Introduction to CISCO IOS

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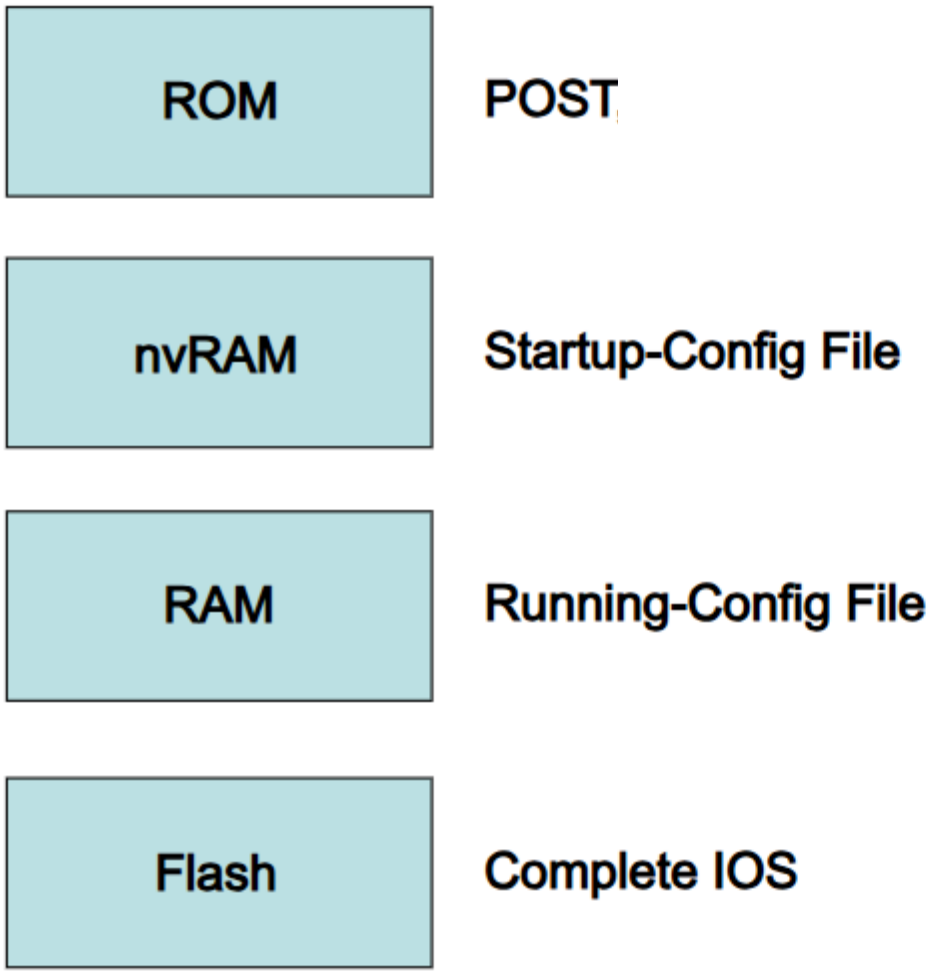
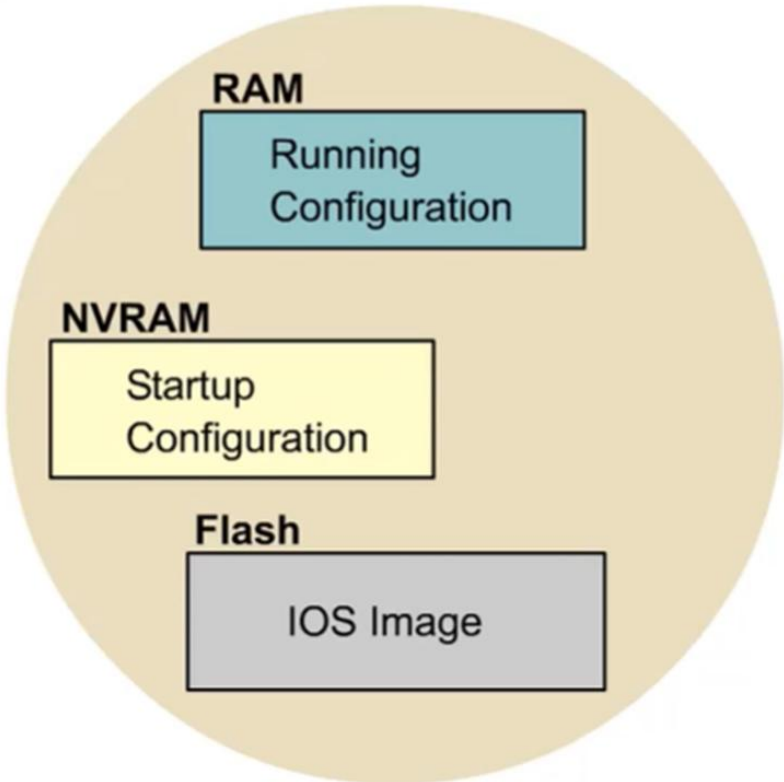
Cisco Router Physical Components



