



# Configuring and Testing Your Network



## Network Fundamentals – Chapter 11

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# Objectives

- Define the role of the Internetwork Operating System (IOS)
- Use Cisco CLI commands to perform basic router and switch configuration and verification
- Given a network addressing scheme, select, apply, and verify appropriate addressing parameters to a host
- Use common utilities to verify network connectivity between hosts
- Use common utilities to establish a relative performance baseline for the network

# Role of Internetwork Operating System (IOS)

- Identify several classes of devices that have IOS embedded

Cisco IOS

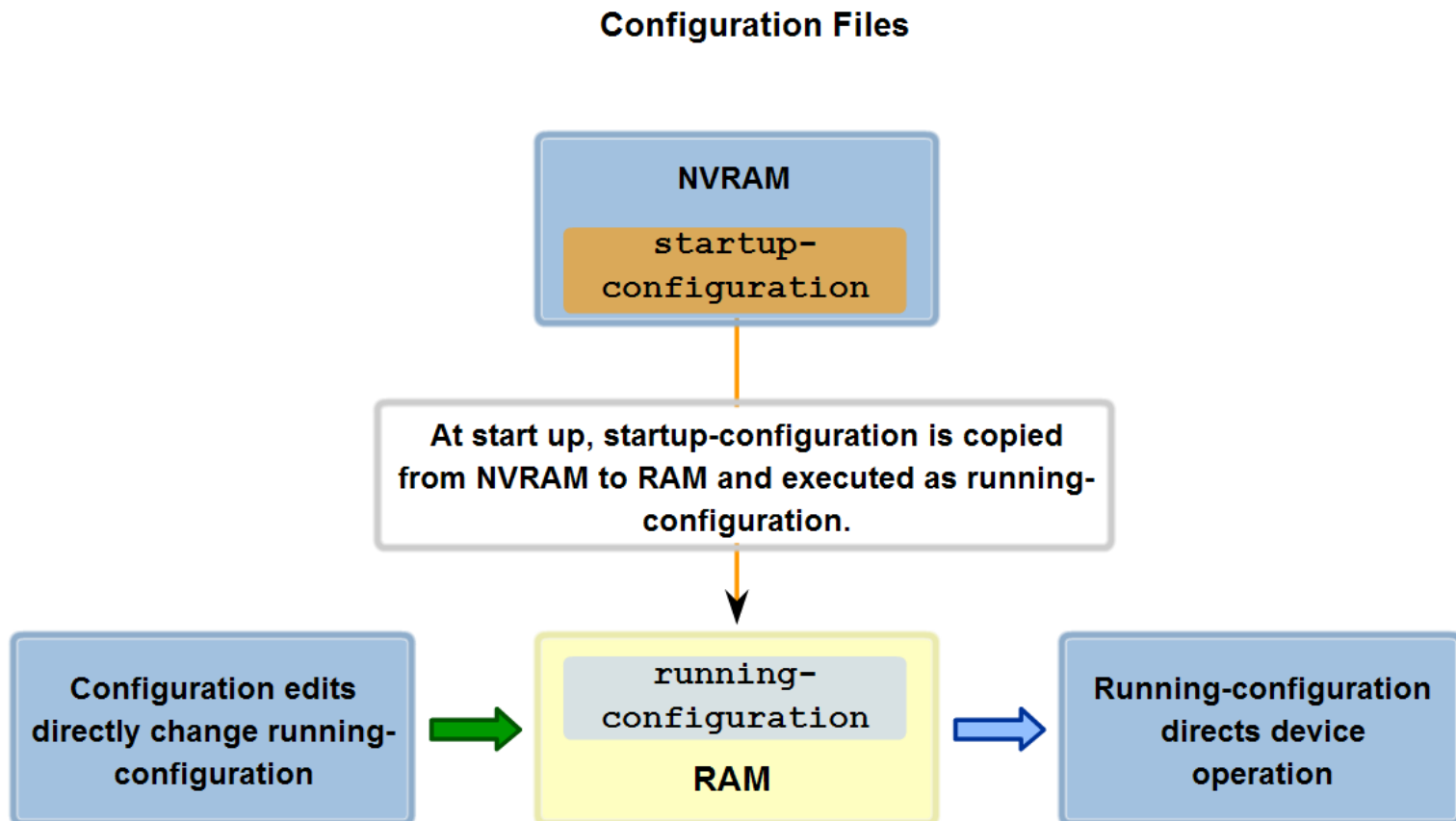


Internetwork Operating System for Cisco networking devices



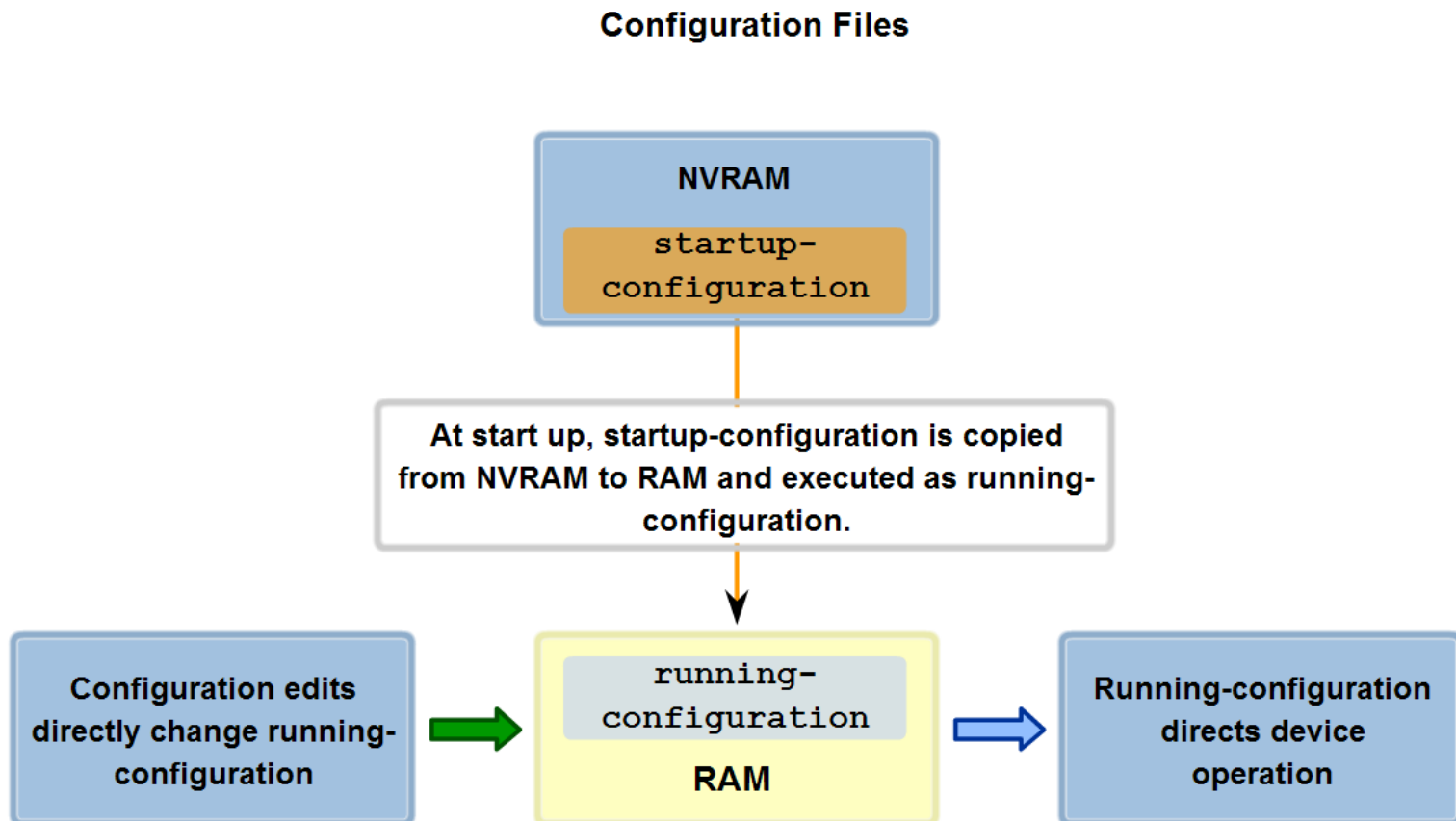
# Role of Internetwork Operating System (IOS)

