Implementation Of Static Routing In Cisco – 3 Router Connections

Objective

The objective of this lab is to demonstrate the implementation of static routing on Cisco routers to enable communication between different subnets connected through a linear topology of three routers.

Theory

Static routing is a type of routing where the network administrator manually configures the routing entries in the routing table of each router. In static routing, the router maintains a table that maps destination networks to the appropriate next-hop IP addresses or interfaces. This approach is suitable for small networks with relatively stable topologies, as manual intervention is required to update the routing table whenever there are network changes.

Connections:

The network topology consists of the following components:

- Routers:
  3 Cisco routers (Router1, Router2, and Router3)

- Switches:
  3 switches (Switch1, Switch2, and Switch3)

- End Devices:
  6 laptops (Laptop0, Laptop1, Laptop2, Laptop3, Laptop4, and Laptop5)

Interconnections

Router

- Router1, Router2, and Router3 are connected in a linear fashion through serial links using the fa0/1 interfaces.
- Router1 (fa0/0) is connected to Switch1 with IP address 192.168.10.0/24.
- Router2 (fa0/0) is connected to Switch2 with IP address 192.168.20.0/24.
- Router3 (fa0/0) is connected to Switch3 with IP address 192.168.30.0/24.

End Devices

- Laptop0 (192.168.10.10) and Laptop1 (192.168.10.11) are connected to Switch1.
- Laptop2 (192.168.20.10) and Laptop3 (192.168.20.11) are connected to Switch2.
- Laptop4 (192.168.30.10) and Laptop5 (192.168.30.11) are connected to Switch3.

IP Addressing

Router

- Router1: fa0/1 - 112.1.1.120
- Router2: fa0/1 - 112.1.1.210
- Router3: fa0/1 - 113.1.1.230

Switch

- Switch1: 192.168.10.0/24
- Switch2: 192.168.20.0/24
- Switch3: 192.168.30.0/24

End Devices

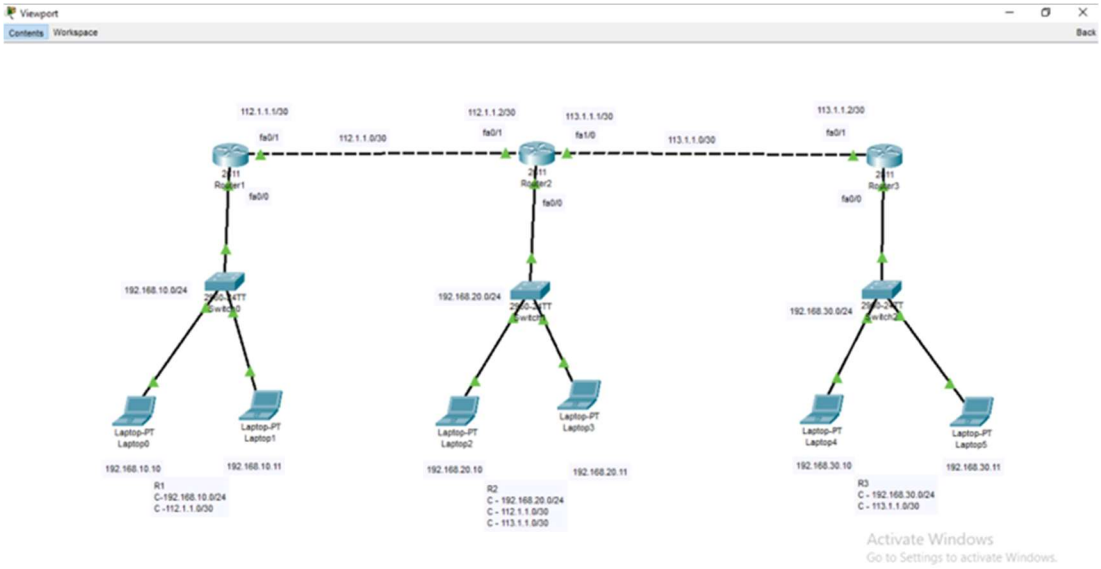
- Laptop0: 192.168.10.10
- Laptop1: 192.168.10.11
- Laptop2: 192.168.20.10
- Laptop3: 192.168.20.11
- Laptop4: 192.168.30.10
- Laptop5: 192.168.30.11

