Lab 8

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Assigning Routing

The software that will be used is **Cisco Packet Tracer.**

Introduction

In this laboratory exercise, you will be assigning routing.

1.1. Load lab 3 into Packet Tracer. It should be the configuration shown in Figure 1, with all IP addresses assigned and all interfaces showing green arrows.

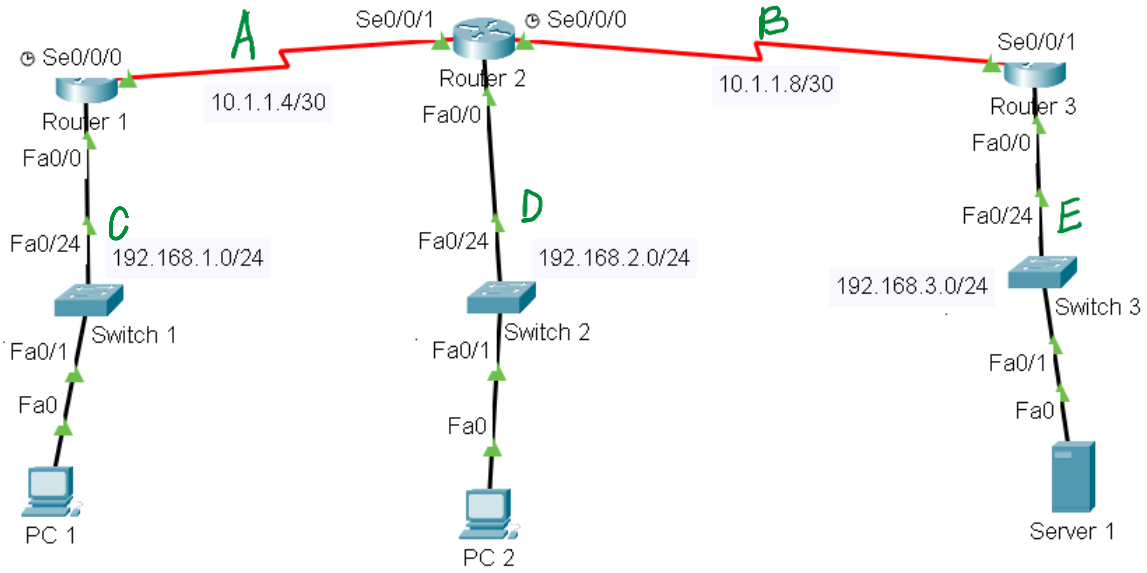


Figure 1: Network Laboratory Topology for IP Assignment

INITIAL TEST BEFORE STATIC ROUTING

Ping	Success (yes/no)
Ping from PC1 to Server 1	no
Ping from PC2 to Server 1	no
Ping from PC1 to PC2	no

Default routes

Default static routes can only be configured on the stub routers. The stub routers are R1 and R3. If there are no routes in the router's routing table, the router will use this route. So, instead of dropping the packet, the packet will be sent out over this specified interface.

The format of the command is: R1(config)#ip route (destination network) (destination mask) (exit interface)

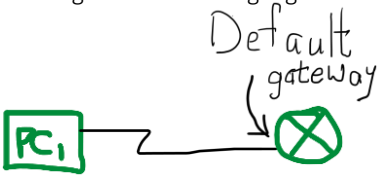
1.1. R1(config)#ip route 0.0.0.0 0.0.0.0 s0/0/0
1.2. R3(config)#ip route 0.0.0.0 0.0.0.0 s0/0/1

1.3. Ensure the above running configs are saved to the Startup file.
1.4. R1#sh ip route
1.5. The above command will show the router's routing table. The static route should be configured.

Field	Meaning
0.0.0.0 0.0.0.0	Destination network = *"any-where"* (all IPv4 prefixes). Mask 0.0.0.0 means *no bits* must match, so this is a **default route**.
s0/0/0	Exit interface. Every packet that doesn't hit a more-specific route gets pushed out on Serial0/0/0.
Administrative Distance	**No administrative distance** specified → IOS uses the default AD = 1, so this static has higher priority than RIP (120) or OSPF (110) but lower than another static where you explicitly set AD 0 (rare).

Static routes

The administrative distance of the route is the believability of the route. The smaller the number, the more believable the route, the more precedence the route has. Static routes have administrative distances of 0 or 1. When dynamic routing is enabled, the static route administrative distance must be changed to something higher than RIP, EIGRP and OSPF



Let's configure PC1 (*use your own IP address values*)

1.6. Select PC1, then the Config tab.
1.7. Select FastEthernet0 and set the Static IP address.
1.8. Then select Settings, and under Gateway/DNS IPv4, set the Default Gateway to the IP address of the R1 interface on the same network as **PC1**.
1.9. Do the same for **PC2** and the **server**.

