

## Lab 9: Cisco IOS Command Line Interface (CLI) (Sheet for Week 10 & 11)

The aim of this lab session is to understand how to configure a Cisco router and to learn the Cisco's Internetworking Operating System (IOS) commands.

### Equipments:

A PC with Cisco Packet Tracer installed. Logbook.

### Objectives

- Set up a new Cisco 1841 Integrated Services Router (ISR).
- Connect a computer to the router console interface.
- Configure HyperTerminal so that the computer can communicate with the router and observe the router start-up sequence.
- Display router configuration information using the **show running-config** and **show startup-config** commands and restart the router using the **reload** command.
- Display router system, Cisco IOS software and configuration register information using the **show version** command.
- Exploration of the IOS Command Line Interface (CLI)

### Exercise

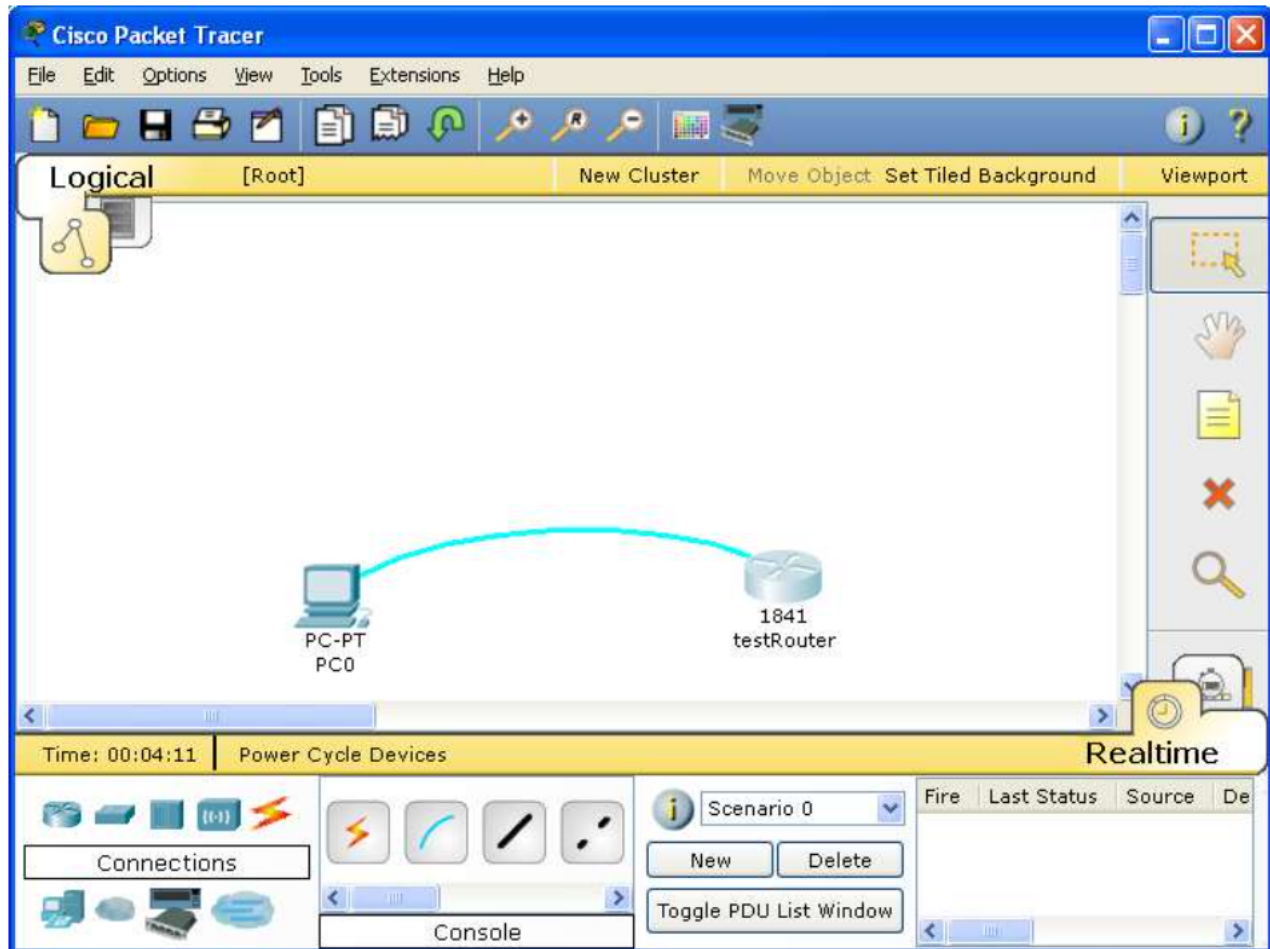
#### Part 1: Using Packet Tracer to create a logical connection diagram for this workshop.