- Define the purpose of startup config.



# Role of Internetwork Operating System (IOS)

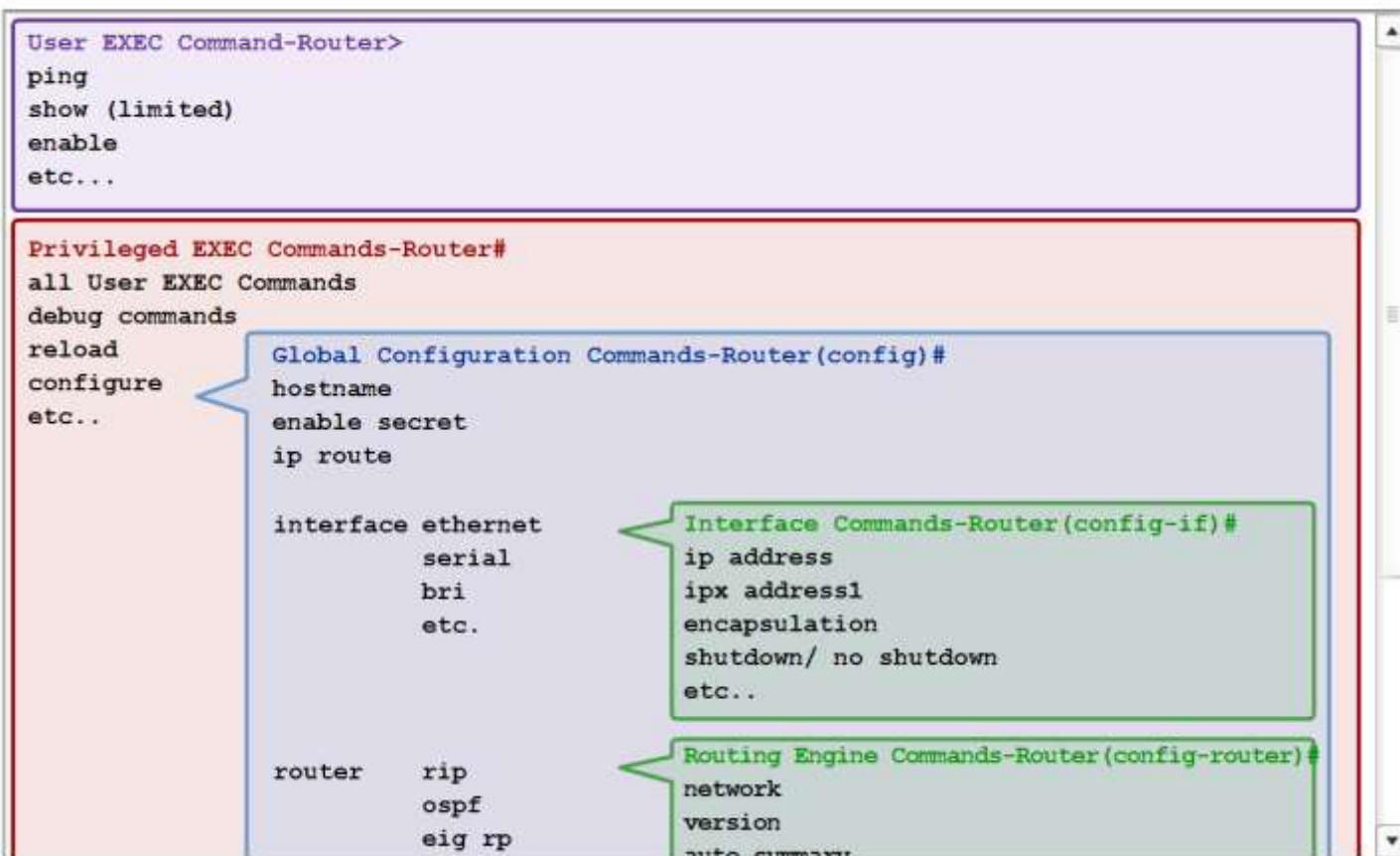
- Identify the relationship between IOS and config



# Role of Internetwork Operating System (IOS)

- Recognize that Cisco IOS is modal and describe the implications of modes.

