**Laboratory 3 – Basic configuration of Cisco routers[[1]](#footnote-1)**

Student name: …………………………….. Student ID: …………………………………...

**Topology**



**Addressing table**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device** | **Interface** | **IP Address** | **Subnet Mask** | **Default Gateway** |
| R1 | Fa0/0 | 192.168.x1.1 | 255.255.255.0 | N/A |
| S0/0/0 | 192.168.x2.1 | 255.255.255.0 | N/A |
| R2 | Fa0/0 | 192.168.x3.1 | 255.255.255.0 | N/A |
| S0/0/0 | 192.168.x2.2 | 255.255.255.0 | N/A |
| PC1 | N/A | 192.168.x1.10 | 255.255.255.0 | 192.168.x1.1 |
| PC2 | N/A | 192.168.x3.10 | 255.255.255.0 | 192.168.x3.1 |

***Note****: x is student ID.*

**Learning Objectives**

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

* Using the emulation environment GNS3 or the simulation Packet Tracer
* Perform basic IOS command line interface operations.
* Perform basic router configuration.
* Verify and test configurations using show commands, ping and traceroute.
* Create a startup configuration file.

**Scenario**

In this lab activity, you will learn skills such as cabling devices, establishing a console connection, and basic IOS command line interface operation and configuration commands. You will also learn to save configuration files and capture your configurations to a text file. The skill presented in this lab are essential to completing the rest of the labs in this course.

**Task 1: Install GNS3 software and create the topology**

Download software from Blackboard.

Create the simulation topology given above witch router 2600 series.

(The students can google the instruction for installation from the Internet.)

**Task 2: Understand Command Line Basics.**

**Step 1: Enter privileged EXEC mode.**

Router>**enable**   
Router#

**Step 2: Enter an incorrect command and observe the router response.**

Router#comfigure terminal   
^   
% Invalid input detected at '^' marker.   
  
Router#

Command line errors occur primarily from typing mistakes. If a command keyword is incorrectly typed, the user interface uses the caret symbol (^) to identify and isolate the error. The ^ appears at or near the point in the command string where an incorrect command, keyword, or argument was entered.

**Step 3: Correct the previous command.**

If a command is entered incorrectly, and the **Enter** key is pressed, the **Up Arrow** key on the keyboard can be pressed to repeat the last command. Use the **Right Arrow** and **Left** **Arrow** keys to move the cursor to the location where the mistake was made. Then make the correction. If something needs to be deleted, use the **Backspace** key. Use the directional keys and the **Backspace** key to correct the command to **configure terminal**, and then press **Enter**.

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

**Step 4: Return to privileged EXEC mode with the exit command.**

Router(config)#exit   
%SYS-5-CONFIG\_I: Configured from console by console   
Router#

**Step 5: Examine the commands that are available for privileged EXEC mode.**

A question mark, **?**, can be entered at the prompt to display a list of available commands.

Router#**?**   
Exec commands:   
<1-99> Session number to resume   
clear Reset functions   
clock Manage the system clock   
configure Enter configuration mode   
connect Open a terminal connection   
copy Copy from one file to another   
debug Debugging functions (see also 'undebug')   
delete Delete a file   
dir List files on a filesystem   
disable Turn off privileged commands   
disconnect Disconnect an existing network connection   
enable Turn on privileged commands   
erase Erase a filesystem   
exit Exit from the EXEC   
logout Exit from the EXEC   
no Disable debugging informations   
ping Send echo messages   
reload Halt and perform a cold restart   
resume Resume an active network connection   
setup Run the SETUP command facility   
show Show running system information   
--More--

Notice the --More-- at the bottom of the command output. The --More-- prompt indicates that there are multiple screens of output. When a --More-- prompt appears, press the **Spacebar** to view the next available screen. To display only the next line, press the **Enter** key. Press any other key to return to the prompt.

**Step 6: View output.**

View the rest of the command output by pressing the **Spacebar**. The remainder of the output will appear where the --More-- prompt appeared previously. telnet Open a telnet connection traceroute Trace route to destination undebug Disable debugging functions (see also 'debug') vlan Configure VLAN parameters write Write running configuration to memory, network, or terminal

**Step 7: Exit privileged EXEC mode with the exit command.**

Router#**exit**

The following output should be displayed:

Router con0 is now available   
Press RETURN to get started.

**Step 8: Press the Enter key to enter user EXEC mode.**

The Router> prompt should be visible.

