

Lab 5 : Configuration of Static Routes and Default Routes

Objectives :

- To establish communication between different Local Area Networks (LANs) by manually configuring static routes between routers.
- To understand how a router forwards packets by consulting the routing table and selecting the appropriate next-hop IP address.

Theory :

Routing is the process of forwarding data packets from a source network to a destination network through intermediate devices called routers. A router examines the destination IP address of each packet and consults its routing table to determine the best path for forwarding the packet.

Static Routing :

Static routing is a routing technique in which routes are manually configured by a network administrator. These routes remain fixed unless they are manually modified or removed.

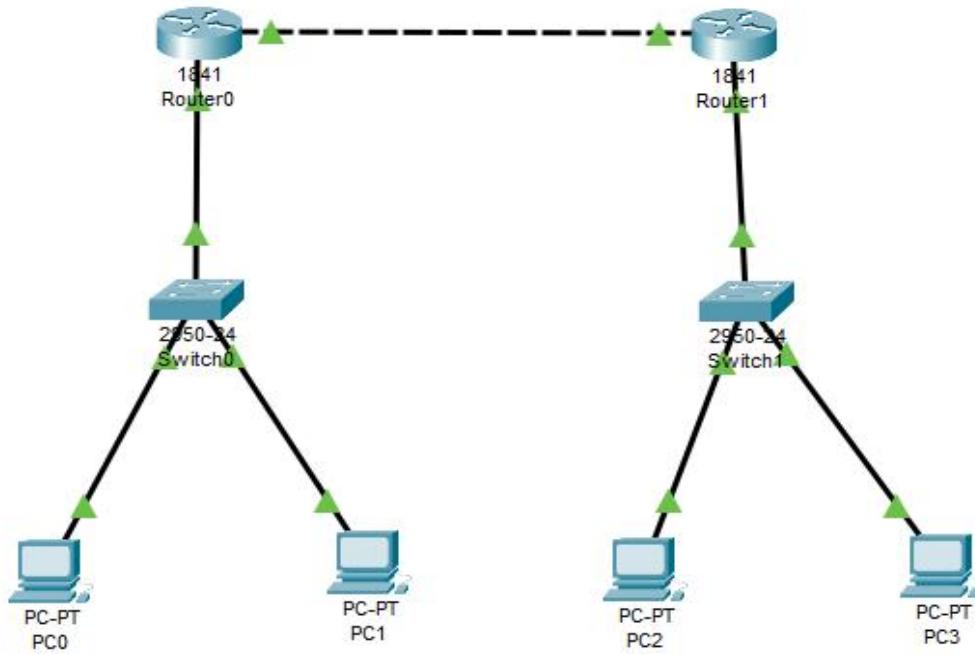
Cisco Static Route Command Syntax:

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

Key Characteristics:

- Resource Efficiency: Because there are no routing updates being exchanged between routers, static routing consumes zero bandwidth and very little CPU/RAM.
- Predictability: The administrator has complete control over routing paths.
- Security: Since routes aren't advertised, an attacker cannot "inject" a fake route into your network easily.

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	Ethernet Cable	Default Gateway
Router 1	192.168.2.0	255.255.255.0	10.0.0.2	gig 0/0	10.0.0.1
				gig 0/1	192.168.1.1
Router 2	192.168.1.0	255.255.255.0	10.0.0.1	gig 0/0	10.0.0.2
				gig 0/1	192.168.2.1

Observation :

```
Pinging 192.168.2.2 with 32 bytes of data:  
  
Request timed out.  
Request timed out.  
Reply from 192.168.2.2: bytes=32 time=12ms TTL=126  
Reply from 192.168.2.2: bytes=32 time=13ms TTL=126  
  
Ping statistics for 192.168.2.2:  
    Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),  
    Approximate round trip times in milli-seconds:  
        Minimum = 12ms, Maximum = 13ms, Average = 12ms  
  
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=12ms 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 = 12ms, Average = 3ms  
  
C:\>
```

Default Routing :

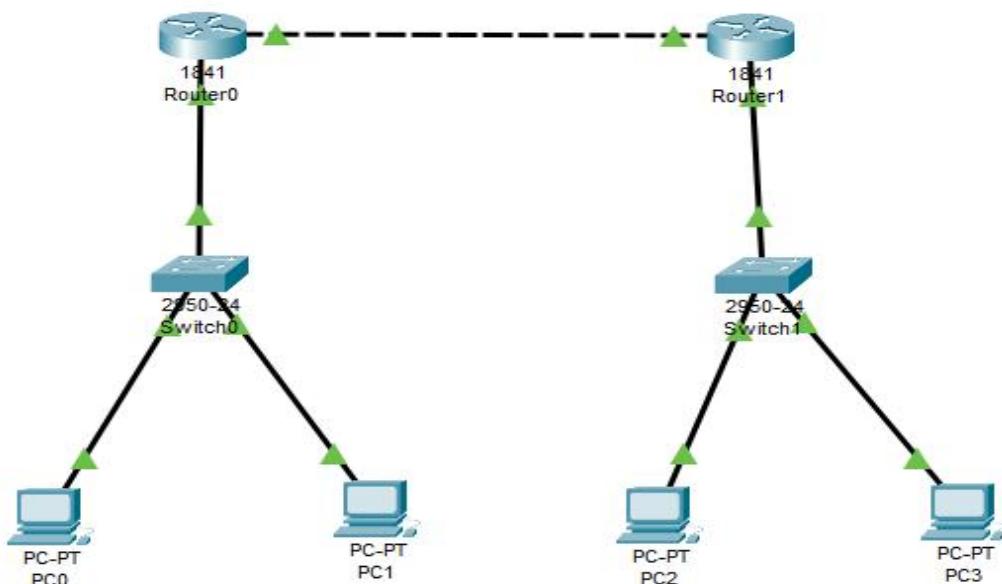
Definition: A default route is a special type of static route used when a router receives a packet for a destination that is not explicitly listed in its routing table.

Quad-Zero Route Syntax:

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

Default routing is commonly used on routers with a single exit path, such as those connected to an ISP.

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 :

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.2.3

Pinging 192.168.2.3 with 32 bytes of data:

Request timed out.
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 = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Result :

Static routing successfully enabled communication between different LANs by explicitly defining routes. Default routing further simplified the configuration by forwarding all unknown traffic through a single route. In both cases, connectivity was verified through successful ping operations.

Discussion :

This lab demonstrated the importance of routing in inter-network communication. Static routing allowed precise control over packet forwarding while conserving bandwidth. Default routing reduced routing table complexity and provided an efficient method for handling unspecified destinations. Minor packet loss observed initially was due to address resolution and was resolved automatically.

Conclusion :

The lab successfully demonstrated the configuration and operation of static and default routing using Cisco Packet Tracer. Both routing techniques proved effective in establishing reliable communication between separate LANs and are suitable for small-scale and controlled network environments.