

LAB 3: CONFIGURING AND CONNECTING A ROUTER IN THE NETWORK

OBJECTIVES

Student Name: _____

After performing this lab, students should be able to:

PC #: _____

- Cisco Router IOS
- Connecting to a router for configuration
- Connecting to a Router through Console Cable
- Command Line Interface (CLI)
- Overview of Router Modes
- Understand the Router Prompts
- Router Interfaces
- Editing and Help Features
- Gathering Basic Router Information
- Router Interfaces
- Configuring an Ethernet Interface of a Router
- Configuring a Serial Interface of a Router
- Viewing, Saving Configurations of a Router

Assigned IP #: _____

DELIVERABLES:

- Upload the lab report as one PDF file. Your Lab Report must include the following:
 - Format: Times New Roman, 11-point font size, All Margins 1 inch, single-line spacing. All headings and subheadings are in 12-point Bold font.
 - Figures: Number all figures with a caption, such as Figure 1, Figure 2. Use Times New Roman, 11-point font size for figure caption.
 - Title Page: Your Name, Your PC # in the lab, Course Name and Section, and Lab title. Use font size 14 or 18 for the title page.
 - Objective: Describe the objective of the lab in your own words concisely.
 - Tools and Equipment: Describe briefly about the Tools (Cisco Packet Tracer) and Equipment (PC #, what was the OS of the PC you used in the lab, what was the Router model, what was the Switch model)
 - Use the heading of Task 1, and so on. Explain each Task in your own words and include answers to questions in your own words. Include all screenshots of ping responses. Include the screenshots of your network models with labels. Describe how you set up the network, etc. Clearly explain what does the ping response (success/fail) indicate.
 - My Learning: Describe what you learned from this lab, what hands-on skills you gained, where you can apply these skills in the future or in practical life, and how this lab helped you improve your learning in this subject area.
- Name your pkt files as LastName_Lab3_Task3.pkt, and LastName_Lab3_Task4.pkt. Upload all packet tracer files as pkt, Do not zip.
- Never upload any zip file

CISCO ROUTER IOS:

The Cisco IOS was created to deliver network services and enable networked applications. It runs on most Cisco routers and switches. You can access the Cisco IOS through the console port of a router, from a modem into the auxiliary (or Aux) port, or even through Telnet. Access to the IOS command line is called an EXEC session.

COMMAND-LINE INTERFACE (CLI)

Due to flexibility, the command-line interface (CLI) is the best way to configure a router.

Understanding the different prompts when configuring a router is important. Always check your prompts before making any changes to a router's configuration!

```
Router>          This prompt is User-Exec Mode. Use Enable command to go to Privileged-Exec Mode
Router#          This prompt is Privileged-Exec Mode. Use config t command to go to Global Configuration Mode.
Router(config)#  This prompt is Global Configuration Mode. Use Interface command to go to Interface Mode.
Router(config-if)# This prompt is Interface Configuration Mode. Press ^Z or exit to go back to earlier mode.
```

GATHERING BASIC ROUTER'S INFORMATION

The changes made through global configuration mode are the Router's running configuration (running-config). The running-config stores in the RAM and can be lost by a power cycle to the router. The permanent configuration of a router is known as the Router's startup configuration (startup-config), which resides in NVRAM and is employed when the router is powered on. A new router does not have a startup-config. To view the running-config:

```
Router#show running-config
```

To avoid losing running-config, it is copied over startup-config:

NEVER USE THIS COPY COMMAND ON THE LAB ROUTER AND SWITCH

```
Router#copy running-config startup-config
```

To view the startup-config:

```
Router#show startup-config
```

ROUTER'S HOSTNAME

You can set the identity of the router with the hostname command. This is only locally significant, which means that it has no bearing on how the router performs name lookups or how the router works on the internet. In router, if you enter a wrong command, it goes to search for DNS lookup, so it is highly recommended that you disable domain lookup.

```
Router>enable
Router#config t
Router(config)#hostname Router1
Router1(config)#no ip domain-lookup
Router1(config)#
```

ROUTER'S HARDWARE IN CISCO PACKET TRACER

We will primarily be using the 4321 router model because it is similar to the router we have in our lab. However, by default, this router has two GigabitEthernet ports and no serial ports. To match the hardware we currently use, we can add four serial ports to the router. For this, we first powered off the router in the **Physical** tab of Cisco Packet Tracer, then dragged and dropped the NIM-2T module from the **Modules** list into the empty slots of the router. We installed two NIM-2T modules, which provide four serial ports labeled as **Serial 0/1/0**, **Serial 0/1/1**, **Serial 0/2/0**, and **Serial 0/2/1**. The GigabitEthernet ports on this router are labeled as **GigabitEthernet 0/0/0** and **GigabitEthernet 0/0/1**.