Bringing up a Router

- Boot-up process:
  1: POST
  2: Looks for the Cisco IOS from *Flash* memory
  3: IOS loads & looks for a valid configuration;
    - *startup-config*
    - stored in nonvolatile RAM (NVRAM)
  4: If a valid config is not found in NVRAM:
    - *setup mode*



Boot Sequence

1) POST: Power On Self Test

- When you first bring up a Cisco router, it will run a power-on self-test (POST).

2) Boot Program (BootP) is loaded:

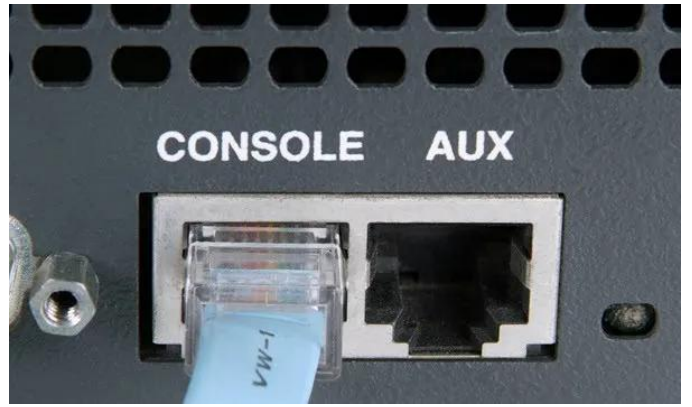
a) IOS is loaded
- Flash

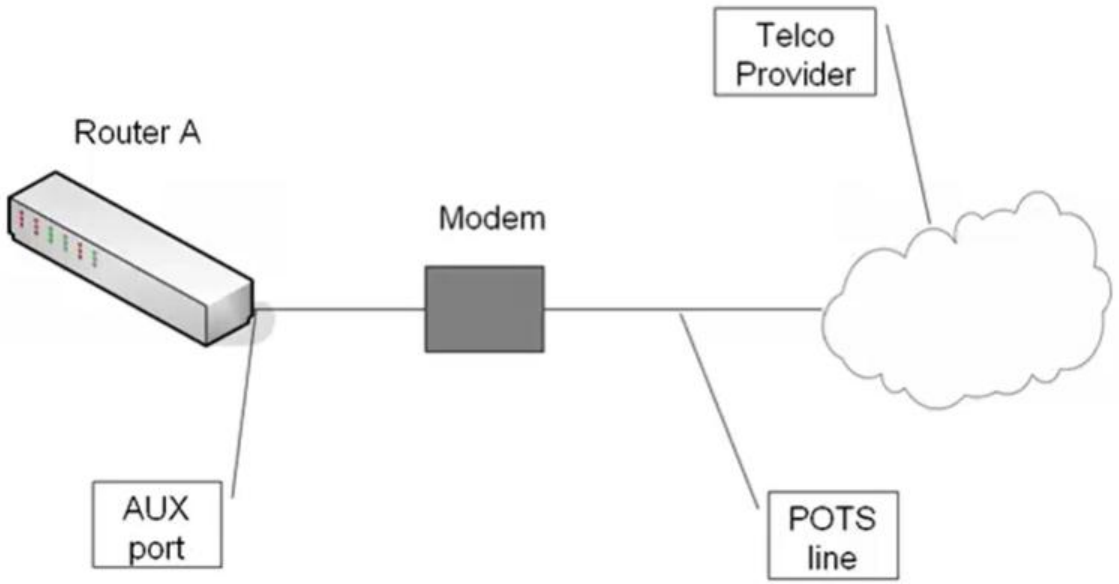
b) Configuration is loaded
- nvRAM

When the IOS is loaded and running, a preconfiguration (valid configuration called startup-config) will be copied from NVRAM into RAM. The copy of this file will be placed in RAM and called running-config.

