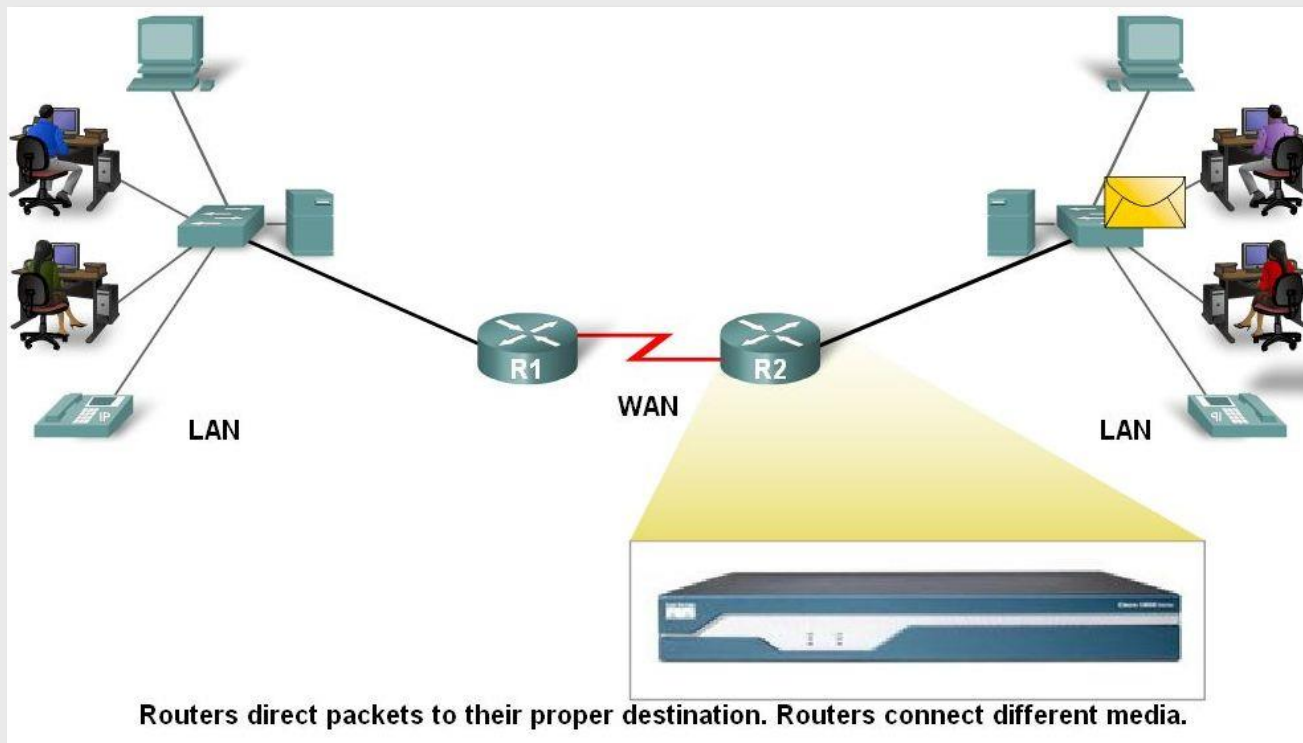


Lab 1

- Packet Tracer
- Cisco IOS – introduction
- Basic commands

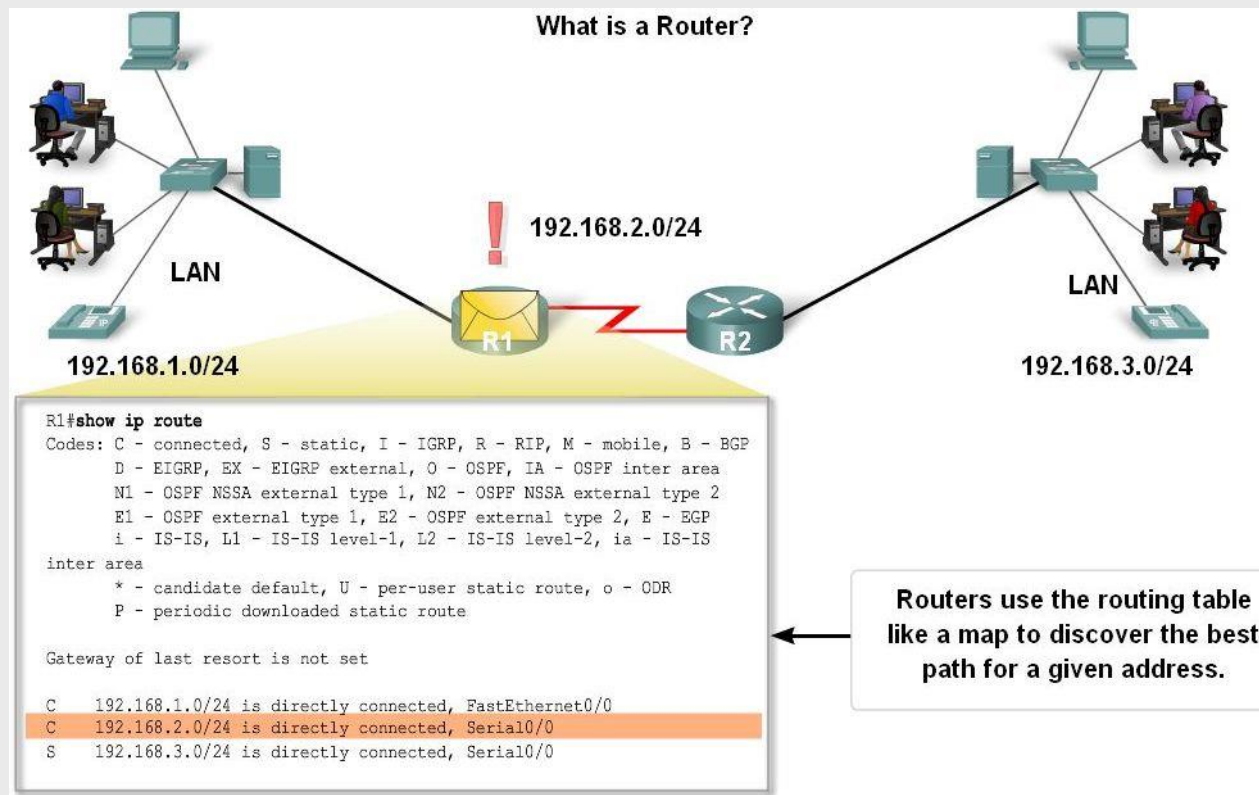
Routers are “specialized” computers

- Computer devices that specialize in sending packets over the data network.
