

Basic Router Configuration

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Agenda

- 1.Router Components – memory types (RAM, ROM,Flash, NVRAM), configuration register
- 2.Router Configuration types e.g running-con fig, startup-con fig
- 3.Router Access modes – User Exec. Privileged Exec, ROM Monitor
- 4.Password configuration for console, auxiliary, and vty lines
- 5.Configuring login banners
- 6.Setting up secure management protocols (SSH)
- 7.Configuring router interfaces- Assigning IP addresses, enabling or disabling interfaces, Configuring interface descriptions

Router Versus Switch

Router and switch look similar and perform some similar functions, but each has its own distinct function to perform on a network.

.Switch- create a networks

.Router- Connect networks

What is Router?

A router connects two or more local area networks (LANs) and acts as an intermediary for data exchange between them. To transmit data between two computers on different LANs, routers use the Internet Protocol (IP), which includes the IP addresses of both the sending and receiving devices. Routers are located between these LANs, where the transmitting and receiving devices are linked

What are the components of a Router?

The components of a router are majorly categorized into:

1. External Components
2. Internal Components

External Components of a router

- The external components include
- Power switch and Power code- Power code is used to supply power to the router whereas the power switch is used to power on and power off the router
- Console port- This port is used to access the terminal of the device by attaching the console
- Auxillary port- It is also used to access the device terminal
- LAN ports- this could be Ethernet Ports, Fastethernet ports or Gigaethernet ports

Internal Components of a Router

- The internal components include
- POST(Power on Self Test) -When the router powers on it tests itself and find out how many modules on it and how many interfaces exists on it. It is basically a self test that the router performs to check its hardware
- ROM(Read only Memory)-Its is the memory which is used to load the bootstrap program and searches for IOS
- FLASH-It is the storage where the IOS of the router is stored
- NVRAM(Non volatile Random Access Memory)-It is where the configurations (Start up configurations)are stored permanently.
- RAM(Random Access Memory)-It is the Memory that stores the configurations temporarily (running configurations)

Types of Memory

Cisco devices usually have four types of memory that are being used for different purposes. These four types are:

- **ROM (Read-only memory)** – stores a bootstrap program that is used to initialize a boot process. This is a read-only type of memory, so it can't be altered.
- **RAM (Random Access Memory)** – the running configuration and routing tables of the device are stored here. This type of memory loses its content when a device is restarted.
- **Flash memory** – used to store IOS software images. Can also be used to store other files, for example backup configuration files. Retains its content even after a device is restarted.
- **NVRAM (Nonvolatile RAM)** – usually used to store a startup configuration file. This type of memory retains its content even after a device is powered down or restarted.

Configuration Register

- It is a 16bit configuration registers in NVRAM . It controls how router boots;
- The value can be seen with “show version” command
- For most Cisco routers the value is 0x2102, which tells the router to load the IOS from flash memory and the startup-config file from NVRAM
- When the value is set to 0x2142, that tells the router to ignore the NVRAM configuration when rebooting
- Leading “0x” means “hexadecimal”

Purpose of the configuration register

The configuration register can be used to change router behavior in several ways, such as:

- how the router boots (into ROMmon, NetBoot)
- options while booting (ignore configuration, disable boot messages)
- console speed (baud rate for a terminal emulation session)
- Set and display the configuration register value
- Force the router into the ROM monitor (bootstrap program)
- Select a boot source and default boot filename
- Enable or disable the Break function
- Control broadcast addresses
- Load operating software from ROM

How to check the configuration register

- Router# show version
- Router#show version | include register
- Configuration register is 0x2102

How to configure configuration register?

- There are two ways to change Config Register on a router. This can be done both in Rommon mode and in configuration mode.
- In Rommon mode, it can be change with “confreg” command. Below, we are changing Configuration Register as 0x2142.
- **rommon > confreg 0x2142**
- After this configuration we should reset the router to use this new value, or to force the router boot through this config register.
- The other way is configuring on configuration mode with “config- register” command.
- **Router# configure terminal**
- **Router(config)# config-register 0x2142**

Where is the configuration?

