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Lab - 9: Hardware Router Configurations

Computer Networks

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Lab 9: Hardware Router Configurations

Objectives:

- To be familiar with Hardware Router Connections and Configurations

Requirements:

- Hardware routers and PCs
- Connecting cables: straight-through cable/ crossover cable and Console Cable

Theory:

Configuring an Interface

Steps to Configure an Ethernet/Serial Interface:

1. Enter interface configuration mode: User EXEC mode ⇒ Privileged EXEC ⇒ Global configuration mode ⇒ Interface configuration mode
2. Enter IP address and subnet mask.
3. Set the clock rate if the interface is serial and connected as DCE; otherwise, skip this step.
4. Activate the interface using the no shutdown command.

Exercises:

1. What kind of differences have you experienced during this hardware based lab as compared with simulation based lab? Discuss briefly.

=> During this hardware-based lab, we saw several differences compared to using Packet Tracer for simulations. For starters, setting up simulations was a quick and easy task, clicking through configurations and instantly seeing the results, compared to dealing with actual hardware, where the process took a bit longer. Booting up the hardware, finding the right ports, and physically connecting cables were time-consuming and also tricky.

Simulations come with built-in tutorials and instant feedback, making them great for learning the basics and experimenting without any risk. However, working with real hardware provided hands-on experience that's crucial for understanding the physical aspects of networking. We got to deal with real cables, ports, and devices, teaching us practical troubleshooting skills that were not possible through simulations alone.

Another major issue with real hardware is connection instability. Any disturbance in wiring or connection disruption can result in the loss of all IP configurations on the router, requiring reconfiguration from scratch. In contrast, simulators allow easy saving and recovery of configurations, preventing such issues.

2. Note down the observations of each step with necessary commands used in above activities mentioned above and comment on it.

A. We created the Physical Network as given:

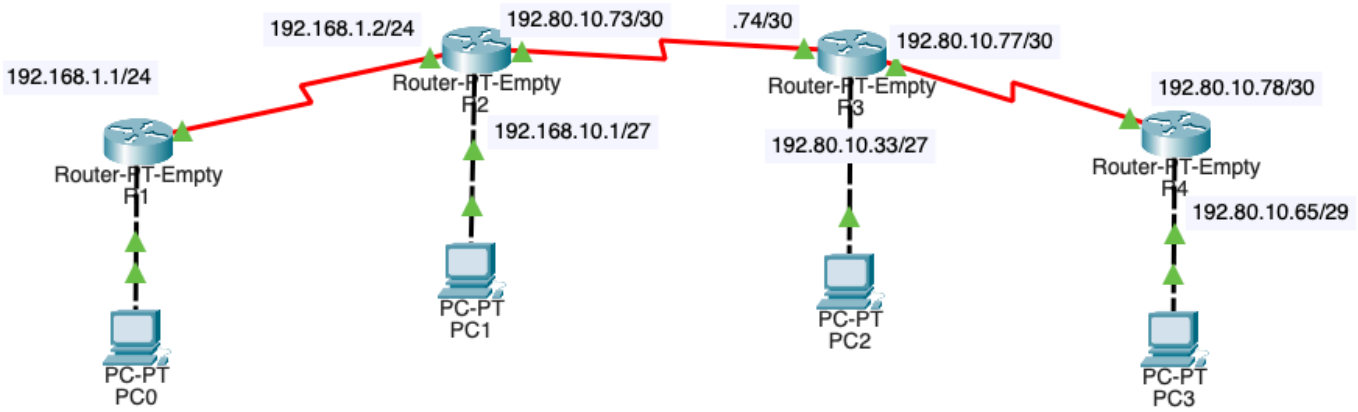

Fig: Visualization of the Physical Network in Packet Tracer

1. Configuration of Router Interfaces:
   - Configuration of different interfaces of all routers with the given IP addresses and subnet masks.
   - Using the no shutdown command to activate the corresponding interface.

Example, on Router4:

Router4> enable
Router4# configure terminal
Router4(config)# interface serial 0
Router4(config-if)# ip address 192.80.10.78 255.255.255.252
Router4(config-if)# clock rate 56000
Router4(config-if)# no shutdown

2. Configuration of Static Routes: Setting up static routes in each router to route data packets from one network to each of the destination networks

Router4> enable
Router4# configure terminal
Router4(config)# ip route 0.0.0.0 0.0.0.0 192.80.10.77

3.Testing the connectivity from one PC to other PCs and to the IP addresses of the routers.
=> After configuring routes in each router, ping from one router to another was successful.