The bottom left-hand corner of the Packet Tracer screen displays eight icons that represent device categories or groups, such as Routers, Switches, or End Devices.

Moving the cursor over the device categories will show the name of the category in the box. To select a device, first select the device category. Once the device category is selected, the options within that category appear in the box next to the category listings. Select the device option that is required.

- (a) Select End Devices from the options in the bottom left-hand corner. Drag and drop one generic PC onto the design area. Click on the PC, from the window, select the Config tab and rename them to PC0 (if it is not).
- (b) Select routers from the options in the bottom left-hand corner. Add one generic router onto the design area. Rename it to testRouter.
- (c) Select Connections from the bottom left-hand corner. Choose a Console cable type to connect PC0 (RS232) and testRouter (Console port)

The creating testing system should like the following figure 1.



**Part 2:** Configure HyperTerminal so that the computer can communicate with the router and Router's Boot up process

Although by clicking on the testRouter Router in the Packet tracer environment, you can monitor how the Cisco IOS works. In the practical work, the first step to boot up and set up a router is through the PC which connects to the router by console cable.

- (a) Click on the PC0, a window like the following figure 2 will pop up. Click on the Desktop tab, several simulation software are available. Click terminal icon, a simulation HyperTerminal will be running for you to remotely configure a network device like router. You must first configure the terminal emulation parameters as follows:

- 9600 baud
- 8 data bits
- no parity
- 1 stop bit
- no flow control and no parity

By clicking on OK you will be able to move to the HyperTerminal window displayed in Figure 3

