Configuring Cisco Routers

Router

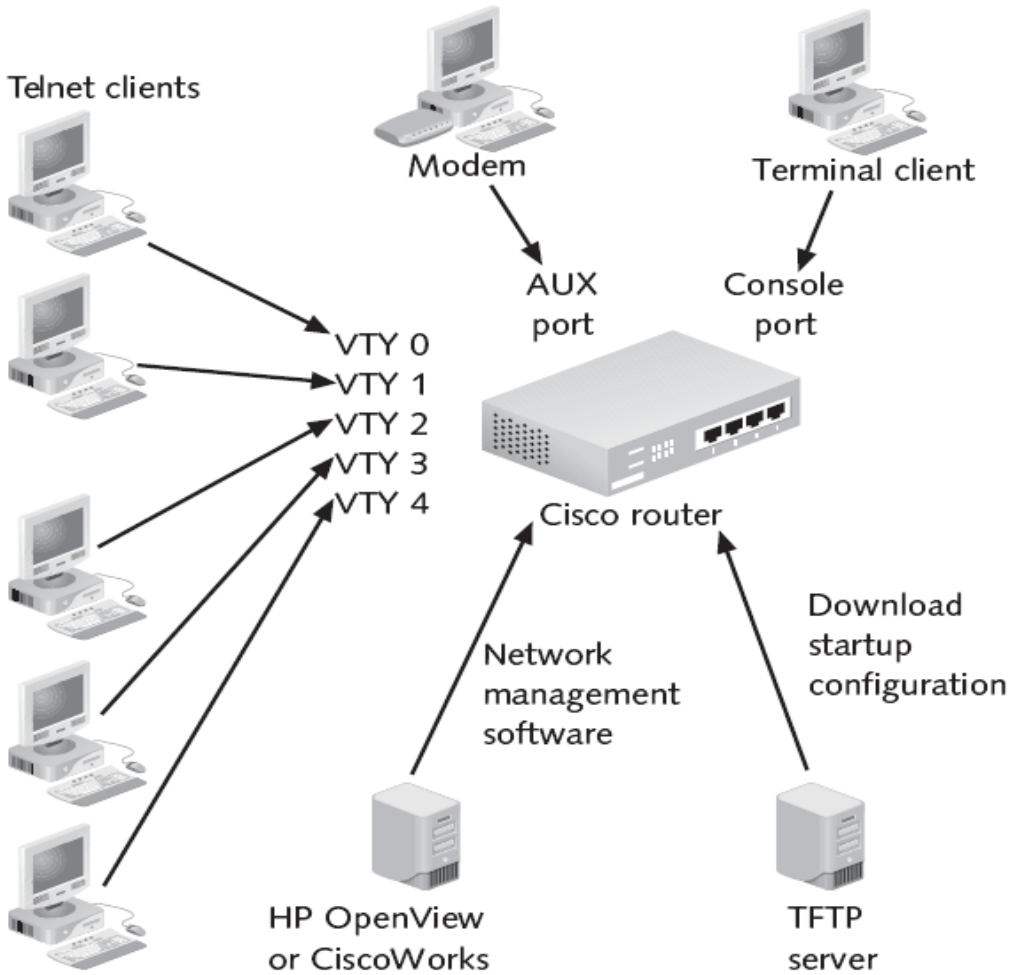
- Router is a device which makes connection possible between two or more different networks present at same or different geographical locations.
- It works on 3rd layer of OSI model
- It does two basic things:.
  1. Select the best path from the routing table.
  2. Forward the packet on that path.

Cisco IOS Software

- A router or switch cannot function without an OS.
- Cisco calls its operating system the Cisco Internetwork Operating System or Cisco IOS.
- The Cisco IOS provides the following network services:
  - Basic routing and switching functions
  - Reliable and secure access to networked resources
  - Network scalability
- Provides a command-line interface (CLI)
  - Allows network operators to check the status of the router and network administrators to manage and configure the router