## IOS Mode Hierarchical Structure





# Role of Internetwork Operating System (IOS)

- Define the different modes and identify the mode prompts in the CLI

## 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

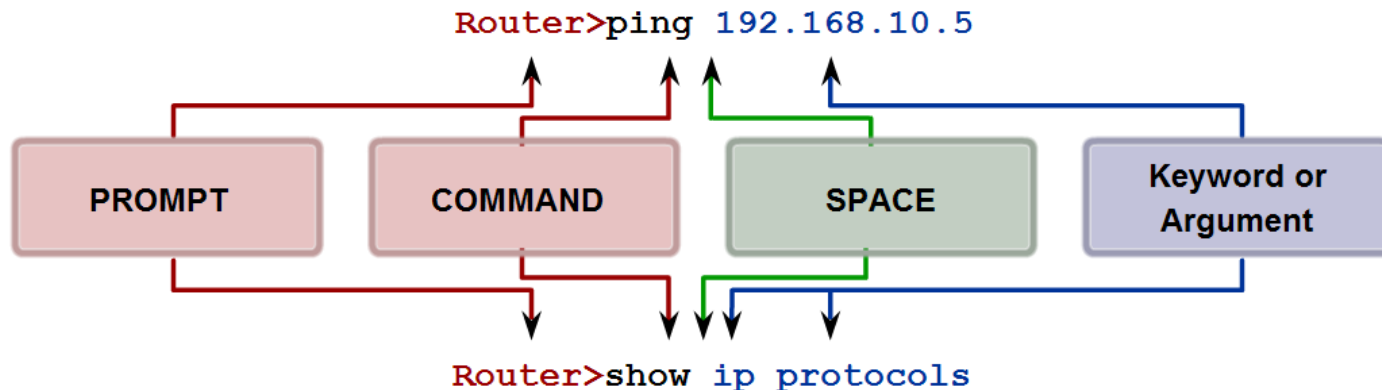
Complex and multiple-line  
configurations.

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

# Role of Internetwork Operating System (IOS)

- Identify the basic command structure for IOS commands

## Basic IOS Command Structure



Prompt commands are followed by a space and then the keyword or arguments.



# Role of Internetwork Operating System (IOS)

- Identify the types of help and feedback available while using IOS and use these features to get help, take

## 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

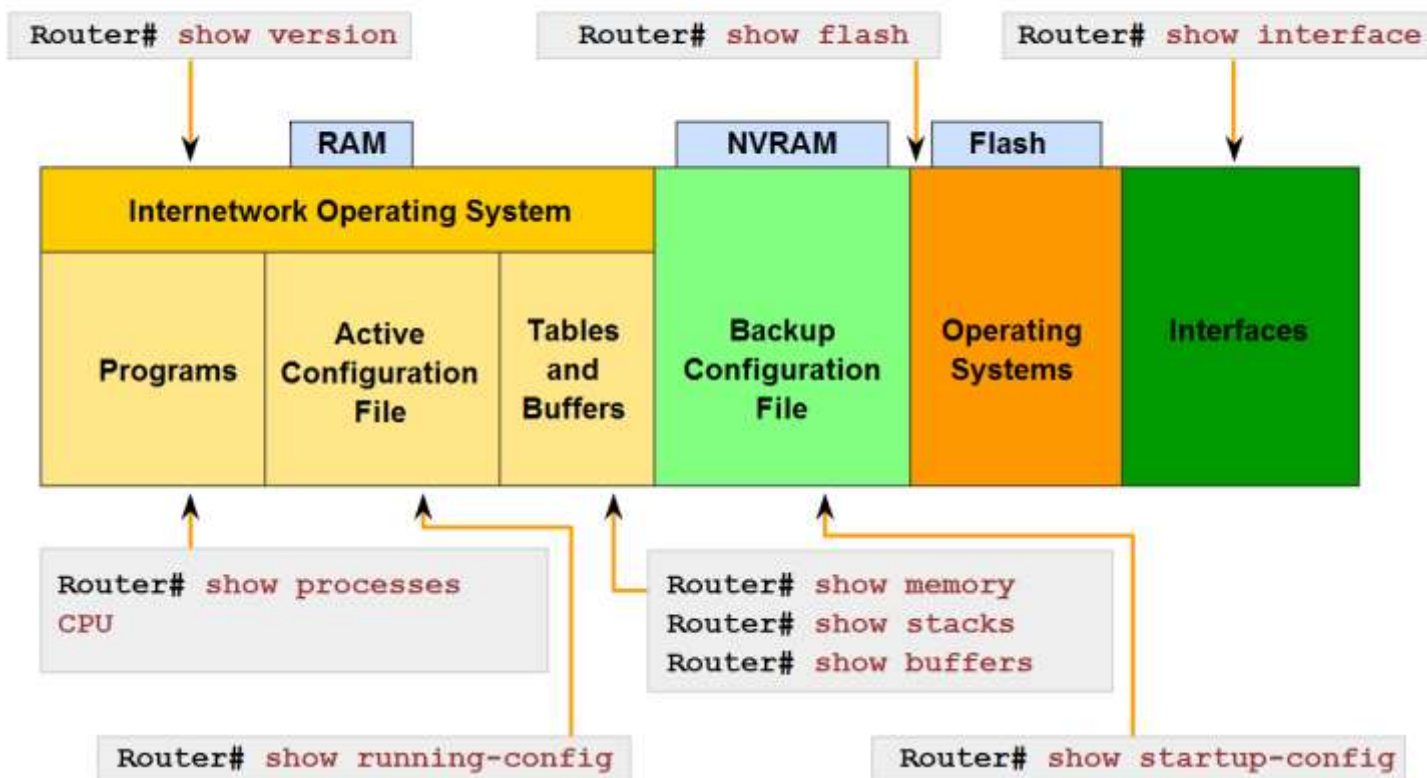
Variable formats

```
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#
```

# Role of Internetwork Operating System (IOS)

- Identify the purpose of the show command and several of its variations

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



# Role of Internetwork Operating System (IOS)

- Identify several of the configuration modes, their purpose and their associated prompt