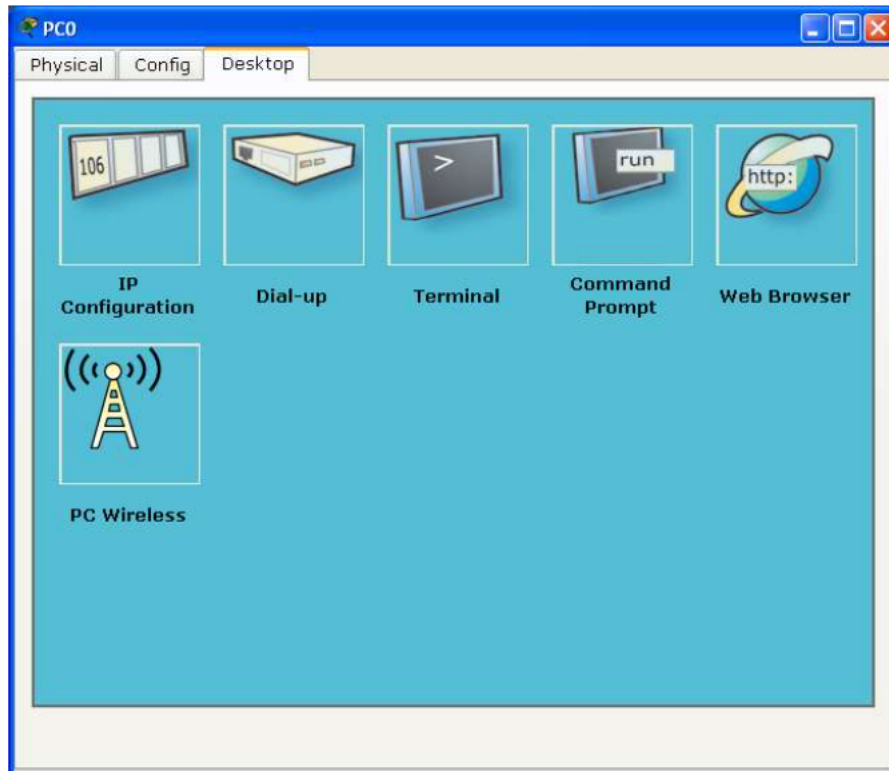


Figure 2 Simulation software available for Packet Tracer End Devices

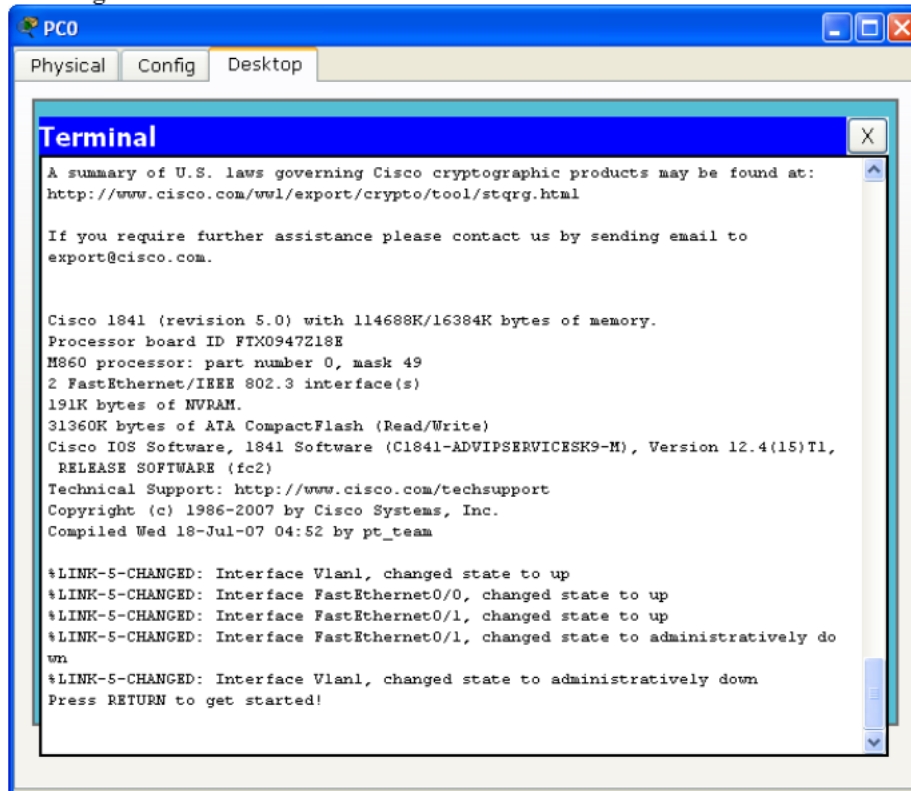


Figure 3 Router Start up Message

- (b) Observe the startup messages as they appear in the terminal emulation program window. While these messages are appearing, do not press any keys on the keyboard. Pressing a key interrupts the router startup

process. Some examples of startup messages displayed are the amount of main memory installed and the image type of the Cisco IOS software that the router is using. Can you find these example startup messages in the following figure?

- (c) The figure shows that there is 114 MB of memory installed on this router, and the Cisco IOS image type is C1841-ADVSECURITYK9-M. Startup messages are generated by the operating system of the router. The messages vary depending on the software installed on the router. These messages scroll by quickly and take a few minutes to stop.

When the router is finished starting up, the following system messages appear in the terminal emulation window:

--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: no

Would you like to terminate autoinstall? [yes]:

Press RETURN to get started!

- (d) After pressing **Return** (Enter) to get started, several system messages regarding the interface and line status appear. If the router is in its default configuration, the user mode prompt **Router>** is displayed.

**Note:** It may be necessary to press **Enter** after the interface status messages are displayed.

### Part 3: Displaying Router Information using show Commands

#### Step 1: Display the router running configuration.

From the router user prompt, enter privileged mode using the **enable** command, and then issue the **show running-config** command to see the current router configuration in RAM.

If the router is in default configuration, the output is similar to that shown below. The default host name is Router, and none of the interfaces have IP addresses. This 1841 router has two built-in Fast Ethernet interfaces (0/0 and 0/1). In the default configuration, all interfaces are shutdown. In addition, there are no passwords set.