- Cisco devices always stores commands in 2 configuration files;
 - **Startup configuration**
 - **Running configuration**
- Running configuration- stored in RAM, determines how the router is currently operating
 - Is modified using the configure command
 - To see it:
 - Router #show running-config
- Startup configuration :Stored in NVRAM, determines how the router will operate after next reload
 - Is modified using the copy command
 - Router# show startup-config

```
Router#copy running-config startup-config
```

```
Destination filename [startup-config]?
```

```
Building configuration...
```

```
[OK]
```

Where is the configuration?

- Can also be stored in more permanent places:
 - External hosts, using TFTP, FTP, SCP, etc
 - In flash memory in the router
- Copy command is used to move it around
- copy run start
- copy run tftp
- copy start tftp
- copy tftp start
- copy flash start
- copy start flash

Router Configuration/ Access modes

- Router access modes refers to a level where you are able to perform specific functions. If you are not at the correct level, you cannot perform the correct function (to configure the router).
- **User EXEC mode**—The user EXEC mode is the mode that you connect to by default. You will know that you are in the user EXEC mode because the router displays the host name followed by a right-angle bracket (>) symbol.
- Router>
- In the user EXEC mode, you can perform limited functions to check the status of the router but cannot change the router configuration. To exit the user EXEC mode, use the command logout.