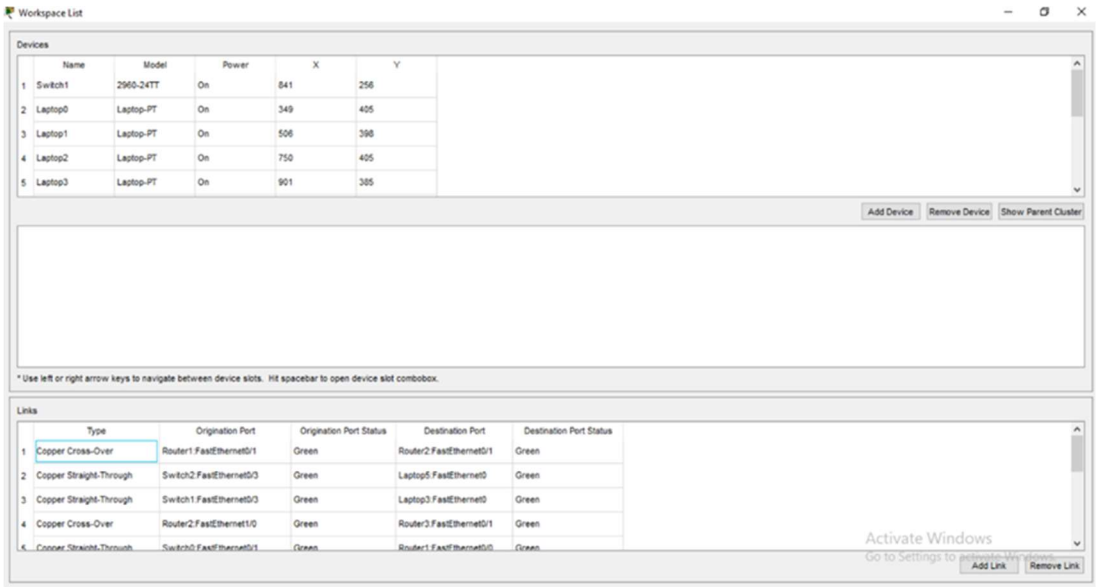
Default Gateways

- Devices in the 192.168.10.0/24 subnet use Router1 (192.168.10.0/24) as the default gateway.
- Devices in the 192.168.20.0/24 subnet use Router2 (192.168.20.0/24) as the default gateway.
- -Devices in the 192.168.30.0/24 subnet use Router3 (192.168.30.0/24) as the default gateway.

LAN Interfaces:

- Router1: fa0/0 (192.168.10.0/24)
- Router2: fa0/0 (192.168.20.0/24)
- Router3: fa0/0 (192.168.30.0/24)





CLI Command

Router R1 configuration:
Router>enable Router#conf t Router(config)#hostname R1 R1(config)#interface fastEthernet 0/0 R1(config-if)#ip address 192.168.10.100 255.255.255.0 R1(config-if)#no shutdown R1(config-if)#exit R1(config)#interface fastEthernet 0/1 R1(config-if)#ip address 112.1.1.1 255.255.255.252 R1(config-if)#no shut R1(config-if)#^Z R1#wr Building configuration... [OK]

Router R2 configuration
Router>en Router#conf t Router(config)#hostname R2 R2(config)#interface fa0/1 R2(config-if)#ip add 112.1.1.2 255.255.255.252 R2(config-if)#no shut R2(config-if)#exit R2(config)#interface fa0/0 R2(config-if)#ip add 192.168.20.100 255.255.255.0 R2(config-if)#no shut R2(config-if)#exit R2(config)#int fa1/0 R2(config-if)#ip add 113.1.1.1 255.255.255.252 R2(config-if)#no shut R2(config-if)#exit R2(config)#^Z R2#wr Building configuration... [OK] R2# %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up

Router R3 configuration

```
Router>en
Router#conf t
Router(config)#hostname R3
R3(config)#int fa0/1
R3(config-if)#ip add 113.1.1.2 255.255.255.252
R3(config-if)#no shut
R3(config-if)#exit
R3(config)#int fa0/0
R3(config-if)#ip add 192.168.30.100 255.255.255.0
R3(config-if)#no shut
R3(config-if)#^Z
R3#wr
Building configuration...
[OK]
R3#
```

To config static routing for Router R1:

```
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#ip route 192.168.20.0 255.255.255.0 112.1.1.2
R1(config)#ip route 192.168.30.0 255.255.255.0 112.1.1.2
R1(config)#ip route 113.1.1.0 255.255.255.252 112.1.1.2
R1(config)#^Z
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#wr
Building configuration...
[OK]
R1#
```

To config static routing for Router R2:

```
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#
R2(config)#ip route 192.168.10.0 255.255.255.0 112.1.1.1
R2(config)#ip route 192.168.30.0 255.255.255.0 113.1.1.2
R2(config)#^Z
R2#
%SYS-5-CONFIG_I: Configured from console by console

R2#wr
Building configuration...
[OK]
R2#
```

To config static routing for Router R3:

```
R3>
R3>en
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#ip route 192.168.10.0 255.255.255.0 113.1.1.1
R3(config)#ip route 192.168.20.0 255.255.255.0 113.1.1.1
R3(config)#ip route 112.1.1.0 255.255.255.252 113.1.1.1
R3(config)#^Z
R3#
%SYS-5-CONFIG_I: Configured from console by console

R3#wr
Building configuration...
[OK]
```

Output

After configuring the static routes on each router, we can verify the routing table using the "show ip route" command. The output will display the configured static routes along with the directly connected networks.

