Router Basic Configuration

LEARNING ACHIEVEMENTS:

- students can understand how *the router* works, the mode in the router operating system, display information from *the router*, explain the basic ways of use and configuration of *the router* (C2)

1.1 INTRODUCTION TO CISCO ROUTERS

Like our PCs, *routers* or *switches* cannot function without an operating system. Without an operating system, *the hardware* has no capabilities. Cisco Inter*network*ing Operating System (Cisco IOS) is an operating system owned by Cisco network devices, both routers and *manageable switches*. Cisco IOS operating system can be accessed in general through the command line interface or CLI (Command Line Interface) or we call it console.

On Cisco *routers* , to access the CLI there can be done in several ways. The most common

1. Console
2. Telnet / SSH
3. Aux port

Cisco routers work based on the configuration we specify. There are 2 types of configurations found in Cisco devices:

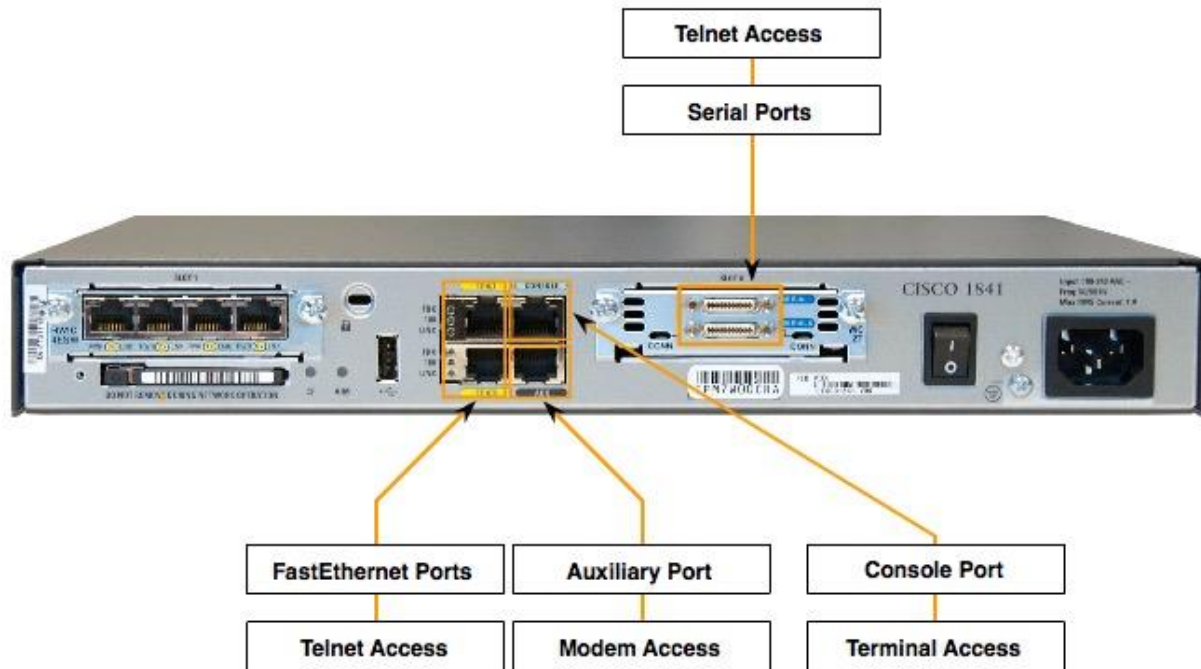1. startup-configuration
2. running-configuration

Figure 112. Router Cisco

Startup-configuration is a configuration stored in the storage media of Cisco devices, namely NVRAM memory (Non-volatile RAM) that functions like a hard drive. Startup configuration will be loaded into the memory (RAM) of each CISCO device turned on or booted. After being loaded into memory, the device will run according to the configuration on the RAM memory. The configuration in the RAM is called running-configuration. Every time we make a configuration change (via cli), what changes is the running-configuration configuration, and the configuration commands we do will be directly executed by the IOS operating system.

