LAB 9

Practice and Exercise

Basic Router Configuration

BITS 2343
Computer Network

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

LAB 9 - Practice
Basic Router Configuration

Learning Objectives

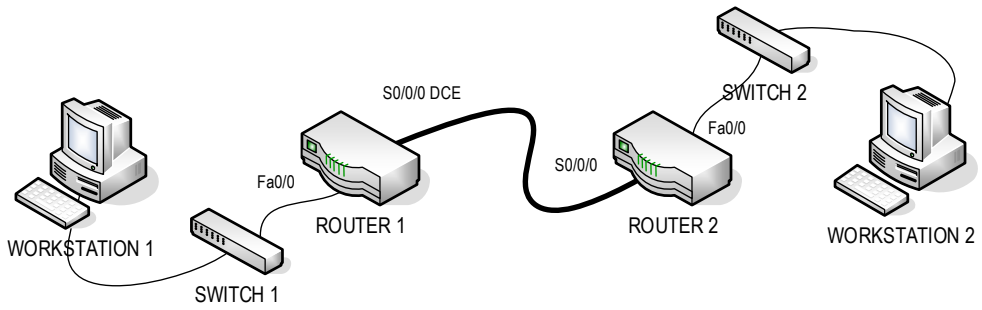
Upon completion of this lab, you will be able to:

- Cable a network according to the Topology Diagram.
- Erase the startup configuration and reload a router to the default state.
- Perform basic configuration tasks on a router.
- Configure and activate Ethernet interfaces.
- Test and verify configurations.
- Reflect upon and document the network implementation.

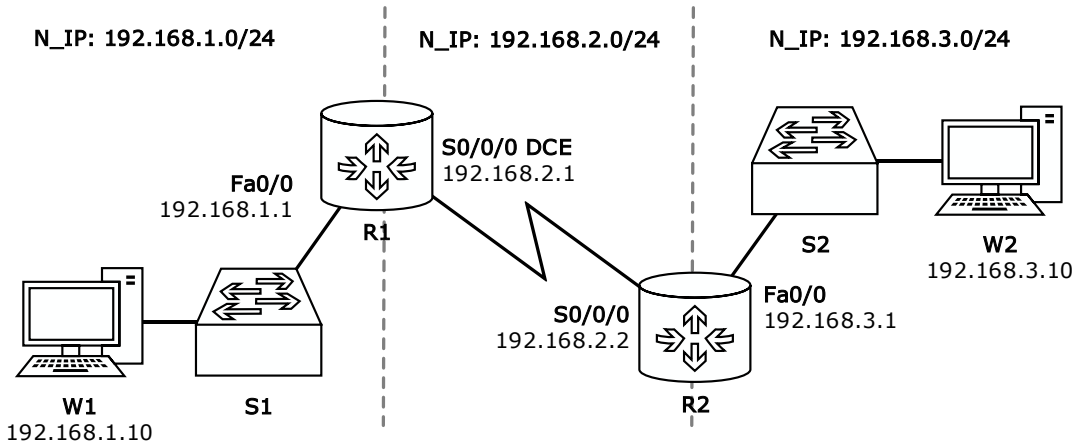
Scenario

In this lab activity, you will create a network that is similar to the one shown in the Topology Diagram. Begin by cabling the network as shown in the Topology Diagram. You will then perform the initial router configurations required for connectivity. Use the IP addresses that are 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 is operating properly. This lab is a shorter version and assumes you are proficient in basic cabling and configuration file management.

Topology Diagram



Logical Diagram



Addressing Table

Device	Interface	IP Address	Subnet Mask	Def. Gateway
ROUTER 1	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
ROUTER 2	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. You can use any current router in your lab 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.

Answer the following questions:

a. What type of cable is used to connect the Ethernet interface on a host WS to the Ethernet interface on a switch? .....

b. What type of cable is used to connect the Ethernet interface on a switch to the Ethernet interface on a router? .....

c. What type of cable is used to connect the Ethernet interface on a router to the Ethernet interface on a host WS? .....

Task 2: Erase and Reload the Routers [Skip if using P. Tracer]

Step 1: Establish a Terminal session to router R1.

Terminal emulation and connecting to a router.

a. What type of cable is used?

b. When the prompt returns, issue the **`reload`** command. Answer 'no' if asked to save changes.

Step 2: Enter privileged EXEC mode.

```
Router>enable ↙
Router#
```

Step 3: Clear the configuration.

To clear the configuration, issue the **`erase startup-config`** command. Press Enter when prompted to **`[confirm]`** that you really do want to erase the configuration currently stored in NVRAM.

```
Router#erase startup-config ↙
Erasing the nvram filesystem will remove all files! Continue? [confirm]
↙
[OK]
Erase of nvram: complete
Router#
```

Step 4: Reload configuration.

```
Router#reload ↙
Proceed with reload? [confirm] ↙
```

When the prompt returns, issue the **reload** command. Answer 'no' if asked to save changes.

Step 5: Repeat Steps 1 through 4 on router R2 to remove any startup configuration file that may be present.

