EXPLORATION 1

Chapter 11

Configuring and Testing Your Network

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Upon completion of this chapter, you will be able to:

- Define the role of the Internetwork Operating System (IOS).
- Define the purpose of a configuration file.
- Identify several classes of devices that have the IOS embedded.
- Identify the factors contributing to the set of IOS commands available to a device.
- Identify the IOS modes of operation.
- Identify the basic IOS commands.
- Compare and contrast the basic show commands.

Question

What is Router?

Router is a Computer

CISCO IOS - Cisco Internetwork Operating System

Internetwork Operating System for Cisco networking devices

SECURITY

ADDRESSING

INTERFACES

ROUTING

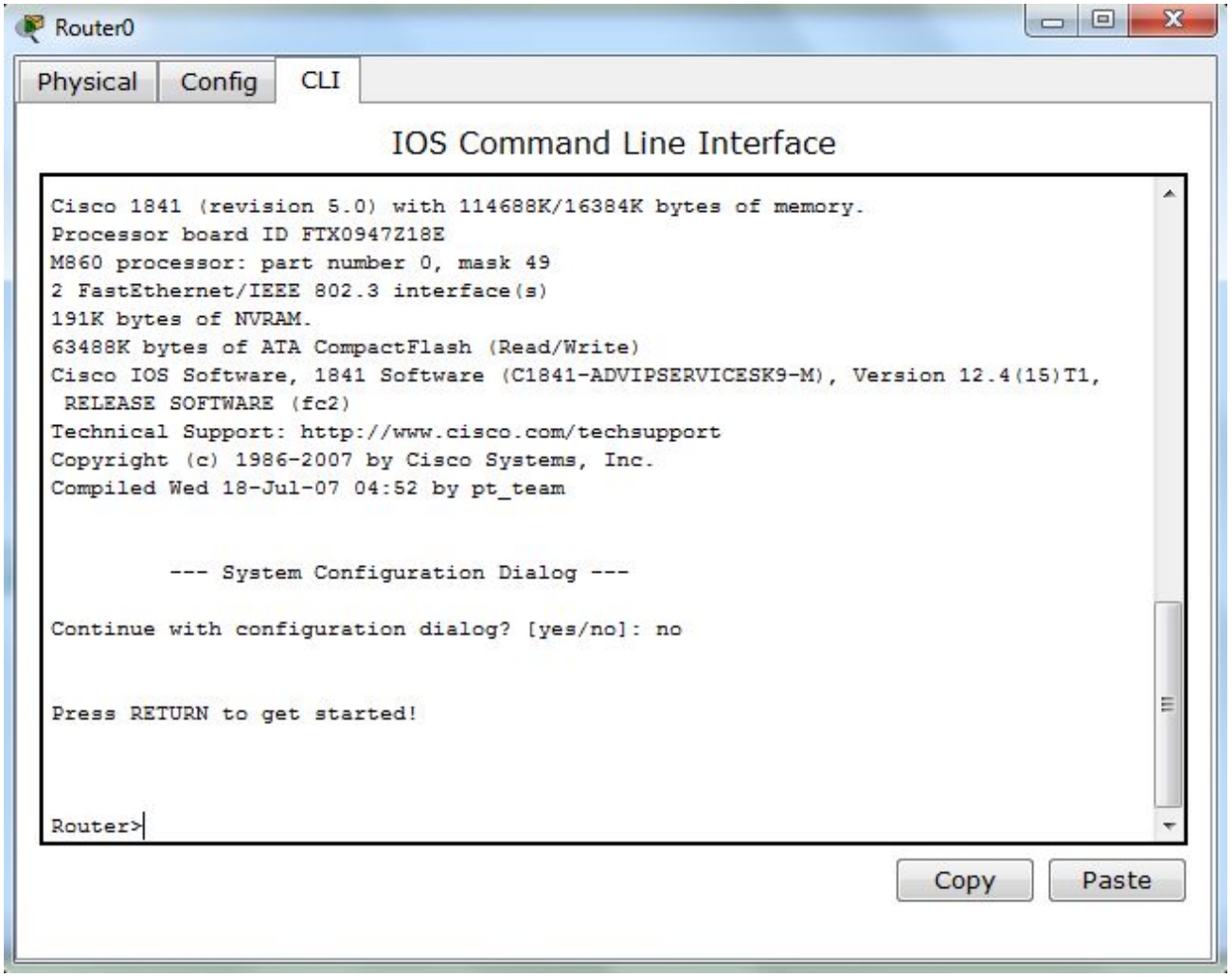
QoS

MANAGING RESOURCES