ROUTER'S ETHERNET INTERFACES

Interface configuration is one of the most important router configurations, because without interfaces, a router is pretty much a completely useless object. Plus, interface configurations must be totally precise to enable communication with other devices. Some of the configurations used to configure an interface are Network layer addresses, media type, bandwidth, and other administrator commands. For instance, the following command shows the configuration of a Gigabitethernet interface:

```
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface gigabitethernet 0/0/0
Router(config-if)#ip address 192.168.10.100 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#^Z
```

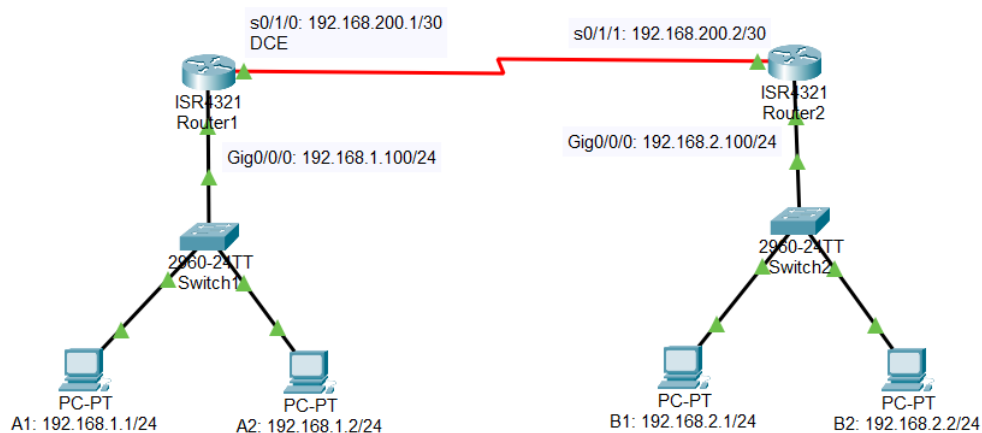
The following set of commands shows the configuration of a Fastethernet interface:

```
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fastethernet 0/0
Router(config-if)#ip address 192.168.10.100 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#^Z
```

ROUTER'S SERIAL INTERFACES

Before configuring a serial interface, there are a few things you need to know. If you have a back-to-back configuration, one end of the cable—the Data Communication Equipment (DCE) end—must provide clocking. By default, Cisco routers are Data Terminal Equipment (DTE) devices, so you must configure an interface to provide clocking if it needs to function as a DCE device.

Let's consider the following network diagram:



In this part, serial 0/1/0 of Router1 will be configured as DCE, while serial 0/1/1 of Router2 will be configured as DTE.

- In Cisco Packet Tracer only, you will have to add serial ports because serial ports are not in Router 4321 by default. If you have already started working on the router and you would like to make a hardware change that requires you to power off the router, then you first save the router configuration using copy running-config startup-config before powering off.
- In Packet Tracer, once you decide which serial port to configure as DCE, go to Connection, Select Serial DCE cable, and first connect to Router1 serial 0/1/0 port, because we have to configure it as DCE, and then connect cable to Router2 serial 0/1/1 port.

- Now configure a DCE serial interface with the clock rate command on Router1 serial 0/1/0 interface:

```
Router1#config t  
Router1 (config) #interface serial 0/1/0  
Router1 (config-if) #ip address 192.168.200.1 255.255.255.252  
Router1 (config-if) #no shutdown  
Router1 (config-if) #clock rate 250000
```

- Now, the following set of commands is used to configure a DTE serial interface. It will be configured on Router2 serial 0/1/1 interface.

```
Router2#config t  
Router2 (config) #interface serial 0/1/1  
Router2 (config-if) #ip address 192.168.200.2 255.255.255.252  
Router2 (config-if) #no shutdown  
Router2 (config-if) #exit
```

Notice that the clock rate command is in bits per second.

You can see if a router's serial interface has a DCE cable connected with the show controllers interface command.

```
Router1>show controllers serial 0/1/0  
Interface Serial0/1/0  
Hardware is PowerQUICC MPC860  
DCE V.35, clock rate 250000
```

This output verifies that Router1 serial 1/0 port is configured as DCE with a clock rate of 250000.