1.2   IOS OPERATING SYSTEM

The iOS Operating System is designed as a modal operating system, which means it has several different operating modes. The use of CLI on iOS has a hierarchical mode structure, namely:

1. *user* executive mode
2. previlege executive mode
3. global configuration mode

4. specific configuration mode

Each mode is used to complete different functions, therefore it has different commands that can be executed in each mode. For example, to configure a *router* interface, *the user* must enter interface configuration mode. All configurations performed on the configuration interface only apply to that interface.
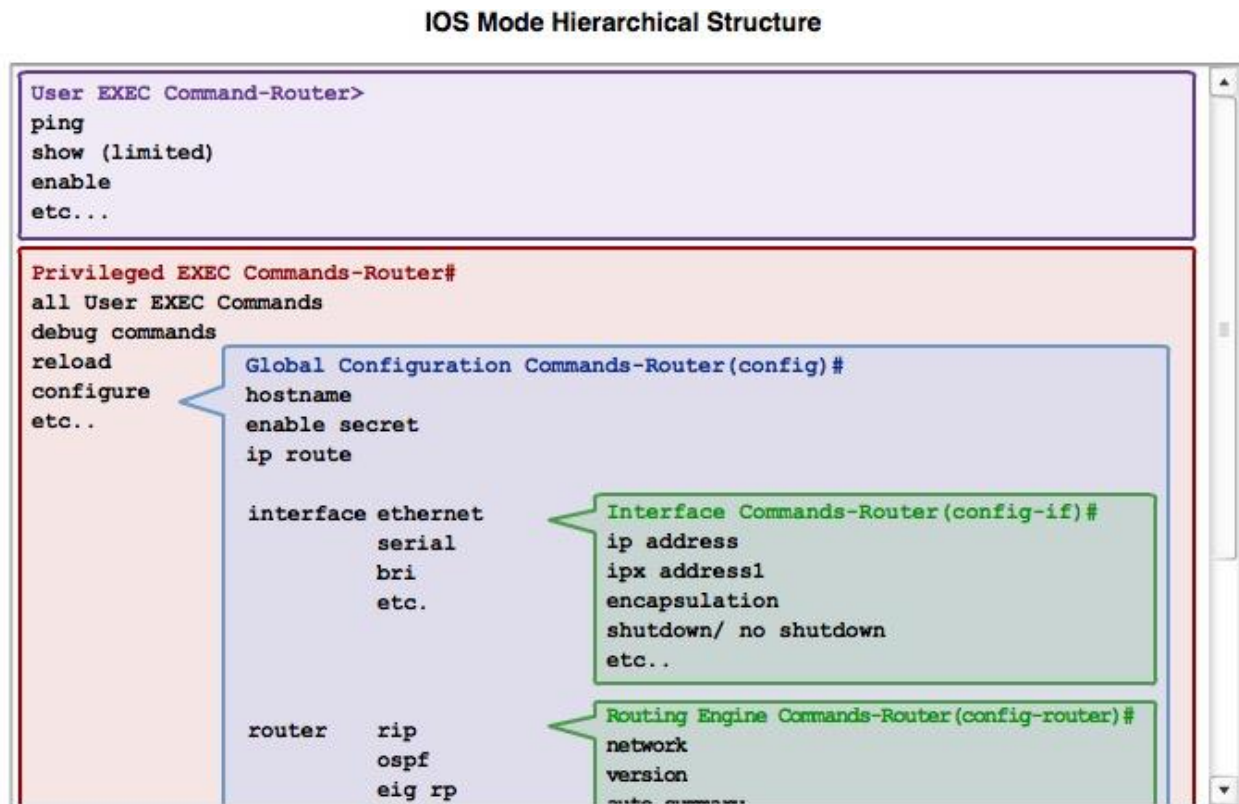
IOS Mode Hierarchical Structure

```
User EXEC Command-Router>
ping
show (limited)
enable
etc...

Privileged EXEC Commands-Router#
all User EXEC Commands
debug commands
reload          Global Configuration Commands-Router(config)#
configure           hostname
etc..               enable secret
                    ip route

                interface ethernet       Interface Commands-Router(config-if)#
                          serial         ip address
                          bri            ipx address1
                          etc.           encapsulation
                                         shutdown/ no shutdown
                                         etc..

                                         Routing Engine Commands-Router(config-router)#
                router    rip            network
                          ospf           version
                          eig rp
```

Figure 113. Mode IOS

In the use of the CLI, each mode is indicated by the command prompt display. So that *users* know what mode is currently active by looking at the prompt display.