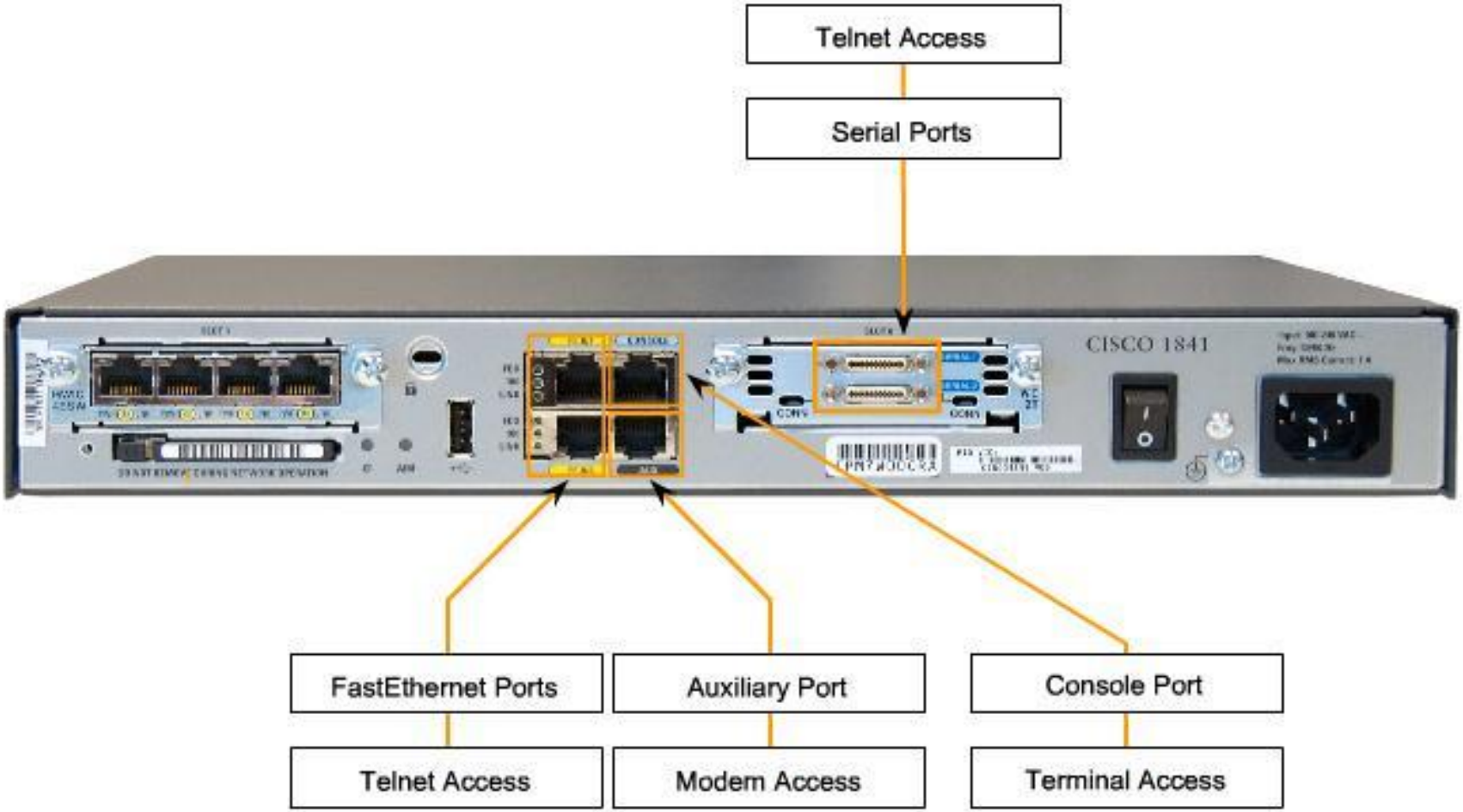
CISCO IOS

- CLI – Command Line Interface
- The IOS file itself is several megabytes in size and is stored in semi-permanent memory area called FLASH.
- In many Routers IOS is copied into RAM and the device is powered on and the IOS runs from RAM.

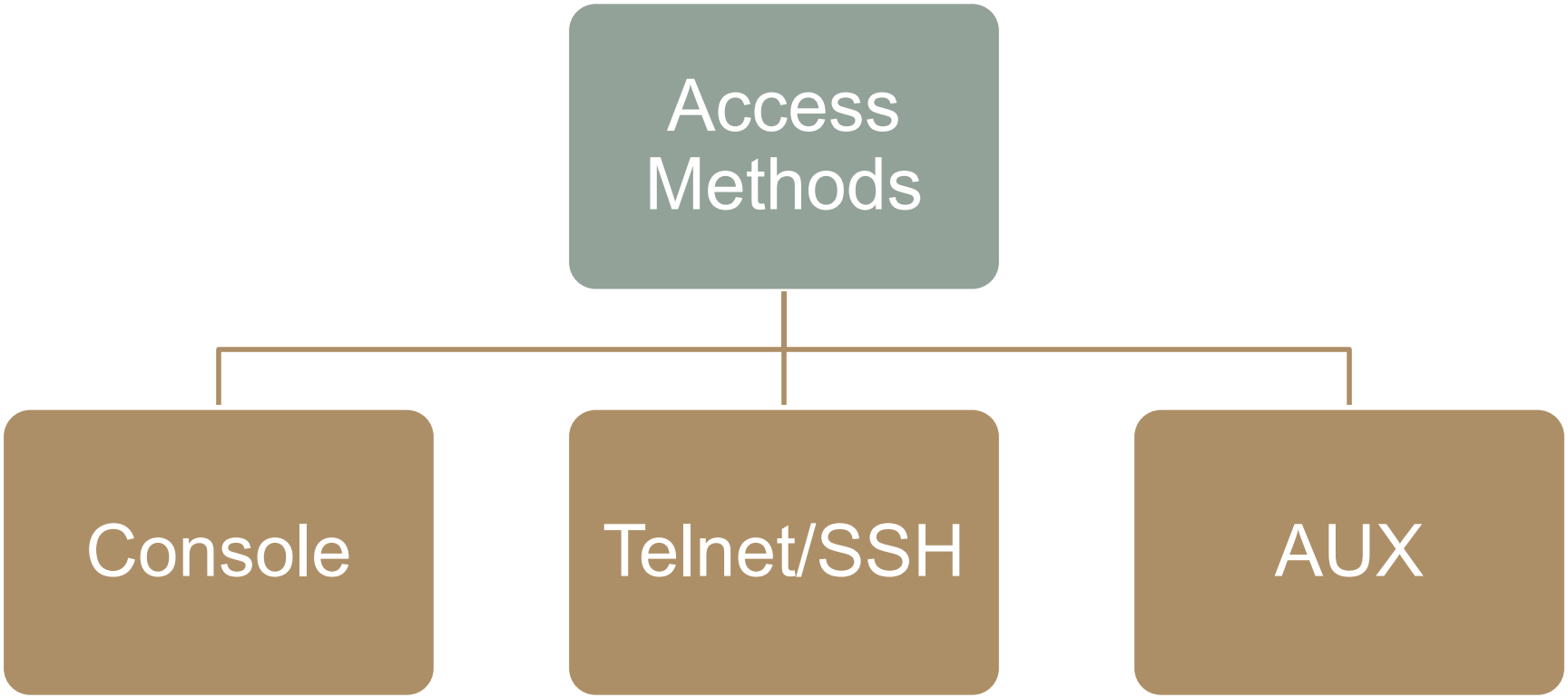
CLI – Command Line Interface



Accessing to Router



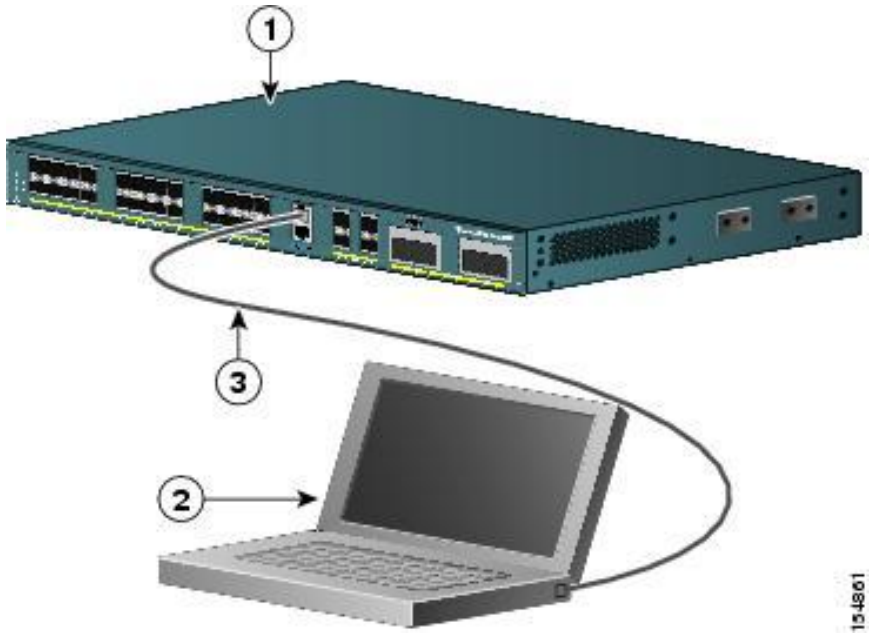
Access Methods



Access with Console

- Also known as CTY line
- Is a management port
- Accessible even if no network services have been configure on the device

Access with Console



Examples of Console use are:

- The initial configuration of the network device
- Disaster recovery procedures and troubleshooting where remote access is not possible
- Password recovery procedures