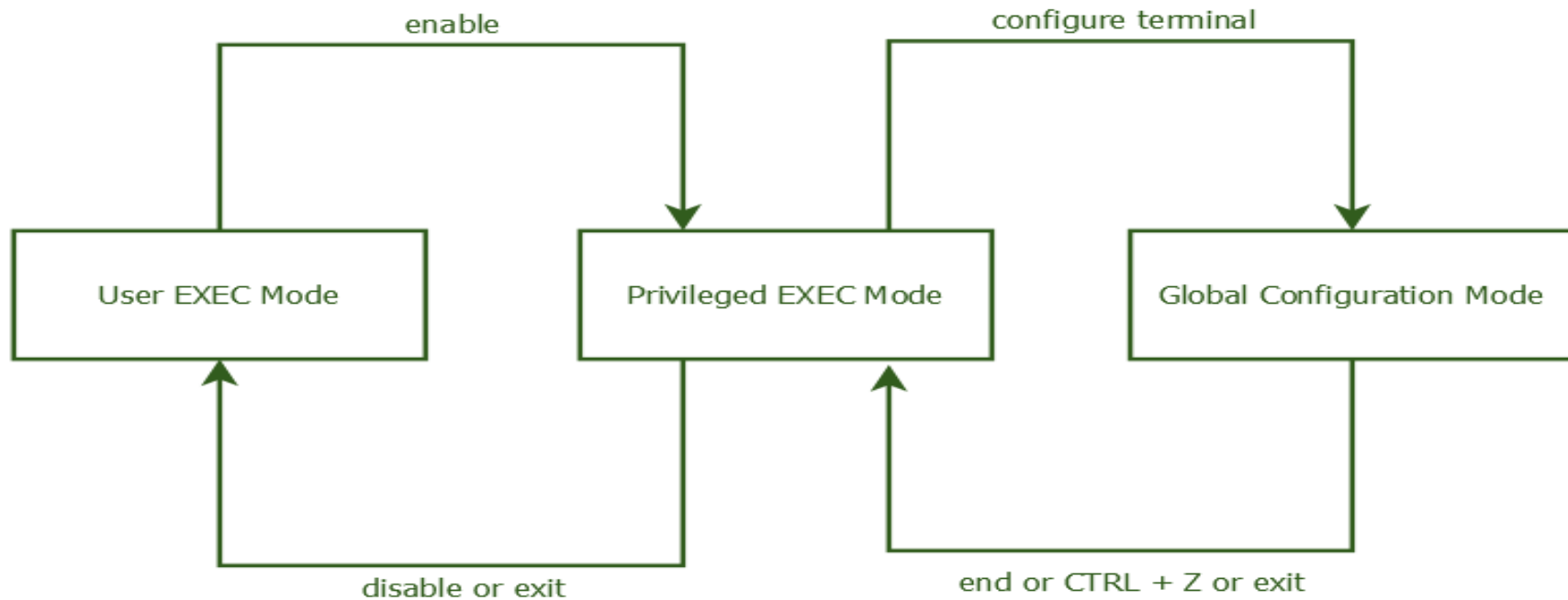
Privileged EXEC mode

- Privileged EXEC mode—To get from the user EXEC mode to privileged EXEC mode, use the enable command. If an enable password (or better yet, enable secret password) has been configured (and it should have), you are again prompted for a password. In this mode, the router displays its host name followed by the hash (#) symbol.
- Router> enable
- Router#
 - the privileged EXEC mode, you can perform all the functions that were available in the user EXEC mode but still cannot make any configuration changes.
 - have access to show and debug commands that are not available in the user EXEC mode. The privileged EXEC mode is the path to the global configuration mode. To return to the user EXEC mode, use the command disable.
- Router# disable
- Router>
- Although this mode allows the user to manage device configuration and IOS image files, it does not allow the user to change the device configuration. A user can change device configuration only from the configuration mode.

Global Configuration Mode

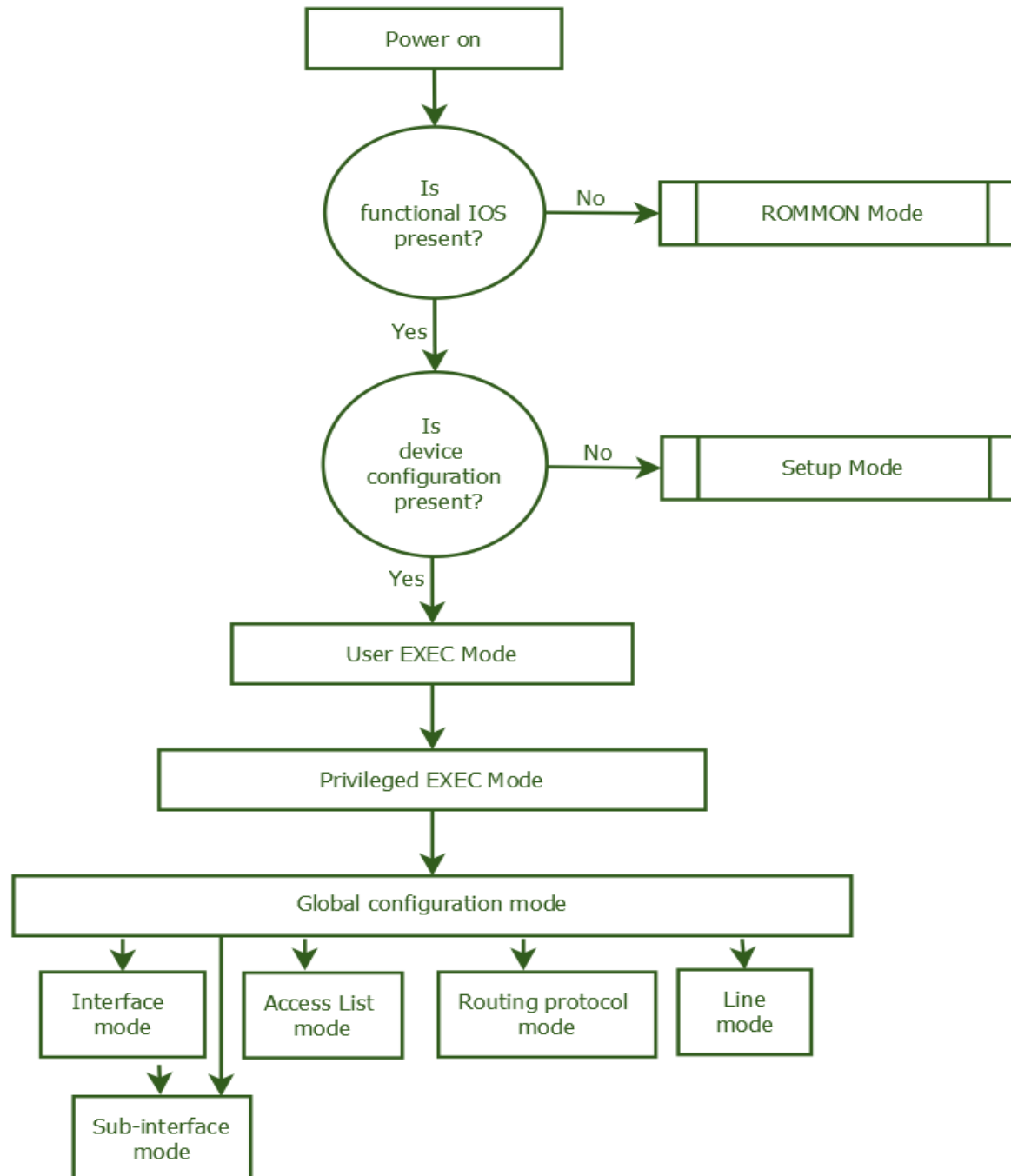
- As the name suggests, this mode includes the commands that are used to configure the device. From this mode, a user can not only configure new settings but can also change, update or delete existing settings.
- To enter this mode, use the 'configure terminal' command from the privileged-exec mode. To exit from this mode, you can use the 'end' or the 'exit' commands. You can also press the CTRL + Z key combinations.