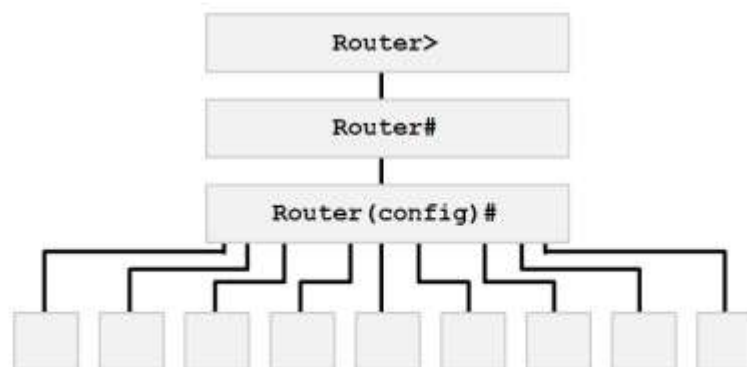
## IOS Configuration Modes

User EXEC mode

Privileged EXEC mode

Global configuration mode

Specific configuration mode

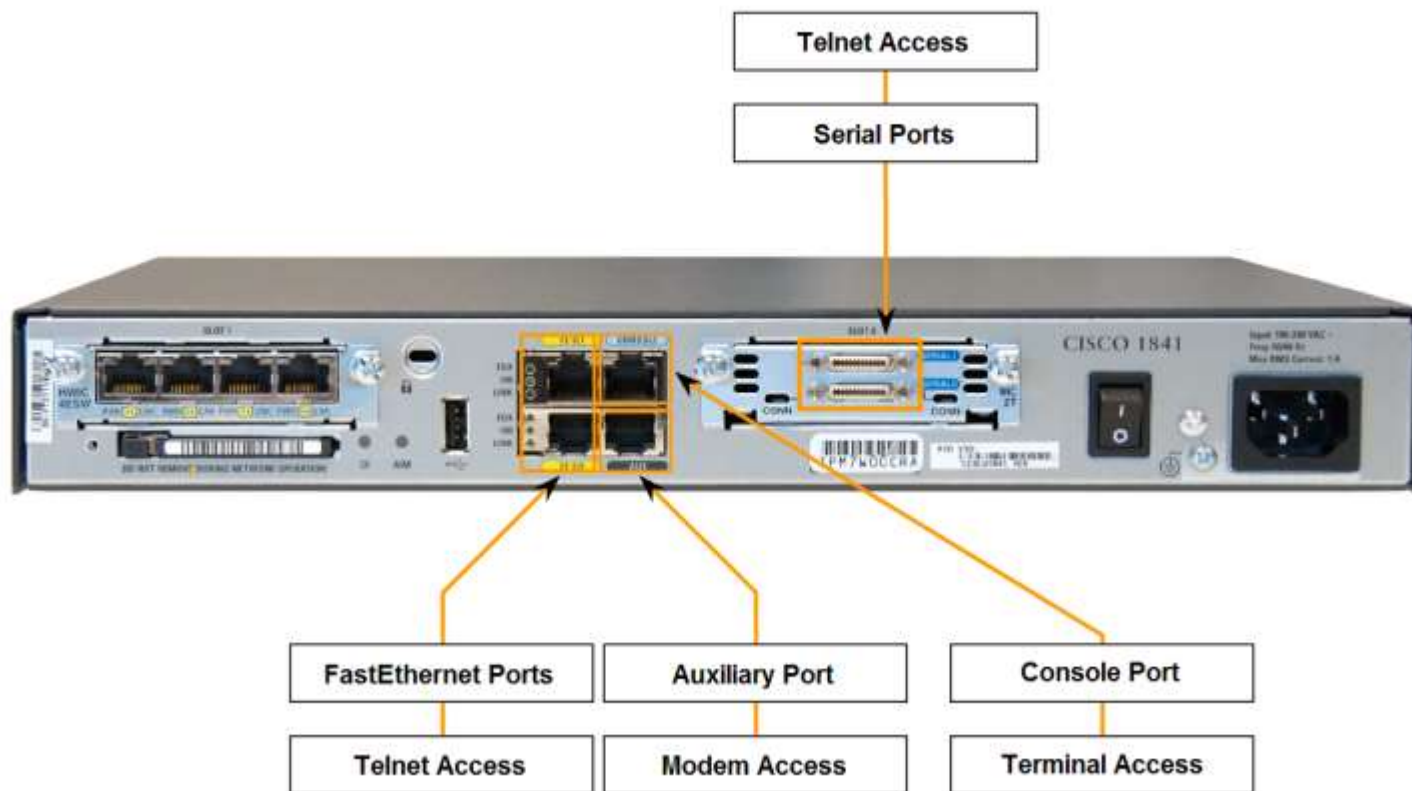


Configuration Mode	Prompt
Interface	Router (config-if) #
Line	Router (config-line) #
Routers	Router (config-router) #

# Role of Internetwork Operating System (IOS)

- Use the CLI to access various IOS configuration modes on a device

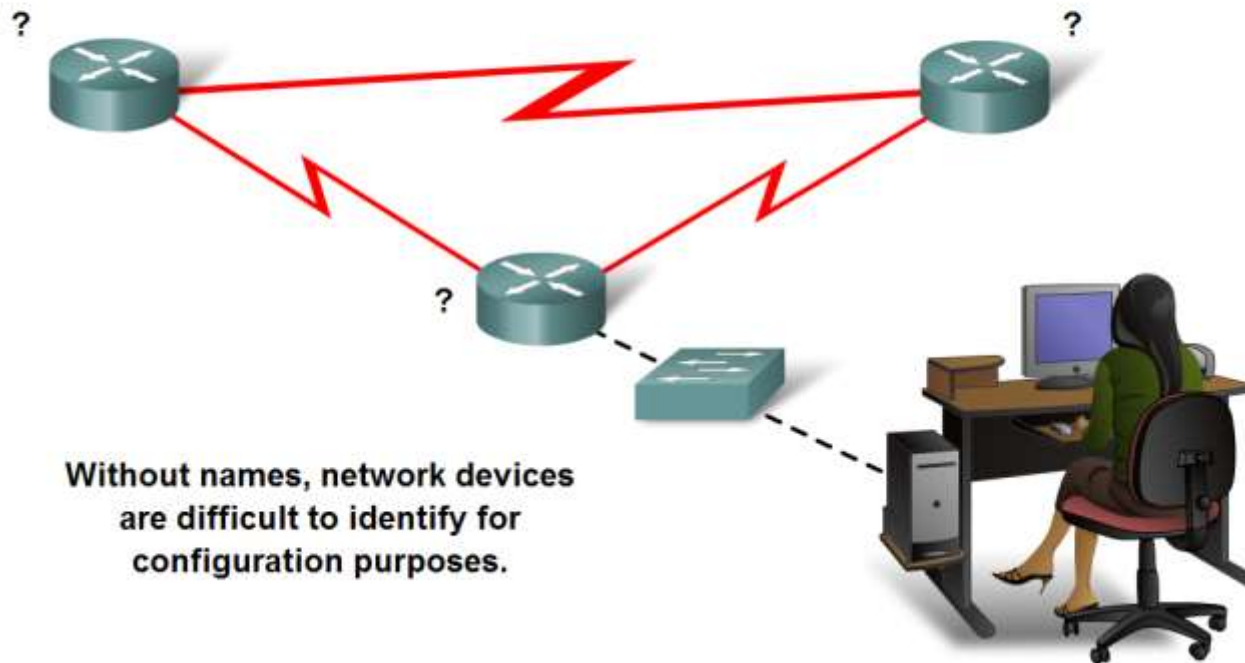
Accessing the Cisco IOS on a Device



# Use Cisco CLI Commands to Perform Basic Router & Switch Configuration and Verification

- Explain the reasons for naming devices.

