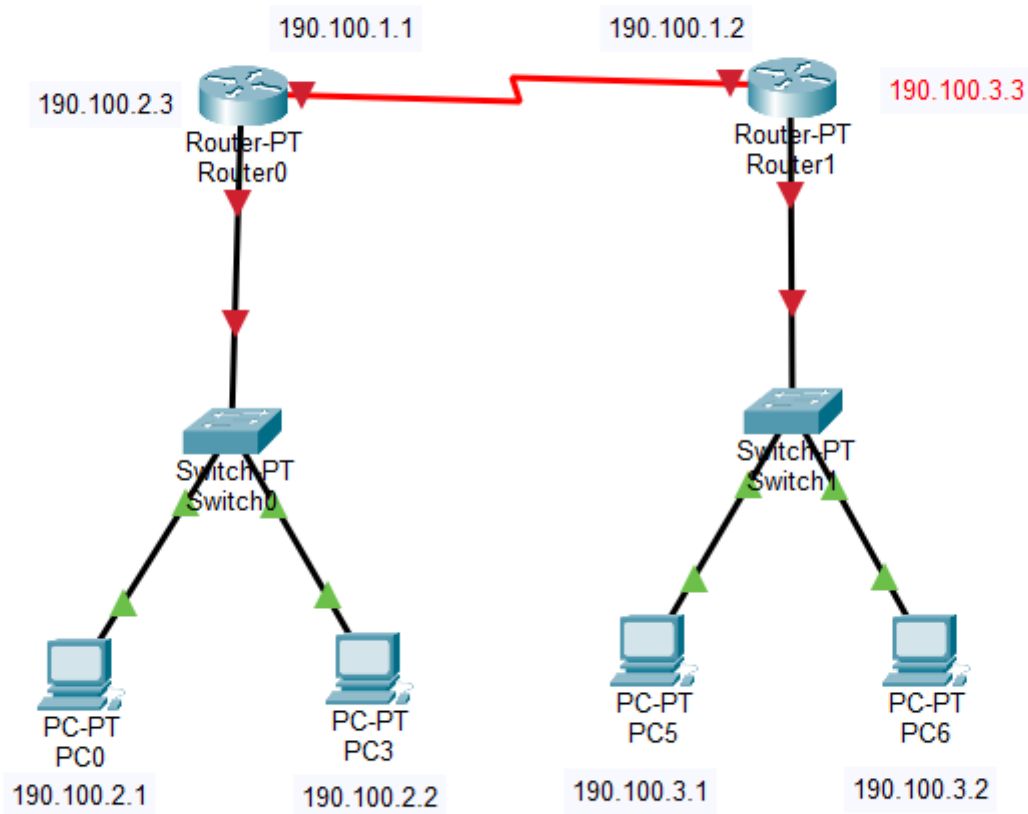
File Transfer:



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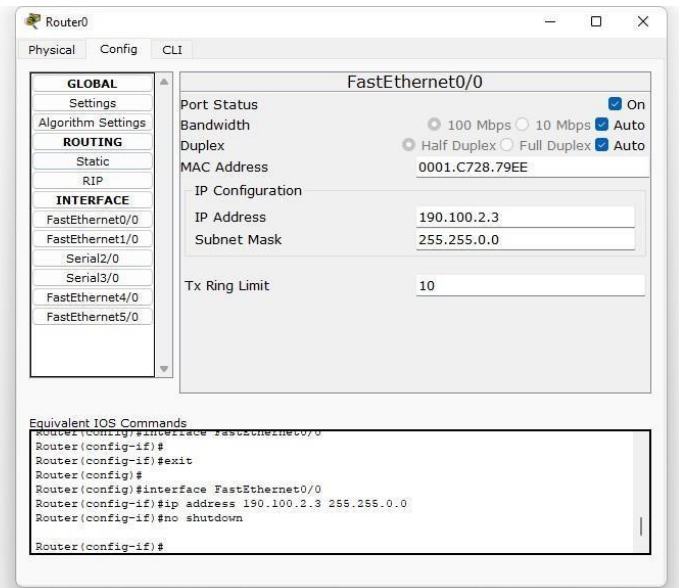
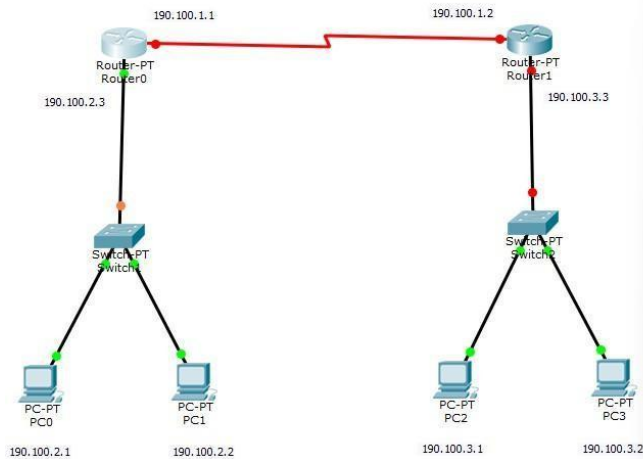
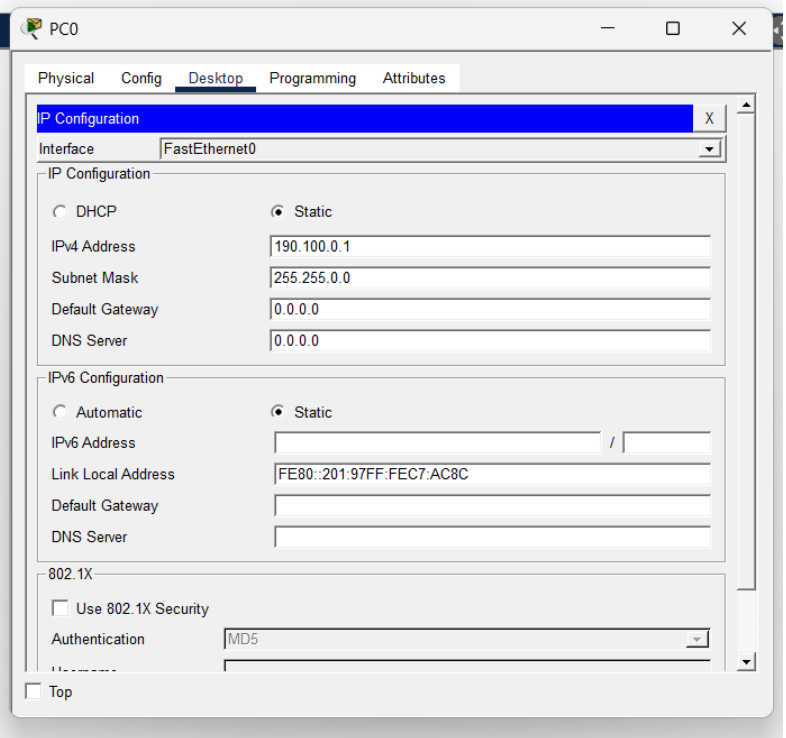
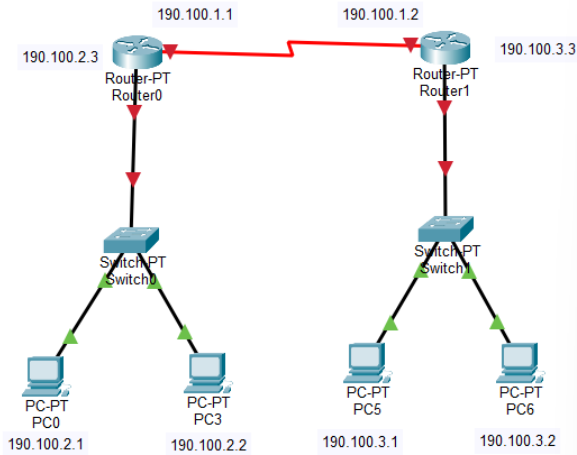
- Static

Routing: Topology:

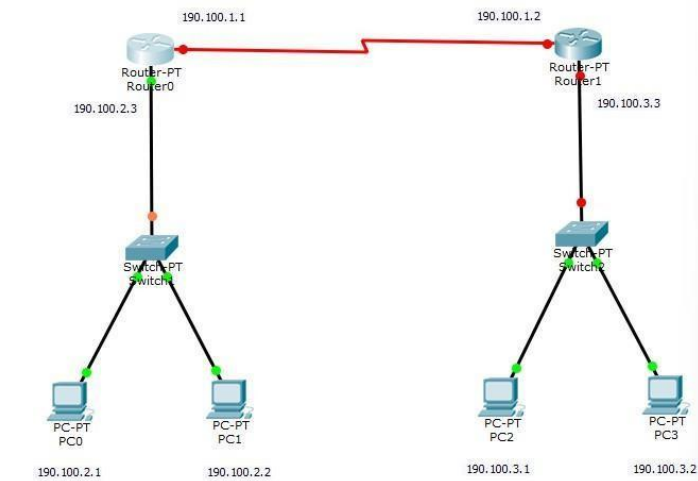


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Configuration:



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Router0

Physical Config CLI

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

INTERFACE

FastEthernet0/0

FastEthernet1/0

Serial2/0

Serial3/0

FastEthernet4/0

FastEthernet5/0

Serial2/0

Port Status ☒ On

Duplex ☐ Full Duplex

Clock Rate Not Set

IP Configuration

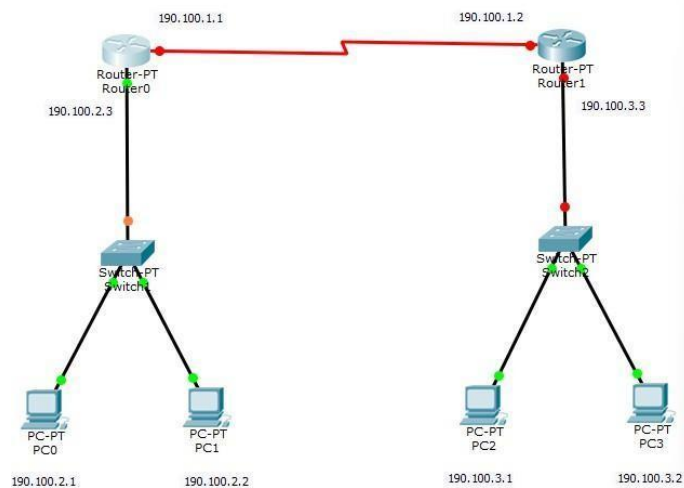
IP Address 190.100.1.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Equivalent IOS Commands

```
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#ip route 190.100.3.0 255.255.255.0 190.100.1.2
Router(config)#
Router(config)#interface Serial2/0
Router(config-if)#
```



Router0

Physical Config CLI

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

INTERFACE

FastEthernet0/0

FastEthernet1/0

Serial2/0

Serial3/0

FastEthernet4/0

FastEthernet5/0

Static Routes

Network 190.100.3.0

Mask 255.255.255.0

Next Hop 190.100.1.2

Add

Network Address

190.100.3.0/24 via 190.100.1.2

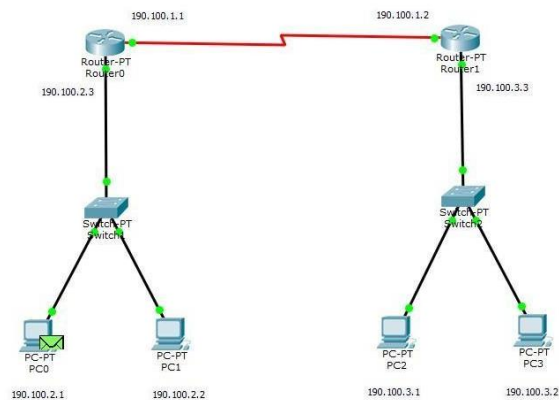
Remove

Equivalent IOS Commands

```
Router(config-if)#
Router(config-if)#exit
Router(config)#ip route 190.100.3.0 255.255.255.0 190.100.1.2
Router(config)#
Router(config)#interface Serial2/0
Router(config-if)#
Router(config-if)#exit
Router(config)#
```

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File Transfer:



Simulation Panel

Vis.	Time(sec)	Last Device	At Device	Type	Info
	0.002	Switch1	Router0	ICMP	
	0.003	Router0	Router1	ICMP	
	0.004	Router1	Switch2	ICMP	
	0.005	Switch2	PC2	ICMP	
	0.006	PC2	Switch2	ICMP	
	0.007	Switch2	Router1	ICMP	
	0.008	Router1	Router0	ICMP	
	0.009	Router0	Switch1	ICMP	
	0.010	Switch1	PC0	ICMP	

Reset Simulation ☒ Constant Delay Captured to: 0.010 s

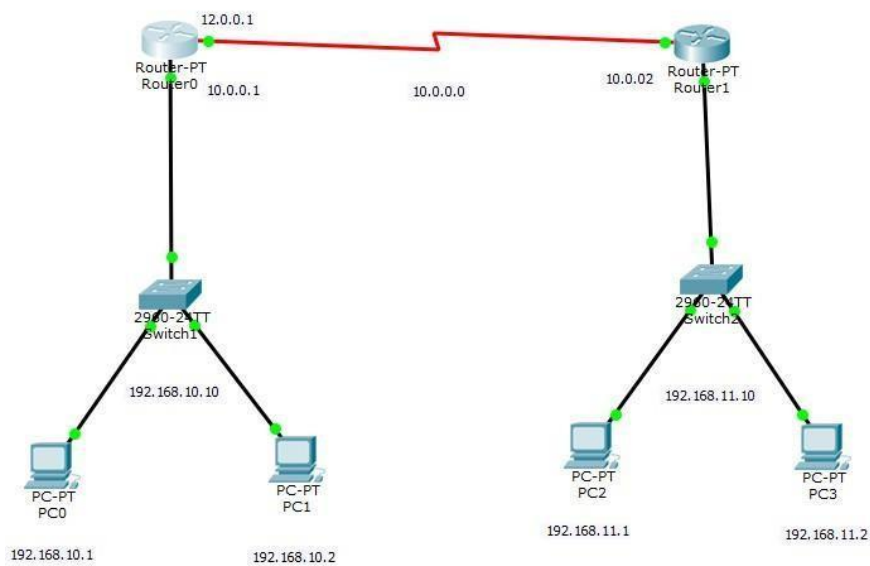
Play Controls: Back Auto Capture / Play Capture / Forward

Event List Filters - Visible Events: ICMP Edit Filters Show All/None

- Dynamic Routing:

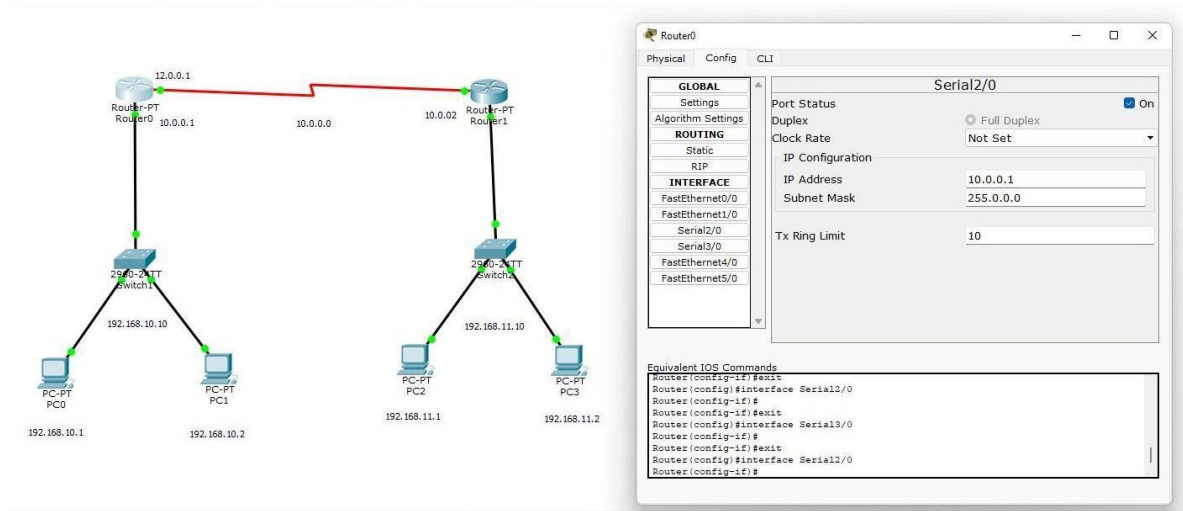
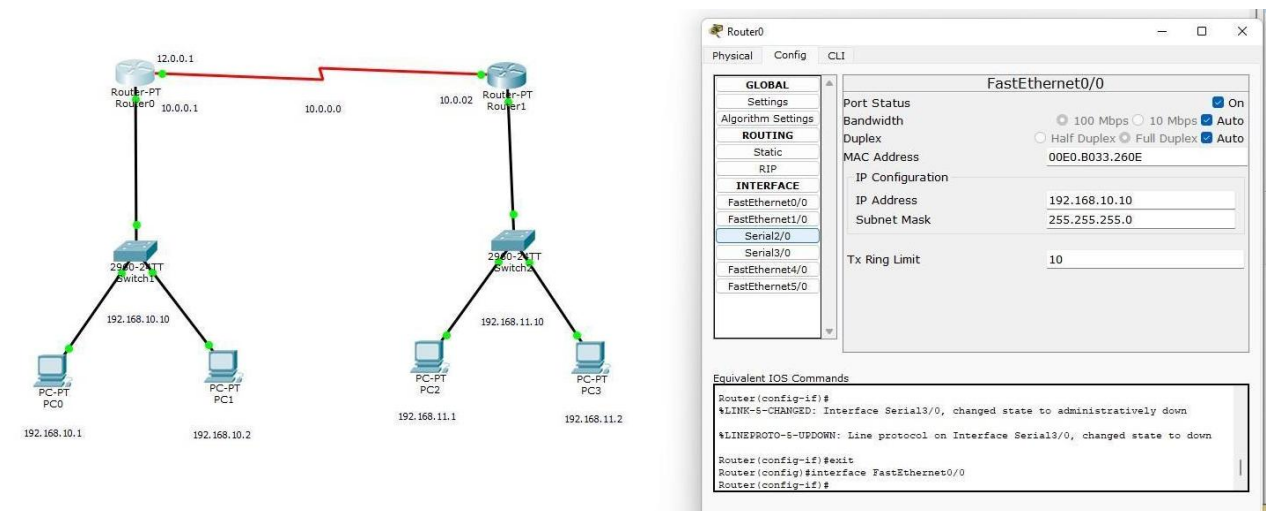
For Two Routers:

Topology:

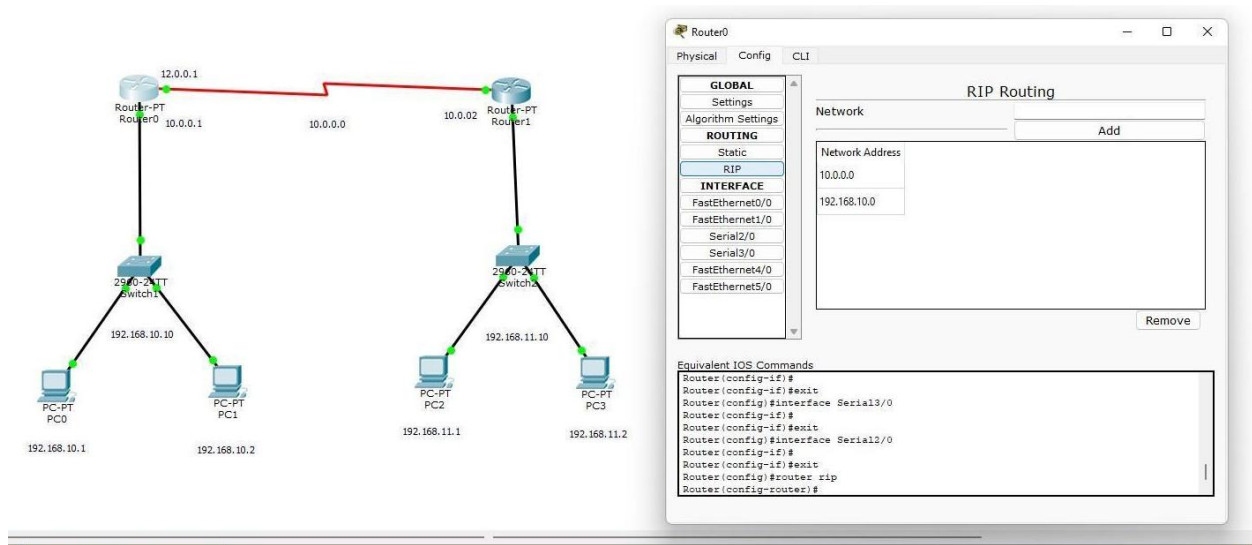


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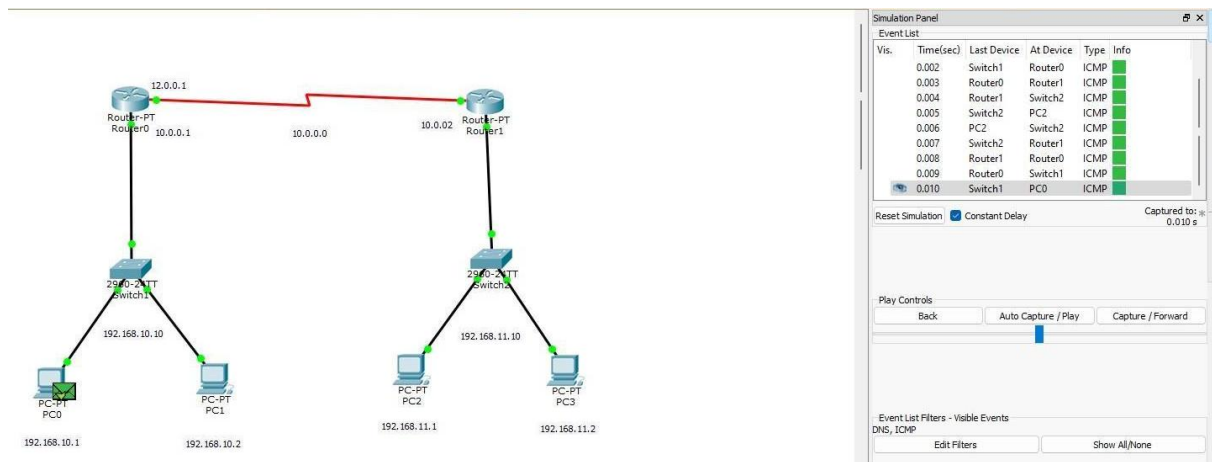
Configuration:



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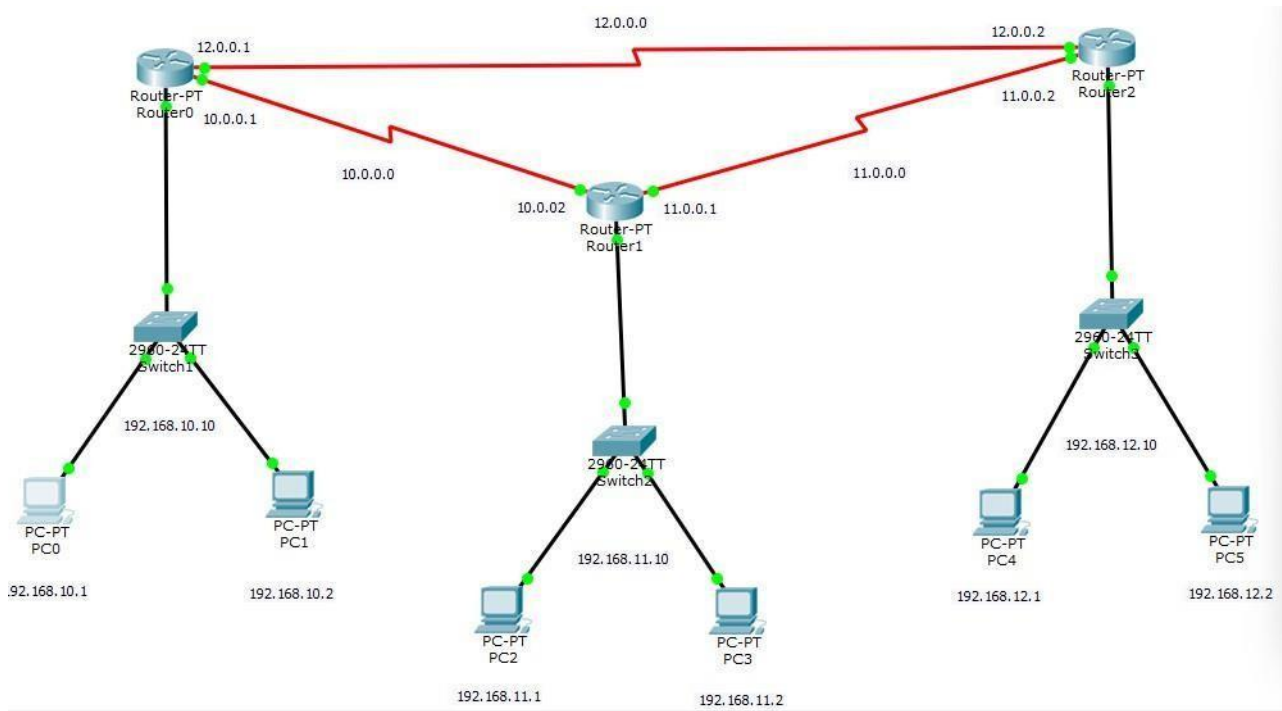
File Transfer:



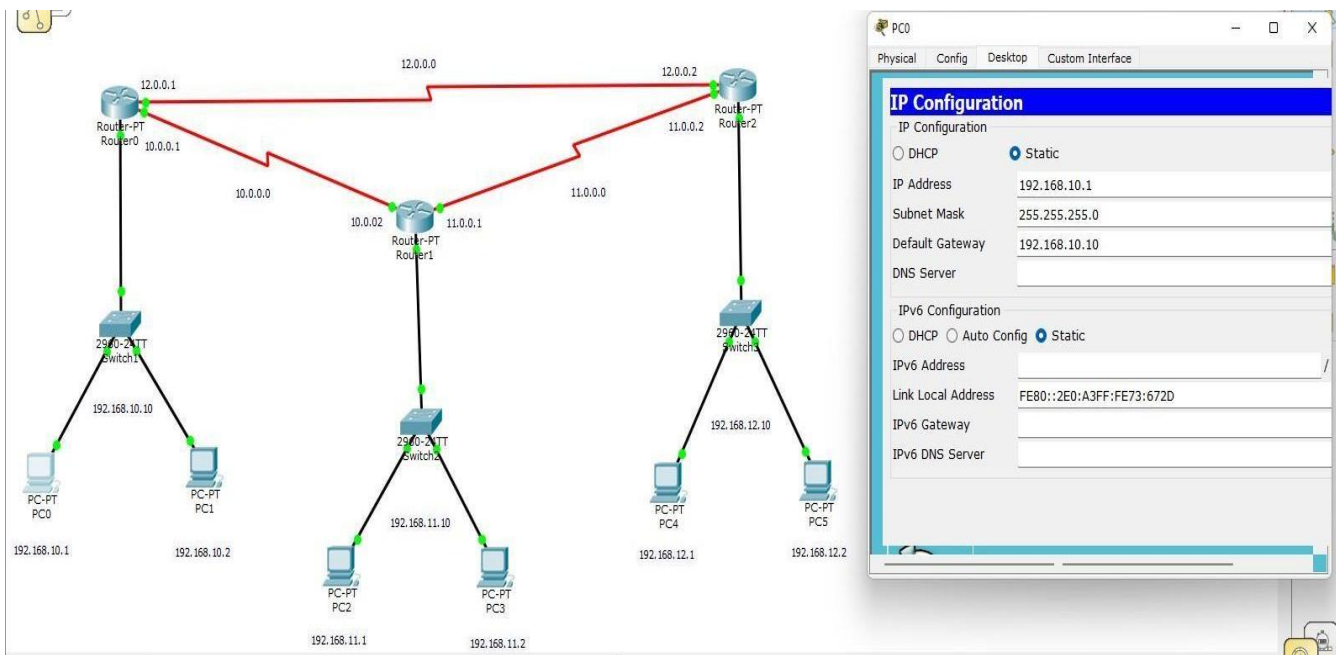
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For Three Routers:

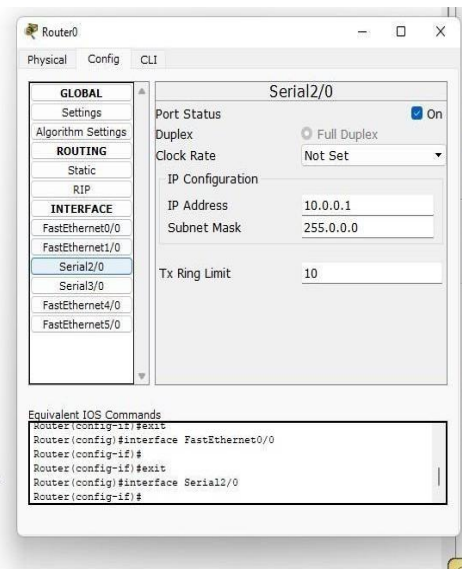
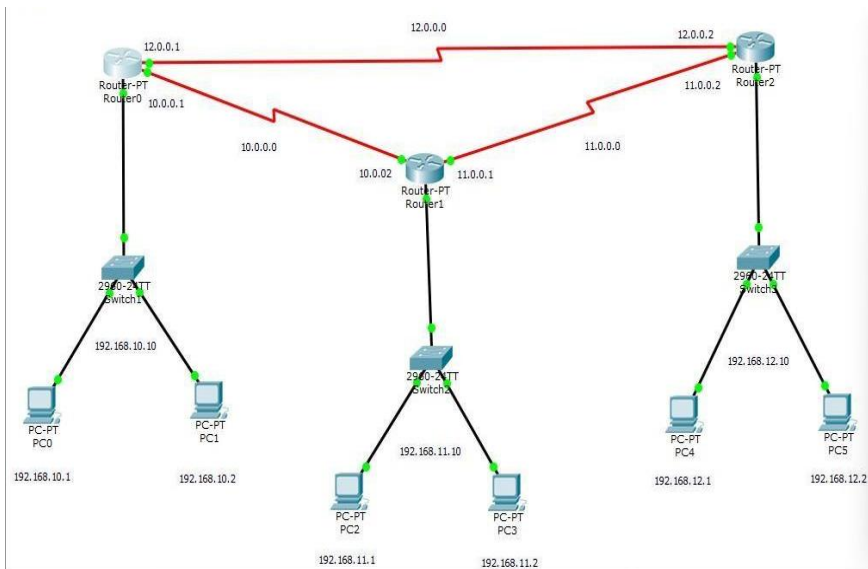
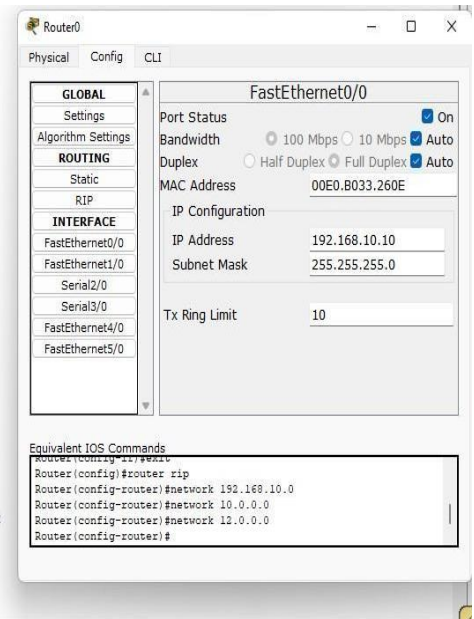
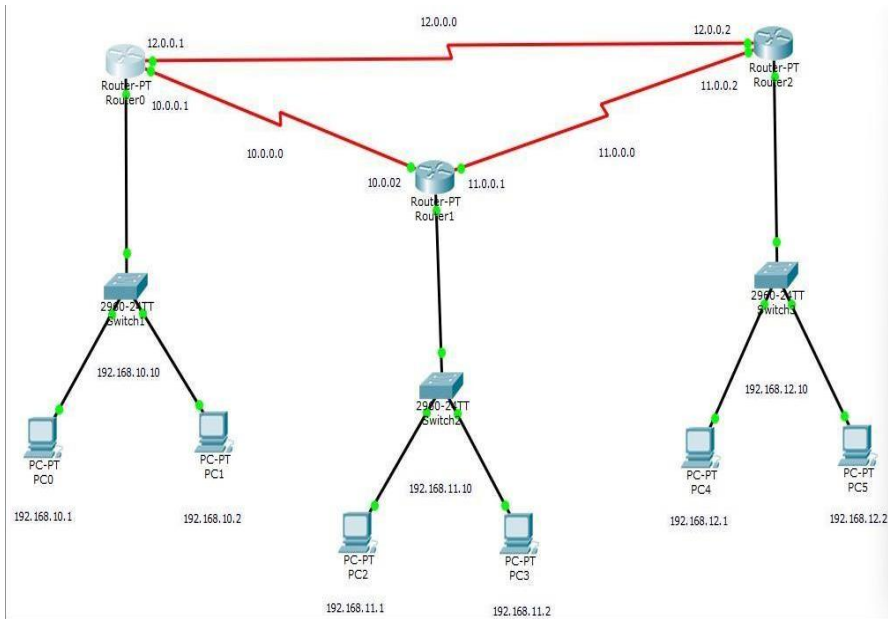
Topology:



Configuration:

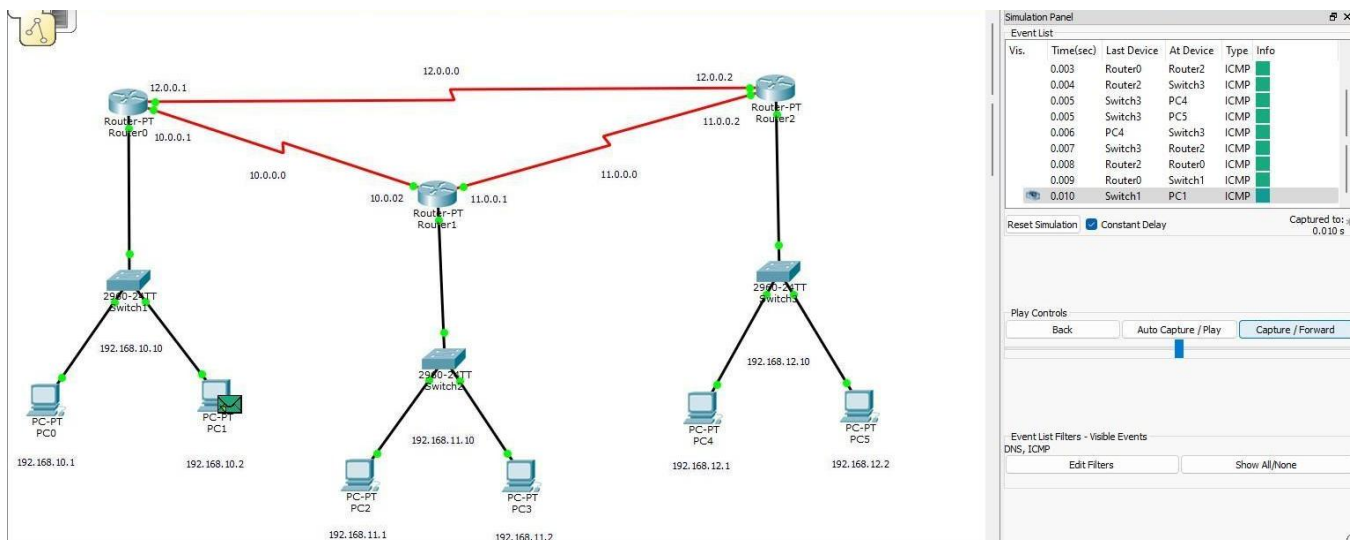
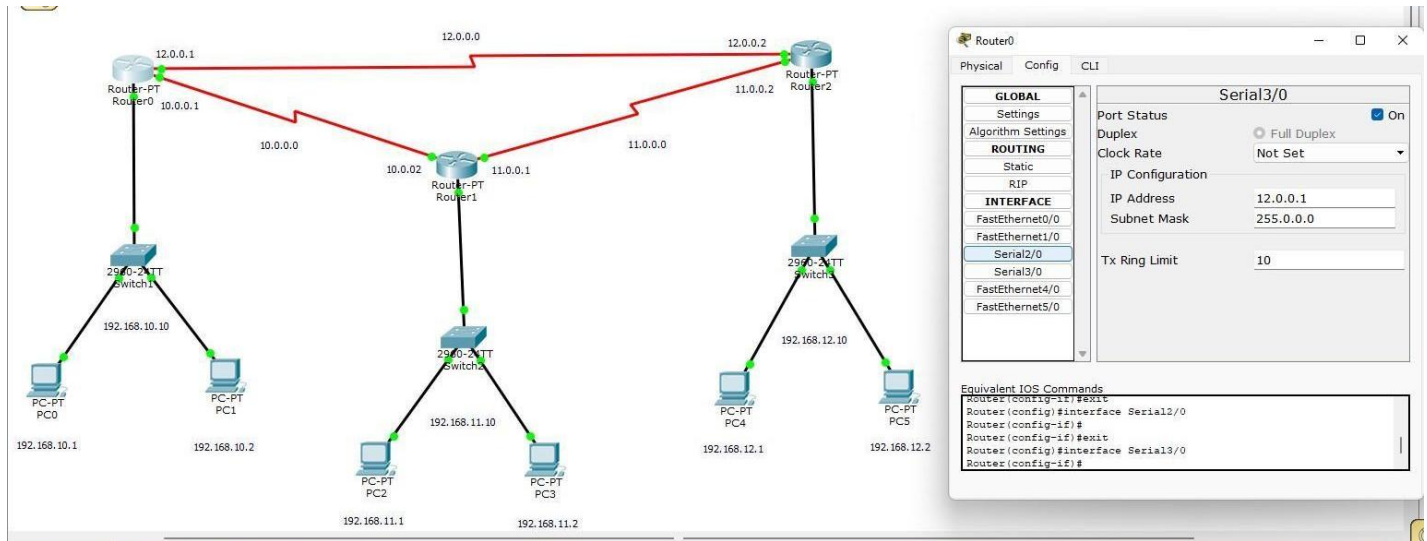


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File Transfer:



CONCLUSION: Thus, we have successfully studied and designed an environment for switch, hub, static routing and dynamic routing in Cisco Packet Tracer.