Router Access

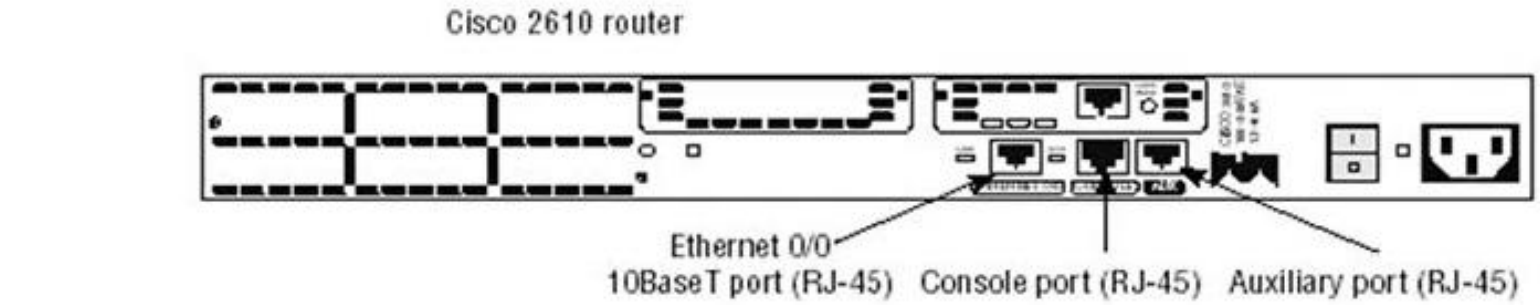
- Console port (console)
  - Rollover cable, RJ-45 to DB-9, RJ-45 to DB-25
- Auxiliary port (AUX)





Connecting To A Cisco Router

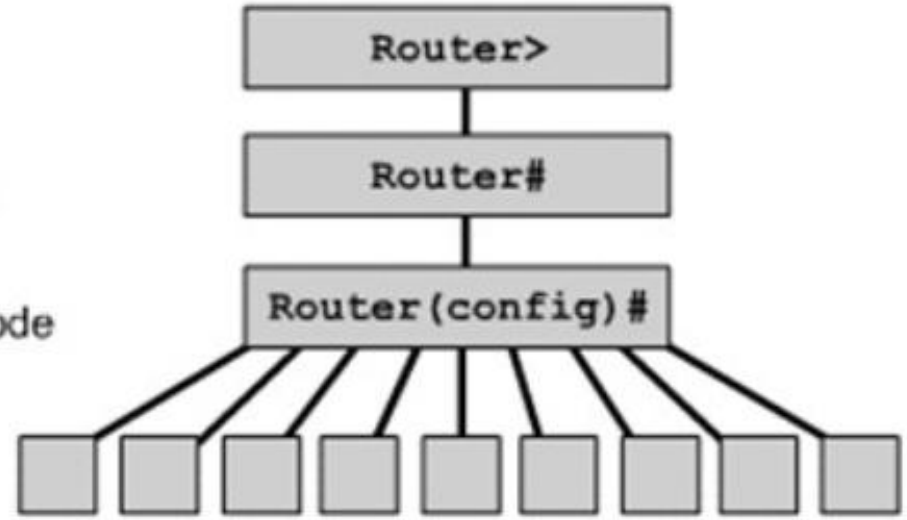
FIGURE 4.2 A Cisco 2600 router



Cisco 2811

Cisco 1841

- User EXEC mode
- Privileged EXEC mode
- Global configuration mode
- Specific configuration modes



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)#`

Configuration Modes

- Global configuration mode
  - Router(config)#
- Interface mode
  - Router(config–if)#
- Line configuration mode
  - Router(config-line)#
- Router configuration mode
  - Router(config-router)#

Switching between User and Privileged Modes

Router>enable

Router#

Router#disable

Router>

- User mode:
  - Router>
  - Used mostly to view statistics
- Privileged mode:
  - Router#
  - Used to view & change router configuration

Exiting configuration

Router>logout

OR

Router>exit

OR

Router#exit

Global Configuration Mode **GCM**

Router#config t
.Enter configuration commands, one per line. End with CNTL/Z
#Router(config)

Basic Commands

Router(config)#hostname CISCO
CISCO(config)#

- Global changes:
  - config terminal or config t
  - Changes made to *running-config* (DRAM)
  - To change the *startup-config* (NVRAM)
    - config memory or config mem

CLI command modes

- All command-line interface (CLI) configuration changes to a Cisco router are made from the global configuration mode.
- Other more specific modes are entered depending upon the configuration change that is required, but these specific modes are all subsets of the global configuration mode.
- **Note:** The prompt changes to indicate that the router is now in global configuration mode.