- They are responsible for *interconnecting networks* by selecting the best path for a packet to travel and forwarding packets to their destination

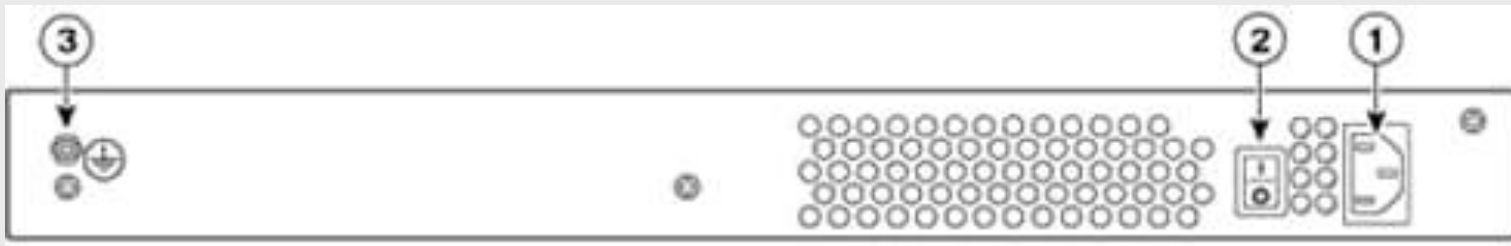
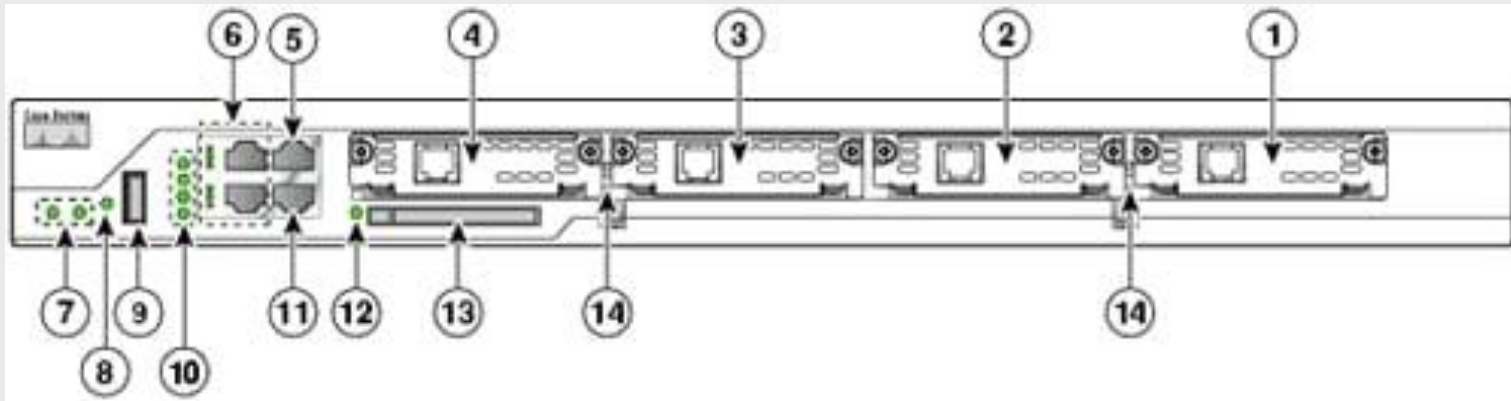