**Step 9: Type an abbreviated IOS command.**

IOS commands can be abbreviated, as long as enough characters are typed for the IOS to recognize the unique command. Enter only the character **e** at the command prompt and observe the results.

Router>**e**   
% Ambiguous command: "e"   
Router>

Enter **en** at the command prompt and observe the results.

Router>**en**   
Router#

The abbreviated command **en** contains enough characters for the IOS to distinguish the **enable** command from the **exit** command.

**Step 10: Press the Tab key after an abbreviated command to use auto-complete.**

Typing an abbreviated command, such as **conf**, followed by the **Tab** key completes a partial command name. This functionality of the IOS is called auto-complete. Type the abbreviated command **conf**, press the **Tab** key, and observe the results.

Router#**conf**   
Router#**configure**

This auto-complete feature can be used as long as enough characters are typed for the IOS to recognize the unique command.

**Step 11: Enter IOS commands in the correct mode.**

IOS commands must be entered in the correct mode. For example, configuration changes cannot be made while in privileged EXEC mode. Attempt to enter the command hostname **R1** at the privileged EXEC prompt and observe the results.

Router#hostname R1   
^   
% Invalid input detected at '^' marker.   
  
Router#

**Task 3: Perform Basic Configuration of Router R1.**

**Step 1: Enter privileged EXEC mode.**

Router>**enable**   
Router#

**Step 2: Enter global configuration mode.**

Router#**configure terminal**

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#

**Step 3: Configure the router name as R1.**

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

Router(config)#**hostname R1**   
R1(config)#

**Step 4: Disable DNS lookup with the no ip domain-lookup command.**

R1(config)#**no ip domain-lookup**   
R1(config)#

Why would you want to disable DNS lookup in a lab environment?

What would happen if you disabled DNS lookup in a production environment?

**Step 5: Configure an EXEC mode password.**

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

R1(config)#**enable secret class**   
R1(config)#

The **enable secret** command is used to provide an additional layer of security over the **enable password** command. The **enable secret** command provides better security by storing the **enable secret** password using a non-reversible cryptographic function. The added layer of security encryption provides is useful in environments where the password crosses the network or is stored on a TFTP server. When both the **enable password** and **enable secret** passwords are configured, the router expects the password as defined in the **enable secret** command. In this case, the router ignores the password defined in the **enable password** command.

**Step 6: Remove the enable password.**

Because the **enable secret** is configured, the **enable password** is no longer necessary. IOS commands can be removed from the configuration using the **no** form of the command.

R1(config)#**no enable password**   
R1(config)#

**Step 7: 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)#   
  
When does this banner display?

Why should every router have a message-of-the-day banner?

**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)#

**Step 10: Configure the FastEthernet 0/0 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: Use the description command to provide a description for this interface.**

R1(config-if)#**description R1 LAN**   
R1(config-if)#

**Step 12: Configure the Serial0/0/0 interface with the IP address 192.168.2.1/24.**

Set the clock rate to 64000.

**Note:** Because the routers in the labs will not be connected to a live leased line, one of the routers wil need to provide the clocking for the circuit. This is normally provided to each of the routers by the service provider. To provide this clocking signal in the lab, one of the routers wil need to act as the DCE on the connection. This function is achieved by applying the **clock rate 64000** command on the serial 0/0/0 interface, where the DCE end of the nul modem cable has been connected.

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 wil not be activated until the serial interface on R2 is configured and activated.

**Step 13: Use the description command to provide a description for this interface.**

R1(config-if)#description **Link to R2**   
R1(config-if)#

**Step 14: Use the end command to return to privileged EXEC mode.**

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

**Step 15: Save the R1 configuration.**

Save the R1 configuration using the **copy running-config startup-config** command. (This command may not work on GNS3.)

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

**Task 4: Perform Basic Configuration of Router R2.**

**Step 1: For R2, repeat Steps 1 through 9 from Task 6.**

**Step 2: 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: Use the description command to provide a description for this interface.**

R1(config-if)#**description Link to R1**   
R1(config-if)#

**Step 4: Configure the FastEthernet 0/0 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 5: Use the description command to provide a description for this interface.**

R1(config-if)#**description R2 LAN**   
R1(config-if)#

**Step 6: Use the end command to return to privileged EXEC mode.**

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

**Step 7: Save the R2 configuration.**

Save the R2 configuration using the **copy running-config startup-config** command, (this command may not work on GNS3.)