IOS Prompt Structure

```
Router>ping 192.168.10.5

Router#show running-config

Router(config)#Interface FastEthernet 0/0

Router(config-if)#ip address 192.168.10.1 255.255.255.0
```

Figure 114. IOS mode is indicated by the Prompt

User Executive Mode

When we access the IOS CLI, we will go into *user* executive mode. This mode is a regular/common *user* mode . Executable commands in this mode are very limited, only those commands for basic network monitoring. The shape of the prompt is indicated by the prompt: Router>_

Previleged Executive Mode

To do the management and configuration, we must first go into previleged mode, or administrator mode. Previleged Mode is indicated by prompt : Router#_

By default, before setting anything, entering previleged mode does not have a password. It can be accessed by typing the command "enable" in *user* mode.

The list of commands that can be executed in each mode can be displayed by typing "?" at the prompt of each mode. We can find out the parameters needed after the command to be executed , by typing "?" after the command.

To be able to detect errors in the network (especially *routers*) and correct them, we must be able to find out the existing operations on routers. The basic command for checking the status of the *router* is the "show" command. There are many parameters that can be entered after the "show" command, and each mode has a difference in executable parameters.

These are some variants of 'show' commands that are often used to display information from the Router that we configure:

- show version: displays the information of the *version of the software* used
- show interface: displays statistical information of all interfaces of the device
- show arp : displays device ARP table
- startup-config show : display startup configuration
- show running-config : displays running configuration
- show ip route : display routing table
- show ip interface brief: displays ip information from the device

Global Configuration Mode

The main configuration mode on Cisco IOS is called Global Configuration Mode or Global Config. In this global config mode, the configuration changes that occur apply to the whole *router* operations. This mode is also the mode that must be passed before we enter specific configuration mode.

To enter Global Configuration mode, from Previleged Mode we type the command "configure terminal". Next, changes to the prompt will be seen to indicate that we are already in Global Config.

```
Router#configure terminal

Router(config)#
```

Specific Configuration Mode

From Global Config mode, there are several configuration modes that we can access. Each mode specifically regulates the operation or function of a particular part of the *router* . Some of the specific configuration modes found in Cisco IOS are as follows:

- **Interface mode** : to set the configuration of a specific network interface that the *router* has

- **Line mode**: to set the router's physical access point (console, AUX, VTY (telnet)).

- **Routers mode** : to set the parameters of the routing protocol that the *router uses*.

In configuration-specific mode, the prompt display will also tell us what mode we are in.

Configuration Mode	Prompt
Interface	Router(config-if)#
Line	Router(config-line)#
Routers	Router(config-router)#

Figure 115. Configuration Mode

To exit the specific configuration mode, and return to global mode, we must input the "exit" command. Similarly, if we want to exit the global configuration mode to the *user's* previleged mode.

Keep in mind that any changes that occur (after we input the configuration command), it will be stored in the *router* memory which means that the change is immediately executed. However, these changes have not been stored in non-volatile memory (router storage media / nvram) until we save it. Therefore, if the changes we make to the configuration mode are correct, always remember to save it so that if *the router* reboots or restarts, our configuration is not lost.