Router>**enable**

Router#**show running-config**

*Building configuration...*

*Current configuration : 357 bytes*

!

*version 12.4*

*no service password-encryption*

!

*hostname Router*

!

!

!

!

!

*ip ssh version 1*

!

!

*interface FastEthernet0/0*

*no ip address*

*duplex auto*

*speed auto*

*shutdown*

!

From the router privileged mode prompt, issue the **configure terminal** command to enter configuration mode. Change the router name using the **hostname** command, and then end configuration mode with the **end** command.

Router#**configure terminal**

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

Router(config)#**hostname testRouter**

testRouter(config)#**end**

testRouter#

%SYS-5-CONFIG\_I: Configured from console by console

testRouter#

c. What is the router prompt now? \_\_\_\_\_

d. From the router privileged mode prompt, issue the **show running-config** command again. How does the output differ from the first time you issued this command?

\_\_\_\_\_

### Step 2: Display the router startup configuration.

From the router privileged mode prompt, issue the **show startup-config** command to see the startup file stored in NVRAM. Is the output from this command the same as that from the **show running-config** command issued in Step 1d?

Router#**show startup-config**

\_\_\_\_\_

### Step 3: Save the running-config to the startup-config.

When the router is booted up, the startup-config file is loaded into router RAM and becomes the running-config file. Changes made to the running-config take effect immediately, but do not affect the startup-config. To make running-config changes permanent, they must be copied to the startup-config using the **copy running-config startup-config** command.

From the router privileged mode prompt, issue the **copy running-config startup-config** command to make the changes permanent. When prompted for the destination filename, press **Enter** to accept the default name of startup-config.

testRouter#**copy running-config startup-config**

Destination filename [startup-config]?

Building configuration...

[OK]

testRouter#

From the router privileged mode prompt, issue the **show startup-config** command again. Is the output from this command the same as that from the **show running-config** command issued in Step 1d?

To restart the router, from the router privileged mode prompt, issue the **reload** command. This performs a software restart and loads the startup-config file from NVRAM. What is the router prompt now?

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### Step 4: Display the router system information using the show version command.

The **show version** command displays useful information about the router internal components, including the amount of RAM, Cisco IOS software version, the number and type of interfaces installed, and the configuration register, which controls how the router boots up. By default, the config register is set to hexadecimal 2102 (0x2102), which causes the router to load the operating system (Cisco IOS) from flash memory.

The information displayed by the **show version** command is displayed as part of router bootup. Your output may vary, depending on the router model, Cisco IOS software version, and internal components installed.

From the router privileged mode prompt, issue the **show version** command and answer the following questions:

1. What is the Cisco IOS software version number? \_\_\_\_\_
2. How long has the router been up (uptime)? \_\_\_\_\_
3. What is the name of the system image file? \_\_\_\_\_
4. How many and what types of interfaces does this router have? \_\_\_\_\_
5. How many bytes of NVRAM does the router have? \_\_\_\_\_
6. How many bytes of flash (RAM) memory does the router have? \_\_\_\_\_
7. What is the configuration register setting? \_\_\_\_\_

#### **Part 4: Router Connection and Exploration of the IOS Command Line Interface (CLI)**

- (a) As you have known from the previous operations, access to the IOS command line interface is generally referred to as an EXEC session. As a security feature, Cisco IOS separates EXEC session into two different access levels – user EXEC level which will have a right arrow (>) in the prompt and privileged EXEC level which has a sharp key (#) in the prompt. Privileged EXEC level allows a person to access all router commands and can be password protected. You can use “enable” and “disable” commands to switch between these two levels.
- (b) Switch between the two levels and use “?” to show all the commands in these two levels. Copies these commands to your logbook and compare what are missing in the user EXEC level. Figure 4 shows the **IOS CLI hierarchy**.