Router are “specialized” computers

- Data is sent in form of packets between two end devices
- Routers are used to direct a packet to its destination
- Routers examine a packet's destination IP address and determine the best path with the aid of a routing table



Router are "specialized" computers



The operating system

- Cisco Internetwork Operating System (IOS)
- Juniper Network Operating System (Junos)
- ...

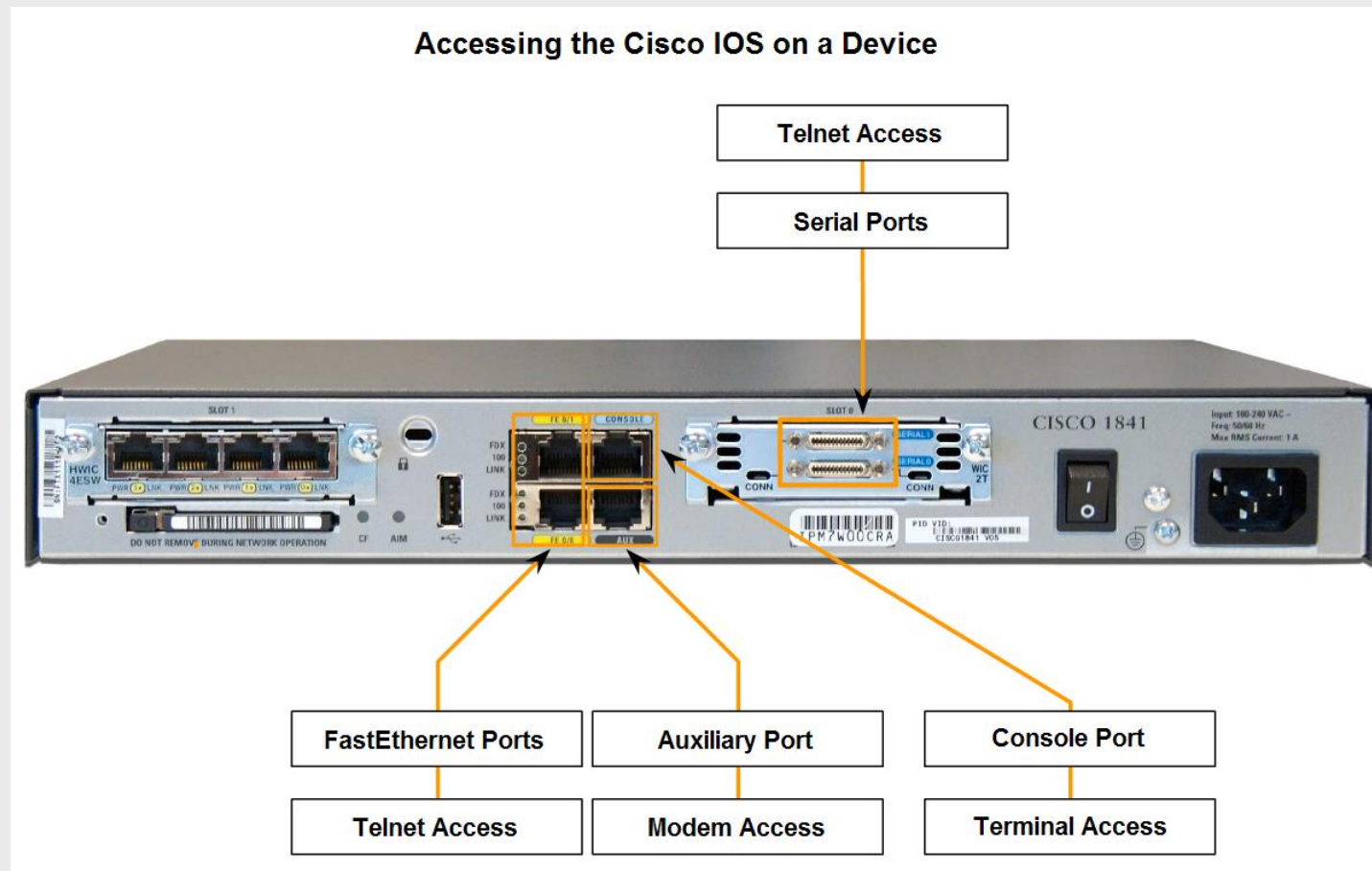


Internetwork Operating System for Cisco networking devices



Accessing the Cisco IOS

- The services provided by the Cisco IOS are generally accessed using a **command line interface** (CLI).



Cisco IOS modes

User EXEC Command-Router>

ping
show (limited)
enable
etc...

Privileged EXEC Commands-Router#

all User EXEC Commands
debug commands
reload
configure
etc..

Global Configuration Commands-Router(config)#

hostname
enable secret
ip route

interface ethernet
serial
bri
etc.

Interface Commands-Router(config-if)#

ip address
ipx network
encapsulation
shutdown/ no shutdown
etc..

router rip
ospf
eigrp
etc..

Routing Engine Commands-Router(config-router)#

network
version
auto summary
etc...

line vty
console
etc.

Line Commands-Router(config-line)#

password
login
modem commands
etc..

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
```

The prompt changes to denote the current CLI mode.

```
Switch>ping 192.168.10.9

Switch#show running-config

Switch(config)#Interface FastEthernet 0/1

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


IOS primary modes

User EXEC Mode

Limited examination of router.
Remote access.

```
Switch>  
Router>
```

Global Configuration Mode

Simple configuration commands.

```
Switch (config) #  
Router (config) #
```

Privileged EXEC Mode

Detailed examination of router,
Debugging and testing. File
manipulation. Remote access.

```
Switch#  
Router#
```