Router1

```
R1>en
R1#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     112.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       112.1.1.0/30 is directly connected, FastEthernet0/1
L       112.1.1.1/32 is directly connected, FastEthernet0/1
     113.0.0.0/30 is subnetted, 1 subnets
S       113.1.1.0/30 [1/0] via 112.1.1.2
     192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.10.0/24 is directly connected, FastEthernet0/0
L       192.168.10.100/32 is directly connected, FastEthernet0/0
S    192.168.20.0/24 [1/0] via 112.1.1.2
S    192.168.30.0/24 [1/0] via 112.1.1.2

R1#
```

Router2

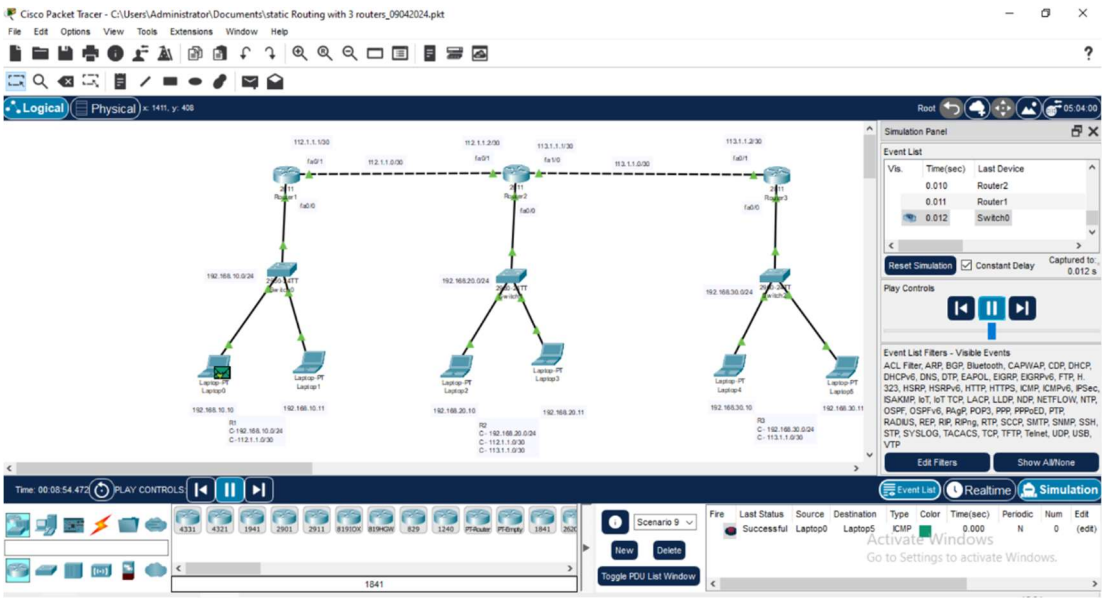
```
R2#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     112.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       112.1.1.0/30 is directly connected, FastEthernet0/1
L       112.1.1.2/32 is directly connected, FastEthernet0/1
     113.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       113.1.1.0/30 is directly connected, FastEthernet1/0
L       113.1.1.1/32 is directly connected, FastEthernet1/0
S    192.168.10.0/24 [1/0] via 112.1.1.1
     192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.20.0/24 is directly connected, FastEthernet0/0
L       192.168.20.100/32 is directly connected, FastEthernet0/0
S    192.168.30.0/24 [1/0] via 113.1.1.2

R2#
```