Access with Telnet

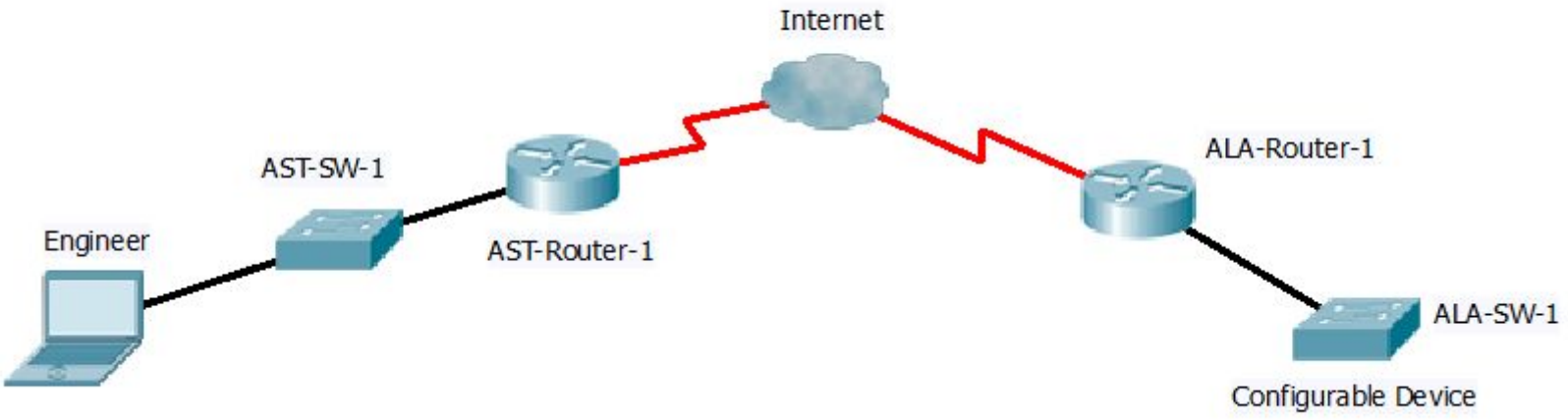
- Method for recovery accessing a CLI session is to telnet to the router
- Telnet sessions require active networking services on the device
- The network device must have at least one active interface configured with a Layer 3 address

Access with SSH (Secure Shell)

- Secure method for remote device access
- Provides stronger password authentication
- Encrypts all communications between the client and the IOS device

Telnet/SSH Configuration

Connection by IP address

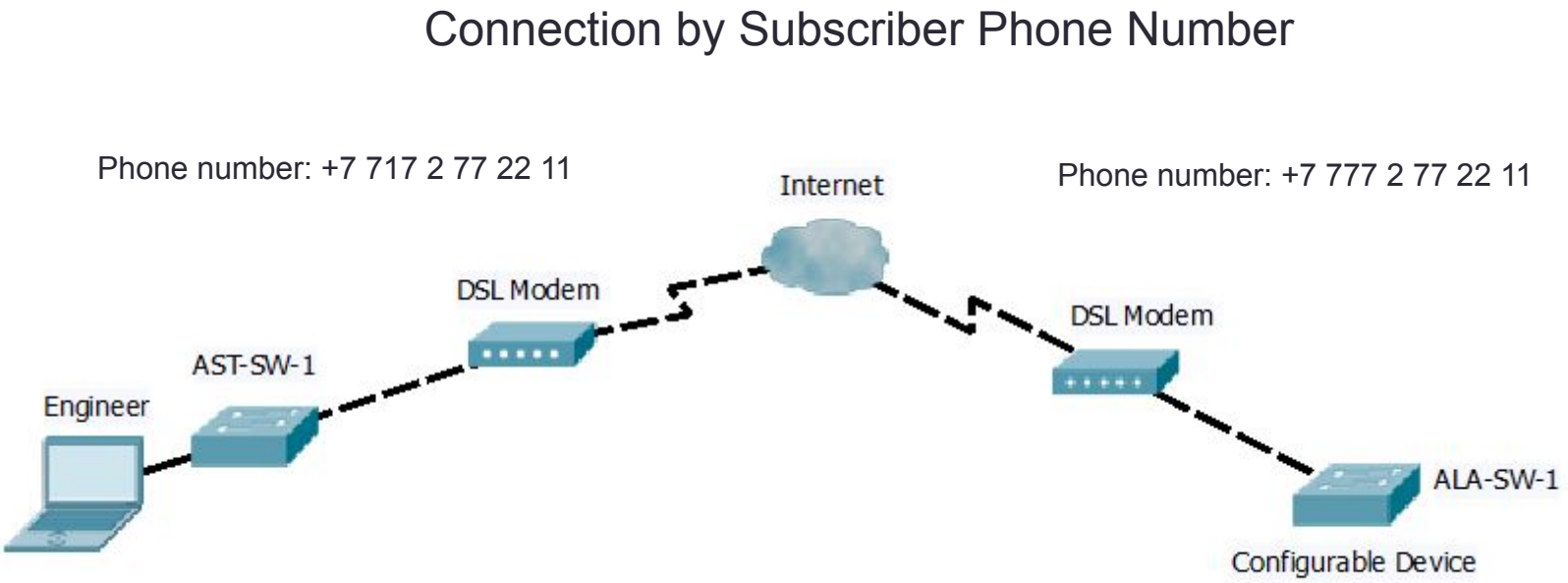


IP address:202.22.22.11

Access with AUX port

- CLI session remotely is via telephone dialup connection using a modem connected to the router's AUX port
- Doesn't require any configured interfaces

