

LAB 10

Practice and Exercise

Static Routing



BITS 2343
Computer Network

LAB 10 - Practice

Static Routing

Learning Objectives

Upon completion of this lab, you will be able to:

- Cable a network according to the Topology Diagram.
- Perform basic configuration tasks on a router.
- Configure and activate Serial and Ethernet interfaces.
- Configure a static route using an intermediate address.
- Test and verify configurations.

Scenario

In this activity, use Packet Tracer to create a network that is similar to the one shown in Figure 1. Begin by cabling the network, as shown in Table 1. You will then perform the initial router configurations required for connectivity. Use the IP addresses provided in the Topology Diagram to apply an addressing scheme to the network devices. When the network configuration is complete, examine the routing tables to verify that the network operates appropriately. This lab is a shorter version and assumes you are proficient in basic cabling and configuration file management.

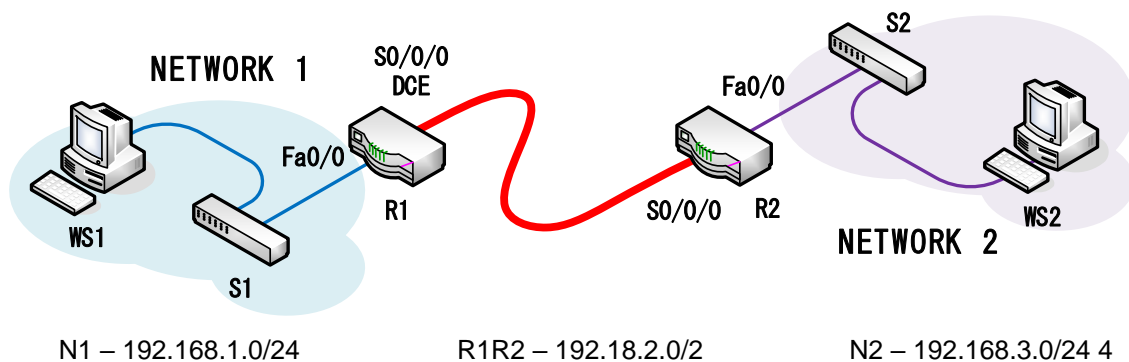


Figure 1: Network Diagram

Topology Diagram and Addressing Table

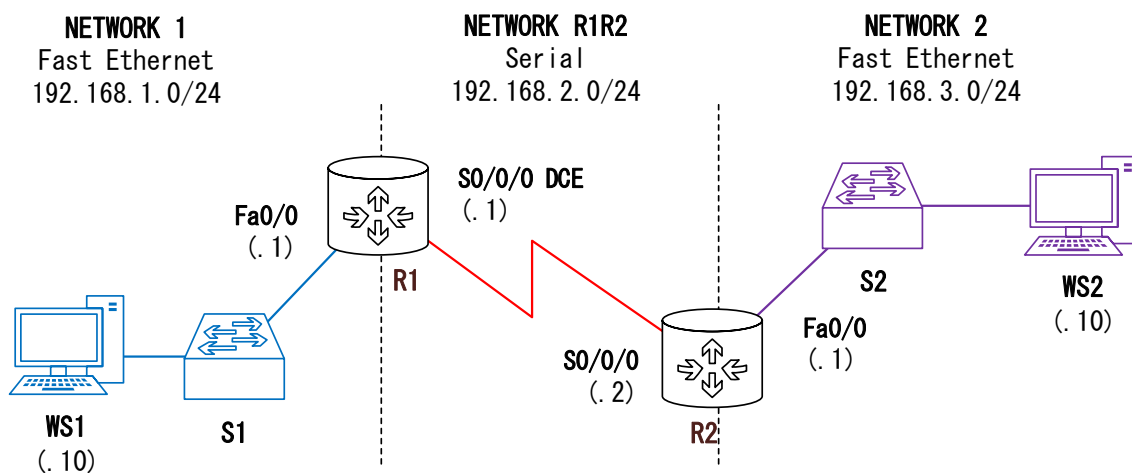


Table 1: Addressing Table

Device	Interface	IP Address	Subnet Mask	Def. Gateway
R1	Fa0/0	192.168.1.1	255.255.255.0	N/A
	S0/0/0	192.168.2.1	255.255.255.0	N/A
R2	Fa0/0	192.168.3.1	255.255.255.0	N/A
	S0/0/0	192.168.2.2	255.255.255.0	N/A
WS1	N/A	192.168.1.10	255.255.255.0	192.168.1.1
WS2	N/A	192.168.3.10	255.255.255.0	192.168.3.1

Task 1: Cable the Network.