Other Configuration Modes

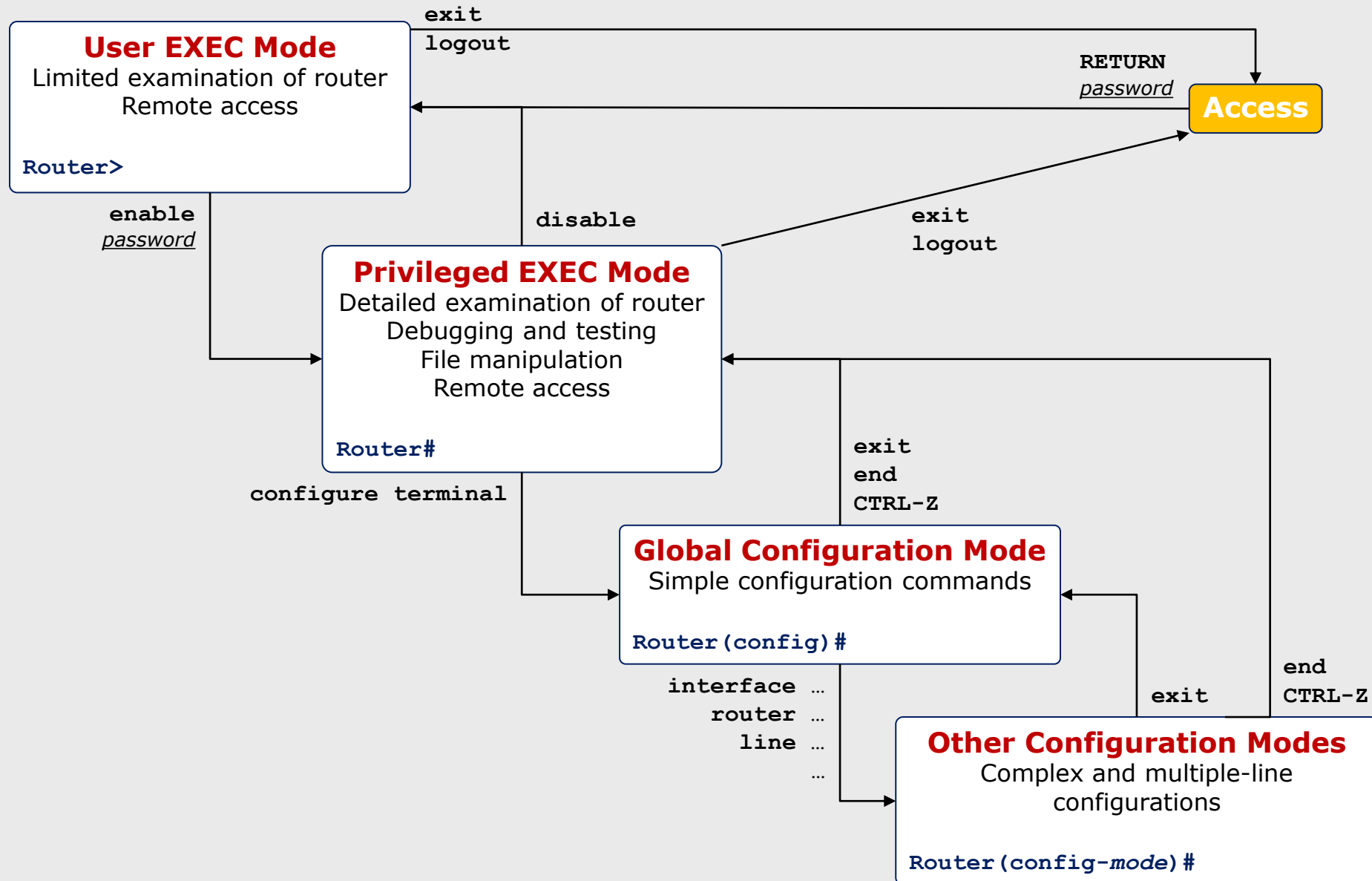
Complex and multiple-line
configurations.

```
Switch (config-mode) #  
Router (config-mode) #
```

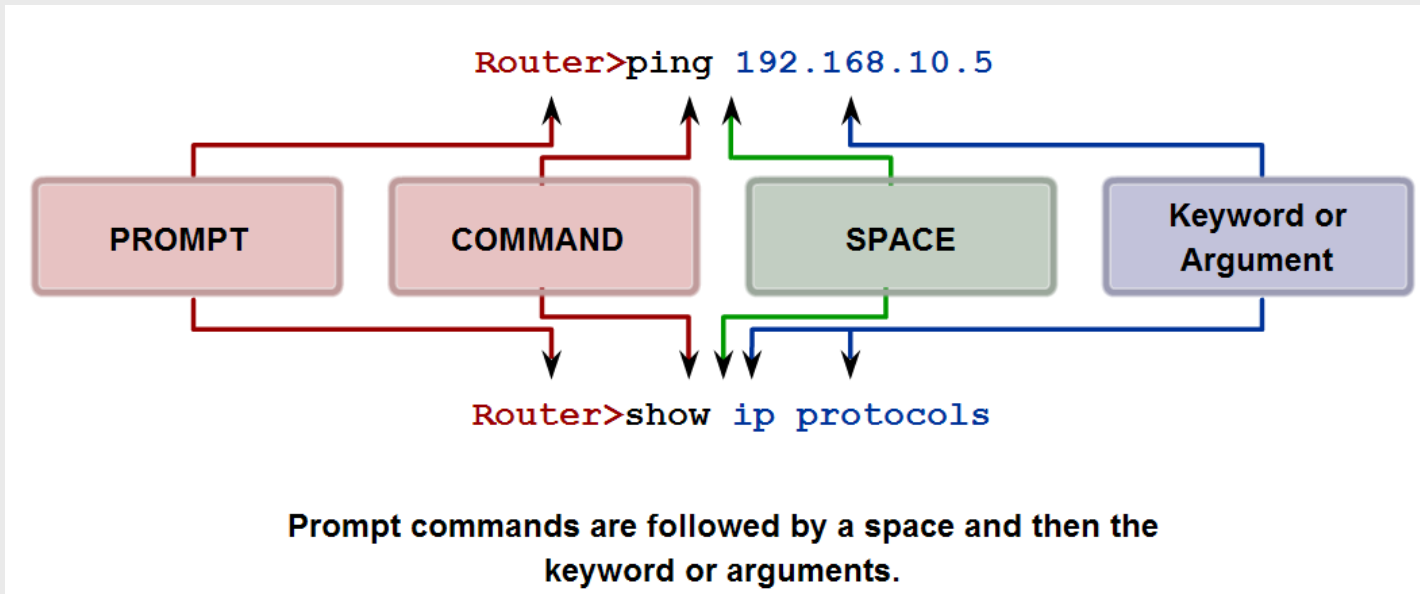
Moving between primary modes

```
Router con0 is now available.  
  
Press RETURN to get started.  
  
User Access Verification  
Password:  
Router> ← User-Mode Prompt  
Router>enable  
Password:  
Router# ← Privileged-Mode  
Router#disable  
Router> ← User-Mode Prompt  
Router>exit
```

