Computer Network

LAB No: 4

Static Routing & Default Route

Objectives:

- To be familiar with Static Routing and its configuration
- To be familiar with default route and its configuration
- To be familiar with route aggregation

Environmental Setup:

- Network simulation tool: Packet Tracer

Theory:

Routing involves directing data packets from a source to a destination through a network. Routers use routing tables and algorithms to determine the best path for data transmission. There are two main types of routing:

1. Static Routing:

   This type of routing are manually configured by network administrators and provides fixed routes to network destinations. Simplicity and security are some advantages of the static routing while its scalability for larger networks and requiring manual updates are its disadvantages.

2. Dynamic Routing:

   These routing techniques learn and update by routers using routing protocols such as OSPF and BGP. It has scalability, adaptability to network changes while it is complex and possesses potential security risks if not properly managed.

Task Performed and Observations:

1. **Activity A:**

   After constructing the network topology as mentioned in the lab sheet all the devices had their host name and passwords configured along. The routes of the network were configured with the mentioned IP addresses and subnet mask. Then all the devices had their subnet mask, ip addresses and default gateway configured.

   Then the ping command was used between the devices and routers in the network but they couldn't communicate with each other. Inorder to solve this issue the routers had their static route for each destinations configured individually. The ping command now was operational or the destinations were alive. And the tracert command displayed the route taken from the source to the destination and it searched for all the possible routes to find the 2.2.2.2 but was unsuccessful.

2. **Activity B:**

   All the static routes configured in activity A were removed using ‘no ip route’ command and the route entities were minimized by using the default route in each router. And the connection between different PCs were tested using the ping command which worked well.

   Then the tracert command gave the route to reach the destination from the source and could not figure out the trace for the unknown address 2.2.2.2.

3. **Activity C:**

   After creating the network topology in the packet tracer, the IP Address and subnet mask of the given computers were assigned and then the hostname and passwords were configured. Then the Interfaces of Routers were configured as directed in the lab sheet.

   The show Ip route command in the routers presented the interface connection configuration of those routers. The ping command showed the live destination for the devices in the local area network and displayed request time out for the ping to another LAN across routers.

Now the default gateway of each of the computers were assigned respectively. The Network 1 and Network 2 that are connected to the same router had the communication going on smoothly but the network 3 was said to be unreachable.

To solve this problem, router0 configured the static route for the destination network as Network 3. And from there router1 was configured to have static route for destination network of Network 1 and Network 2

Now there was a seamless communication between all three networks. The communication was smooth even after altering the static route for the destination network as an aggregation to use a single entry for the route.

Exercise:

1. How does a sending host know whether the destination computer is on the same network or on a different network? Explain.

The sending host uses the subnet mask and the destination IP address to determine if the destination is on the same network or a different network.

2. Explain, how the data is forwarded from sending host in each of the following cases:

a. When the destination computer is within the same network

The data is sent directly to the destination computer using the MAC address.

b. When the destination computer is on the different network

The data is sent to the default gateway, which then forwards it to the appropriate network.

3. What is routing? Discuss static routing and configuration of static routing in a router with its syntax briefly.

Routing is the process of selecting paths in a network along which to send network traffic. Static routing involves manually entering routes, while dynamic routing uses protocols to discover and maintain routes.

`ip route <Destination_Network> <Subnet_Mask> <next_hop_address>

4. What information can we get from the routing table? How can we observe the routing table of a router? Explain.

   The routing table contains network routes, including the destination network, subnet mask, next-hop IP address, and interface. It can be viewed using the ‘ show ip route ‘ command.

5. What is a default route? What is its importance? State the default route configuration command with its syntax.

   A default route is used when no specific route for a destination exists. It ensures packets are forwarded to a default gateway, typically leading to an Internet connection.

   ‘ ip route 0.0.0.0 0.0.0.0 <next-hop-address or outgoing interface>

Conclusion:

This lab exercise helped us get hands-on experience with static and default route configurations, reinforcing the theoretical concepts of routing in computer networks. Through various activities and exercises, the practical understanding of the routing behavior, configuration, and network management was enhanced.