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

**Task 5: Configure IP Addressing on the Host PCs.**

**Step 1: Configure the host PC1.**

Configure the host PC1 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 PC2.**

Configure the host PC2 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 7: Examine Router show Commands.**

There are many **show** commands that can be used to examine the operation of the router. In both privileged EXEC and user EXEC modes, the command **show ?** provides a list of available **show** commands. The list is considerably longer in privileged EXEC mode than it is in user EXEC mode.

**Step 1: Examine the show running-config command.**

The **show running-config** command is used to display the contents of the currently running configuration file. From privileged EXEC mode on the R1 router, examine the output of the **show running-config** command. If the ­-More-- prompt appears, press the **Spacebar** to view the remainder of the command output.

*<paste your output here >*

**Step 2: Examine The show startup-config command.**

The **show startup-config** command displays the startup configuration file contained in NVRAM. From privileged EXEC mode on the R1 router, examine the output of the **show startup-config** command. If the ­-More-- prompt appears, press the **Spacebar** to view the remainder of the command output.

*<paste your output here >*

Does the startup-config similer to the running-config ?

**Step 3: Examine the show interfaces command.**

The **show interfaces** command displays statistics for all interfaces configured on the router. A specific interface can be added to the end of this command to display the statistics for only that interface. From privileged EXEC mode on the R1 router, examine the output of the **show interfaces fastEthernet0/0** command. If the ­-More-- prompt appears, press the **Spacebar** to view the remainder of the command output.

*<paste your output here >*

How is the status of the using interfaces ?

**Step 4: Examine the show version command.**

The **show version** command displays information about the currently loaded software version along with hardware and device information. From privileged EXEC mode on the R1 router, examine the output of the **show version** command. If the ­-More-- prompt appears, press the **Spacebar** to view the remainder of the command output.

*<paste your output here >*

What is the Cisco IOS version that the router is running?

What is the system image filename?

**Step 5: Examine the show ip interface brief command.**

The **show ip interface brief** command displays a summary of the usability status information for each interface. From privileged EXEC mode on the R1 router, examine the output of the **show ip interface brief** command. If the ­-More-- prompt appears, press the **Spacebar** to view the remainder of the command output.

*<paste your output here >*

Are the necessary interfaces up ?

**Task 8: Using ping.**

The **ping** command is a useful tool for troubleshooting Layers 1 though 3 of the OSI model and diagnosing basic network connectivity. This operation can be performed at either the user or privileged EXEC modes. Using **ping** sends an Internet Control Message Protocol (ICMP) packet to the specified device and then waits for a reply. Pings can be sent from a router or a host PC.

**Step 1: Use the ping command to test connectivity between the R1 router and PC1.**

R1#**ping 192.168.1.10**   
Type escape sequence to abort.   
Sending 5, 100-byte ICMP Echos to 192.168.1.10, timeout is 2 seconds:   
.!!!!   
Success rate is 80 percent (4/5), round-trip min/avg/max = 72/79/91 ms

Each exclamation point (!) indicates a successful echo. Each period (.) on the display indicates that the application on the router timed out while it waited for a packet echo from a target. The first ping packet failed because the router did not have an ARP table entry for the destination address of the IP packet. Because there is no ARP table entry, the packet is dropped. The router then sends an ARP request, receives a response, and adds the MAC address to the ARP table. When the next ping packet arrives, it will be forwarded and be successful.

**Step 2: Repeat the ping from R1 to PC1.**

R1#**ping 192.168.1.10**   
  
Type escape sequence to abort.   
Sending 5, 100-byte ICMP Echos to 192.168.1.10, timeout is 2 seconds:   
!!!!!   
Success rate is 100 percent (5/5), round-trip min/avg/max = 72/83/93 ms   
  
R1#

All of the pings are successful this time because the router has an entry for the destination IP address in the ARP table.

**Step 3: Send an extended ping from R1 to PC1.**

To accomplish this, type **ping** at the privileged EXEC prompt and press **Enter**. Fill out the rest of the prompts as shown:

R1#**ping**   
Protocol [ip]:   
Target IP address: **192.168.1.10**   
Repeat count [5]: **10**   
Datagram size [100]:   
Timeout in seconds [2]:   
Extended commands [n]:   
Sweep range of sizes [n]:   
Type escape sequence to abort.   
  