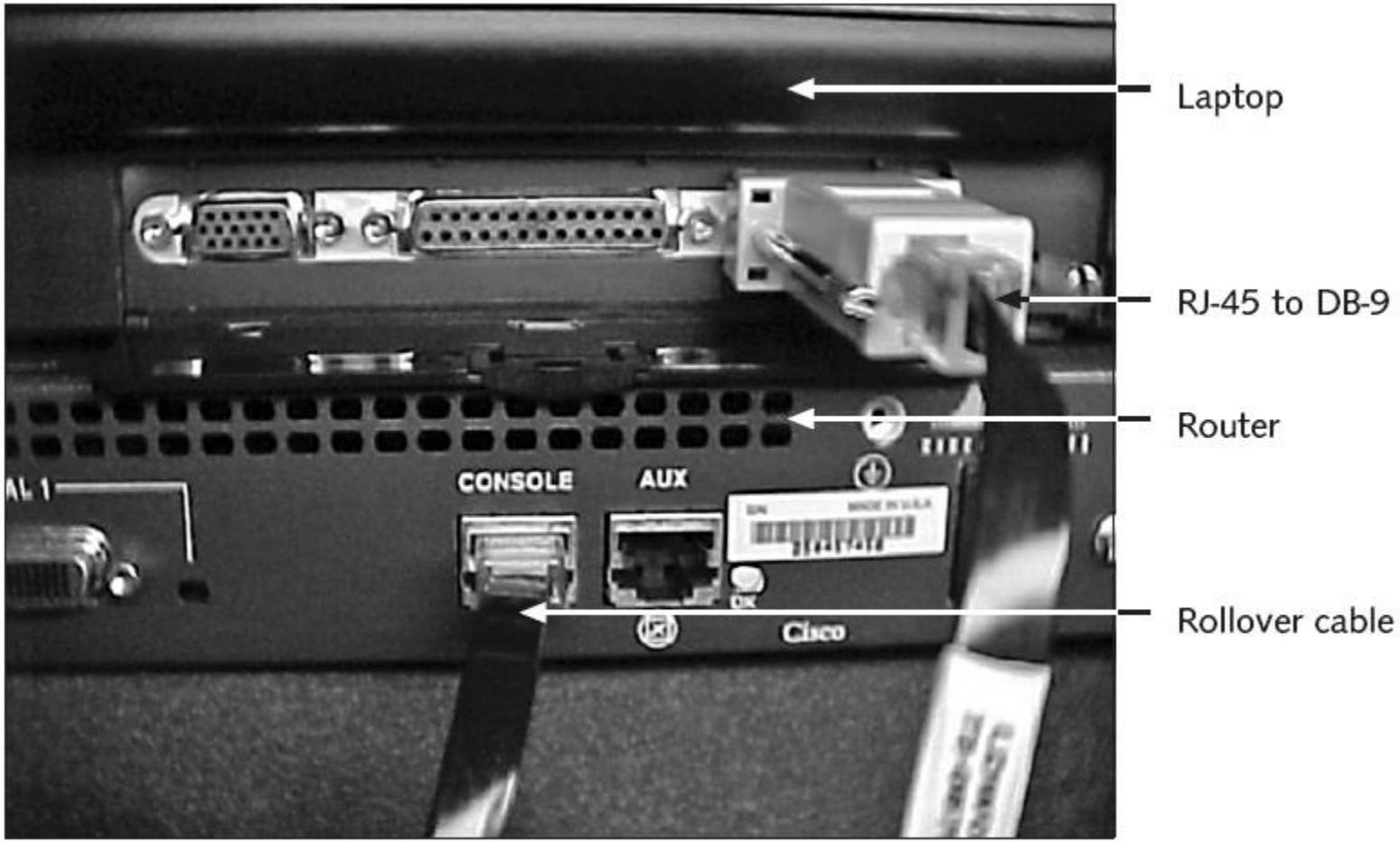
Configuration Sources

- Router can be configured from:
  - Console port (A console session).
  - Auxiliary port (AUX) (A dialup connection using a modem).
  - Virtual terminals (VTY) (Telnet session to the router).
  - Trivial File Transfer Protocol (TFTP) server.



