LAB#3 Introduction to Router configuration

Objectives:

- *To learn the Cisco router boot sequence.*
- *To learn different cabling types that might be needed for the Cisco IOS router.*
- *Configure basic Cisco router configuration commands.*
- *Verify and test configurations using show commands, ping and traceroute.*
- *Practice packet tracer simulation.*

The Cisco Router Boot Sequence

When a router is powered up, the boot sequence steps are listed below:

- *The "Power-On Self-Test" checks the Router Hardware. "CPU, memory, etc. "*
- *The "Bootstrap Program," stored in ROM, runs itself.to find out the proper Operating System source.*
- *The "IOS software image" is loaded from Flash, TFTP, or ROM into RAM.*
- *The Startup Configuration File is loaded from NVRAM or a TFTP server to the RAM. The Configuration File is then executed one line at a time.*
- *If no "Startup Configuration File" is found in NVRAM, the Cisco IOS will offer you the chance to use the "System Configuration Dialog" or commonly called the "Setup Script." This is a set of questions for you to answer to create a basic configuration. Exit the setup mode by using ctrl c or just escape it by answering no.*

IOS Options

The router operating system is called the Internetwork operating system "IOS", each release has different set of features that support for a certain protocols, or added features.

Command Interpreter

***User Mode**: Denoted by a greater than (>) sign after the router prompt (Router>), execute limited and basic monitoring commands. There are no configuration permissions and only limited troubleshooting commands available in user mode.*

***Privileged Mode**: Denoted by a pound (#) sign like this: Router#,commands in the Exec are entered via the Command Line Interface (CLI).*

CLI Help

Context-sensitive help can be used in two ways, command syntax and word help.
Router# show v? {version vines vpdn}

Inline Help -- Command Syntax
If you are configuring the IP address of an Ethernet interface, but are not sure of the syntax, you can use the (?) to help you along:

Router(config-if)# ip add ?
A.B.C.D IP address

Router(config-if)# ip add 192.168.1.1 ?
A.B.C.D IP subnet mask

Command Line Completion

Another CLI feature is command line completion, the function of the [tab] key.
Router# show ve[tab]
Router# show version
Router# con[tab] "Many commands starts with the same letter" % Ambiguous command: "con"
Router# con?
configure connect
As you can see, there are two commands that begin with "con," and you must specify which one you wish to use. In this case you can type "con?" and get the two options available to you.

Syntax Checking
Automatic syntax checking is built into the CLI. If command is not improperly spelled or valid, the router will respond by placing a caret symbol below.

Router# show versoin
^
Basic Router Configuration

All CLI configuration changes to a Cisco router are made from global configuration mode. Specific modes are used for various configuration changes, but these modes are all subsets of the global configuration mode. Global configuration mode commands are used in a router to apply configuration statements that affect the system as a whole.

Router#configure terminal

Router(config)#
Here are a few of the modes that can be entered from global configuration mode:
1. Interface mode
2. Line mode
3. Router mode

When these specific modes are entered, the router prompts changes to indicate the current configuration mode. Any configuration changes that are made will apply only to the interfaces or processes covered by the particular mode. Type exit from one of the specific modes to return a

router to global configuration mode. Pressing Ctrl-Z leaves the configuration modes completely and returns the router to privileged EXEC mode.

Configuring a router Name

This task helps with network management and uniquely identifies each router within a network. If a router is not named, then the system default will be "Router".
Router(config)#hostname FET
FET (config)#

Configuring router passwords

Passwords restrict access to routers. There are five separate passwords you can set to protect your router:
Console: protects the Console Port
Enable Password: guards the use of the Enable mode super-user status
Enable Secret: an encrypted secret form of the above (better!)
VTY: protects against unauthorized Telnet port logons
Auxiliary: protects the AUX Port (for your modem)

The Console Password
Set a password for the Console Port.
Router(config)# line console 0
Router(config-line)# login
Router(config-line)# password cisco
Router(config-line)# Ctrl-Z
Router#
Notice that the Router prompt changes to Router (config-line). Also note that the Ctrl-Z ends your session, and brings you back up to the Router# prompt.