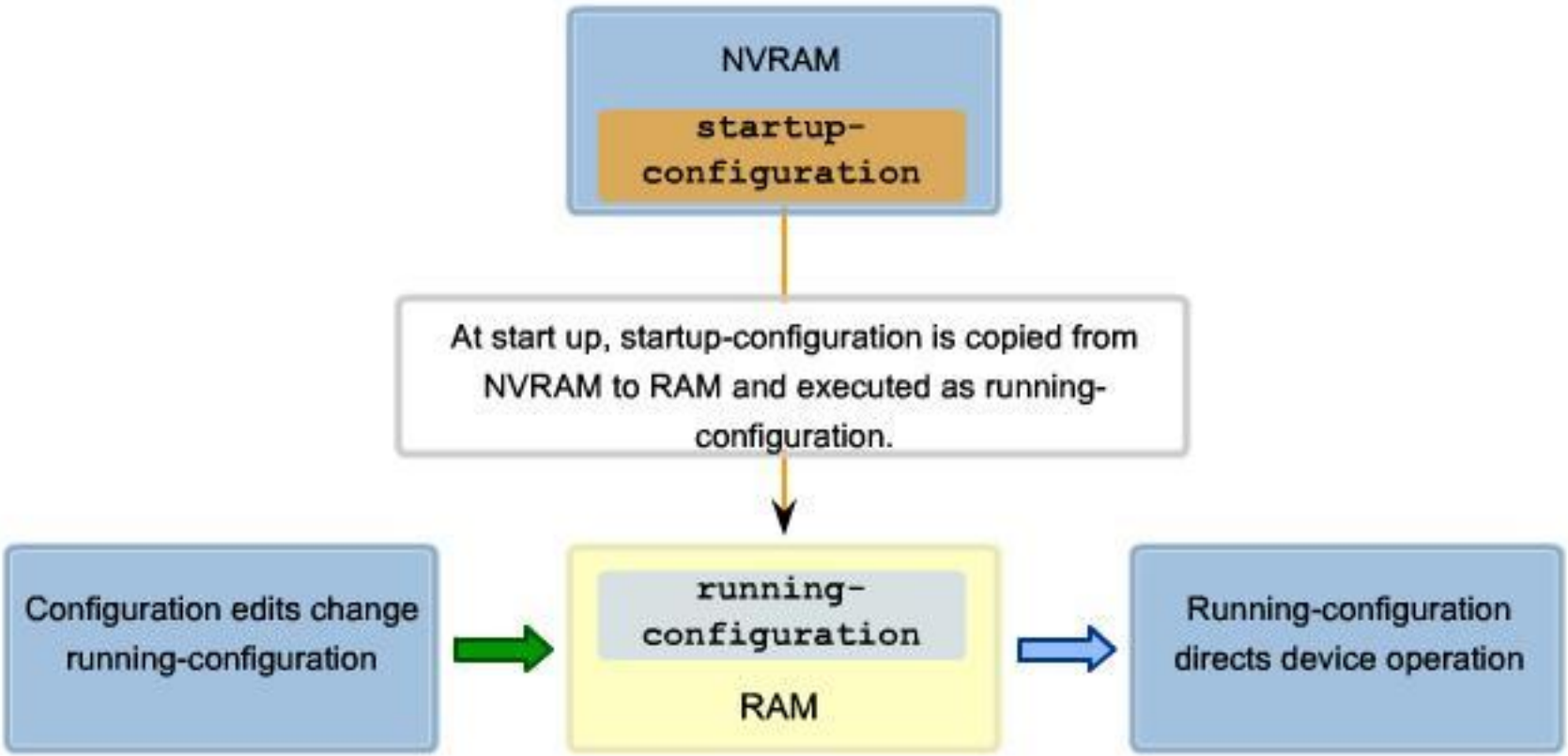
Aux Configuration



Types of Configuration Files

- Running configuration file
- Startup configuration file

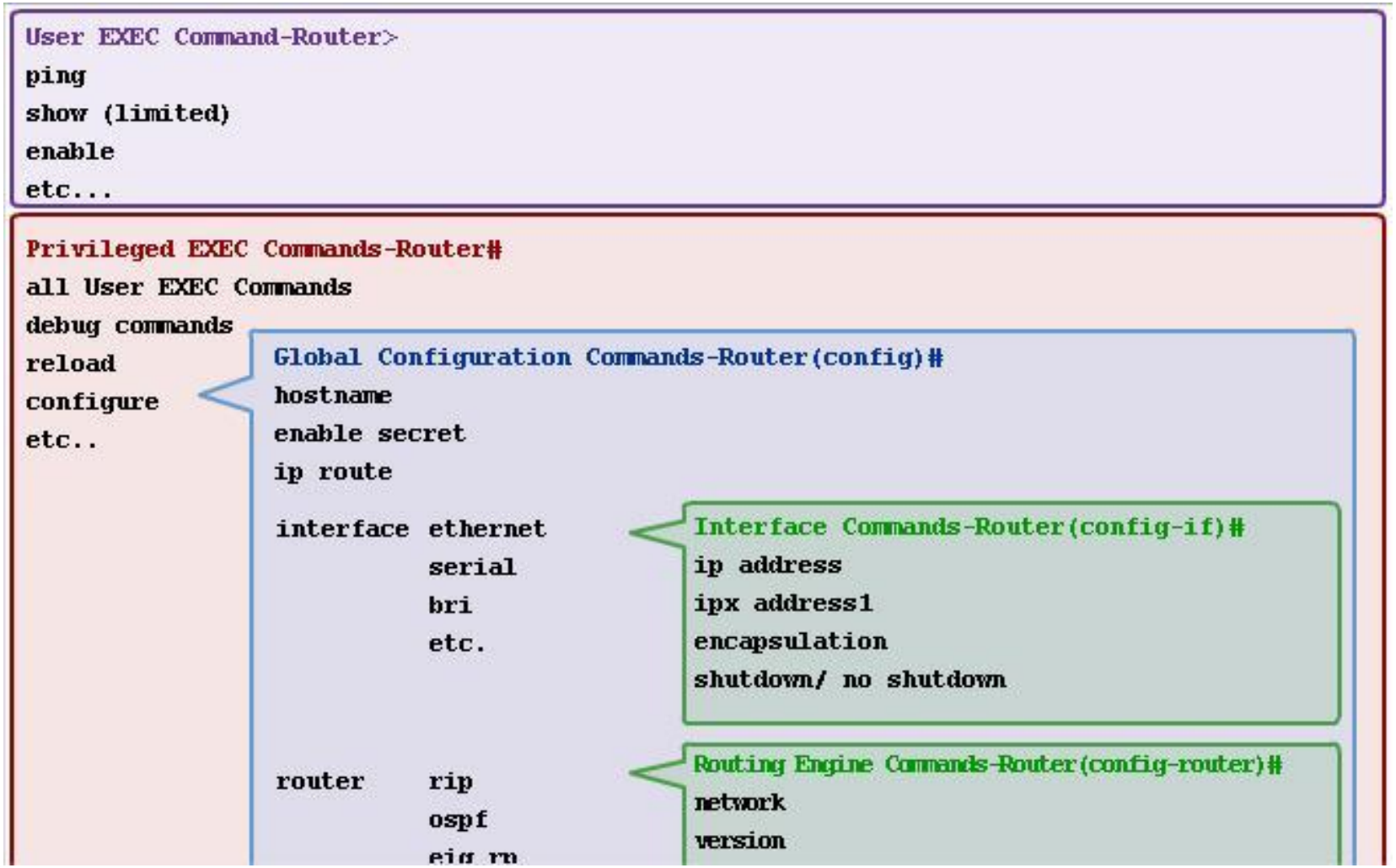
Configuration Files



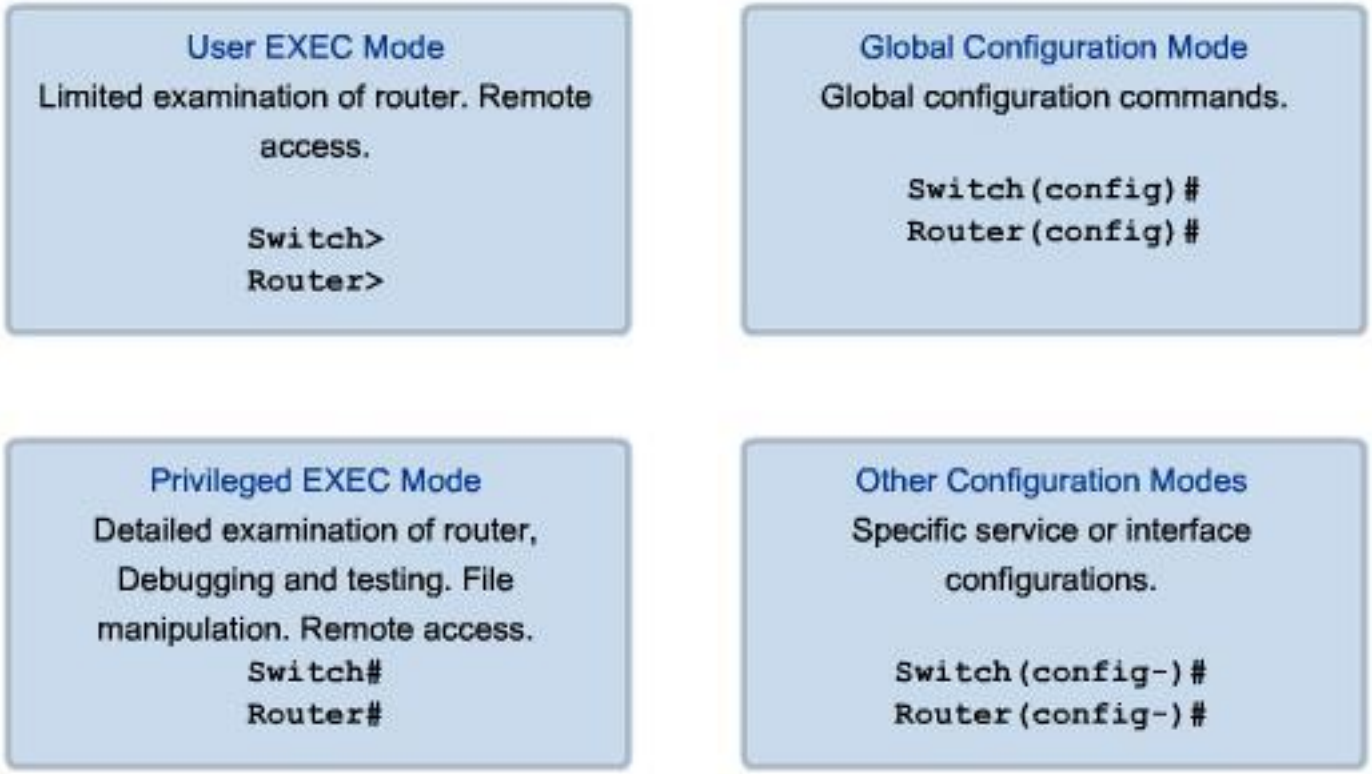
CISCO IOS Modes

- User executive mode
- Privileged executive mode
- Global configuration mode
- Other specific configuration modes

CISCO IOS Modes



CISCO IOS Modes



CISCO IOS Modes

```
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
```

The prompt changes to denote the current CLI mode.

```
Switch>ping 192.168.10.9

Switch#show running-config

Switch(config)#Interface FastEthernet 0/0