Methods for configuring a Cisco router

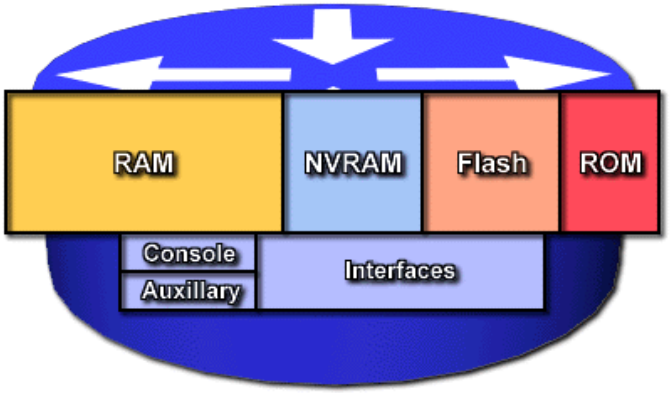
Configuration Sources



Connecting a PC to the console

Router Components

- **RAM/DRAM**
  - Routing tables.
  - ARP cache.
  - Packet buffering
  - Packet queues.
  - RAM contents lost when power is lost.



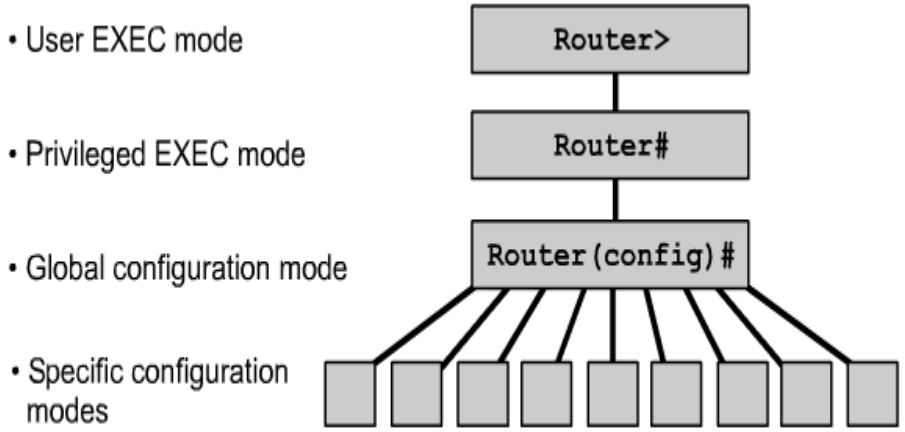
- **NVRAM – nonvolatile RAM**
  - Router Configuration saved here
  - Configuration loaded from here on startup
  - NVRAM retains data when power is turned off.
- **Flash - erasable, reprogrammable ROM (EEPROM)**
  - OS image & microcode.
  - Can have multiple copies of IOS.
  - Flash contents are retained when power is turned off.
- **ROM - read only memory.**
  - POST (power on self test).
  - Bootstrap program (boots router and loads the IOS)
  - Operating system software.

Modes of the Router

- Here are different modes of the router
  - Setup Mode
  - User Mode
  - Privileged Mode
  - Global Configuration Mode
  - Interface Mode

CLI command modes

```
Router> enable
Router# configure terminal
Router(config)# interface fa 0/0
Router(config-if)#
```



Configuration Mode	Prompt
Interface	Router(config-if)#
Subinterface	Router(config-subif)#
Controller	Router(config-controller)#
Map-list	Router(config-map-list)#
Map-class	Router(config-map-class)#
Line	Router(config-line)#
Router	Router(config-router)#
IPX-router	Router(config-ipx-router)#
Route-map	Router(config-route-map)#

Cont..

- **User EXEC mode** – allows the user to check the router status. No router configuration changes are allowed.
- **Privileged EXEC mode** – allows the user to change the router configuration.
- **Global configuration mode** – used to modify system wide configuration parameters .
- **Interface configuration mode** – allows you to configure the Ethernet and serial interfaces on your router.
- **Line configuration mode** – allows to configure the virtual terminals, console, and AUX lines that let us access the router.