Now let's configure R1 (*use your own IP address values*)

1.10. R1(config)#ip route *BBB.BBB.BBB.BBB* 255.255.255.252 s0/0/0 150……(datagrams destined for network B)
1.11. R1(config)#ip route *DDD.DDD.DDD.DDD* 255.255.255.0 s0/0/0 150…(datagrams destined for network D)
1.12. R1(config)#ip route *EEE.EEE.EEE.EEE* 255.255.255.0 s0/0/0 150……(datagrams destined for network E)
1.13. R1#copy run start
1.14. R1#sh ip route

> **What is the 150 at the end of the *ip route* command?**
>
> The **administrative distance (AD)** you're assigning to the route. IOS will believe lower-AD routes first, so an AD of 150 makes this a *floating* (backup) static route—one that only appears in the routing table if all competing routes have a worse AD (e.g., RIP's default AD = 120 is *better*, so this static route stays idle until RIP fails).

Configure Static Routes on R2 (*use your own IP address values*)

1.15. R2(config)#ip route CCC.CCC.CCC.CCC 255.255.255.0 s0/0/1 150
1.16. R2(config)#ip route *EEE.EEE.EEE.EEE* 255.255.255.0 s0/0/0 150……(datagrams destined for network B)
1.17. The router is aware of the other networks because they are connected directly to the router.
1.18. R2#copy run start
1.19. R2#sh ip route

Configure Static Routes on R3 (*use your own IP address values*)

1.20. R3(config)#ip route AAA.AAA.AAA.AAA 255.255.255.252 s0/0/1 150
1.21. R3(config)#ip route CCC.CCC.CCC.CCC 255.255.255.0 s0/0/1 150
1.22. R3(config)#ip route DDD.DDD.DDD.DDD 255.255.255.0 s0/0/1 150

1.23. R3#copy run start
1.24. R3#sh ip route

TEST AFTER STATIC ROUTING

Ping	Paste the Ping success output here
Ping from PC1 to Server 1	ping 192.168.1.2 Pinging 192.168.1.2 with 32 bytes of data: Reply from 192.168.1.2: bytes=32 time=2ms TTL=125 Reply from 192.168.1.2: bytes=32 time=2ms TTL=125 Reply from 192.168.1.2: bytes=32 time=13ms TTL=125 Reply from 192.168.1.2: bytes=32 time=2ms TTL=125 Ping statistics for 192.168.1.2: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 2ms, Maximum = 13ms, Average = 4ms
Ping from PC2 to Server 1	ping 192.168.1.2 Pinging 192.168.1.2 with 32 bytes of data: Request timed out. Reply from 192.168.1.2: bytes=32 time=6ms TTL=126 Reply from 192.168.1.2: bytes=32 time=1ms TTL=126 Reply from 192.168.1.2: bytes=32 time=1ms TTL=126

	Ping statistics for 192.168.1.2: Packets: Sent = 4, Received = 3, Lost = 1 (25% loss), Approximate round trip times in milli-seconds: Minimum = 1ms, Maximum = 6ms, Average = 2ms
Ping from PC1 to PC2	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 = 1ms, Maximum = 1ms, Average = 1ms

Some thoughts on default routes.

Default routes can only be configured on the stub routers, R1 and R3, as shown in Figure 1.

Configuring default routes on stub networks is often recommended for several reasons, mainly due to the nature and design of stub networks. Here's a breakdown of why this is beneficial:

1. Simplicity in Routing: Stub networks typically have only one exit path towards the rest of the network. Since there's only one way out, there's no need for a complex routing table with multiple routes. A default route can simplify routing by directing all outbound traffic to a single exit point.

2. Reduced Overhead: Using a default route minimises the amount of routing information that needs to be processed and stored. This reduces the overhead on network devices (like routers), which is particularly beneficial for devices with limited processing power and memory.

3. Ease of Management: Managing a network becomes simpler when fewer routes exist. In a stub network, changes in the network topology outside the stub typically do not require changes to the routing configuration within the stub. A default route pointing to the gateway router suffices.

4. Efficiency in Resource Usage: Default routes help avoid the unnecessary propagation of routing information through the network. This is efficient regarding bandwidth and router CPU resources, as routers do not need to maintain large routing tables or constantly update them through routing protocols.

5. Prevention of Routing Loops: In a stub network, the simplicity of having a single default route also helps prevent routing loops. Since there's only one exit route, the chances of misconfiguration leading to loops are significantly reduced.

In practice, a default route in a stub network might be configured to point to the next-hop router, which takes responsibility for more complex routing decisions to other network parts. This keeps the stub network's routing configuration straightforward and efficient.