Now go to Router2 CLI mode and use show controllers:

```
Router2>show controllers serial 0/1/1  
Interface Serial0/1/1  
Hardware is PowerQUICC MPC860  
DTE V.35 TX and RX clocks detected
```

The output verifies that Router2 serial 0/1/1 is configured as DTE.

You can also verify using show running-config

To verify connectivity between serial interface, go to CLI mode of Router1 and use ping

```
Router1#ping 192.168.200.2
```

Similarly, you can check connectivity of the serial interface from Router2 using ping:

```
Router2#ping 192.168.200.1
```

TASK 1: LOGGING INTO A ROUTER USING CLI

1. Start a new file in Cisco Packet Tracer.
2. Drag and drop Router 4321 on the workspace.
3. Click on the router and select the CLI tab.
4. If asked, Continue with configuration dialog? [yes/no], type no and press Enter. Then, press Return (Enter) again. You will get Router>. **What this prompt is called?** _____

Can you change the Router's configuration at this mode? _____

5. You can view and change the configuration of a Cisco router in privileged exec mode (privileged mode), which you get into with the enable command. Here is how:

```
Router>
Router>enable
Router#
```

6. You can make global changes to the router by typing configure terminal (or config t for short), which puts you in global configuration mode. A global command (a command run from global config) is set only once and affects the entire router.

```
Router#config t
Router(config)#
```

7. You can go back to the User EXEC mode by using the disable or exit command, as shown below:

```
Router(config)#exit
Router#exit
Router>
```

8. At this point, you can type logout or exit to exit the console:

```
Router>logout
Router con0 is now available
Press RETURN to get started.
```

9. Attach a screenshot of the Router's CLI screen to your lab report.

TASK 2: ROUTER'S HELP AND VIEWING CONFIGURATION

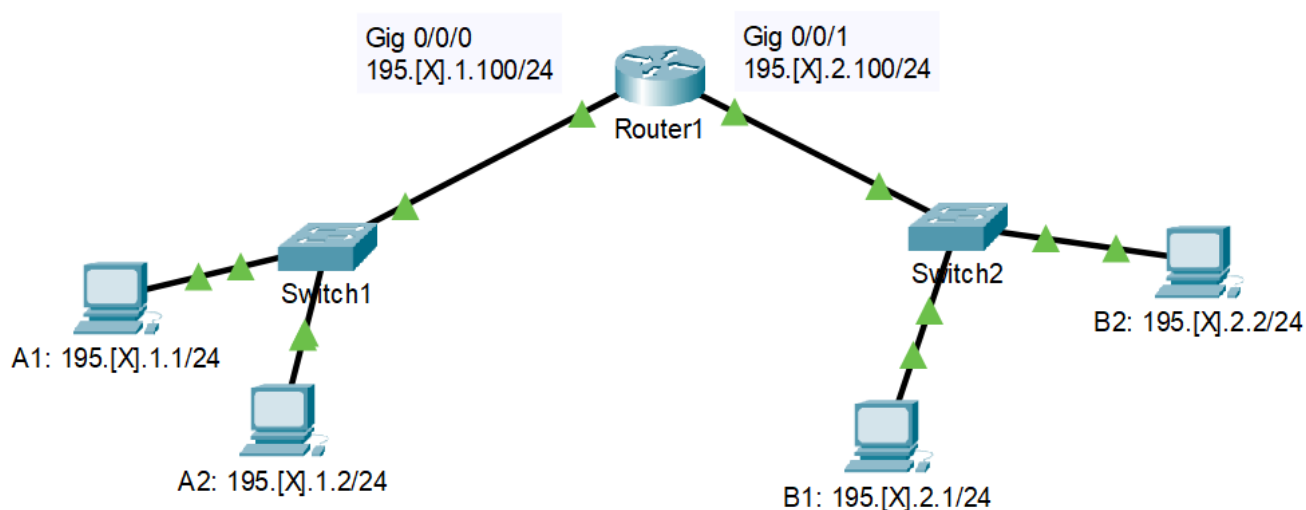
1. Start a new file in Cisco Packet Tracer.
2. Drag and drop Router 4321 on the workspace.
3. Click on the router and select the CLI tab.
4. To go to Privileged EXEC mode, you use the command **enable**. You are in rush, you just type **e**. Type the following command, and describe the reasoning of the output you receive:

```
Router>e
```

5. Check the Router's IOS version (use show version), what is the version? _____
6. Go to the Router's Privilege Exec Mode. View the Router's startup configuration (show startup-config), what did you get on the screen? And why? _____