The VTY Password

VTY ports are not real physical ports. They are also called "Virtual Ports" and they wait for a remote connection, usually using Telnet, to log in. So the virtual terminal password is essentially the same as a Telnet password. There are five VTY virtual ports, which are named 0, 1, 2, 3, and 4. You can use the shortcut 0 4 (a zero, a space, and 4) to set all five passwords at the same time:
Router(config)# line vty 0 4
Router(config-line)# pass cisco
Router(config-line)# exit
By the way, it is not necessary to exit back to the global config mode every time you are finished configuring one line.

The Auxiliary Line Password
You can set the Auxiliary Line Password for external modem connections in the same way starting from: Router (config) #line aux 0

The Enable Password and Enable Secret Password

To leave the enable mode you need to type in the word disable (the opposite of enable, the command that got you into this mode). The enable mode is also called "Privileged Exec Mode." The enable password and enable secret commands are used to restrict access to the privileged EXEC mode. The enable password is only used if the enable secret has not been set. The enable secret command should be used because the enable secret command is encrypted. The enable password command is not encrypted. The following commands are used to set the passwords.
Router(config)# enable password cisco2
Router(config)# enable secret cisco
Router# disable
This will leave you at the User Exec Mode prompt, Router >.
Now you are going to leave User Exec Mode by typing quit or exit. Sometimes it is undesirable for passwords to be shown in clear text in the output from the show running-config or show startup-config commands. This command is used to encrypt passwords in configuration output:
Router(config)#service password-encryption
Applies a weak encryption to all unencrypted passwords. The enable secret <password > command uses a strong MD5 algorithm for encryption.

Examining the show commands

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.

- *Show interfaces – Displays statistics for all interfaces on a router or for a specific interface as follows : Router#show interfaces serial 0/1*
- *Show controllers serial - Displays information that is specific to the interface hardware or as follows : Router#show controllers serial 0/1*
- *Show hosts - Displays a cached list of host names and addresses.*
- *Show users - Displays all users who are connected to the router.*
- *Show history - Displays a history of commands that have been entered.*
- *Show flash - Displays information about flash memory and what IOS files are stored there the available flash memory and the amount used*
- *Show version - Displays information about the currently loaded software version along with hardware and device information.*
- *Show arp - Displays the routers address resolution table ARP.*
- *Show protocols - Displays the global and interface-specific status of any configured Layer 3 protocols*
- *Show startup-config - Displays the saved configuration located in NVRAM. This is the file that will be used to configure the router when it is first started or rebooted.*
- *Show running-config - Displays the currently running configuration file or the active configuration file running in RAM.*

Configuring a serial interface

Each connected serial interface must have an IP address and subnet mask to route IP packets. Serial interfaces require a clock signal to control the timing of the communications. In most

environments, a DCE device such as a CSU/DSU will provide the clock. By default, Cisco routers are DTE devices but they can be configured as DCE devices.

On serial links that are directly interconnected, as in a lab environment, one side must be considered a DCE and provide a clocking signal. The clock is enabled and speed is specified with the clock rate command.

By default, interfaces are turned off, or disabled. To turn on or enable an interface, the command no shutdown is entered. If an interface needs to be administratively disabled for maintenance or troubleshooting, the shutdown command used to turn off the interface. In the lab environment, the clockrate setting that will be used is 56000.

Interfaces can be configured from the console or through a virtual terminal line. To configure a serial interface follow these steps:
1. Enter global configuration mode.
2. Enter interface mode.
3. Specify the interface address and subnet mask.
4. Set clock rate if a DCE cable is connected. Skip this step if a DTE cable is connected.
5. Turn on the interface.
6. Configure Ethernet interfaces in the same way as the serial interface but doesn't need a clock rate.