## Basic Configuration Using Cisco IOS

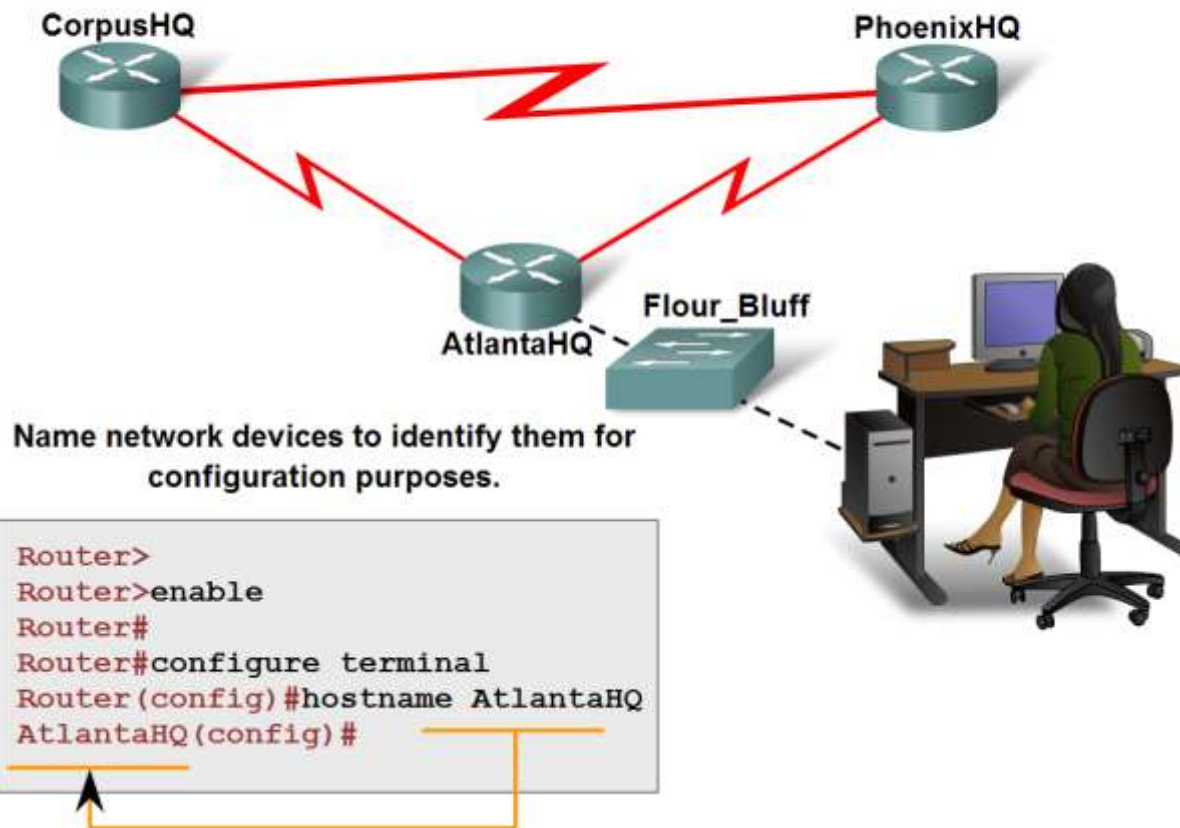




# Use Cisco CLI Commands to Perform Basic Router & Switch Configuration and Verification

- Describe two common approaches to establishing naming conventions

Configuring Device Names





# Use Cisco CLI Commands to Perform Basic Router & Switch Configuration and Verification

- Based on a diagram, configure host names using the CLI



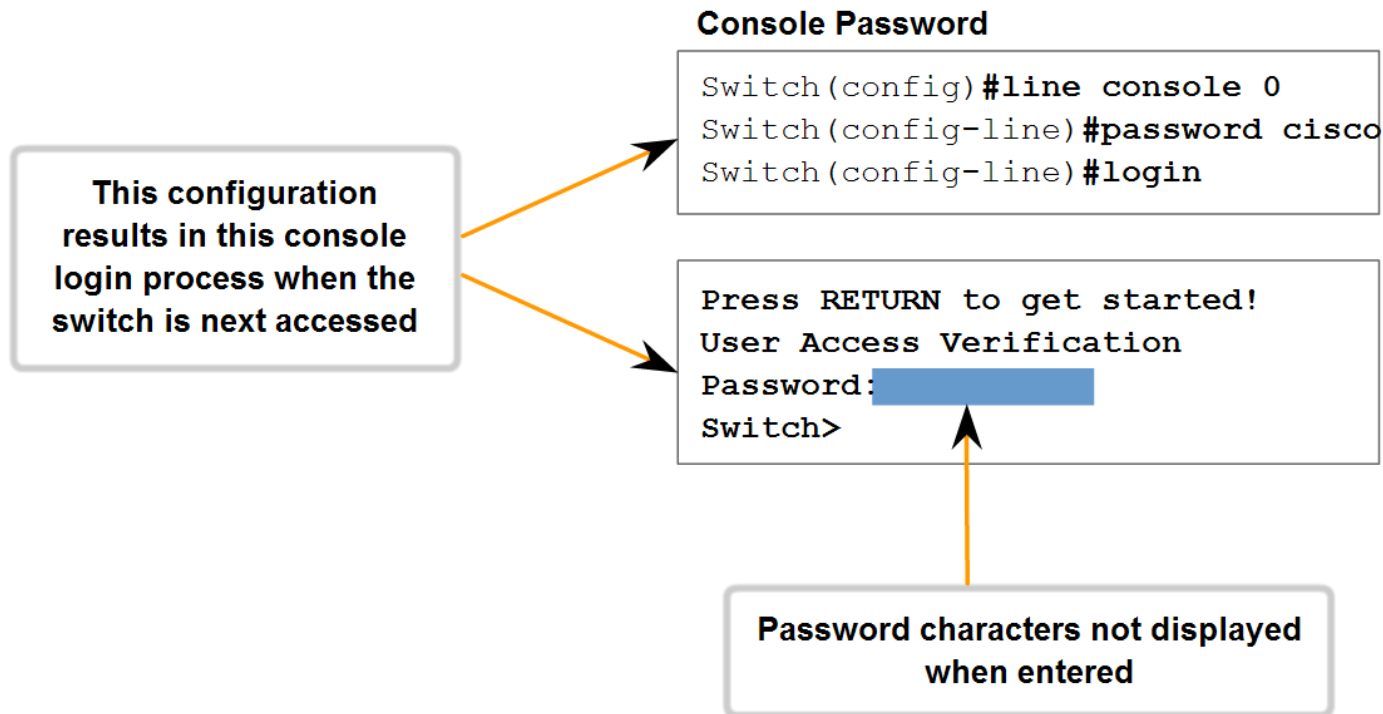
**Packet Tracer Exploration:**  
Configuring Hostnames on Routers and Switches