4.Using Traceroute from one PC to other PCs:

Router2# traceroute 192.80.10.78
Tracing the route to 192.80.10.78

1 192.80.10.74 29 msec 4 msec 15 msec
2 192.80.10.78 39 msec 33 msec 28 msec

5.Observing Routing Tables: using the show ip route command.

Router 4:

Router4# show ip route
Codes: C - connected, S - static, I - IGRP, 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
** - candidate default, U - per-user static route, o - ODR*
P - periodic downloaded static route
Gateway of last resort is 192.80.10.78 to network 0.0.0.0
192.80.10.0/30 is subnetted, 1 subnets
C 192.80.10.76 is directly connected, Serial1/0
S 0.0.0.0/0 [1/0] via 192.80.10.78*

Router 3:

Router3# show ip route
Codes: C - connected, S - static, I - IGRP, 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
** - candidate default, U - per-user static route, o - ODR*
P - periodic downloaded static route
Gateway of last resort is 192.80.10.74 to network 0.0.0.0
192.80.10.0/30 is subnetted, 1 subnets
C 192.80.10.72 is directly connected, Serial2/0
C 192.80.10.76 is directly connected, Serial1/0
S 0.0.0.0/0 [1/0] via 192.80.10.74*

Router 2:

Router2# show ip route
Codes: C - connected, S - static, I - IGRP, 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
** - candidate default, U - per-user static route, o - ODR*
P - periodic downloaded static route
Gateway of last resort is 192.80.10.73 to network 0.0.0.0

192.80.10.0/30 is subnetted, 2 subnets
C 192.80.10.72 is directly connected, Serial2/0
C 192.168.1.0 is directly connected, Serial3/0
S 0.0.0.0/0 [1/0] via 192.80.10.73*

Router 1:
Router1# show ip route
Codes: C - connected, S - static, I - IGRP, 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
** - candidate default, U - per-user static route, o - ODR*
P - periodic downloaded static route
Gateway of last resort is 192.168.1.0 to network 0.0.0.0
192.80.10.0/30 is subnetted, 1 subnets
C 192.168.1.0 is directly connected, Serial2/0
S 0.0.0.0/0 [1/0] via 192.168.1.0*

7.Additional Static Routing was configured in each router ensuring connectivity between all networks.

B. Dynamic Routing using RIP:
1. Remove all the static routes and Configure RIP routing(with appropriate version).
=> All the static routes were removed with commands:
Router2> enable
Router2# configure terminal
Router2(config)#no ip route 192.168.96.0 255.255.224 192.168.1.1
Router2(config)# no ip route 0.0.0.0 0.0.0.0 192.80.10.74

To add RIP in each of the routers,
Router2(config)# router rip
Router2(config-router)# version 2
Router2(config-router)# network 192.168.1.0
Router2(config-router)# network 192.168.10.0
Router2(config-router)# network 192.80.10.72
Router2(config-router)# exit
Router2(config)# exit
Router2# write memory

All the routers were configured with RIP version 2 similarly.

2. Observe the Routing table and test the connectivity using ping and traceroute.

Router2# show ip route
Codes: 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
** - candidate default, U - per-user static route, o - ODR*
P - periodic downloaded static route

Gateway of last resort is not set

192.168.0.0/24 is subnetted, 1 subnets
C 192.168.1.0 is directly connected, Serial3/0
192.168.10.0/27 is subnetted, 1 subnets
C 192.168.10.0 is directly connected, FastEthernet0/1
192.80.10.0/30 is subnetted, 1 subnets
C 192.80.10.72 is directly connected, Serial2/0
R 192.168.96.0/24 [120/1] via 192.168.1.1, 00:00:12, FastEthernet0/0
R 192.80.10.76/30 [120/1] via 192.80.10.74, 00:00:12, FastEthernet0/2
R 192.80.10.64/29 [120/2] via 192.80.10.74, 00:00:12, FastEthernet0/2
R 192.168.10.32/27 [120/1] via 192.80.10.74, 00:00:12, FastEthernet0/2

All the pings among network devices were successful, indicating the proper configuration using RIP. Tracing the route from Router2 to PC4,

Router2# traceroute 192.80.10.66
Tracing the route to 192.80.10.66
1 192.80.10.74 26 msec 3 msec 12msec
2 192.80.10.78 28 msec 30 msec 18 msec
3 192.80.10.66 13 msec 23 msec 7 msec

Discussion and Conclusion

In this lab, we explored hardware router configurations, which included setting up different interfaces, configuring static routes, and testing connectivity. The practical exposure to configuring Ethernet and Serial interfaces, as well as the experience of using different cables (straight-through, crossover, and console cables), was invaluable. By following the step-by-step procedure, we established a functional network topology, configured static and dynamic routing protocols, and verified network connectivity using tools like ping and traceroute.