Switch(config-if)#Description connection to WEST LAN4
```

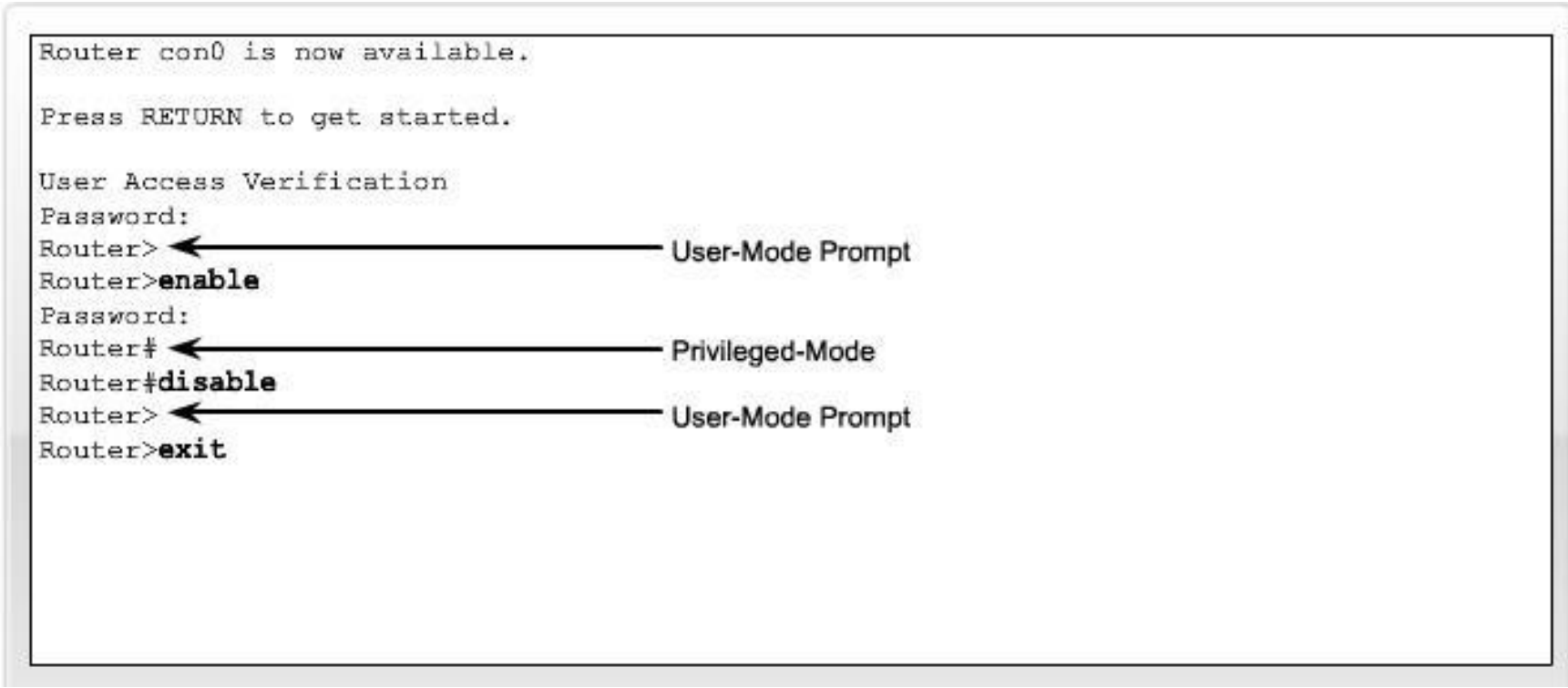
User Executive Mode

- EXEC mode is view-only mode
- Doesn’t allow execution of any commands that might change the configuration of device
- By default, there is no authentication required to access the EXEC mode from the console
- It is good practice to ensure that authentication is configured during the initial configuration

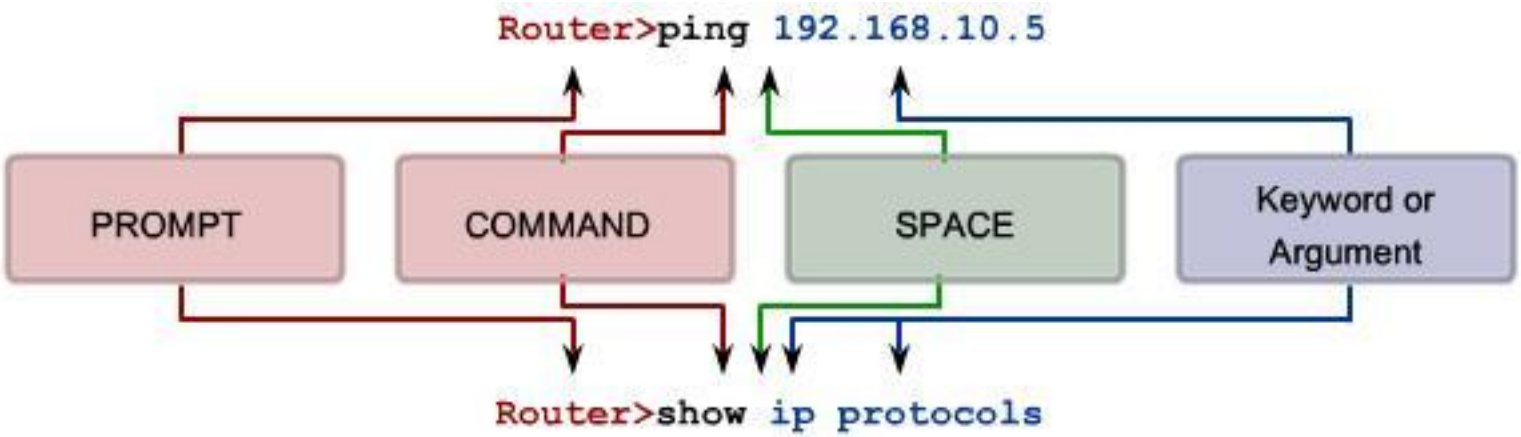
Privileged EXEC Mode

- The execution of configuration and management commands requires that the network administrator use the privileged EXEC mode, or a specific mode further down the hierarchy.