Cable a network that is similar to the one in the Topology Diagram. The output used in this lab is from 2811 routers with WIC-2T module in slot 0. You can use any router as long as it has the required interfaces as shown in the topology. Be sure to use the appropriate type of Ethernet cable to connect from host to switch, switch to router, and host to router. Be sure to connect the serial DCE cable to router R1 and the serial DTE cable to router R2.

Task 2: Perform Basic Configuration of Router R1.

Step 1: Establish a HyperTerminal or CLI session to router R1.

Step 2: Enter privileged EXEC mode.

```
Router>enable
Router#
```

Step 3: Enter global configuration mode.

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
```

Step 4: Configure the router name as R1.

Enter the command **hostname R1** at the prompt.

```
Router(config)#hostname R1
R1(config)#
```

Step 5: Configure the FastEthernet0/0 interface.

Configure the FastEthernet0/0 interface with the IP address 192.168.1.1/24.

```
R1(config)#interface fastethernet 0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up
R1(config-if)#
```

Step 6: Configure the Serial0/0/0 interface.

Configure the Serial0/0/0 interface with the IP address 192.168.2.1/24. Set the clock rate to 64000.

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Note: The purpose of the **clock rate** command is explained in LN102: Routing Concept.

```
R1 (config-if) #interface serial 0/0/0
R1 (config-if) #ip address 192.168.2.1 255.255.255.0
R1 (config-if) #clock rate 64000
R1 (config-if) #no shutdown
R1 (config-if) #
```

Note: The interface will not be activated until the serial interface on R2 is configured and activated

Step 7: Return to privileged EXEC mode.

Use the **end** command to return to privileged EXEC mode.

```
R1 (config-if) #end
R1 #
```

Step 13: Save the R1 configuration.

Save the R1 configuration using the **copy running-config startup-config** command.

```
R1 #copy running-config startup-config
Building configuration...
[OK]
R1 #
```

Task 3: Perform Basic Configuration of Router R2.

Step 1: Establish a HyperTerminal session to router R1.

Step 2: Enter privileged EXEC mode.

```
Router >enable
Router #
```

Step 3: Enter global configuration mode.

```
Router #configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router (config) #
```

Step 4: Configure the router name as R2.

Enter the command **hostname R2** at the prompt.

```
Router (config) #hostname R2
R2 (config) #
```

Step 5: Configure the Serial 0/0/0 interface.

Configure the Serial 0/0/0 interface with the IP address 192.168.2.2/24.

```
R2 (config) #interface serial 0/0/0
R2 (config-if) #ip address 192.168.2.2 255.255.255.0
R2 (config-if) #no shutdown

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed
state to up
R2 (config-if) #
```

Step 6: Configure the FastEthernet0/0 interface.

Configure the FastEthernet0/0 interface with the IP address 192.168.3.1/24.

```
R2(config-if)#interface fastethernet 0/0
R2(config-if)#ip address 192.168.3.1 255.255.255.0
R2(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up
R2(config-if)#
```

Step 7: Return to privileged EXEC mode.

Use the **end** command to return to privileged EXEC mode.

```
R2(config-if)#end
R2#
```

Step 8: Save the R2 configuration.

Save the R2 configuration using the **copy running-config startup-config** command.

```
R2#copy running-config startup-config
Building configuration...
[OK]
R2#
```

Task 4: Configure IP Addressing on the Host Workstations.**Step 1: Configure the host WS1.**

Configure the host WS1 that is attached to R1 with an IP address of 192.168.1.10/24 and a default gateway of 192.168.1.1.

Step 2: Configure the host WS2.

Configure the host WS2 that is attached to R2 with an IP address of 192.168.3.10/24 and a default gateway of 192.168.3.1.

Task 5: Verify and Test the Configurations.**Step 1: Verify that routing tables have the following routes using the `show ip route` command.**

The **show ip route** command and output will be thoroughly explored in upcoming chapters. For now, you are interested in seeing that both R1 and R2 have two routes. Both routes are designated with a **C**. These are the directly connected networks that were activated when you configured the interfaces on each router.

```
R1#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
       i - IS-IS, su - IS-IS summary, 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

```
C    192.168.1.0/24 is directly connected, FastEthernet0/0
C    192.168.2.0/24 is directly connected, Serial0/0/0
```

```
-----
```

```
n a z r u l a z h a r @ u t e m . e d u . m y
```

R2#**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
 i - IS-IS, su - IS-IS summary, 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

```
C 192.168.2.0/24 is directly connected, Serial0/0/0
C 192.168.3.0/24 is directly connected, FastEthernet0/0
```

Step 2: Verify interface configurations.