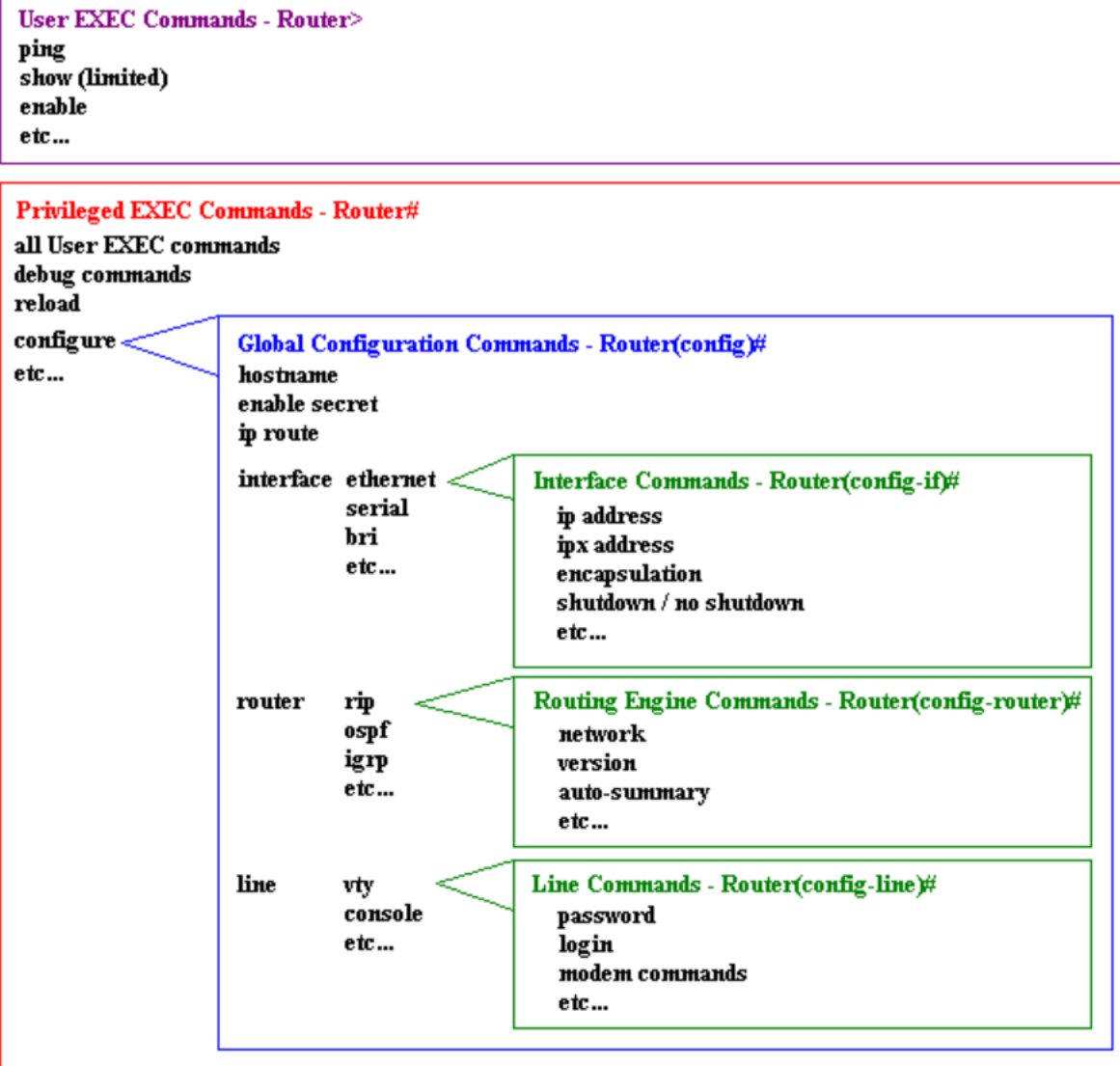


Figure 4 - IOS CLI hierarchy

**CLI Editor Features**

- (c) Cisco IOS CAI offers two types of context sensitive help word help and command syntax help. Word help can be used to obtain a list of commands that begin with a particular character sequence. To use word help, type in the characters in question followed immediately by the question mark(?), the router will display list of commands that start with the characters that were entered. Try to run the command “co?” to see what happens
- (d) Command syntax help can be used to obtain a list of command, keyword, or argument options that available based on the syntax the user has already entered. Try run the command “configure ?” to see what will happen (attention: there is a space between the command and ? mark).

**Router Configuration****(e) Entering Configurations**

Make sure you are on the privileged level to implement the following operations. Follow the commands of the left column step by step to set up your router. Here the “Router” is the hostname you give to the router. You can change to the name you like by using the *hostname* command in the configuration status.