Mode	Prompt	To enter	To exit	Used for
User EXEC	`Router>`	If there is a line password, enter it. Otherwise, press the Enter key.	`logout` or `exit`	Shows the status of the router and allows network operators to manage connections
Privileged EXEC	`Router#`	Type `enable` at the prompt.	`disable` `exit` `logout`	Copies, erases, sets up, and shows router settings
Global configuration	`Router (config)#`	`configure`	`exit` `end`	Allows you to configure various items, including clock, host name, enable password, and enable secret password
Interface configuration	Router (config-if)#	interface fastethernet0/0 or interface serial0/0	`exit` `end`	Allows you to configure the settings, such as IP, for a specific interface
Line configuration	`Router (config-line)#`	line console 0 *or* line vty 0 4 *or* line aux 0	`exit` `end`	Configures lines, such as the console, virtual terminal, or auxiliary
Router configuration	`Router (config-router)#`	router rip *or* router igrp	`exit` `end`	Adds or configures RIP, IGRP, or other routing protocols

Configure Global Parameters

	Command	Purpose

Step 1	**configure terminal**
	
	Example:
	`Router> enable`
	`Router# configure terminal`
	`Router(config)#`
		Enters global configuration mode, when using the console port.

Step 2	**hostname** *name*
	
	Example:
	`Router(config)# hostname Router`
	`Router(config)#`
		Specifies the name for the router.

Step 3	**enable secret** *password*
	
	Example:
	`Router(config)# enable secret cr1ny5ho`
	`Router(config)#`
		Specifies an encrypted password to prevent unauthorized access to the router.

Step 4	**no ip domain-lookup**
	
	Example:
	`Router(config)# no ip domain-lookup`
	`Router(config)#`
		Disables the router from translating unfamiliar words (typos) into IP addresses.

Configure the Fast Ethernet Interface

	Command	Purpose

Step 1	**interface** *type number*
	
	Example:
	`Router(config)# interface fastethernet 4`
	`Router(config-int)#`
		Enters the configuration mode for a Fast Ethernet WAN interface on the router.

Step 2	**ip address** *ip-address mask*
	
	Example:
	`Router(config-int)# ip address 192.168.12.2 255.255.255.0`
	`Router(config-int)#`
		Sets the IP address and subnet mask for the specified Fast Ethernet interface.

Step 3	**no shutdown**
	
	Example:
	`Router(config-int)# no shutdown`
	`Router(config-int)#`
		Enables the Ethernet interface, changing its state from administratively down to administratively up.

Step 4	**exit**
	
	Example:
	`Router(config-int)# exit`
	`Router(config)#`
		Exits configuration mode for the Fast Ethernet interface and returns to global configuration mode.

Configure Command-Line Access

	Command	Purpose

Step 1	**line [aux | console | tty | vty]** *line-number*
	
	Example:
	`Router(config)# line console 0`
	`Router(config)#`
		Enters line configuration mode, and specifies the type of line.
		
		This example specifies a console terminal for access.

Step 2	**password** *password*
	
	Example:
	`Router(config)# password 5dr4Hepw3`
	`Router(config)#`
		Specifies a unique password for the console terminal line.

Step 3	**login**
	
	Example:
	`Router(config)# login`
	`Router(config)#`
		Enables password checking at terminal session login.

Step 4	**exec-timeout** *minutes* [*seconds*]
	
	Example:
	`Router(config)# exec-timeout 5 30`
	`Router(config)#`
		Sets the interval that the EXEC command interpreter waits until user input is detected. The default is 10 minutes. Optionally, add seconds to the interval value.
		
		This example shows a timeout of 5 minutes and 30 seconds. Entering a timeout of 0 0 specifies never to time out.

Configure Command-Line Access

Step 5	**line [aux | console | tty | vty]** *line-number*
	
	Example:
	`Router(config)# line vty 0 4`
	`Router(config)#`
		Specifies a virtual terminal for remote console access.

Step 6	**password** *password*
	
	Example:
	`Router(config)# password aldf2ad1`
	`Router(config)#`
		Specifies a unique password for the virtual terminal line.

Step 7	**login**
	
	Example:
	`Router(config)# login`
	`Router(config)#`
		Enables password checking at the virtual terminal session login.

Step 8	**end**
	
	Example:
	`Router(config)# end`
	`Router#`
		Exits line configuration mode, and returns to privileged EXEC mode.