7. View the Router's running configuration, write the command you used: _____
8. Copy the Router's running configuration to the startup configuration, write the command you used: _____
9. Again, try to view the Router's startup configuration, write the command: _____
10. Attach the screenshots of the startup config and running config outputs and compare them: _____
How would you recognize the difference between startup-config and running-config outputs? _____
11. Set the hostname of the Router to *YourLastName*
12. Disable IP domain lookup on your router
13. View the Router's running configuration. Describe where it shows the hostname and where it shows the IP domain lookup: _____
14. Take a screenshot of running-config and attach it to your lab report. In the screenshot, highlight the hostname and IP domain lookup.

TASK 3: CONFIGURING A ROUTER TO CONNECT TWO NETWORKS



1. Find your allocated IP address from the Canvas, Write your allocated IP: _____. [X] in the above network diagram will replace a number from the allocated IP list.
2. Start a new file in Cisco Packet Tracer. Drag and drop one Router 4321, two switches 2960 and 4 PCs on the workspace, according to the above network diagram.
3. From the above network diagram, Write the following information:

A1: IP Address: _____, Subnet Mask: _____, Default Gateway: _____

A2: IP Address: _____, Subnet Mask: _____, Default Gateway: _____

B1: IP Address: _____, Subnet Mask: _____, Default Gateway: _____

B2: IP Address: _____, Subnet Mask: _____, Default Gateway: _____
4. Configure TCP/IP of all PCs with their IP addresses, subnet masks and default gateways. For this purpose, click on a PC, go to Desktop tab, click IP Configuration, and then enter IP Address, Subnet Mask and Default Gateway. Do not enter anything in DNS. Attach a screenshot of one PC configuration to your lab report.

5. To change the display name of a PC, click on a PC, go to Config tab, and enter the Display Name as your PC-# with IP address and /mask.
6. Connect PCs to their Switches.
7. Test the connectivity of all PCs in Network A using ping utility. Click on a PC, go to Desktop tab, and click Command Prompt, it opens a window with C:\>, then type ping <ip_address>. On A1, ping 195.[X].1.2 and answer the following:
Is ping from A1 to A2 successful (Yes/No): _____, if No, discuss with the instructor/TA.
8. Similarly, test the connectivity of B1 and B2. On B1, ping 192.168.[Y].2 and answer the following:
Is ping from B1 to B2 successful (Yes/No): _____, if No, discuss with the instructor/TA.
9. Connect Switch1 interface to Router1's GigabitEthernet 0/0/0 interface using Straight-through cable. Click on Connections at the bottom, then select Copper Straight-through cable. Now, click on a Switch1 and then take it to connect with Router GigabitEthernet 0/0/0. Make sure you connect to the correct interface of the Router1 which is GigabitEthernet 0/0/0.
10. Similarly, connect Switch2 interface to Router1's GigabitEthernet 0/0/1.
11. Go to Router1's CLI mode, and perform the initial configurations: disable ip domain lookup and configure the hostname to Router1. Write your list of commands in the following starting from User EXEC mode:

```
Router>enable
```

```
Router#config t
```

```
Router(config)#hostname Router1
```

```
Router1(config)#no ip domain-lookup
```

Attach the screenshot of the above configuration steps to your lab report and describe in your own words.

12. Configure Router1's GigabitEthernet interface 0/0/0. Write your list of commands in the following starting from User EXEC mode:

```
Router1>enable
```

```
Router1#config t
```

```
Router1(config)#interface gigabitethernet 0/0/0
```

```
Router1(config-if)#ip address 195.[X].1.100 255.255.255.0
```

```
Router1(config-if)#no shutdown
```

Attach the screenshot of the above configuration steps to your lab report and describe in your own words.

13. Similarly, configure Router1's GigabitEthernet interface 0/0/1. Write your list of commands in the following starting from User EXEC mode:

```
Router1>enable
```

```
Router1#config t
```

```
Router1(config)#interface gigabitethernet 0/0/1
```

```
Router1(config-if)#ip address 195.[X].2.100 255.255.255.0
```

```
Router1(config-if) #no shutdown
```

Attach the screenshot of the above configuration steps to your lab report and describe in your own words.

14. Go to Privileged Exec Mode of Router1 and view running configuration using show running-config in the router. Verify the interface addresses as per the configuration.

```
Router1#show running-config
```

Compare interfaces' IP addresses and subnet masks of Router1 with your diagram,

Did you find any error? _____

15. Test the connectivity of all PCs to the default gateway:

Is ping from A1 to Default Gateway successful (Yes/No): _____, if No, discuss with instructor.