- Typing **exit** from one of these specific configuration modes will return the 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

- A router should be given a unique name as one of the first configuration tasks.
- This task is accomplished in global configuration mode using the following commands:

```
Router(config)#hostname Tokyo
Tokyo(config)#
```

- As soon as the Enter key is pressed, the prompt changes from the default host name (Router) to the newly configured host name, which is Tokyo in the example.

Router

```
Router#hostname Tokyo
Tokyo(config)#
```

Configuring router passwords

- Passwords
  - virtual terminal lines
  - console line
- The following commands are used to set an optional but recommended password on the console line:

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

Console Password

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

Configuring router passwords

Console Line (line console 0)

- Used to access and configure the router locally.
- Used for Setup, maintenance, recovery, and password configuration.
- Who uses it :Network admins sitting physically next to the router.
- Data type : Configuration commands — not network traffic.

Serial Interface

- Used to connect routers together over a WAN — transmits real network data.
- Used for WAN connections
- Who uses it The router itself to communicate with other routers/networks.

Configuring a serial interface

- To configure a serial interface follow these steps:
  - Enter global configuration mode
  - Enter interface mode
  - Specify the interface address and subnet mask
  - Set clock rate if a DCE cable is connected. Skip this step if a DTE cable is connected.
  - Turn on the interface
- By default, Cisco routers are DTE devices but they can be configured as DCE devices.
- Serial interfaces require a clock signal to control the timing of the communications.

- Configure the IP address using the following commands:
- Enter global **configure terminal** configuration mode by entering the command.

  Router(config)#**interface** **serial 0/0**

  Router(config-if)#**ip address** **<***ip address***>** **<***netmask***>**

- By default, interfaces are turned off, or disabled.
- To turn on or enable an interface, the command **no shutdown** is entered

- The commands for setting a clock rate and enabling a serial interface are as follows:

```
Router(config)#interface  serial  0/0
Router(config-if)#clock  rate  56000
Router(config-if)#no shutdown
```

Configuring an Ethernet interface

- To configure an Ethernet interface follow these steps:
  - Enter global configuration mode
  - Enter interface configuration mode
  - Specify the interface address and subnet mask
  - Enable the interface
- By default, interfaces are turned off, or disabled.
- To turn on or enable an interface, the command **no shutdown** is entered.

Router

```
Router(config)#interface e0
Router(config-if)#ip address 183.8.126.2 255.255.255.128
Router(config-if)#no shutdown
```

Examining the show commands

- There are many **show** commands that can be used to examine the contents of files in the router and for troubleshooting.
- In both privileged EXEC and user EXEC modes, the command **show ?** provides a list of available **show** commands.

- **show interfaces** – Displays all the statistics for all the interfaces on the router. To view the statistics for a specific interface, enter the **show interfaces** command followed by the specific interface and port number. For example:

  Router#**show interfaces serial 0/1**

- **show controllers serial** – Displays information-specific to the interface hardware
- **show clock** – Shows the time set in the router
- **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
- **show version** – Displays information about the router and the IOS that is running in RAM
- **show ARP** – Displays the ARP table of the router
- **show protocol** – Displays the global and interface specific status of any configured Layer 3 protocols
- **show startup-configuration** – Displays the saved configuration located in NVRAM
- **show running-configuration** – Displays the configuration currently running in RAM

Enhanced Editing Commands

Command	Meaning
Ctrl+A	Moves your cursor to the beginning of the line
Ctrl+E	Moves your cursor to the end of the line
Esc+B	Moves back one word
Ctrl+B	Moves back one character
Ctrl+F	Moves forward one character
Esc+F	Moves forward one word

Router Command History

Command	Meaning
Ctrl+P or up arrow	Shows last command entered
Ctrl+N or down arrow	Shows previous commands entered
`show history`	Shows last 10 commands entered by default
`show terminal`	Shows terminal configurations and history buffer size
`terminal history size`	Changes buffer size (max 256)

Executing adds, moves, and changes

- If a configuration requires modification, go to the appropriate mode and enter the proper command.
- To verify changes, use the **show running-config** command.
- 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**