LAB 5: Configuration of Static Routes and Default Routes

❖ Objectives

1. To learn how static routing and default routing are used for manually selecting the path that packets follow in a network.
2. To design and configure a network in Cisco Packet Tracer where multiple networks communicate using static and default routes, allowing observation of packet transmission between networks.

❖ Software and Hardware Requirements

1. Cisco Packet Tracer (Version 6.2 or later)
2. A Windows computer or laptop

❖ Theory

1. Static Routing

Static routing refers to the manual configuration of routing information in a router's routing table. In this method, the network administrator specifies the exact path that packets should follow to reach a particular destination network.

Operation:
The route is configured using the command:

ip route [destination_network] [subnet_mask] [next_hop_address]

The router forwards packets according to this manually defined path. If the network topology changes or a link fails, the administrator must manually modify the routing entries.

Applications:
Static routing is suitable for small or stable networks where the structure rarely changes. It is also useful when administrators want tighter control over routing for security purposes.

2. Default Routing

Default routing is a special form of static routing used when the router does not have a specific route to a destination network. In such cases, packets are sent to a predefined next-hop router known as the **gateway of last resort**.

Operation:
It is configured with the command:

ip route 0.0.0.0 0.0.0.0 [next_hop_address]

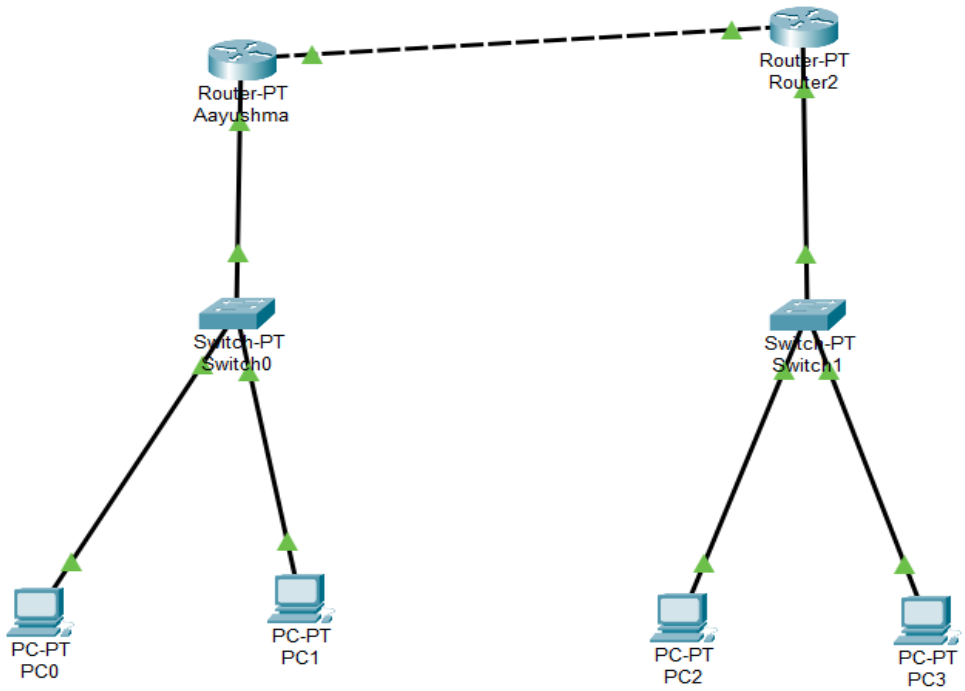
This command instructs the router to forward all unknown traffic to the specified neighboring router.

Applications:
Default routing is commonly used in networks that have only one path to external networks (stub networks) or when connecting a local network to an Internet Service Provider (ISP). It also helps reduce the number of entries in the routing table.

❖ Implementation:

The network setup includes two routers named **Aayushma** and **Router2**, connected through a serial connection. On the first side, **Switch0** connects **PC0** and **PC1** to the **Aayushma** router, forming the first local network. On the other side, **Switch1** connects **PC2** and **PC3** to **Router2**, creating the second network. These two networks communicate with each other through static and default routing configured on the routers.