Navigation between User EXEC , Privileged EXEC and Global configuration mode.



ROM Monitor mode

- ROM monitor mode—The ROM monitor mode is the mode the router boots to if it cannot find a valid system image. You only need to use this mode if you need to change the system boot parameters to include resetting the system password. If the router has a working image installed, you need to press the Break key during the first 60 seconds of the router boot sequence.



How to password protect the console port

To configure the console password, follow these steps.

```
Router(config)# line console 0  
Router(config-line)# password CISCO  
Router(config-line)# login
```

Login command is used for enforcing the password before accessing user exec mode. If you don't enter the login command then the router will not ask for password before entering the user exec mode

How to password protect the auxillary ports

To configure the auxiliary password, follow these steps.

```
Router#config t
Router(config)#line aux 0
Router(config-line)#password cisco
Router(config-line)#login
```

How to password protect the VT VTY LINE

- Configuring the VTY password is very similar to doing the Console and Aux ones. There are several VTY ports . You can use the shortcut 0 4 (a zero, a space, and 4) to set passwords for all the VTY ports at the same time. To configure the VTY

```
Router#config t
```

```
Router(config)#line vty 0 15
```

```
Router(config-line)#password cisco
```

```
Router(config-line)#login
```

How to Password protect privileged Mode

- The Enable Password is the old form of the password for "[Privileged Mode](#)". Here the password is stored un-encrypted.
- Router#config t
- Router(config)#enable password cisco
- Router(config-line)# Ctrl-Z
- Enable Secret provides better security since password is kept encrypted using irreversible encryption algorithm.
- Router#config t
- Router(config)#enable secret cisco
- Router(config-line)# Ctrl-Z

Configuring a Cisco Banner



MOTD, Login, & Exec Banners

- Cisco banners are customized messages displayed on a terminal when a user is trying to connect to our Cisco IOS devices via Telnet, SSH, Console port, or Auxillary port.
- They are most commonly used to display security warnings and informational messages.
- There are different types of banner messages, such as Message of the day (MOTD), Login banners, and Exec banners.
- These can be displayed in the CLI before and/or after the user logs in to a Cisco IOS device. The three are the most common types of a banner that can be configured on a Cisco switch and routers.

Login Banner

Unlike the MOTD Banner, it is designed to commonly display legal notices, such as security warnings and more permanent messages to the users.