Moving between IOS modes



Basic IOS command structure



IOS 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#
```

IOS CLI help (cont.)

■ 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:

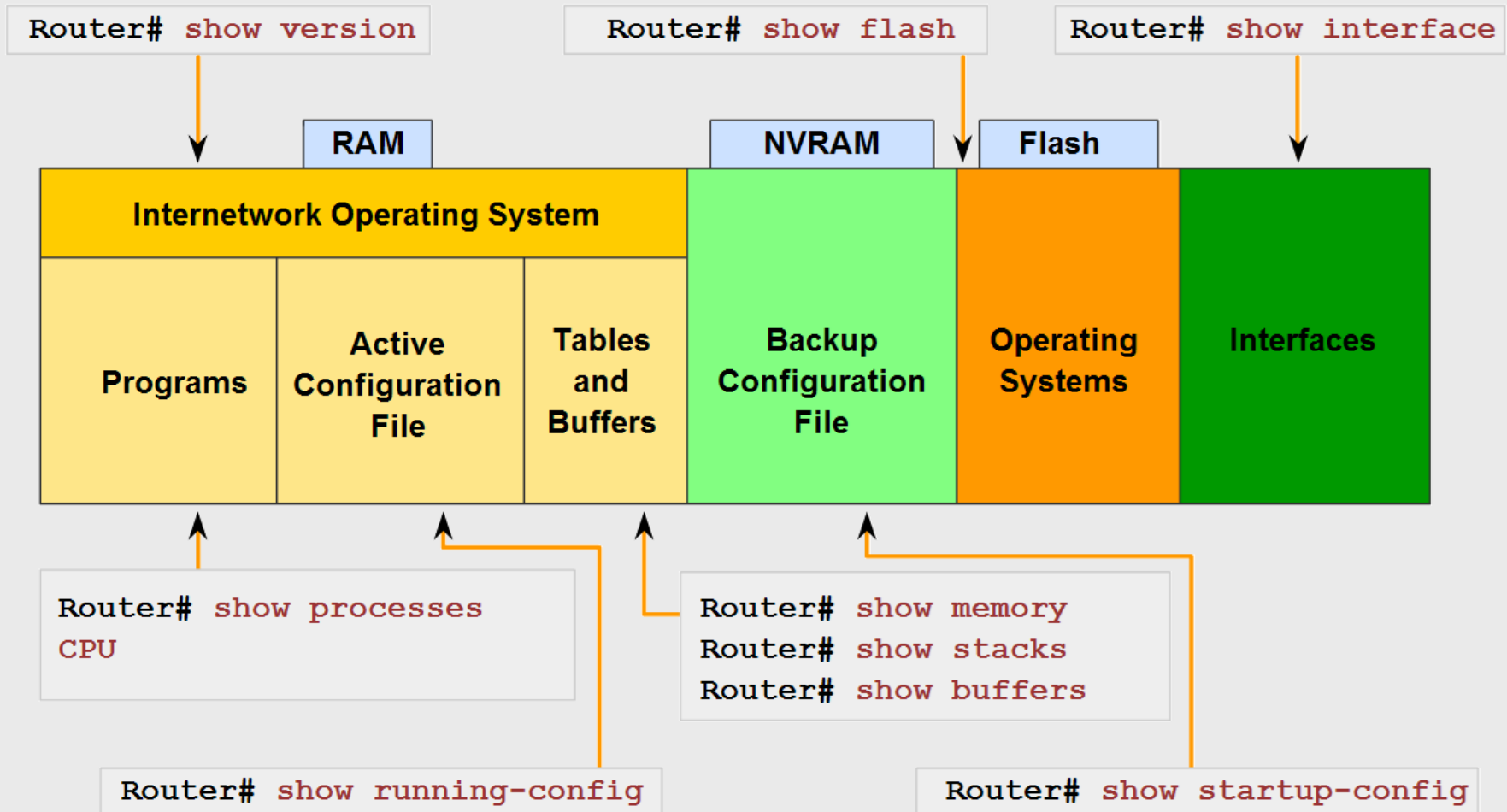
```
Switch#clock set 19:50:00 25 6
                        ^
% Invalid input detected at '^' marker.
```

IOS hot keys and shortcuts

Hot Key / Command	Action
Tab	Completes the remainder of the command or keyword
Ctrl-R	Redisplays a line
Ctrl-Z	Exits configuration mode and returns to the EXEC
Up/Down Arrow	Allows user to scroll backward/forward through former commands
Ctrl-Shift-6	Allows the user to interrupt an IOS process such as ping or traceroute
Ctrl-C	Aborts the current command and exits the configuration mode
...	...

The IOS show command

IOS show commands can provide information about the configuration, operation and status of parts of a Cisco router.



The IOS `show` command (cont.)

- `show interfaces` - Displays statistics for all interfaces on the device.
- `show version` - Displays information about the currently loaded software version, along with hardware and device information.
- `show arp` - Displays the ARP table of the device.
- `show startup-config` - Displays the saved configuration located in NVRAM.
- `show running-config` - Displays the contents of the currently running configuration file or the configuration for a specific interface, or map class information.
- `show ip interface` - Displays IPv4 statistics for all interfaces on a router. To view the statistics for a specific interface, enter the `show ip interfaces` command followed by the specific interface slot/port number. Another important format of this command is `show ip interface brief`. This is useful to get a quick summary of the interfaces and their operational state.

The IOS show command (cont.)