Figure of Network Topology:



Configuration Table:

Device	Interface	IPv4 Address	Subnet Mask	Default Gateway
Aayushma (Router)	FastEthernet0/0	192.168.1.1	255.255.255.0	N/A
Aayushma (Router)	FastEthernet0/1	10.0.0.1	255.0.0.0	N/A
Router2	FastEthernet0/0	192.168.2.1	255.255.255.0	N/A
Router2	FastEthernet0/1	10.0.0.2	255.0.0.0	N/A
PC0	FastEthernet0	192.168.1.2	255.255.255.0	192.168.1.1
PC1	FastEthernet0	192.168.1.3	255.255.255.0	192.168.1.1
PC2	FastEthernet0	192.168.2.2	255.255.255.0	192.168.2.1
PC3	FastEthernet0	192.168.2.3	255.255.255.0	192.168.2.1

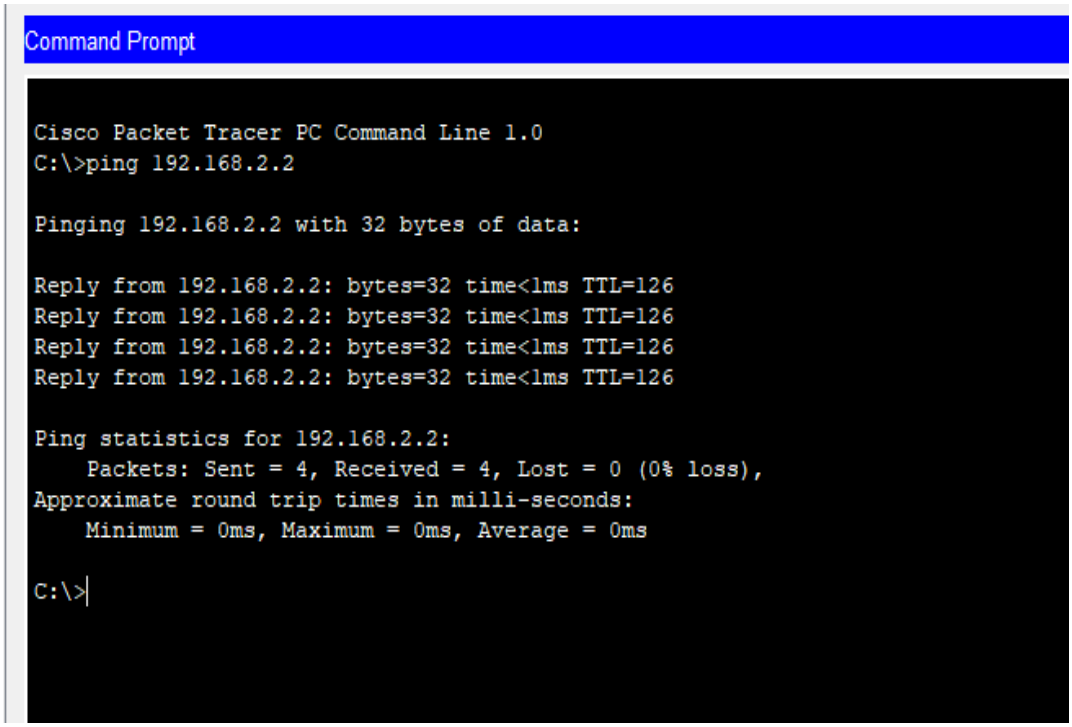
Routing Configuration:

Device	Routing Type	Command / Route
Router Aayushma	Static Route	ip route 192.168.2.0 255.255.255.0 10.0.0.2
Router2	Static Route	ip route 192.168.1.0 255.255.255.0 10.0.0.1
Router Aayushma	Default Route (Alternative)	ip route 0.0.0.0 0.0.0.0 10.0.0.2

❖ Result:

The network configuration was completed successfully. To confirm proper connectivity, a ping test was performed from **PC0 (192.168.1.2)** in the first network to **PC2 (192.168.2.2)** in the second network. The ping replies were received without any packet loss, indicating that communication between the two networks was functioning correctly. This result verified that the configured static route was working as intended. A similar connectivity test was also conducted to validate the default route configuration, and it was found to operate successfully as well.

Output:



❖ Discussion and Conclusion

In this lab, we configured static routes and default routes to understand how routers forward packets between different networks. Static routing allowed us to manually define the exact path that data packets should follow, giving better administrative control over network traffic. This method is especially useful in small and stable networks where the topology does not change frequently. We also configured a default route, which acts as a gateway of last resort and forwards packets whose destination is not found in the routing table. This helped simplify routing management and reduced the size of the routing table. After configuration, successful communication between the two networks confirmed that the routing setup was correct. The practical implementation in Cisco Packet Tracer improved our understanding of manual routing techniques. Overall, the lab provided valuable hands-on experience in configuring and verifying static and default routing.