Switching between EXEC and Privileged EXEC modes



Structure of Command



Using CLI Help
Context-Sensitive Help

Example of a sequence of commands using the CLI context sensitive help

```
Cisco#cl?
clear  clock
Cisco#clock ?
  set  Set the time and date
Cisco#clock set
% Incomplete command.
Cisco#clock set ?
  hh:mm:ss  Current Time
Cisco#clock set 19:50:00
% Incomplete command.
```

Command explanations

Incomplete command messages

Invalid input messages

Variable formats

```
Cisco#clock set 19:50:00 ?
  <1-31>  Day of the month
  MONTH   Month of the year
Cisco#clock set 19:50:00 25 6
                            ^
Invalid input detected at '^' marker.
Cisco#clock set 19:50:00 25 June
% Incomplete command.
Cisco#clock set 19:50:00 25 June ?
  <1993-2035>  Year
Cisco#clock set 19:50:00 25 June 2007
Cisco#
```

Command Syntax Check

The IOS returns a help message indicating that required keywords or arguments were left off the end of the command:

```
Switch#>clock set
% Incomplete command.
Switch#clock set 19:50:00
% Incomplete command.
```

The IOS returns a help message to indicate that there were not enough characters entered for the command interpreter to recognize the command.

```
Switch#c
% Ambiguous command:'c'
```

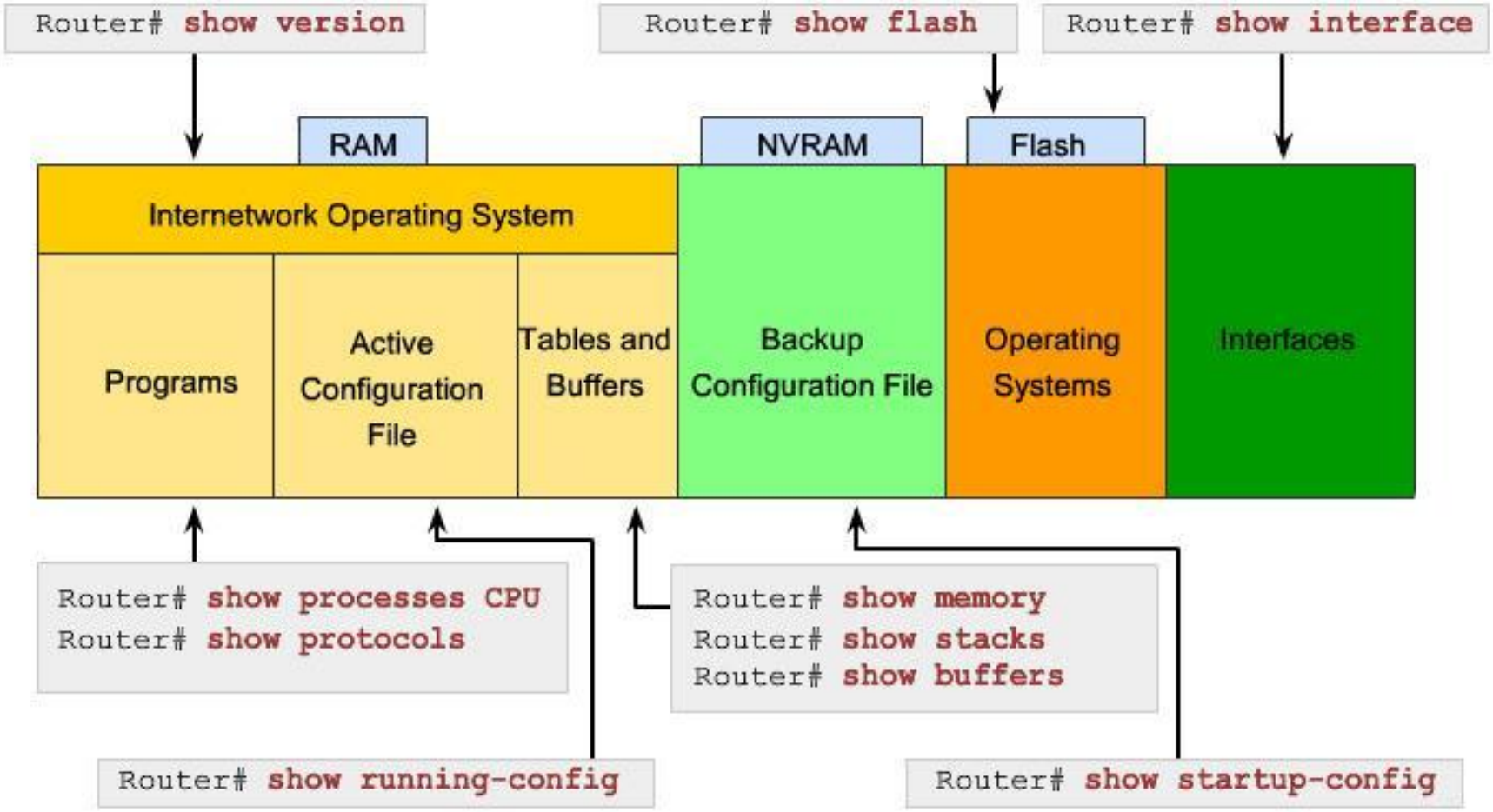
The IOS returns a "^" to indicate where the command interpreter can not decipher the command:

```
Switch#clock set 19:50:00 25 6
                          ^
% Invalid input detected at '^' marker.
```

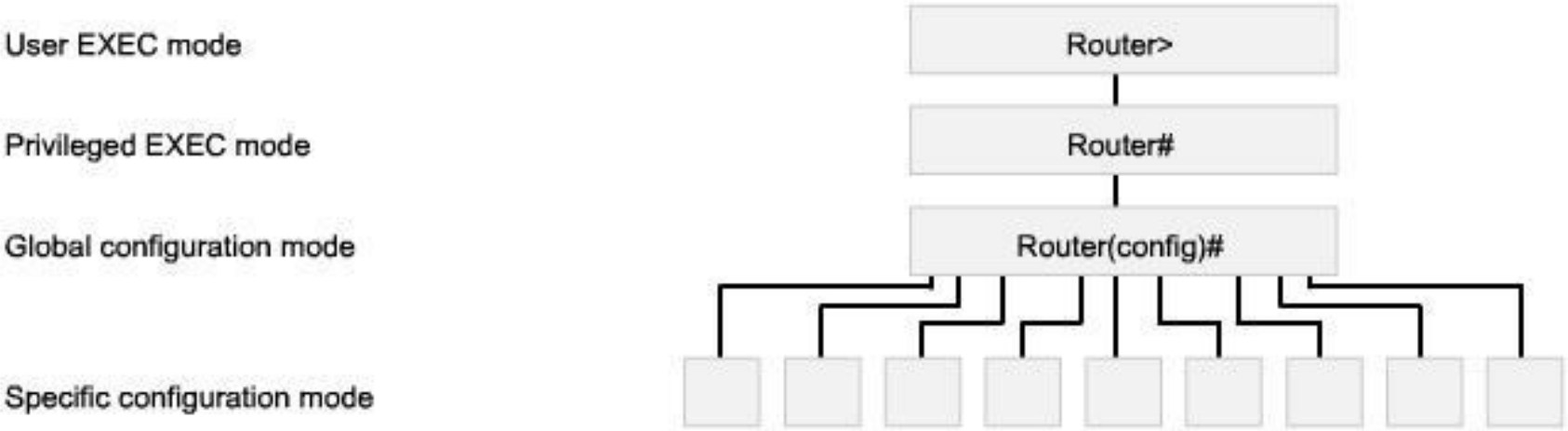
Hot Keys and Shortcuts

- Tab - Completes the remainder of the command or keyword
- Ctrl-R - Redisplays a line
- Ctrl-Z - Exits configuration mode and returns to the EXEC
- Down Arrow - Allows user to scroll forward through former commands
- Up Arrow - Allows user to scroll backward through former commands
- Ctrl-C - Aborts the current command and exits the configuration mode