Is ping from A2 to Default Gateway successful (Yes/No): _____, if No, discuss with instructor.

Is ping from B1 to Default Gateway successful (Yes/No): _____, if No, discuss with instructor.

Is ping from B2 to Default Gateway successful (Yes/No): _____, if No, discuss with instructor.

Attach two screenshots (A1 to Default Gateway, B1 to Default Gateway) to your lab report, and describe them.

16. Test the connectivity of Network A to Network B:

Is ping from A1 to B1 successful (Yes/No): _____, if No, discuss with instructor.

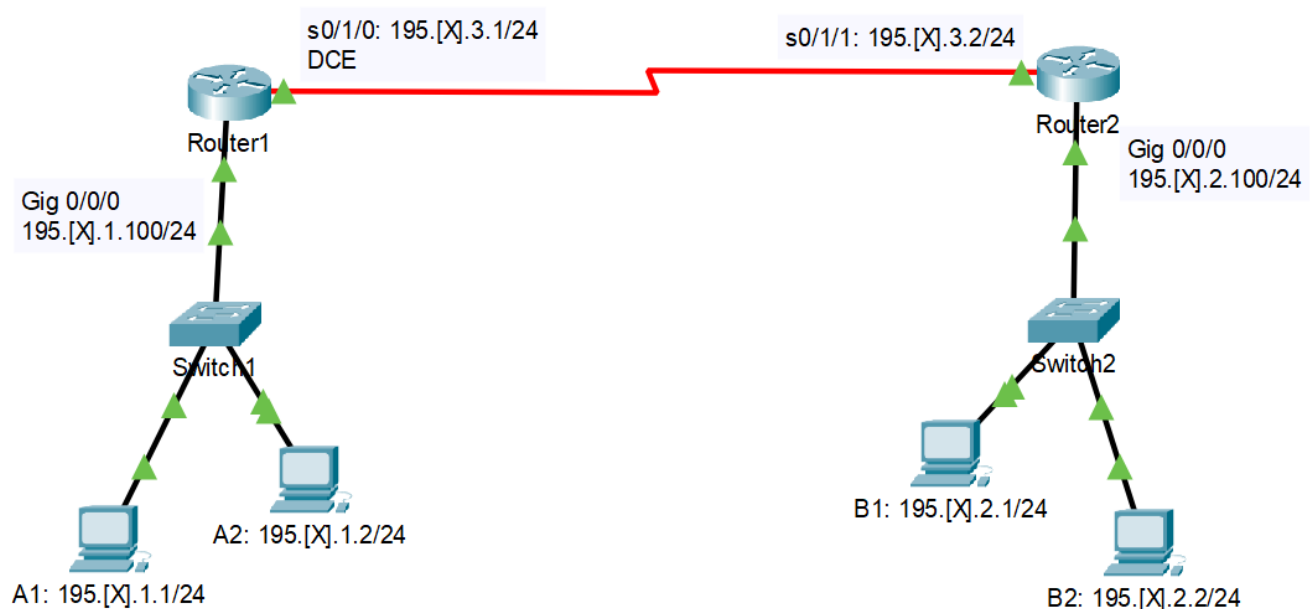
Is ping from B2 to A2 successful (Yes/No): _____, if No, discuss with instructor.

Attach one of the screenshots to your lab report, and describe it.

Attach the complete and labeled network diagram to your lab report.

TASK 4: ROUTER'S SERIAL INTERFACE

Let's build the following network diagram in the Cisco Packet Tracer:



1. Start a new file in Cisco Packet Tracer. Drag and drop two Routers 4321, two switches 2960 and 4 PCs on the workspace, according to the above network diagram.
2. Router 4321 does not have serial ports by default; thus, serial ports should be added to each router. What command would you use to verify the serial and ethernet ports on a router? Write the command _____ and attach the screenshot of the output of the command to your lab report.
3. Configure TCP/IP of all PCs with their IP addresses, subnet masks and default gateways.
4. Assign a display name to each PC.
5. Connect PCs to their Switches.
6. Test the connectivity of all PCs in Network A using ping utility.
Is ping from A1 to A2 successful (Yes/No): _____, if No, fix the PC's TCP/IP configuration.
7. Similarly, test the connectivity of B1 and B2.
Is ping from B1 to B2 successful (Yes/No): _____, if No, fix the PC's TCP/IP configuration.
8. Connect the Switch1 interface to Router1's GigabitEthernet 0/0/0 interface using a straight-through cable
9. Similarly, connect Switch2 interface to Router2's GigabitEthernet 0/0/0.
10. Go to Router1's CLI mode, and perform the initial configurations: disable ip domain lookup and configure the hostname to Router1. Write your list of commands in the following starting from User EXEC mode:

```
Router>enable
```

```
Router#config t
```

```
Router(config)#hostname Router1
```

```
Router1(config)#no ip domain-lookup
```

Attach the screenshot of the above configuration steps to your lab report and describe in your own words.