Router(config)#interface serial 0/0
Router(config-if)#ip address <ip address > <netmask >
Router(config-if)#clock rate 56000
Router(config-if)#no shutdown

Making configuration changes :

If a configuration requires modification, go to the appropriate mode and enter the proper command proceeded by no, enter then the right command. To verify changes, use the show running-config command. If the variables displayed are not correct, the environment can be changed in the following ways:

- *Issue the no form of a configuration command.*
- *Reload the system to return to the original configuration file from NVRAM.*
- *Copy an archived configuration file from a TFTP server.*
- *Remove the startup configuration file with the erase startup-config, then restart. To save the configuration variables to the startup configuration file in NVRAM, enter the following command at the privileged EXEC prompt:*

Router#copy running-config startup-config

Interface descriptions :

A description of an interface can help a network user remember specific information about the interface, such as what network the interface services. The description will not affect the operation of a router. Descriptions allow support personnel to better understand the scope of problems related to an interface and allow for faster resolution of problems.
The steps to configure an interface description are as follows:
Router(config)#interface serial 0/0
Router(config-if)#description The engineering Connection

Login banners
A login banner is a message that is displayed at login. Login banners can be used to convey messages that affect all network users, such as scheduled system shutdowns. A message such as "This is a secure system, authorized access only!" informs unwanted visitors that any further intrusion is illegal.

- *Use the configure terminal command to enter global configuration mode.*
- *Enter the command banner motd # <message of the day > # .*
- *Issue the copy running-config startup-config command to save the changes.*

Host name resolution

Host name resolution is the process that a computer system uses to associate a host name with an IP address. A list of host names and their associated IP addresses is called a host table. Host names, unlike DNS names, are significant only on the router on which they are configured. The host table will allow the network administrator to type either the host name or the IP address to Telnet to a remote host.
1. Enter global configuration mode.
2. Enter the ip host command followed by the name of the router and all IP addresses associated with the router interfaces.
3. Repeat Step 2 until all routers in the network are entered.
4. Save the configuration to NVRAM.

Establishing and verifying a Telnet connection

The Telnet IOS EXEC command allows a user to Telnet from one Cisco device to another. The hostname or the IP address of the remote router may be entered. To end a Telnet session, use the EXEC commands exit or logout.

A hostname table or access to DNS for Telnet must be present for a name to work. Otherwise, the IP address of the remote router must be entered. A successful Telnet connection indicates that the upper-layer application functions properly. If Telnet to one router is successful, failure to another router is likely caused by addressing, naming, or access permission problems. The problem may exist on the original router or on the router that failed as a Telnet target. The

Telnet connection will terminate after ten minutes of inactivity by default or when the exit command is entered at the EXEC prompt. The show sessions command will show which Telnet sessions are active.

Alternative connectivity tests

The ping command sends a packet to the destination host and then waits for a reply packet from that host. Results from this echo protocol can help evaluate the path-to-host reliability, delays over the path, and whether the host can be reached or is functional. This is a basic test mechanism. The ping command uses Internet Control Message Protocol (ICMP). The traceroute command can be used to find where data is sent in a network.

The procedure to use the ping command is as follows:

a. Enter the ping [IP address or name of destination] command.

b. Press the Enter key.

The procedure to use the traceroute command is as follows:

a. Enter the traceroute [IP address or name of destination] command.

b. Press the Enter key.

Routing Protocols

Routing is a set of directions to get from one network to another. These directions, also known as routes, can be dynamically given to the router by another router, or they can be statically assigned by an administrator A network administrator chooses a dynamic routing protocol based upon many considerations. These include the size of the network, the bandwidth, the processing power of the routers, the brands and models of the routers, and the protocols that are used in the network.

The goal of a routing protocol is to build and maintain a routing table. This table contains the learned networks and associated ports for those networks. Routers use routing protocols to manage information received from other routers and its interfaces, as well as manually configured routes. The routing protocol learns all available routes, places the best routes into the routing table, and removes routes when they are no longer valid. The router uses the information in the routing table to forward routed protocol packets. When all routers in an internetwork operate with the same knowledge, the internetwork is said to have converged. To enable an IP routing protocol on a router, global and routing parameters need to be set. Global tasks include the selection of a routing protocol such as RIP, IGRP, EIGRP, or OSPF. The major task in the routing configuration mode is to indicate IP network numbers.