To create a Login banner on our device, the following command is used from the router's global configuration mode:

```
Router(config)# banner login ?Warning!Authorized personnel only.?
Router(config)#
```

Banner EXEC

Banner is designed to be more of a permanent message and would not change frequently.

To create an Exec banner on a Cisco router, the following Exec banner command is used from the router's global configuration mode:

```
Router(config)# banner motd &Please log out immediately if you are not an  
authorized administrator &  
Router(config)#
```

MOTD Banner

To create a MOTD banner on a Cisco router, the following banner MOTD command is used from the router's global config mode:

```
Router(config)# banner motd $Attention!We will be having scheduled system  
maintenance on this device.$  
Router(config)#
```

Configuring SSH on a Cisco Device

- SSH (Secure Shell) is a secure method for remote access as it includes authentication and encryption.
- To do this, it uses a RSA public/private keypair.

Following steps explains how to configure SSH server in Cisco Router.

- Step 1 - Configure an IP address for the Cisco router, if you do not have an IP address configured for the selected interface of Cisco Router.
- Router#configure terminal
- Router(config)#interface gigabitEthernet 1/0
- Router(config-if)#ip address 192.168.10.1 255.255.255.0
- Router(config-if)#no shutdown
- Router(config-if)#exit
- Router#

Step 2: Configuring hostname and Domain name

Step 2 - Configure a hostname and domain name for the Cisco Router as shown below. Hostname and domain name are required to associate crypto keys with Cisco router.

- Router#configure terminal
- Router(config)#hostname Jackline
Jackline(config)#exit
Jackline#
- Jackline#configure terminal
Jackline(config)#ip domain-name jackline.or.ke
Jackline(config)#exit
Jackline#

Step 3: Generate RSA Encryption pair

```
Jackline#configure terminal
Jackline(config)#crypto key generate rsa modulus
2048
...[OK]
Jackline(config)#
```

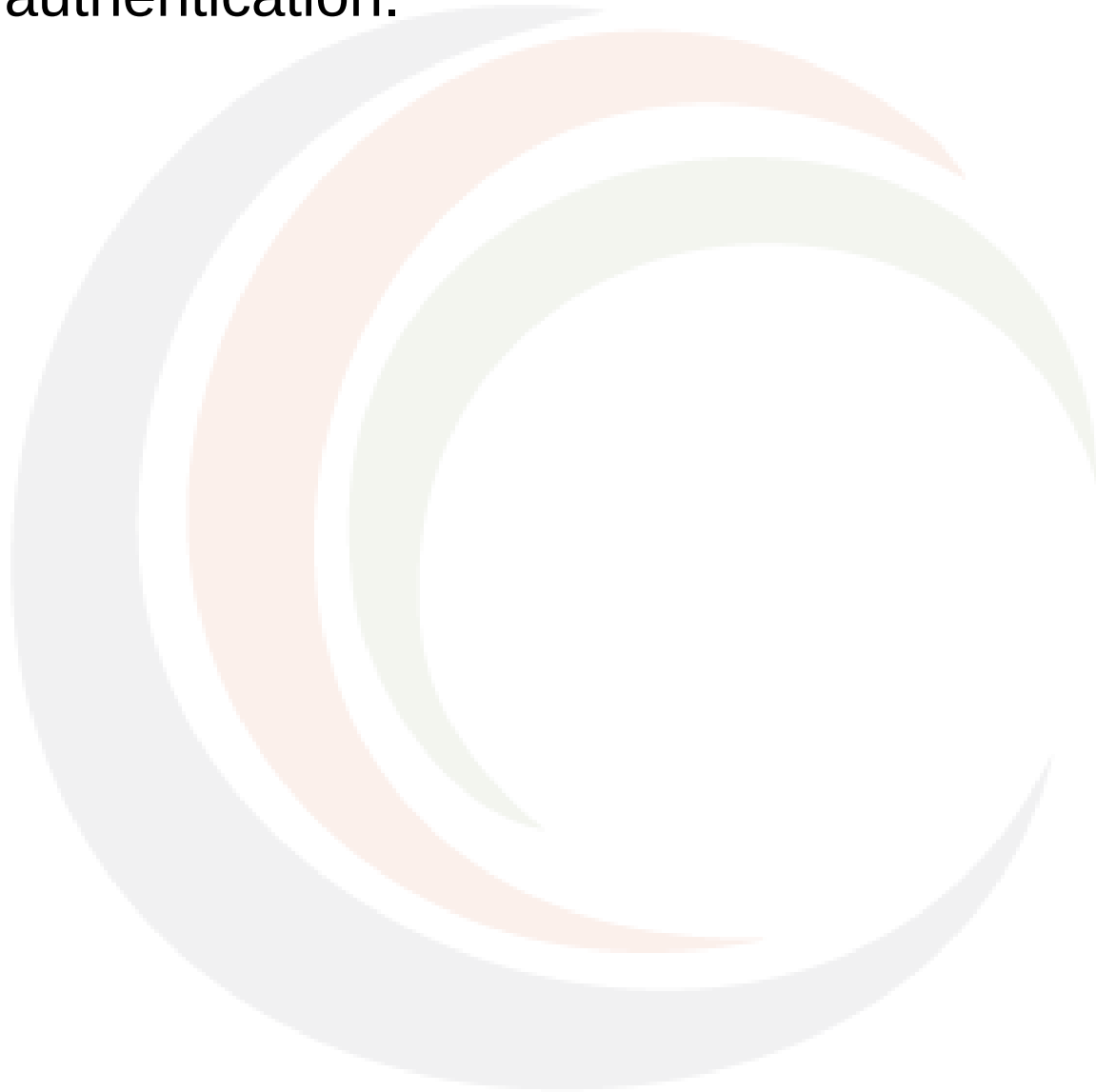
Step 4: Select an SSH version

```
Jacklin#configure terminal  
Jackline(config)#ip ssh version 2  
Jackline(config)#exit
```