Task 3: Perform Basic Configuration of Router R1.

Step 1: Establish a Terminal session to router R1.

Terminal emulation and connecting to a router.

a. What type of cable is used? .....

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: Disable DNS lookup.

Disable DNS lookup to avoid the router entered the DNS resolution process which lasted about a minute after you mistyped the command. This can be annoying and this is why this feature is often turned off, especially in the lab environments.

```
R1(config)#no ip domain-lookup ↙
R1(config)#
```

Step 6: Configure the EXEC mode password.

Configure the EXEC mode password using the **enable secret** *password* command. Use "**class**" for the *password*.

```
R1(config)#enable secret class ↙
R1(config)#
```

Step 7: Configure a message-of-the-day banner.

Configure a message-of-the-day banner using the **banner motd** command.

```
R1(config)#banner motd & ↙
Enter TEXT message.  End with the character '&'.
********************************* ↙
  !!!AUTHORIZED ACCESS ONLY!!! ↙
********************************* ↙
& ↙
R1(config)#
```

Every router should have a banner to warn unauthorized users that access is prohibited but can also be used for sending messages to network personnel/technicians (such as impending system shutdowns or who to contact for access).

a. When does this banner display?

_____

Step 8: Configure the console password on the router.

Use **cisco** as the password. When you are finished, exit from line configuration mode.

```
R1(config)#line console 0
R1(config-line)#password cisco
R1(config-line)#login
R1(config-line)#exit
R1(config)#
```

Step 9: Configure the password for the virtual terminal lines.

Use **cisco** as the password. When you are finished, exit from line configuration mode.

```
R1(config)#line vty 0 4
R1(config-line)#password cisco
R1(config-line)#login
R1(config-line)#exit
R1(config)#
```

Virtual teletype (VTY) is a command line interface (CLI) created in a router and used to facilitate a connection to the daemon via Telnet, a network protocol used in local area networks.

Step 10: 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 11: 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.

Note: The purpose of the **clock rate** command is explained in Chapter 2: Static Routes.

```
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 12: 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#
```

a. What is a shorter version of this command? _____

Task 4: Perform Basic Configuration of Router R2.

Step 1: For R2, repeat Steps 1 through 9 from Task 3.

Step 2: 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 3: 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 4: Return to privileged EXEC mode.

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

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

Step 5: 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 5: Configure IP Addressing on the Host WSs.

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 6: 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. If you do not see two routes for each router as shown in the following output, proceed to Step 2.

```
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

------------------------


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
```

If both interfaces are **up** and **up**, then both routes will be in the routing table. Verify this again by using the **show ip route** command.

Step 3: Test connectivity.

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

a. From the host attached to R1, is it possible to ping the default gateway? _____

b. 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 using the following systematic process:

c. Check the WSs.

- Are they physically connected to the correct router? (Connection could be through a switch or directly.) _____
- Are link lights blinking on all relevant ports? _____

d. Check the WS configurations.

- Do they match the Topology Diagram? _____

e. Check the router interfaces using the **show ip interface brief** command.

- Are the interfaces **up** and **up**? _____

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.

a. From the router R1, is it possible to ping R2 using the command **ping 192.168.2.2**?
_____

b. 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 using the following systematic process:

c. Check the cabling.

- Are the routers physically connected? _____
- Are link lights blinking on all relevant ports? _____

d. Check the router configurations.

- Do they match the Topology Diagram? _____

- Did you configure the **`clock rate`** command on the DCE side of the link?
  _____

e. Check the router interfaces using the **`show ip interface brief`** command.

- Are the interfaces "up" and "up"? _____

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

Step 5: Remote the router

Remote R1 from WS 1 using the **`telnet`** command.

```
C:\>telnet 192.168.1.1
Trying 192.168.1.1 ...Open
User Access Verification

Password:
```

Use password that you created on Step 9 – Task 3.

After successfully establishing the remote session, you can use the **`exit`** command to terminate the connection.

Task 7: 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.

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

_____

_____

Task 8: Documentation

On each router, capture the following command output to a text (.txt) file and save for future reference.

- show running-config
- show ip route
- show ip interface brief

LAB 9 - Exercise
Challenge Router Configuration

Learning Objectives

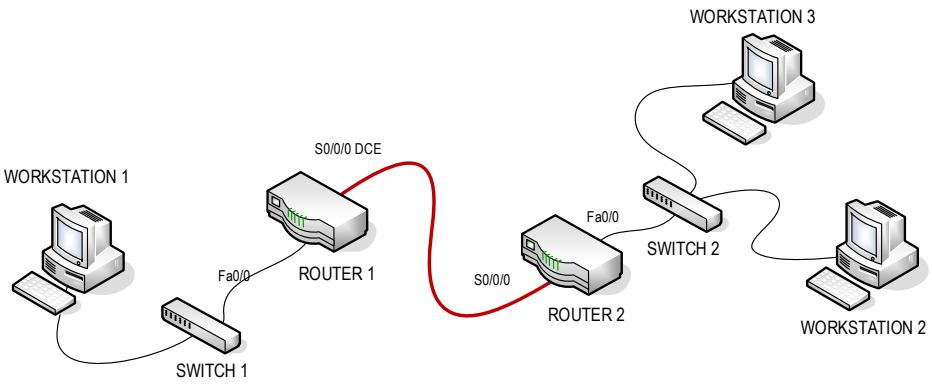
Upon completion of this lab, you will be able to:

- Subnet an address space given requirement.
- Assign appropriate addresses to interfaces and document.
- Cable a network according to the Topology Diagram.
- Erase the startup configuration and reload a router to the default state.
- Perform basic configuration tasks on a router.
- Configure and activate Serial and Ethernet interfaces.
- Test and verify configurations.
- Reflect upon and document the network implementation.