# Use Cisco CLI Commands to Perform Basic Router & Switch Configuration and Verification

- Describe the role of passwords in limiting access to device configurations

## Limiting Device Access - Configuring Console Passwords



# Use Cisco CLI Commands to Perform Basic Router & Switch Configuration and Verification

- Describe several ways in which access to a device configuration can be limited

## Limiting Device Access Configuring Telnet and Password Encryption

### 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
```

Strongly encrypted password

# Use Cisco CLI Commands to Perform Basic Router & Switch Configuration and Verification

- Use the CLI to set passwords and add banners to a device

## Limiting Device Access – Login Banner

```
LAB_A(config)#banner motd # This is a secure system. Authorized Access ONLY!!! #
```

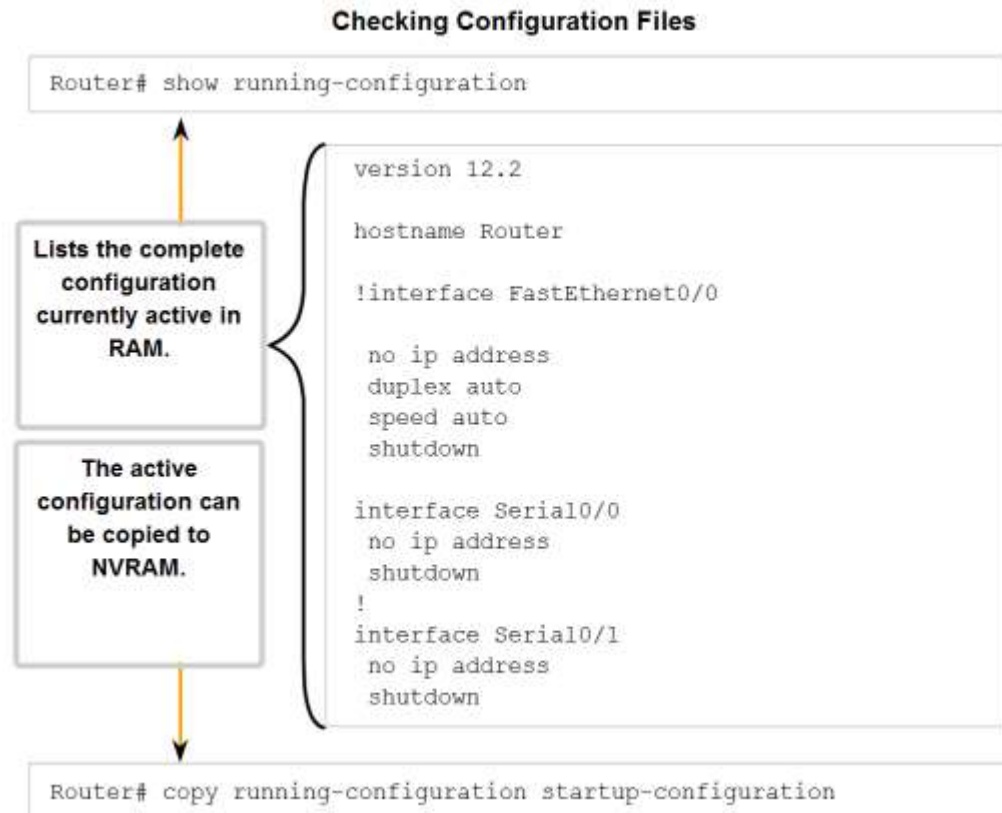
Delimiting characters not included in message

This configuration results in this message of the day banner