  
  
Sending 10, 100-byte ICMP Echos to 192.168.1.10, timeout is 2 seconds:   
!!!!!!!!!!   
Success rate is 100 percent (10/10), round-trip min/avg/max = 53/77/94 ms   
  
R1#

**Step 4: Send a ping from PC1 to R1.**

From Windows go to **Start > Programs > Accessories > Command Prompt**. In the Command Prompt window that opens, ping R1 by issuing the following command:

C:\> **ping 192.168.1.1**

The ping should respond with successful results.

**Step 5: Send an extended ping from PC1 to R1.**

To accomplish this, enter the following command at the Windows command prompt:

C:\>**ping 192.168.1.1 ­n 10**

There should be 10 successful responses from the command.

**Task 9: Using traceroute.**

The **traceroute** command is an excellent utility for troubleshooting the path that a packet takes through an internetwork of routers. It can help to isolate problem links and routers along the way. The **traceroute** command uses ICMP packets and the error message generated by routers when the packet exceeds its Time-To-Live (TTL). This operation can be performed at either the user or privileged EXEC modes. The Windows version of this command is **tracert**.

**Step 1: Use the traceroute command at the R1 privileged EXEC prompt to discover the path that a packet will take from the R1 router to PC1.**

R1#**traceroute 192.168.1.10**   
Type escape sequence to abort.   
Tracing the route to 192.168.1.10   
  
1 192.168.1.10 103 msec 81 msec 70 msec   
R1#

**Step 2: Use the tracert command at the Windows command prompt to discover the path that a packet will take from the R1 router to PC1.**

C:\>**tracert 192.168.1.1**   
Tracing route to 192.168.1.1 over a maximum of 30 hops:   
  
1 71 ms 70 ms 73 ms 192.168.1.1   
  
Trace complete.   
  
C:\>

**Task 10: Create a start.txt File.**

Router configurations can be captured to a text (.txt) file and saved for later use. The configuration can be copied back to the router so that the commands do not have to be entered one at a time.

**Step 1: View the running configuration of the router using the show running-config command.**

<Example of the output>

R1#**show running-config**   
!   
version 12.3   
!   
hostname R1   
!   
!   
enable secret 5 $1$J.hq$Ds72Qz86tvpcuW2X3FqBS.   
!   
no ip domain-lookup   
!   
interface FastEthernet0/0   
description R1 LAN   
mac-address 0007.eca7.1511   
ip address 192.168. 1.1 255.255.255.0   
duplex auto   
speed auto   
!   
interface FastEthernet0/1   
mac-address 0001.42dd.a220   
no ip address   
duplex auto   
speed auto   
shutdown   
!   
interface Serial0/0/0   
description Link to R2   
ip address 192.168. 2.1 255.255.255.0   
clock rate 64000   
!   
interface Serial0/0/1   
no ip address   
shutdown   
!   
interface Vlan1   
no ip address   
shutdown   
!   
ip classless   
!   
!   
!   
!   
line con 0   
password cisco   
line vty 0 4   
password cisco   
login   
!   
  
  
  
  
end   
  
R1#

**Step 2: Copy the command output.**

Select the command output. From the HyperTerminal Edit menu, choose the copy command.

**Step 3: Paste output in Notepad.**

Open Notepad. Notepad is typically found on the **Start** menu under **Programs** **>** **Accessories**. From the Notepad Edit menu, click **Paste**.

**Step 4: Edit commands.**

Some commands wil have to be edited or added before the startup script can be applied to a router. Some of these changes are: Adding a **no shutdown** command to FastEthernet and serial interfaces that are being used. Replacing the encrypted text in the **enable secret** command with the appropriate password. Removing the **mac-address** command from the interfaces. Removing the **ip classless** command. Removing unused interfaces. Edit the text in the Notepad file as shown below:

<for example>

hostname R1   
!   
!   
enable secret class   
!   
no ip domain-lookup   
!   
interface FastEthernet0/0   
description R1 LAN   
ip address 192.168.1.1 255.255.255.0   
no shutdown   
duplex auto   
speed auto   
!   
interface Serial0/0/0   
description Link to R2   
ip address 192.168.2.1 255.255.255.0   
clock rate 64000   
no shutdown   
!   
!   
!   
!   
line con 0   
password cisco   
line vty 0 4   
password cisco   
login   
  
!   
end

**Step 5: Save the open file in Notepad to start.txt and attach to your report.**

R1#

**Task 11: Clean Up**

Save your project, shutdown the computer. Upload your report to Blackboard.

**THE END.**

1. This lab is modified from CCNA lab material. [↑](#footnote-ref-1)