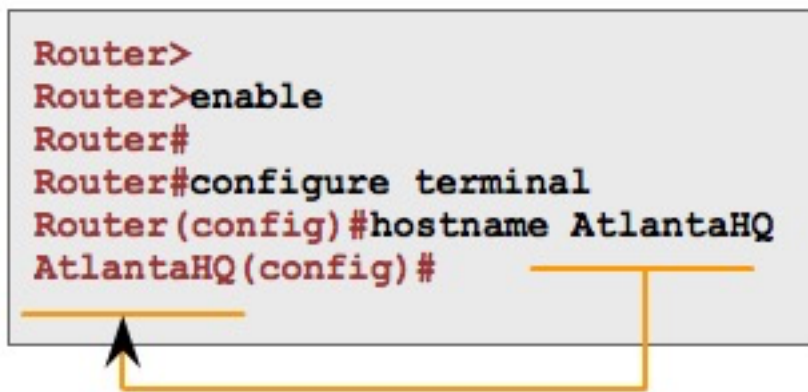The command to save the configuration can be executed in previleged *user* mode:

Router# **copy running-config startup-config**

1.3 *BASIC CONFIGURATION COMMANDS OF THE ROUTER*

Some basic *router* configuration commands :

1. **Name the *router***

We can give the router a host name, which will be displayed at the CLI prompt. By default the hostname is Router, until we make changes the *hostname*. The command is `hostname` <name>.

```
Router>
Router>enable
Router#
Router#configure terminal
Router(config)#hostname AtlantaHQ
AtlantaHQ(config)#
```

Figure 116. Hostname command

2. **Set the router's password**

Passwords are used to restrict access from unauthorized users. Routers have several types of passwords provided:

- Console password: password to access via console line

- VTY password: password to access via virtual terminal (Telnet)

- Enable password: password to enter Previleged *User* mode

- Enable secret password: password to enter Previleged *User* mode, but stored encrypted in the configuration file

We can only choose one between `enable password` or `enable secret password,` and can be done from the global configuration mode, using syntax:

```
Router(config)# enable password <password>
```

or for the encrypted one:

```
Router(config)# enable secret <password>
```

Please note, in order for us to access the *router* from the **telnet / vty** line, we must provide a password to enter this Previleged *User* mode .

As for console and vty, we have to go to the specific configuration for each of these parts (console and vty paths).

To set the console password:

Router(config)# **line console 0**
Router(config-line)# **password** <password>
Router(config-line)# **login**

To set the vty password:

Router(config)# **line vty 0 4**
Router(config-line)# **password** <password>
Router(config-line)# **login**

For console and vty, after we give the password command followed by the password, we must set the **login** command that tells the router to ask the user for a password every time the user wants to access through the console line / vty line.

3. **Configuring the Interface**

Routers have 2 or more interfaces in order to connect one network to another network. For this reason, the *router* interfaces must be configured to be the *gateway* of each network connected to it. Common interface types used by routers are serial interfaces, ethernet, fast-ethernet. Each of these types is usually assigned a number, such as **Fast-Ethernet 0/0**, or **Serial 0/0/1**. To configure the interface, we must go to the specific configuration menu for the interface you want to configure. Like configuring an IP address, enabling it (by default all router interfaces are inactive/shut down), naming the interface, or setting a clock-rate (for serial interfaces with DCE type).

In general, the steps to configure the *router* interface are as follows:

- go to global config mode
- go to the config interface mode of the interface you want to configure
- set IP address and *subnet mask*
- enable interface
- set clock rate (Specific only for serial interfaces with DCE type)

Example of configuring fastethernet interface 0/0 with IP address 192.168.10.1/24:

```
Router(config)#interface FastEthernet 0/0
Router(config-if)#ip address 192.168.10.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
```

4. Add a static route

Router, as the name implies has the function of providing a route for data packets to get to *the destination network*. Routes to the destination network are stored in the routing table. By default, any network directly connected to the *router*, will be entered into the route table. For networks that are not directly connected, i.e. networks that can be reached through other *routers*, the route to the network must be added to the route table with routing protocols. Manually we can add routes to the route table by adding ***static routes***. The command to add a static route is performed in the global config mode, with syntax:

Router(config) **ip route** <*network* destination> <*subnet* destination> < address ip of the destination *router*>

                     or

Router(config) **ip route** <*network* destination> <*subnet* destination> < name of exit interface>