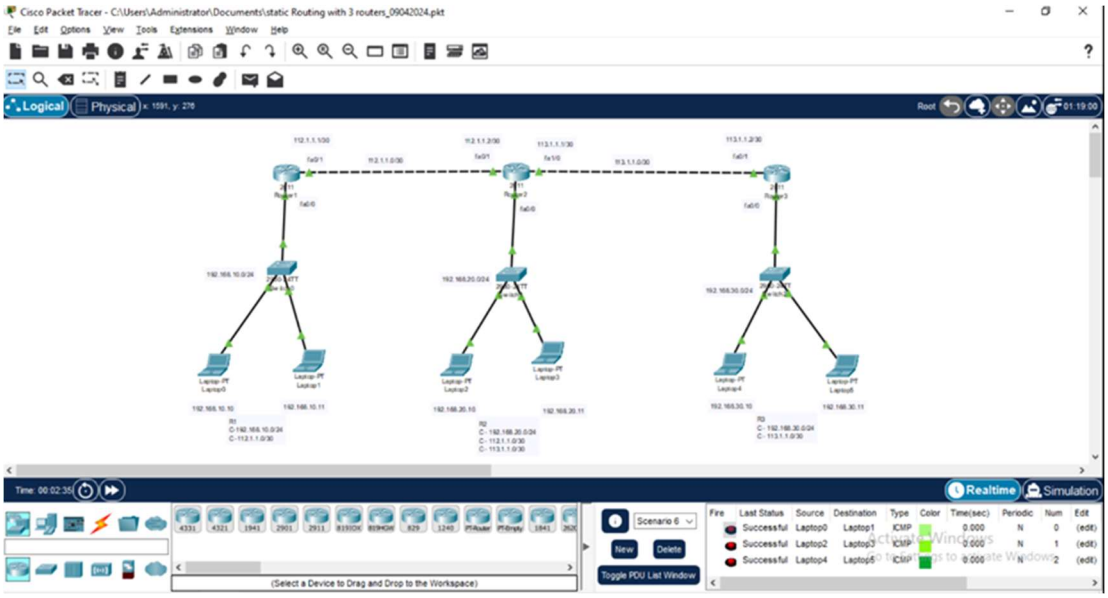
Router3

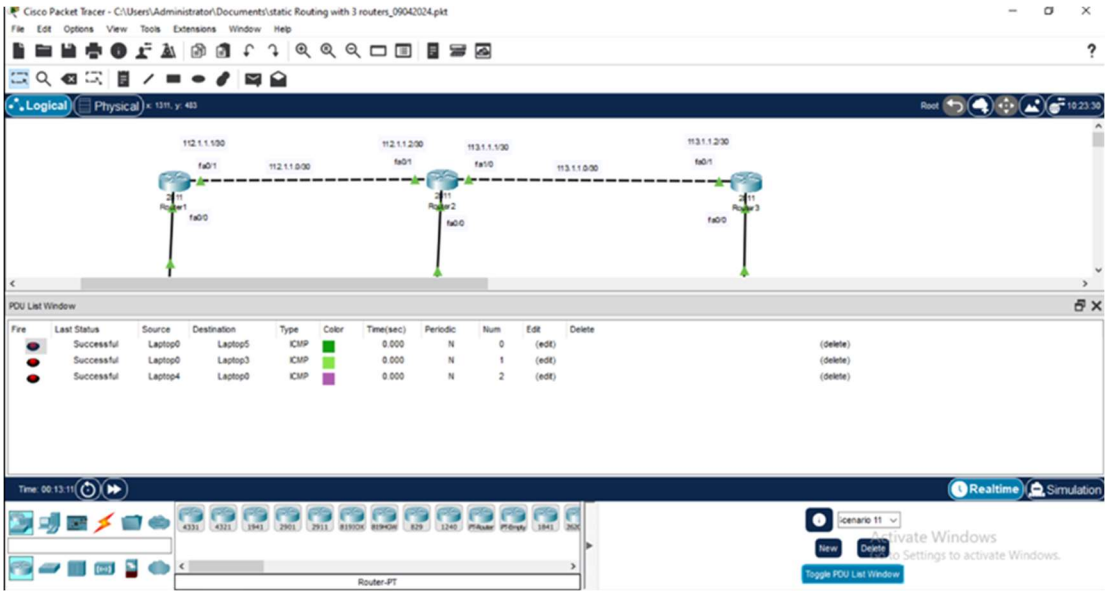
```
R3>en
R3#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     112.0.0.0/30 is subnetted, 1 subnets
S       112.1.1.0/30 [1/0] via 113.1.1.1
     113.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       113.1.1.0/30 is directly connected, FastEthernet0/1
L       113.1.1.2/32 is directly connected, FastEthernet0/1
S    192.168.10.0/24 [1/0] via 113.1.1.1
S    192.168.20.0/24 [1/0] via 113.1.1.1
     192.168.30.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.30.0/24 is directly connected, FastEthernet0/0
L       192.168.30.100/32 is directly connected, FastEthernet0/0

R3#
```

Simulation

successfully simulated the static routing implementation with 3 routers using Cisco Packet Tracer, as seen in the provided screenshot. The simulation environment visually represents the network topology, allowing to configure devices, establish connections, and test network functionality.







Conclusion:

By implementing static routing on the Cisco routers, communication between the different subnets is enabled, allowing devices in one subnet to communicate with devices in other subnets through the appropriate next-hop routers. Static routing is a simple and effective solution for small networks with stable topologies, but it may not be suitable for large or dynamic networks where routing protocols like OSPF or EIGRP are preferred for their scalability and automatic route updates.