11. Configure Router1's GigabitEthernet interface 0/0/0. Write your list of commands in the following starting from User EXEC mode:

```
Router1>enable
```

```
Router1#config t
```

```
Router1(config)#interface gigabitethernet 0/0/0
```

```
Router1(config-if)#ip address 195.[X].1.100 255.255.255.0
```

```
Router1(config-if)#no shutdown
```

Attach the screenshot of the above configuration steps to your lab report and describe in your own words.

12. Now, configure Router1's Serial interface 0/1/0. Write your list of commands in the following starting from User EXEC mode:

```
Router1>enable
```

```
Router1#config t
```

```
Router1(config)#interface serial 0/1/0
```

```
Router1(config-if) #ip address 195.[X].3.1 255.255.255.0
```

```
Router1(config-if) #clock rate 250000
```

```
Router1(config-if) #no shutdown
```

Attach the screenshot of the above configuration steps to your lab report and describe in your own words.

13. Similarly, go to Router2's CLI mode, and perform the initial configurations: disable ip domain lookup and configure the hostname to Router2. Write your list of commands in the following starting from User EXEC mode:

```
Router>enable
```

```
Router#config t
```

```
Router(config) #hostname Router2
```

```
Router2(config) #no ip domain-lookup
```

Attach the screenshot of the above configuration steps to your lab report and describe in your own words.

14. Now, configure Router2's GigabitEthernet interface 0/0/0. Write your list of commands in the following starting from User EXEC mode:

```
Router2>enable
```

```
Router2#config t
```

```
Router2(config) #interface gigabitethernet 0/0/0
```

```
Router2(config-if) #ip address 195.[X].2.100 255.255.255.0
```

```
Router2(config-if) #no shutdown
```

Attach the screenshot of the above configuration steps to your lab report and describe in your own words.

15. Now, configure Router2's Serial interface 0/1/1. Write your list of commands in the following starting from User EXEC mode:

```
Router2>enable
```

```
Router2#config t
```

```
Router2(config) #interface serial 0/1/1
```

```
Router2(config-if) #ip address 195.[X].3.2 255.255.255.0
```

```
Router2(config-if) #no shutdown
```

Attach the screenshot of the above configuration steps to your lab report and describe in your own words.

16. Go to Privileged Exec Mode of Router1 and view running configuration using show running-config in the router. Verify the interface addresses as per the configuration.

```
Router1#show running-config
```

Compare interfaces' IP addresses and subnet masks of Router1 with your diagram,

Did you find any error? _____

If you find errors, fix them, then attach the screenshot of the show running-config displaying only interface

configuration lines.

17. Go to Privileged Exec Mode of Router2 and view running configuration using show running-config in the router. Verify the interface addresses as per the configuration.

Router2#**show running-config**

Compare interfaces' IP addresses and subnet masks of Router2 with your diagram,

Did you find any error? _____

If you find errors, fix them, then attach the screenshot of the show running-config displaying only interface configuration lines.

18. Test the connectivity of all PCs to the default gateway:

Is ping from A1 to Default Gateway successful (Yes/No): _____, if No, fix the PC or Router configuration

Is ping from B1 to Default Gateway successful (Yes/No): _____, if No, fix the PC or Router configuration

Attach two screenshots (A1 to Default Gateway, B1 to Default Gateway) to your lab report, and describe them.

19. Test the connectivity of Router1 to Router2

Is ping from Router1 to Router2 serial interface (Yes/No): _____, if No, fix the serial interface configurations

Attach the screenshot of this output to your lab report and describe it.

20. Test the connectivity of Network A to Network B:

Is ping from A1 to B1 successful (Yes/No): _____, if No, describe the reason.

Is ping from B2 to A2 successful (Yes/No): _____, if No, describe the reason.

Attach one of the screenshots to your lab report, and describe it.

Attach the complete and labeled network diagram to your lab report.