

LAB 5

Configuration of Static Routes and Default Routes

OBJECTIVES

- To enable communication between separate local area networks (LANs) by manually configuring routes across a network consisting of at least two routers.
- To understand how a router handles a static route by checking the next-hop IP address in its routing table.

THEORY

Routing refers to the method of forwarding data packets from a source device to a destination device across a network. A router functions similarly to a postal service system, it receives incoming packets, examines their destination IP address, and then consults its routing table to determine the appropriate path for forwarding them.

Static Routing

Static routing is a routing technique in which the network administrator manually specifies routes in the router's routing table. Unlike dynamic routing, these routes remain fixed and do not automatically adapt to changes in network topology.

Routing Command:

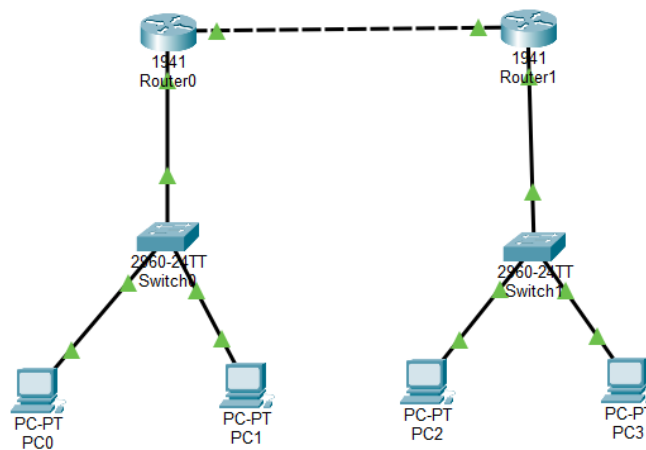
In Cisco routers, static routes are configured using the following command syntax:

Router(config)# ip route <destination network> <subnet mask> <next-hop IP>

Key Characteristics:

- **Efficient Resource Usage:** Static routing does not require routing updates to be exchanged between routers, which means it uses no network bandwidth and very minimal CPU and memory resources.
- **Improved Security:** Since routing information is not advertised to other routers, it is more difficult for unauthorized users to introduce false routing information into the network.

Network Topology



Configuration

For PCs:

Device	IPv4 Address	Subnet Mask	Default Gateway
PC0	192.168.1.2	255.255.255.0	192.168.1.1
PC1	192.168.1.3	255.255.255.0	192.168.1.1
PC2	192.168.2.2	255.255.255.0	192.168.2.1
PC3	192.168.2.3	255.255.255.0	192.168.2.1

For routers:

Device	IPv4 Address	Subnet Mask	Next Hop	Interface	Default Gateway
Router 1	192.168.2.0	255.255.255.0	10.0.0.2	G0/0	10.0.0.1
				G0/1	192.168.1.1
Router 2	192.168.1.0	255.255.255.0	10.0.0.1	G0/0	10.0.0.2
				G0/1	192.168.2.1

OBSERVATION

```
C:\>ping 192.168.2.2

Pinging 192.168.2.2 with 32 bytes of data:

Reply from 192.168.2.2: bytes=32 time<1ms TTL=126
Reply from 192.168.2.2: bytes=32 time<1ms TTL=126
Reply from 192.168.2.2: bytes=32 time<1ms TTL=126
Reply from 192.168.2.2: bytes=32 time<1ms TTL=126

Ping statistics for 192.168.2.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Default Routing

A default route is a special form of static routing that is used when a router receives a packet destined for a network that is not listed in its routing table.

Quad-Zero Route: The default route is identified by the network address 0.0.0.0 with a subnet mask of 0.0.0.0.

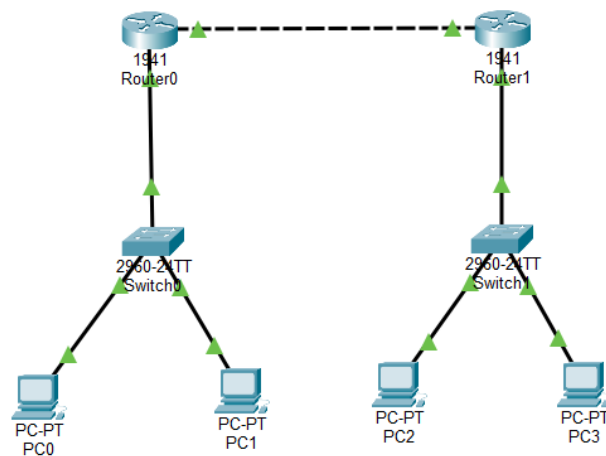
Command Syntax:

```
ip route 0.0.0.0 0.0.0.0 <next-hop IP>
```

Usage:

Default routing is commonly applied on edge routers or routers that have a single exit point to an Internet Service Provider (ISP). Instead of maintaining thousands of routing entries, the router forwards all unknown traffic to the specified next-hop address.

Network Topology



Configuration

For PCs:

Device	IPv4 Address	Subnet Mask	Default Gateway
PC0	192.168.1.2	255.255.255.0	192.168.1.1
PC1	192.168.1.3	255.255.255.0	192.168.1.1
PC2	192.168.2.2	255.255.255.0	192.168.2.1
PC3	192.168.2.3	255.255.255.0	192.168.2.1

For Routers:

Device	Destination Network	Subnet Mask	Next Hop
Router 1	0.0.0.0	0.0.0.0	10.0.0.2
Router 2	0.0.0.0	0.0.0.0	10.0.0.1

OBSERVATION

```
C:\>ping 192.168.2.3

Pinging 192.168.2.3 with 32 bytes of data:

Reply from 192.168.2.3: bytes=32 time<1ms TTL=126
Reply from 192.168.2.3: bytes=32 time<1ms TTL=126
Reply from 192.168.2.3: bytes=32 time<1ms TTL=126
Reply from 192.168.2.3: bytes=32 time<1ms TTL=126

Ping statistics for 192.168.2.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

RESULT

Static Routing

After configuring static routes using the ip route command, successful communication was achieved between the two LANs. Router 1 was configured with a route to the 192.168.2.0 network, while Router 2 was configured with a route to the 192.168.1.0 network. Connectivity was confirmed by performing a ping from a host in the 192.168.1.0 network to the device with IP address 192.168.2.2. Although some initial packet loss occurred, the communication was eventually successful.

Default Routing

When the default (quad-zero) route was configured on both routers, all packets destined for unknown networks were forwarded to the appropriate next-hop IP addresses. Router 1 forwarded traffic to 10.0.0.2, and Router 2 forwarded traffic to 10.0.0.1. Successful ping results verified that default routing was functioning correctly.

DISCUSSION

In this experiment, static routing was implemented by manually configuring routes on each router to establish communication between different LANs. Initially, devices in separate networks were unable to communicate due to the absence of routing information. Once the required static routes were added, the devices were able to exchange data successfully. One

key advantage observed was that static routing does not consume bandwidth since no routing updates are exchanged.

Additionally, default routing was implemented as an alternative approach. This method proved to be simpler and more efficient, especially for networks with a single exit path. Terminal-based commands were used to configure the default routes. Although some packet loss was noticed during the initial ping attempts, all packets were successfully transmitted afterward.

CONCLUSION

This laboratory experiment effectively demonstrated the configuration and operation of static routing and default routing using Cisco Packet Tracer. Both routing methods successfully enabled communication between separate LANs and provided a clear understanding of how routers forward packets based on routing table entries.