```
Router
LAB_A con0 is now available
Press RETURN to get started.
This is a secure system. Authorized Access ONLY!!!
User Access Verification
password:
LAB_A>enable
Password:
LAB_A#
```

# Use Cisco CLI Commands to Perform Basic Router & Switch Configuration and Verification

- Trace the steps used to examine the startup config, make changes to config, and replace the startup config with the running config





# Use Cisco CLI Commands to Perform Basic Router & Switch Configuration and Verification

- Use basic IOS config commands to manage a device.

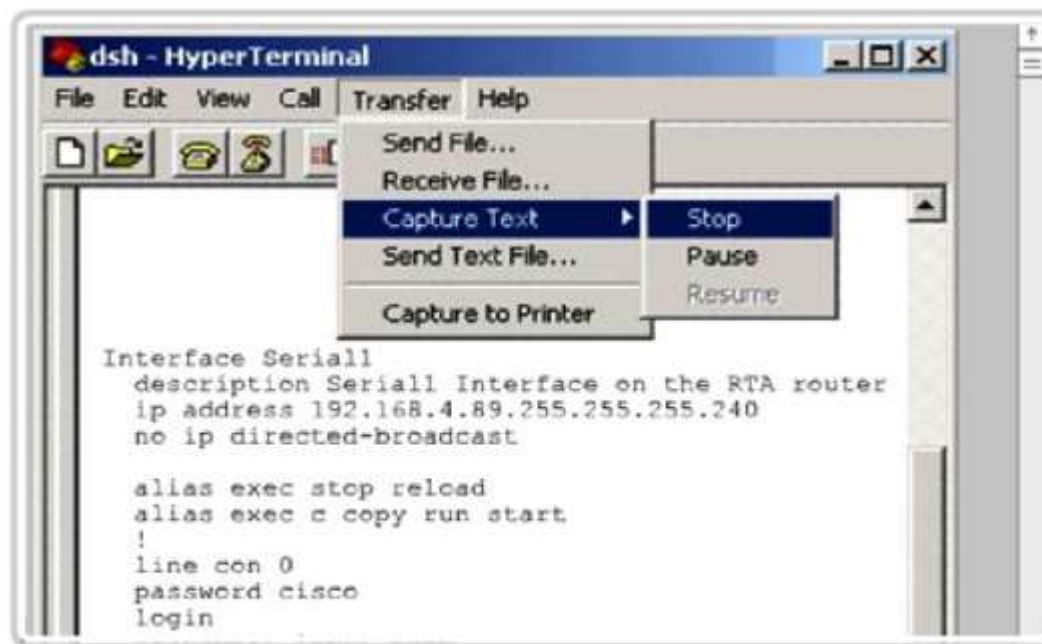
```
Router#copy running-config tftp
Remote host []? 131.108.2.155
Name of configuration file to write[tokyo-config]?tokyo.2
Write file tokyo.2 to 131.108.2.155? [confirm] y
Writing tokyo.2 !!!!!!! [OK]
```



# Use Cisco CLI Commands to Perform Basic Router & Switch Configuration and Verification

- Use a text file to backup and restore config settings

Saving to a Text File in Hyperterminal



## In the terminal session:

1. Start the text capture process
2. Issue a `show running-config` command
3. Stop the capture process
4. Save the text file

# Use Cisco CLI Commands to Perform Basic Router & Switch Configuration and Verification

- Identify the role of a router in a network.

## Configuring Router 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:

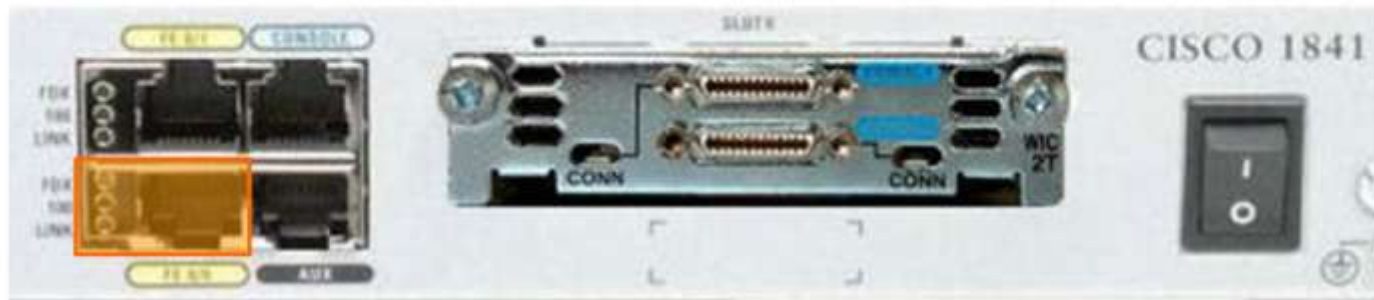
```
Router(config-if)#exit
```

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

# Use Cisco CLI Commands to Perform Basic Router & Switch Configuration and Verification

- Describe the purpose of having multiple interfaces in one router

## Configuring Router Ethernet Interfaces



```
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)#
```

Configure Router Ethernet Interfaces

# Use Cisco CLI Commands to Perform Basic Router & Switch Configuration and Verification

- Explain the purpose of assigning interface descriptions to a router

Router Interfaces Descriptions



```
Router(config)#interface fa0/0
Router(config-if)#description Building B Sales LAN
Router(config-if)#exit
```

Description is all text after this space

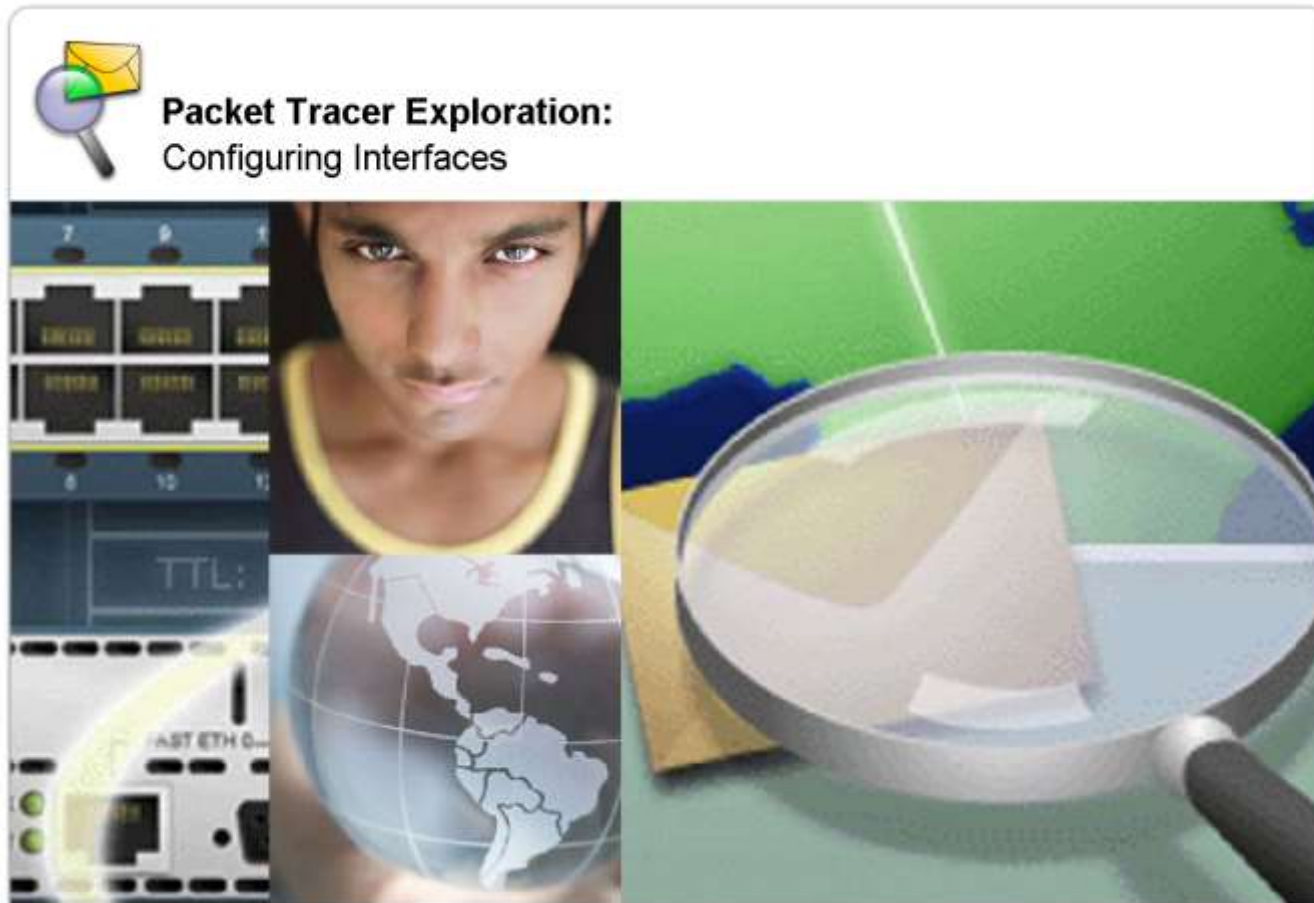
Interface description used for internal network documentation