Structure of IOS



Global Configuration Mode

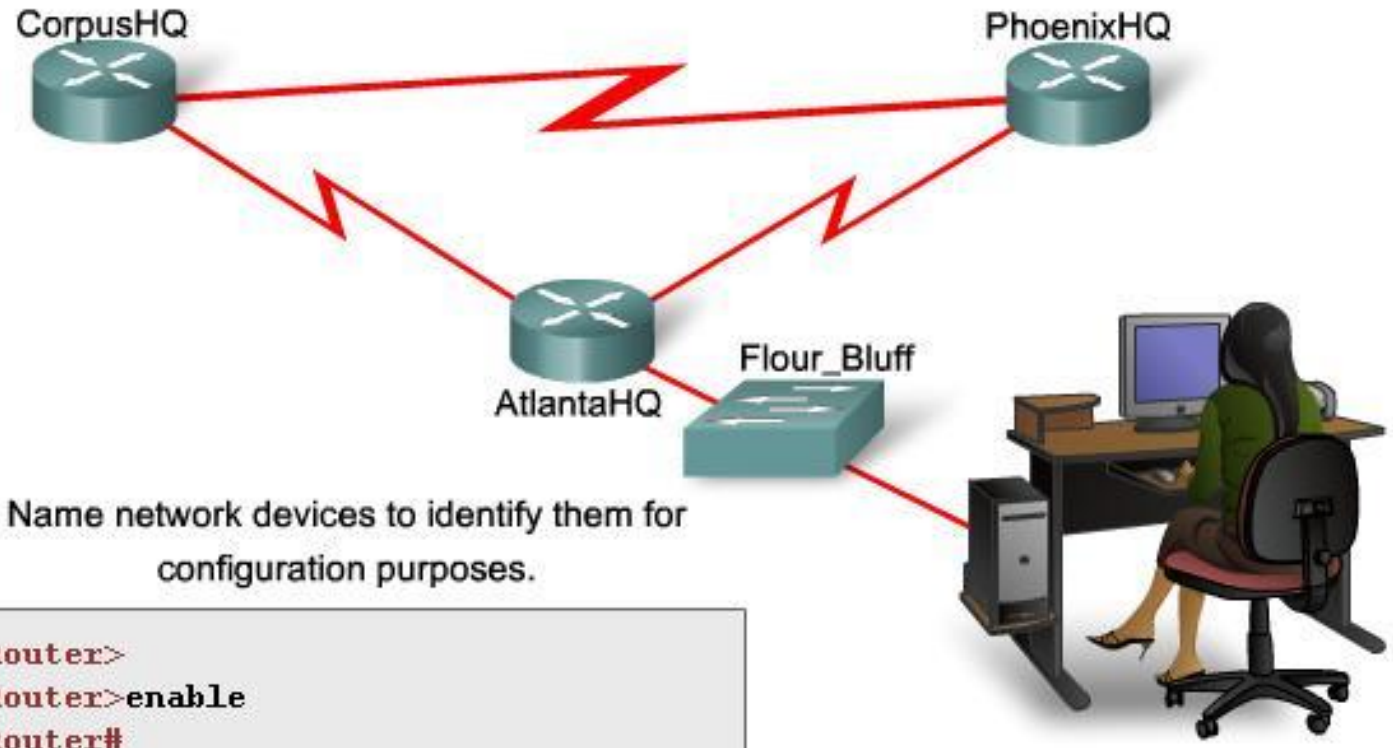


Configuration Mode	Prompt
Interface	Router(config-if)#
Line	Router(config-line)#
Routers	Router(config-router)#

Basic Configurations Using CISCO IOS

- Some guidelines for naming conventions are that names should:
  - Start with a letter
  - Not contain a space
  - End with a letter or digit
  - Have characters of only letters, digits, and dashes
  - Be 63 characters or fewer
- Without name it is difficult to identify devices