Another common problem is router interfaces that are not configured correctly or not activated. Use the **show ip interface brief** command to quickly verify the configuration of each router's interfaces. Your output should look similar to the following:

R1#**show ip interface brief**

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	192.168.2.1	YES	manual	up	up
Serial0/0/1	unassigned	YES	unset	administratively down	down
Vlan1	unassigned	YES	manual	administratively down	down

R2#**show ip interface brief**

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	192.168.3.1	YES	manual	up	up
FastEthernet0/1	unassigned	YES	unset	administratively down	down
Serial0/0/0	192.168.2.2	YES	manual	up	up
Serial0/0/1	unassigned	YES	unset	down	down
Vlan1	unassigned	YES	manual	administratively down	down

Step 3: Test connectivity.

Test connectivity by pinging from each host to the default gateway that has been configured for that host.

- From the host attached to R1, is it possible to ping the default gateway?
- From the host attached to R2, is it possible to ping the default gateway?

If the answer is **no** for any of the above questions, troubleshoot the configurations to find the error.

If your answer to all three steps is **yes**, then you should be able to successfully ping the default gateway.

Step 4: Test connectivity between router R1 and R2.

- From the router R1, is it possible to ping R2 using the command **ping 192.168.2.2**?
- From the router R2, is it possible to ping R1 using the command **ping 192.168.2.1**?

If the answer is **no** for the questions above, troubleshoot the configurations to find the error.

If your answer to all three steps is **yes**, then you should be able to successfully ping from R2 to R1 and from R2 to R3.

Task 6: Reflection

Step 1: Attempt to ping from the host connected to R1 to the host connected to R2.

This ping should be unsuccessful.

Step 2: Attempt to ping from the host connected to R1 to router R2.

This ping should be unsuccessful.

Step 3: Attempt to ping from the host connected to R2 to router R1.

This ping should be unsuccessful.

What is missing from the network that is preventing communication between these devices?

Task 7: Configure a Static Route

Step 1: To configure static routes with a next-hop specified, use the following syntax:

```
Router(config)# ip route network-address subnet-mask ip-address
```

- *network-address*:—Destination network address of the remote network to be added to the routing table.
- *subnet-mask*:—Subnet mask of the remote network to be added to the routing table. The subnet mask can be modified to summarize a group of networks.
- *ip-address*:—Commonly referred to as the next-hop router's IP address.

On the R1 router, configure a static route to the 192.168.1.0 network using the Serial 0/0/1 interface of R2 as the next-hop address.

```
R1(config)#ip route 192.168.3.0 255.255.255.0 192.168.2.2
R1(config)#
```

Step 2: View the routing table to verify the new static route entry.

Notice that the route is coded with an **S**, which means that the route is a **static** route.

```
R1# 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
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
       U - per-user static route, o - ODR
```

```
Gateway of last resort is not set
```

```
S    192.16.3.0 [1/0] via 192.168.2.2
C    192.168.1.0/24 is directly connected, FastEthernet0/0
C    192.168.2.0/24 is directly connected, Serial0/0/0
R1#
```

Step 3: Use ping to check connectivity between the host WS1 and the host WS2.

From the host WS1, is it possible to ping the host WS2?

These pings should fail. The pings will arrive at WS2 if you have configured and verified all devices through Task 7, “Gather Information.” WS2 will send a ping reply back to WS1. However, the ping reply will be discarded at R2 because the R2 does not have a return route to the 192.168.1.0 network in the routing table.

Step 4: On the R2 router, configure a static route to reach the 192.168.1.0 network.

What is the next-hop address to which R2 would send a packet destined for the 192.168.1.0/24 network?

```
R2 (config)#ip route 192.168.1.0 255.255.255.0 192.168.2.1
R2 (config)#
```

Step 5: View the routing table to verify the new static route entry.

Notice that the route is coded with an S, which means the route is a static route.

```
R2# 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
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
       U - per-user static route, o - ODR
```

```
Gateway of last resort is not set
```

```
C    192.168.3.0 is directly connected, FastEthernet0/0
C    192.168.2.0 is directly connected, Serial0/0/0
S    192.168.1.0/24 [1/0] via 192.168.2.1
R2#
```

Step 6: Use ping to check connectivity between the host WS1 and the host WS2.

From the host WS1, is it possible to ping the host WS2?

This ping should be successful.

Step 7: Save the R1 and R2 configuration.

Save the R1 and R2 configuration using the `copy running-config startup-config` command.

```
R2#copy running-config startup-config
Building configuration...
[OK]
R2#
```

Do the same command to the R1.

Task 8: Documentation

- Save your work (*.pkt) and compress it to rar or zip file.
- Send this exercise through ULearn.