```
Router#show version
Cisco IOS Software, 1841 Software (C1841-IPBASEK9-M), Version 12.4(11)T, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Sat 18-Nov-06 15:20 by prod_rel_team

ROM: System Bootstrap, Version 12.3(8r)T8, RELEASE SOFTWARE (fc1)

Router uptime is 10 weeks, 4 days, 23 hours, 36 minutes
System returned to ROM by power-on
System restarted at 16:43:31 UTC Fri Jan 26 2007
System image file is "flash:c1841-ipbasek9-mz.124-11.T.bin"

Cisco 1841 (revision 5.0) with 115712K/15360K bytes of memory.
Processor board ID FTX0932W21Y
 2 FastEthernet interfaces
 2 Low-speed serial(sync/async) interfaces
DRAM configuration is 64 bits wide with parity disabled.
191K bytes of NVRAM.
31360K bytes of ATA CompactFlash (Read/Write)

Configuration register is 0x2102

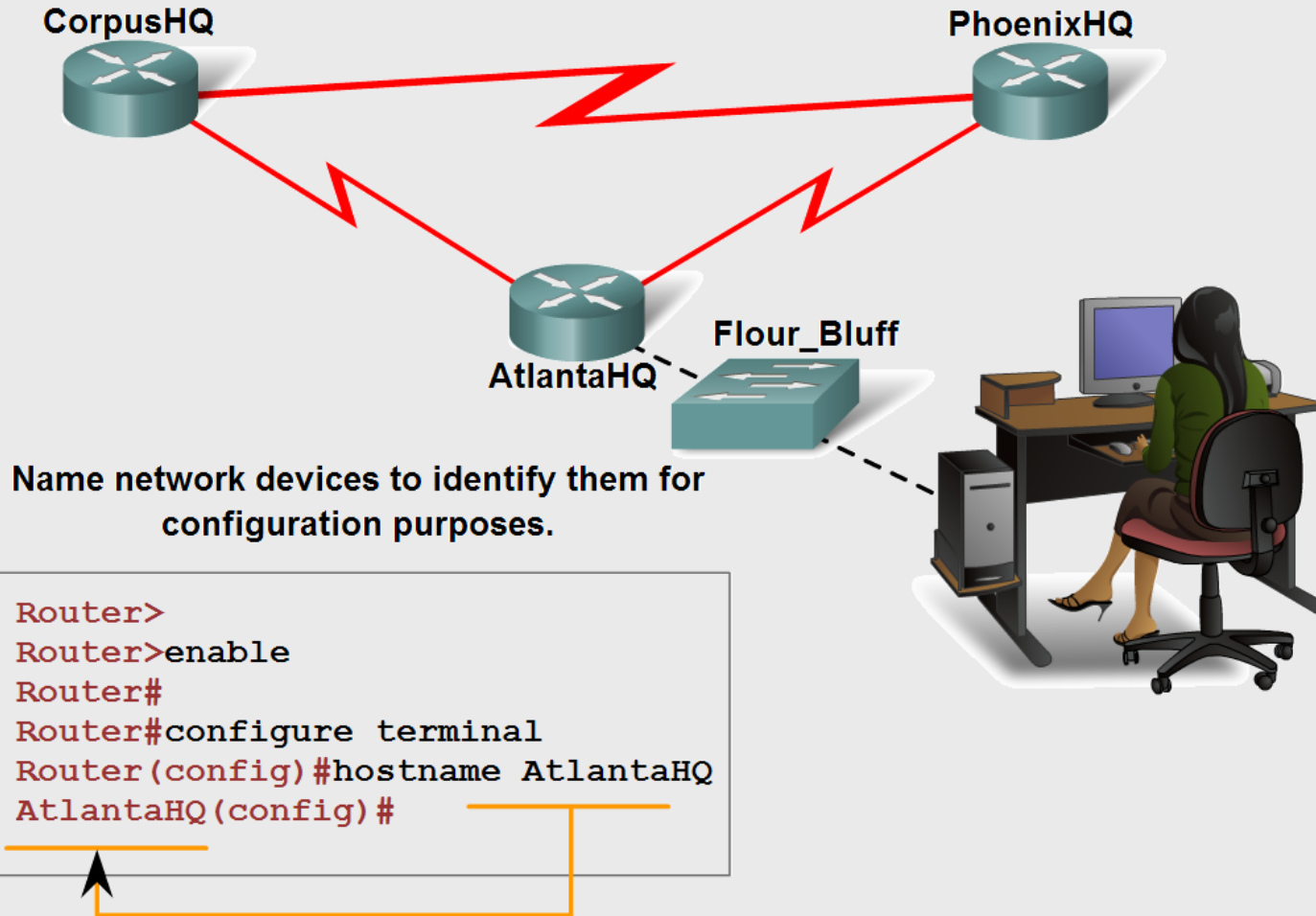
Router#
```

Naming routers

- When accessing a device (remotely), an assigned name provides an immediate confirmation that you are connected to the right device
- Default name for Cisco IOS routers: 'Router'
- It is a good practice to create a naming convention when designing the network
 - The naming convention includes guidelines for choosing "good" names
 - No spaces contained
 - Only alphanumeric characters
 - Shorter than ...
- RFC 1178, "Choosing a Name for Your Computer"

Naming routers (cont.)

Configuring Device Names



Controlling access to routers

■ User EXEC mode via Console Port

Limiting Device Access - Configuring Console Passwords

This configuration results in this console login process when the switch is next accessed

Console Password

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

```
Press RETURN to get started!  
User Access Verification  
Password: XXXXXXXXXX  
Switch>
```

Password characters not displayed when entered

Controlling access to router

- User EXEC mode via Telnet

Virtual Terminal Password

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

Controlling access to router configuration

- Global Configuration mode

Enable Password

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

Enable Secret Password

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

Strongly encrypted password

Banner messages