Scenario

In this lab activity, you will design and apply an IP addressing scheme for the topology shown in the Topology Diagram. Sketch the logical diagram. You will be given one range address that you must subnet to provide a logical addressing scheme for the network. You must first cable the network as shown below before the configuration can begin. Once the network is cabled, configure each device with the appropriate basic configuration commands. The routers will then be ready for interface address configuration according to your IP addressing scheme. When the configuration is complete, use the appropriate commands to verify that the network is working properly. **Note:** Use classless subnetting with VLSM for this lab. Draw the topology diagram and complete the Addressing Table.

Network Diagram



Topology Diagram

Draw the topology diagram

Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
ROUTER 1	Fa0/0			N/A
	S0/0/0			N/A
ROUTER 2	Fa0/0			N/A
	S0/0/0			N/A
WS1	NIC			
WS2	NIC			
WS3	NIC			

Task 1: Subnet the Address Space.

Step 1: Examine the network requirements.

You have been given the 192.168.1.128/25 address space to use in your network design. The network consists of the following segments:

- The network connected to router R1 will require enough IP addresses to support 20 hosts.
- The network connected to router R2 will require enough IP addresses to support 20 hosts.
- The link between router R1 and router R2 will require IP addresses at each end of the link.

(Note: Remember that the interfaces of network devices are also host IP addresses and are included in the above addressing scheme.)

Step 2: Consider the following questions when creating your network design.

a. How many subnets are needed for this network?

b. What is the subnet mask for this network in dotted decimal format?

c. What is the subnet mask for the network in slash format?

d. How many IP addresses are allocated for all subnets?

Step 3: Assign subnetwork addresses to the Topology Diagram.

Task 2: Determine Interface Addresses.

Step 1: Assign appropriate addresses to the device interfaces.

Assign the first valid host address to the LAN interface on R1.

Assign the last valid host address to WS1.

Assign the first valid host address to the WAN interface on R1.

Assign the last valid host address to the WAN interface on R2.

Assign the first valid host address to the LAN interface of R2.

Assign the second and third valid host address to WS2 and WS3.

Step 2: Sketch the logical diagram and write the addresses to be used in the table provided.

Task 3: Prepare the Network

Step 1: Cable a network that is similar to the one in the Topology Diagram.

You can use any current router in your lab as long as it has the required interfaces as shown in the topology.

Step 2: Clear any existing configurations on the routers.

Task 4: Perform Basic Router Configurations.

Perform basic configuration of the R1 and R2 routers according to the following guidelines:

- Configure the router hostname.
- Disable DNS lookup.
- Configure an EXEC mode password.
- Configure a message-of-the-day banner.
- Configure a password for console connections.
- Configure a password for VTY connections.

Task 5: Configure and Activate Serial and Ethernet Addresses.

Step 1: Configure the router interfaces.

Configure the interfaces on the R1 and R2 routers with the IP addresses from your network design. When you have finished, be sure to save the running configuration to the NVRAM of the router.

Step 2: Configure the WS interfaces.

Configure the Ethernet interfaces of WS1 and WS2 with the IP addresses and default gateways from your network design.

Task 6: Verify the Configurations.

Answer the following questions to verify that the network is operating as expected.

a. From the host attached to R1, is it possible to ping the default gateway? _____

b. From the host attached to R2, is it possible to ping the default gateway? _____

c. From the router R1, is it possible to ping the Serial 0/0/0 interface of R2? _____

d. From the router R2, is it possible to ping the Serial 0/0/0 interface of R1? _____

The answer to the above questions should be **yes**. If any of the above pings failed, check your physical connections and configurations. If necessary, refer to "LAB1: Practice, Basic Router Configuration."

e. What is the status of the FastEthernet 0/0 interface of R1? _____

f. What is the status of the Serial 0/0/0 interface of R1? _____

g. What is the status of the FastEthernet 0/0 interface of R2? _____

h. What is the status of the Serial 0/0/0 interface of R2? _____.

i. What routes are present in the routing table of R1?

_____

_____

j. What routes are present in the routing table of R2?

_____

_____

Task 7: Reflection

a. Are there any devices on the network that cannot ping each other?

_____

_____

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

_____

_____

Task 8: Document the Router Configurations.

On each router, capture the following command output to a text (.txt) file and save for future reference.

- Running configuration
- Routing table
- Summary of status information for each interface