Logging into a Router

1. Press Enter to connect to your router. This will put you into user mode.
2. At the `Router>` prompt, type a question mark (?).
3. Notice the `-more-` at the bottom of the screen.
4. Press the Enter key to view the commands line by line. Press the spacebar to view the commands a full screen at a time. You can type **q** at any time to quit.
5. Type **enable** or **en** and press Enter. This will put you into privileged mode where you can change and view the router configuration.
6. At the `Router#` prompt, type a question mark (?). Notice how many options are available to you in privileged mode.
7. Type **q** to quit.
8. Type **config** and press Enter.
9. Press Enter to configure your router using your terminal.
10. At the `Router(config)#` prompt, type a question mark (?), then **q** to quit, or hit the spacebar to view the commands.

11. Type **`interface e0`** or **`int e0`** (or even **`int fa0/0`**) and press Enter. This will allow you to configure interface Ethernet 0.
12. At the `Router(config-if)#` prompt, type a question mark (**?**).
13. Type **`int s0 (int s0/0)`** or **`interface s0`** (same as the `interface serial 0` command) and press Enter. This will allow you to configure interface serial 0. Notice that you can go from interface to interface easily.
14. Type **`encapsulation ?`**.
15. Type **`exit`**. Notice how this brings you back one level.
16. Press Ctrl+Z. Notice how this brings you out of configuration mode and places you back into privileged mode.
17. Type **`disable`**. This will put you into user mode.
18. Type **`exit`**, which will log you out of the router.

Using the Help and Editing Features

1. Log into the router and go to privileged mode by typing **en** or **enable**.
2. Type a question mark (**?**).
3. Type **cl?** and then press Enter. Notice that you can see all the commands that start with *cl*.
4. Type **clock ?** and press Enter.
5. Set the router's clock by typing **clock ?** and, following the help screens, setting the router's time and date.
6. Type **clock ?**.
7. Type **clock set ?**.
8. Type **clock set 10:30:30 ?**.
9. Type **clock set 10:30:30 14 March ?**.
10. Type **clock set 10:30:30 14 March 2002**.
11. Press Enter.
12. Type **show clock** to see the time and date.
13. From privileged mode, type **show access-list 10**. Don't press Enter.
14. Press Ctrl+A. This takes you to the beginning of the line.
15. Press Ctrl+E. This should take you back to the end of the line.
16. Press Ctrl+A, then Ctrl+F. This should move you forward one character.
17. Press Ctrl+B, which will move you back one character.
18. Press Enter, then press Ctrl+P. This will repeat the last command.

19. Press the up arrow key on your keyboard. This will also repeat the last command.

20. Type **`sh history`**. This shows you the last 10 commands entered.

21. Type **`terminal history size ?`**. This changes the history entry size. The ? is the number of allowed lines.

22. Type **`show terminal`** to gather terminal statistics and history size.

Saving a Router Configuration

1. Log into the router and go into privileged mode by typing **en** or **enable**, then press Enter.
2. To see the configuration stored in NVRAM, type **sh start** and press Tab and Enter, or type **show startup-config** and press Enter. However, if no configuration has been saved, you will get an error message.
3. To save a configuration to NVRAM, which is known as startup-config, you can do one of the following:
   - Type **copy run start** and press Enter.
   - Type **copy running**, press Tab, type **start**, press Tab, and press Enter.
   - Type **copy running-config startup-config** and press Enter.
4. Type **sh start**, press Tab, then press Enter.
5. Type **sh run**, press Tab, then press Enter.
6. Type **erase start**, press Tab, then press Enter.
7. Type **sh start**, press Tab, then press Enter. You should get an error message.
8. Type **reload**, then press Enter. Acknowledge the reload by pressing Enter. Wait for the router to reload.
9. Say no to entering setup mode, or just press Ctrl+C.