How to submit

2.1. Paste the output for the 'sh ip route' command for R1, R2 and R3 here.

```
R1>sh 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
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

10.0.0.0/30 is subnetted, 1 subnets
C 10.0.0.0 is directly connected, Serial0/0/0
S 192.168.1.0/24 [1/0] via 10.0.0.2
S 192.168.2.0/24 [1/0] via 10.0.0.2
C 192.168.10.0/24 is directly connected, FastEthernet0/0

R2>sh 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
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

10.0.0.0/30 is subnetted, 2 subnets
C 10.0.0.0 is directly connected, Serial0/0/0
```

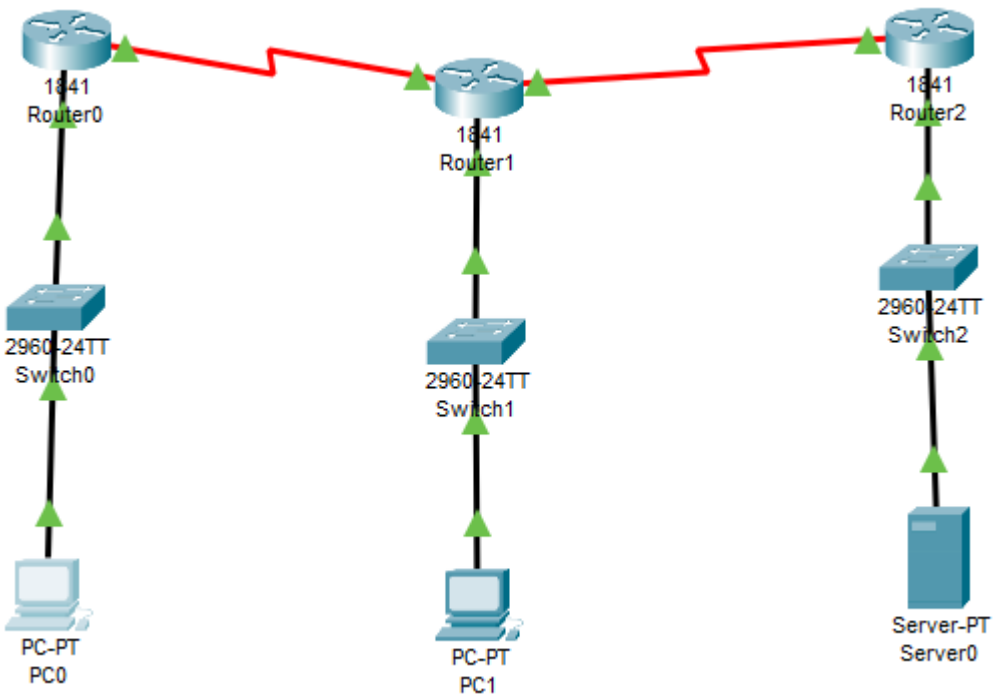
```
        C 10.0.0.4 is directly connected, Serial0/0/1
        S 192.168.1.0/24 [1/0] via 10.0.0.6
        C 192.168.2.0/24 is directly connected, FastEthernet0/0
S 192.168.10.0/24 [1/0] via 10.0.0.1

        R3>sh 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
        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

        10.0.0.0/30 is subnetted, 1 subnets
        C 10.0.0.4 is directly connected, Serial0/0/1
        C 192.168.1.0/24 is directly connected, FastEthernet0/0
        S 192.168.2.0/24 [1/0] via 10.0.0.5
S 192.168.10.0/24 [1/0] via 10.0.0.5
```

2.2. Print the logical topology to the file, then paste the image here.



2.3. For R0, show the output of (sh ip int bri). Paste this output here.

```
        R1>sh ip int bri
```

Interface	IP-Address	OK? Method Status	Protocol
FastEthernet0/0	192.168.10.1	YES manual up	up
FastEthernet0/1	unassigned	YES unset administratively	down down
Serial0/0/0	10.0.0.1	YES manual up	up
Serial0/0/1	unassigned	YES unset administratively	down down
Vlan1	unassigned	YES unset administratively	down down

2.4. For R1, show the output of (sh ip int bri). Paste this output here.

R2>sh ip int bri

Interface	IP-Address	OK? Method Status	Protocol
FastEthernet0/0	192.168.2.1	YES manual up	up
FastEthernet0/1	unassigned	YES unset administratively	down down
Serial0/0/0	10.0.0.2	YES manual up	up
Serial0/0/1	10.0.0.5	YES manual up	up
Vlan1	unassigned	YES unset administratively	down down

2.5. For R2, show the output of (sh ip int bri). Paste this output here.

R3>sh ip int bri

Interface	IP-Address	OK? Method Status	Protocol
FastEthernet0/0	192.168.1.1	YES manual up	up
FastEthernet0/1	unassigned	YES unset administratively	down down
Serial0/0/0	unassigned	YES unset administratively	down down
Serial0/0/1	10.0.0.6	YES manual up	up
Vlan1	unassigned	YES unset administratively	down down

END