Step 5: Create a username, privilege level and associated password

```
Jackline(config)#username Jackline privilege 15  
secret Jacklinesecu
```

Step 6 - Instruct Cisco Router to use SSH instead of TELNET, a privilege level for user login via SSH and to use local user database for authentication.



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- Jackline#configure terminal
- Jackline(config)#line vty 0 15
- Jackline(config-line)#transport input ssh
- Jackline(config-line)#privilege level 15
- Jackline(config-line)#login local
- Jackline(config-line)#exit
- Jackline(config)#exit

Configuring Router Interfaces

- Routers are not reachable by end devices until the interfaces are configured.
- There are many different types of interfaces available on Cisco routers. For example, Fast Ethernet interfaces, Gigabit Ethernet interfaces:

- Enters global configuration mode.
- Enters the configuration mode for a Gigabit Ethernet interface on the router.
- Sets the IP address and subnet mask for the specified GE interface.
- Enables the GE interface, changing its state from administratively down to administratively up.
- Configure the description. It is good practice to configure a description on each interface. The benefits of interface descriptions are quickly realized as they are helpful in troubleshooting.

Example on configuration of interfaces

- Jackline(config)# interface gigabitethernet 0/0/0
- Jackline(config-if)# ip address 192.168.10.1 255.255.255.0
- Jackline(config-if)# ipv6 address 2001:db8:acad:1::1/64
- Jackline(config-if)# description Link to LAN 1
- Jackline(config-if)# no shutdown
- Jackline(config-if)# exit
- Jackline(config)# interface gigabitethernet 0/0/1
- Jackline(config-if)# ip address 192.168.11.1 255.255.255.0
- Jackline(config-if)# ipv6 address 2001:db8:acad:2::1/64
- Jackline(config-if)# description Link to LAN 2
- Jackline(config-if)# no shutdown
- Jackline(config-if)# exit

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Tasks on Basic Router Configuration

- 0) Configure the host name of each
- 1) Configure the IP addresses
- 2) Activate a password
- 3) Encrypt password enabled;
- 4) Set a secret password
- 5) Configure ssh on the router using the above password;



Q & A

THANK YOU

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