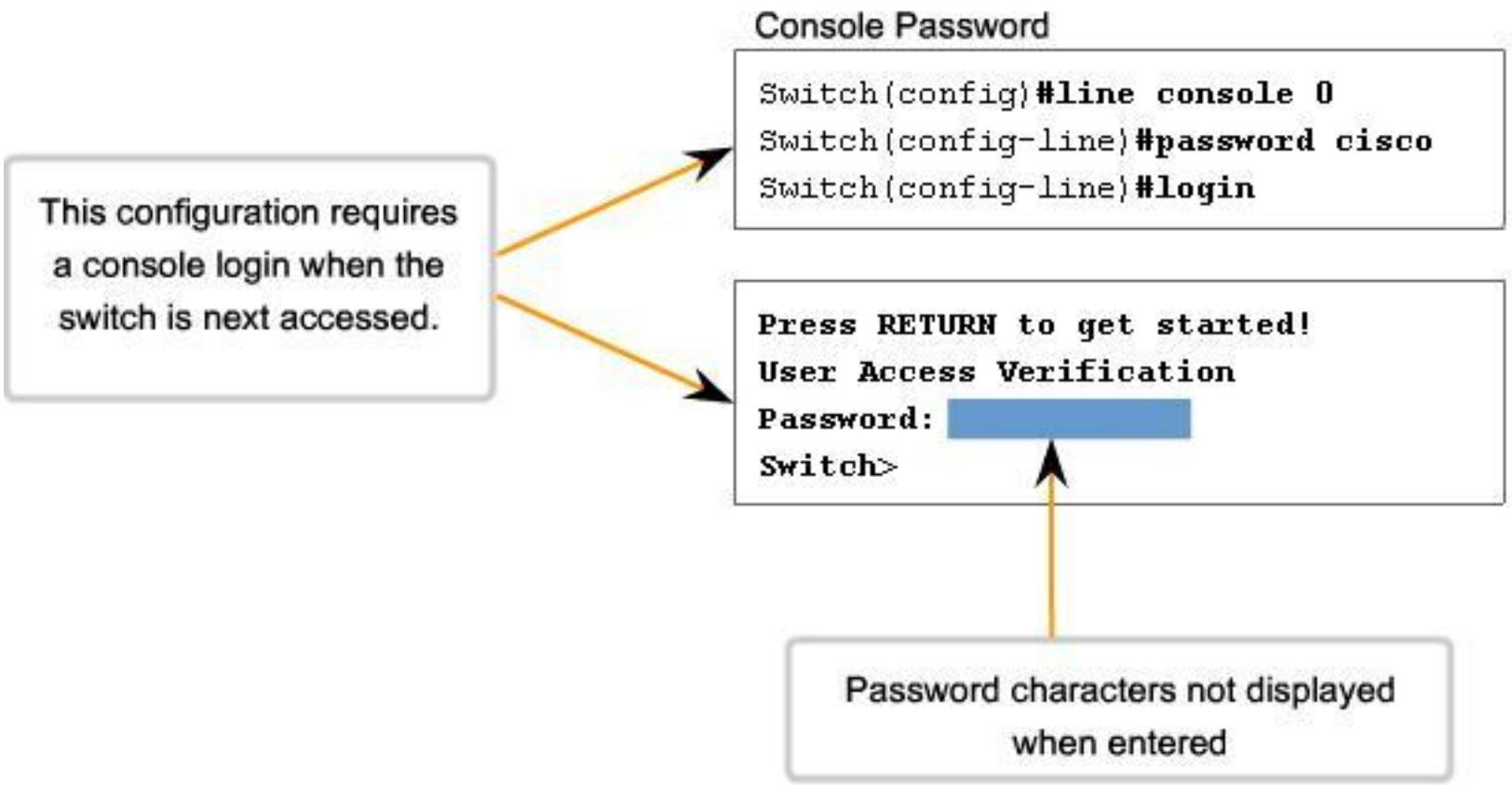
Giving names for devices



Name network devices to identify them for configuration purposes.

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

Password for Console



The passwords introduced here are:

- Console password - limits device access using the console connection
- Enable password - limits access to the privileged EXEC mode
- Enable secret password - encrypted, limits access to the privileged EXEC mode
- VTY password - limits device access using Telnet

Consider these key points when choosing passwords:

- Use passwords that are more than 8 characters in length.
- Use a combination of upper and lowercase and/or numeric sequences in passwords.
- Avoid using the same password for all devices.
- Avoid using common words such as password or administrator, because these are easily guessed.

Different types of Passwords

Virtual Terminal Password

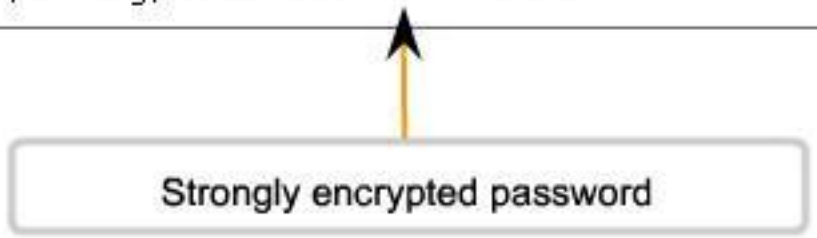
```
Router(config)#line vty 0 4
Router(config-line)#password cisco
Router(config-line)#login
```

Enable Password

```
Router(config)#enable password san fran
```

Enable Secret Password

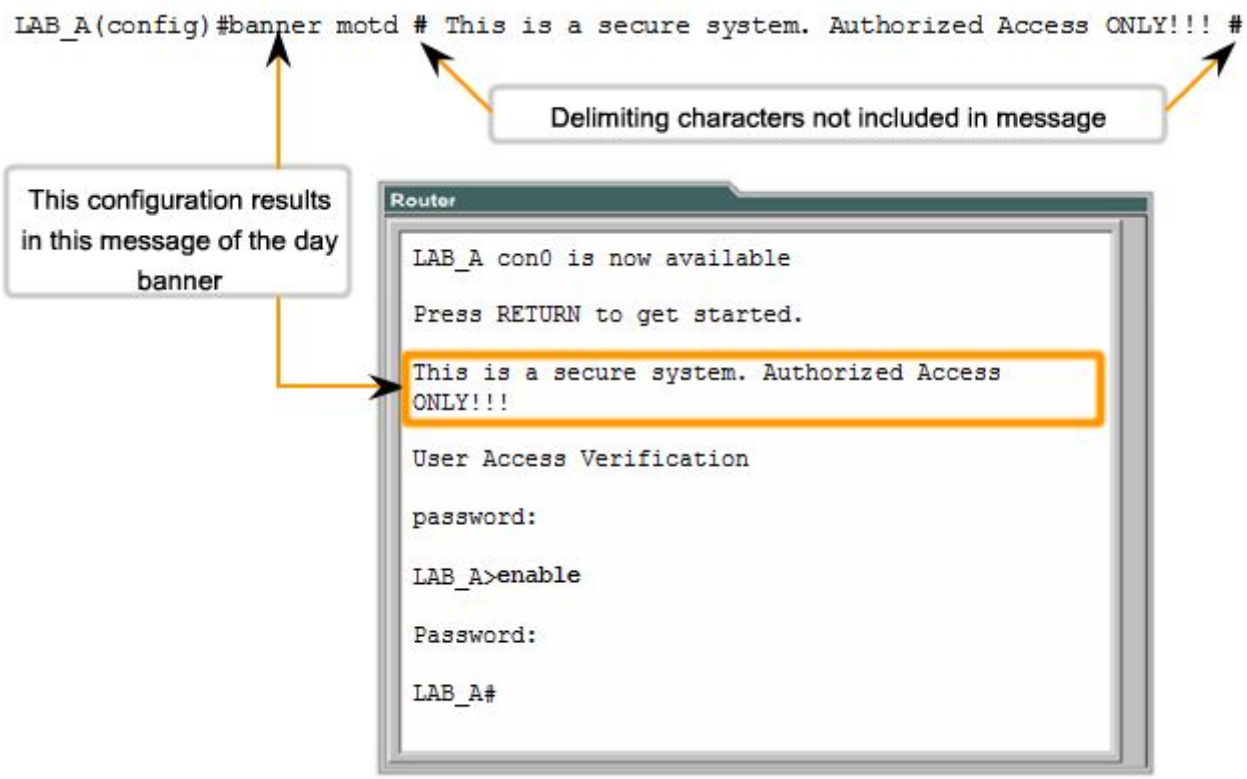
```
Router(config)#enable secret cisco
```



Encryption of Passwords

- service password-encryption

Banner Message



Managing Configuration Files

- router#copy running-config startup-config
- rrase startup-config

Configuring Interfaces

All interfaces are accessed by issuing the **interface** command at the global configuration prompt.

In the following commands, the *type* argument includes serial, ethernet, fastethernet, and others:

```
Router(config)#interface type port
Router(config)#interface type slot/port
Router(config)#interface type slot/subslot/port
```

The following command is used to administratively turn off the interface:

```
Router(config-if)#shutdown
```

The following command is used to turn on an interface that has been shutdown:

```
Router(config-if)#no shutdown
```

The following command is used to quit the current interface configuration mode:

```
Router(config-if)#exit
```

When the configuration is complete, the interface is enabled and interface configuration mode is exited.

Configuration of FastEthernet interface on Router


```
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)#
```

Configuration of Serial interface on Router


```
Router(config)#interface Serial 0/0/0
Router(config-if)#ip address 192.168.11.1 255.255.255.252
Router(config-if)#clock rate 56000
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
```

Interface Description


```
Router(config)#interface FastEthernet 0/0
Router(config-if)#description  Building B Sales LAN
Router(config-if)#exit
```

Description is all text after this space

Interface description used for internal network documentation

```
Router(config)#interface Serial 0/0/0
Router(config-if)#description  To Perth CKT-PT27834365-01
Router(config-if)#exit
```

Description is all text after this space

Q/A