Lab 10 – Exercise

Static Route Configuration

Learning Objectives

Upon completion of this lab, you will be able to:

- Cable a network according to the Topology Diagram.
- Perform basic configuration tasks on a router.
- Configure and activate network interfaces.
- Test and verify configurations.
- Configure a static route using an intermediate address.

Scenario

In this lab exercise, you need to create a similar network by using Packet Tracer, as shown in Figure 1. Begin by cabling the network and then perform the initial router configurations required for connectivity. Use the IP addresses that have been filled in Table 1 to apply an addressing scheme to the available network interface on every device. After complete all basic required configurations, do a connection test between the nodes. Test the connections between directly connected nodes, and after that, test the connection between nodes that are not directly connected. Static routes must be configured on the routers for end-to-end communication to take place between the network hosts. The static routes are needed to allow communication between the hosts. View the routing table after each static route is added to observe how the routing table has changed.

Note: Loopback Interfaces on each router also need to be configured.

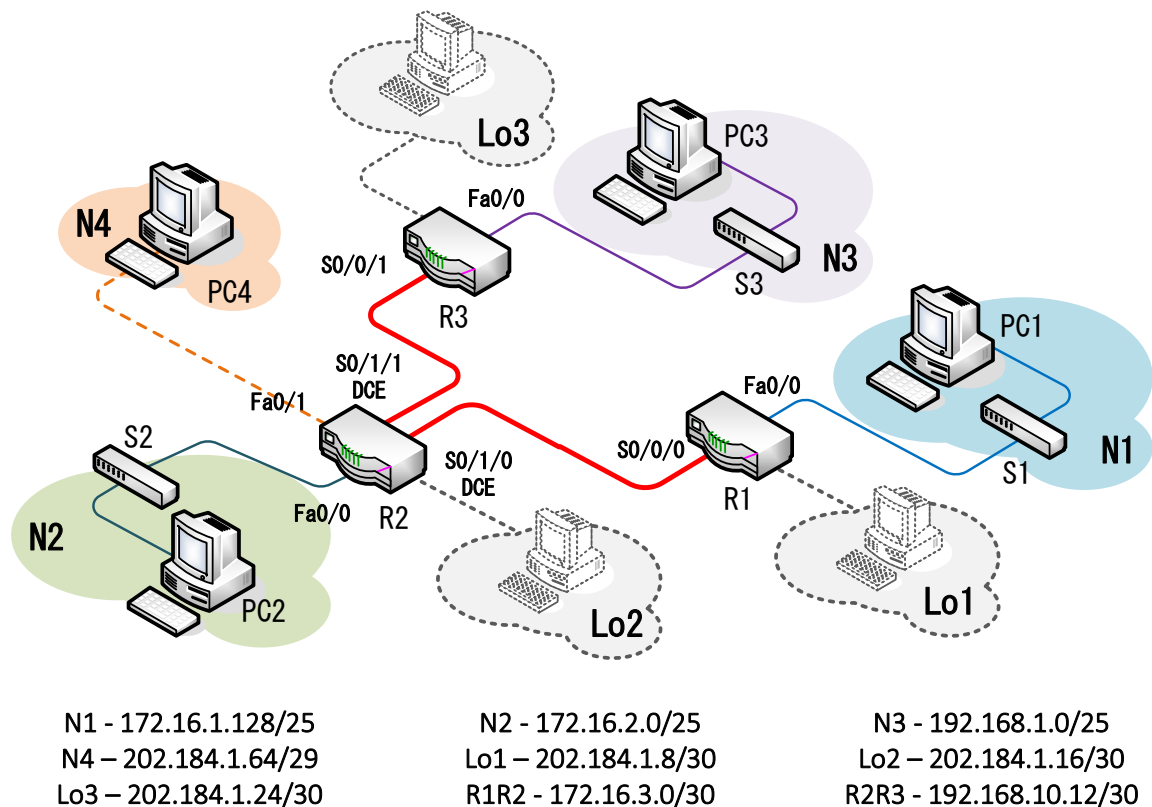


Figure 1: Network Diagram

Topology Diagram and Addressing Table

Figure 2: Topology Diagram

Table 1: Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0			N/A
	S0/0/0			N/A
	Lo1			N/A
R2	Fa0/0			N/A
	Fa0/1			N/A
	S0/1/0			N/A
	S0/1/1			N/A
	Lo2			N/A
R3	FA0/0			N/A
	S0/0/1			N/A
	Lo3			N/A
PC1	NIC			
PC2	NIC			
PC3	NIC			
PC4	NIC			

Task

- Save your work (*.pkt) and compress it to rar or zip file.
- Send this exercise through ULearn.