Setting Your Passwords

1. Log into the router and go into privileged mode by typing **en** or **enable**.
2. Type **config t** and press Enter.
3. Type **enable ?**.
4. Set your enable secret password by typing **enable secret *password*** (the third word should be your own personalized password) and pressing Enter. Do not add the parameter **password** after the parameter **secret** (this would make your password the word *password*). An example would be **enable secret todd**.
5. Now let's see what happens when you log all the way out of the router and then log in. Log out by pressing Ctrl+Z, and then type **exit** and press Enter. Go to privileged mode. Before you are allowed to enter privileged mode, you will be asked for a password. If you successfully enter the secret password, you can proceed.
6. Remove the secret password. Go to privileged mode, type **config t**, and press Enter. Type **no enable secret** and press Enter. Log out and then log back in again; now you should not be asked for a password.
7. One more password used to enter privileged mode is called the enable password. It is an older, less secure password and is not used if an enable secret password is set. Here is an example of how to set it:

   ```
   config t
   enable password todd1
   ```

8. Notice that the enable secret and enable passwords are different. They cannot be the same.
9. Type **config t** to be at the right level to set your console and auxiliary passwords, then type **line ?**.
10. Notice that the parameters for the line commands are **auxiliary**, **vty**, and **console**. You will set all three.

11. To set the Telnet or VTY password, type **`line vty 0 4`** and then press Enter. The `0 4` is the range of the five available virtual lines used to connect with Telnet. If you have an enterprise IOS, the number of lines may vary. Use the question mark to determine the last line number available on your router.
12. The next command is used to set the authentication on or off. Type **`login`** and press Enter to prompt for a user-mode password when telnetting into the router. You will not be able to telnet into a router if the password is not set.
13. One more command you need to set for your VTY password is `password`. Type **`password`** ***`password`*** to set the password. (***`password`*** is your password.)
14. Here is an example of how to set the VTY password:

```
config t
line vty 0 4
login
password todd
```

15. Set your auxiliary password by first typing **`line auxiliary 0`** or **`line aux 0`**.
16. Type **`login`**.
17. Type **`password`** ***`password`***.

18. Set your console password by first typing **`line console 0`** or **`line con 0`**.
19. Type **`login`**.
20. Type **`password`** ***`password`***. Here is an example of the last two commands:

```
config t
line con 0
login
password todd1
line aux 0
login
password todd
```

21. You can add the `Exec-timeout 0 0` command to the `console 0` line. This will stop the console from timing out and logging you out. The command will now look like this:

```
config t
line con 0
login
password todd2
exec-timeout 0 0
```

Setting the Hostname, Descriptions, IP Address, and Clock Rate

1. Log into the router and go into privileged mode by typing **en** or **enable**.
2. Set your hostname on your router by using the **hostname** command. Notice that it is one word. Here is an example of setting your hostname:

   ```
   Router#config t
   Router(config)#hostname RouterA
   RouterA(config)#
   ```

   Notice that the hostname of the router changed as soon as you pressed Enter.
3. Set a banner that the network administrators will see by using the **banner** command.
4. Type **config t**, then **banner ?**.
5. Notice that you can set four different banners. For this lab we are only interested in the login and message of the day (MOTD) banners.

6. Set your MOTD banner, which will be displayed when a console, auxiliary, or Telnet connection is made to the router, by typing

```
config t
banner motd #
This is an motd banner
#
```

7. The preceding example used a # sign as a delimiting character. This tells the router when the message is done. You cannot use the delimiting character in the message itself.
8. You can remove the MOTD banner by typing

```
config t
no banner motd
```

9. Set the login banner by typing

```
config t
banner login #
This is a login banner
#
```

10. The login banner will display immediately after the MOTD but before the user-mode password prompt. Remember that you set your user-mode passwords by setting the console, auxiliary, and VTY line passwords.

11. You can remove the login banner by typing

```
config t
no banner login
```

12. You can add an IP address to an interface with the `ip address` command. You need to get into interface configuration mode first; here is an example of how you do that:

```
config t
int e0 (you can use int Ethernet 0 too)
ip address 1.1.1.1 255.255.0.0
no shutdown
```

Notice that the IP address (1.1.1.1) and subnet mask (255.255.0.0) are configured on one line. The `no shutdown` (or `no shut` for short) command is used to enable the interface. All interfaces are shut down by default.

13. You can add identification to an interface by using the `description` command. This is useful for adding information about the connection. Only administrators see this, not users. Here is an example:

```
config t
int s0
ip address 1.1.1.2 255.255.0.0
no shut
description Wan link to Miami
```

14. You can add the bandwidth of a serial link as well as the clock rate when simulating a DCE WAN link. Here is an example:

```
config t
int s0
bandwidth 64
clock rate 64000
```