<i>Router&gt; enable</i>	- switches to privileged EXEC level
<i>Router# configure terminal</i>	- switches to global configuration level
<i>Router(config)# enable secret cisco</i>	- configures router with an enable secret (global)
<i>Router(config)# ip route 0.0.0.0 0.0.0.0 20.2.2.3</i>	- configures a static IP route (global)
<i>Router(config)# interface FastEthernet0/0</i>	- switches to configure the ethernet0 interface
<i>Router(config-if)# ip address 10.10.x.1 255.255.0255.0</i>	- configures an IP address on ethernet0 (interface)
<i>Router(config-if)# no shutdown</i>	- activates ethernet0 (interface)
<i>Router(config-if)# exit</i>	- exits back to global configuration level
<i>Router(config)# interface Vlan1</i>	- switches to configure the serial0 interface
<i>Router(config-if)# ip address 10.10.10.1 255.255.255.0</i>	- configures an IP address on serial0 (interface)
<i>Router(config-if)# no shutdown</i>	- activates serial0 (interface)
<i>Router(config-if)# description Cisco DHCP</i>	
<i>Router(config-if)# ip dhcp pool cisco</i>	
<i>Router(dhcp-config)# network 10.10.10.0 255.255.255.0</i>	- DHCP setup
<i>Router(dhcp-config)# dns-server 192.168.1.10</i>	
<i>Router(config-if)# default-router 10.10.10.1</i>	
<i>Router(dhcp-config)# exit</i>	
<i>Router(config-if)# exit</i>	- exits back to global configuration level
<i>Router(config)# router rip</i>	- switches to configure RIP routing engine
<i>Router(config-router)# network 10.0.0.0</i>	- adds network 10.0.0.0 to RIP engine (routing engine)
<i>Router(config-router)# network 20.0.0.0</i>	- adds network 20.0.0.0 to RIP engine (routing engine)
<i>Router(config-router)# exit</i>	- exits back to global configuration level
<i>Router(config)# exit</i>	- exits out of configuration level
<i>Router(config)# line console 0</i>	
<i>Router(config)# password [password]</i>	
<i>Router(config)# login</i>	Activates Console access
<i>Router(config)# line vty 0 4</i>	Set up the network connection to the router
<i>Router(config)# password [password]</i>	Setup the password for telnet access
<i>Router(config)# login</i>	Activates the telnet connection
<i>Router# copy running-config startup-config</i>	
<i>Router# disable</i>	- disables privileged EXEC level
<i>Router&gt;</i>	- indicates user is back to user EXEC level

#### (f) Removing Commands / Resetting Default Values

IOS provides an easy way to remove commands from a configuration. To remove a command from the configuration, simply navigate to the proper location and type "no" followed by the command to be removed. The following example displays how to remove an IP address from the ethernet0 interface. (leave to the last steps to implement these examples)

<i>Router&gt; enable</i>	- switches to privileged EXEC level
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Router# configure terminal	- switches to global configuration level
Router(config)# interface ethernet0	- switches to configure the ethernet0 interface
Router(config-if)# no ip address	- removes IP address
Router(config-if)# exit	- exits back to global configuration level
Router(config)# exit	- exits out of configuration level
Router# disable	- disables privileged EXEC level
Router>	- prompt indicates user is back to user EXEC level

### Router Management

- (g) IOS supports many different types of show commands. To display the running-configuration, type the following command in privileged EXEC mode:

Router#show running-config

To display the startup-configuration that is stored in NVRAM, type the following command in privileged EXEC mode:

Router#show startup-config

Writing down the output of these two configuration informations.

- (h) To display the version, type the following command in privileged EXEC mode:

Router# show version

- (i) To view information about a particular interface, use the show interface command. The show interface command provides the following list of important information:

Interface State (e.g. UP, DOWN, LOOPED)  
Protocol addresses  
Bandwidth  
Reliability and Load  
Encapsulation type  
Packet Rates  
Error Rates  
Signaling Status (i.e. DCD,DSR,DTR,RTS,CTS)

- (j) For example, to check the interface you connect to the router, type the following command in privileged EXEC mode:

Router# show interface FastEthernet2