```
Router(config)#interface s0/0/0
Router(config-if)#description To Perth CKT-PT27834365-01
Router(config-if)#exit
```



# Use Cisco CLI Commands to Perform Basic Router & Switch Configuration and Verification

- Assign a router interface, assign a meaningful interface description, and enable the interface



# Select, Apply, and Verify Appropriate Addressing Parameters to a Host

- Given a type of host and a master addressing scheme, trace the steps for assigning host parameters to a host

## Testing Local TCP/IP Stack

Pinging the local host confirms that TCP/IP is installed and working on the local network adapter.

C:>ping 127.0.0.1

Pinging 127.0.0.1 causes a device to ping itself.






# Select, Apply, and Verify Appropriate Addressing Parameters to a Host

- Trace the steps for using ipconfig/ifconfig to verify host parameter assignments and for using ping to test assignments

Device Output



Interface Testing

```

Router1#show ip interface brief
Interface      IP-Address      OK?  Method  Status        Protocol
FastEthernet0/0  192.168.254.254 YES   NVRAM    up             up
FastEthernet0/1/0 unassigned      YES   unset    down           down
Serial0/0/0      172.16.0.254    YES   NVRAM    up             up
Serial0/0/1      unassigned      YES   unset    administratively down down

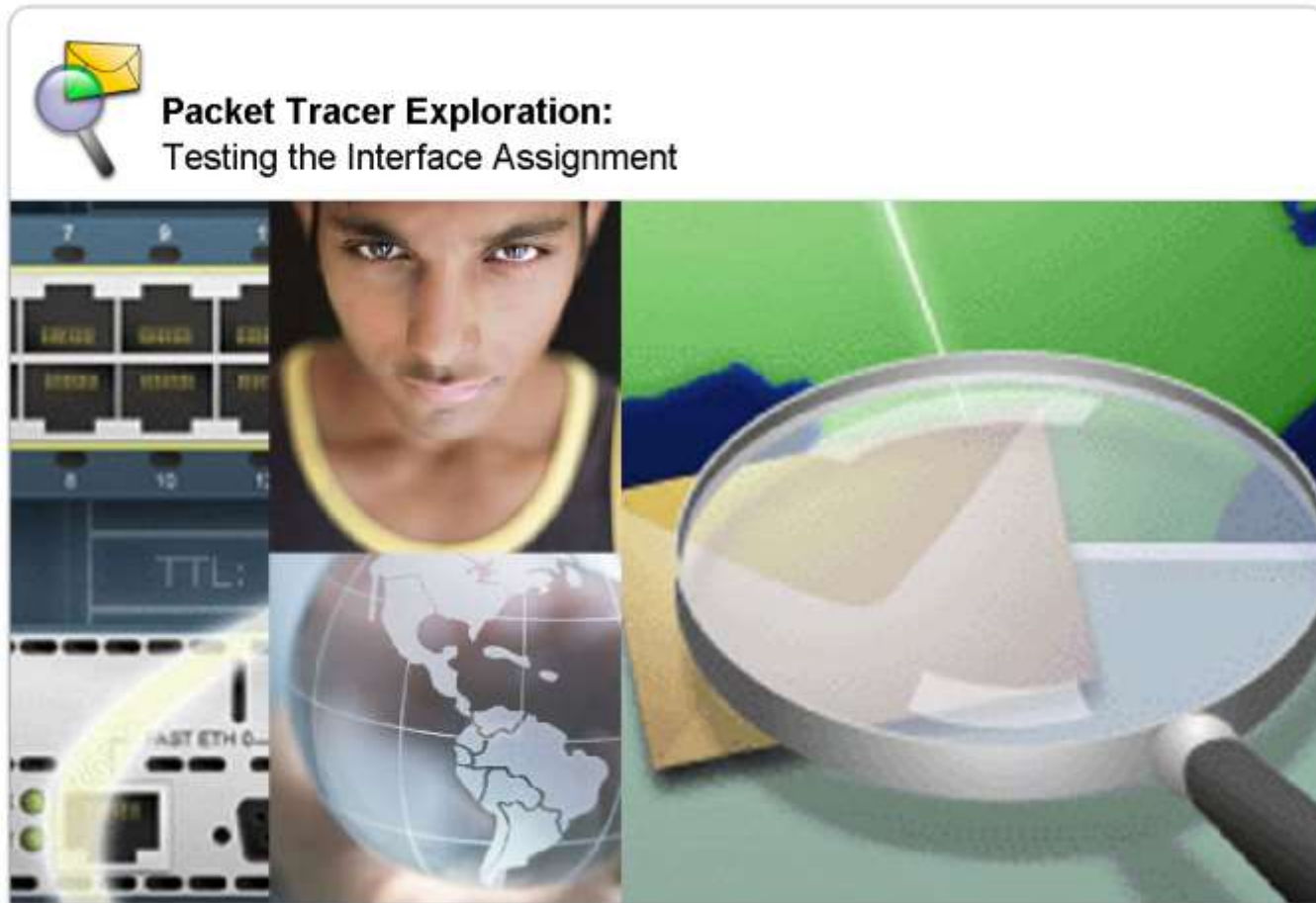
Router1#ping 192.168.254.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.254.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

Router1#traceroute 192.168.0.1
Type escape sequence to abort.
Tracing the route to 192.168.0.1
 0 172.16.0.253 8 msec 4 msec 8 msec
 1 10.0.0.254 16 msec 16 msec 8 msec
 2 192.168.0.1 16 msec * 20 msec

```

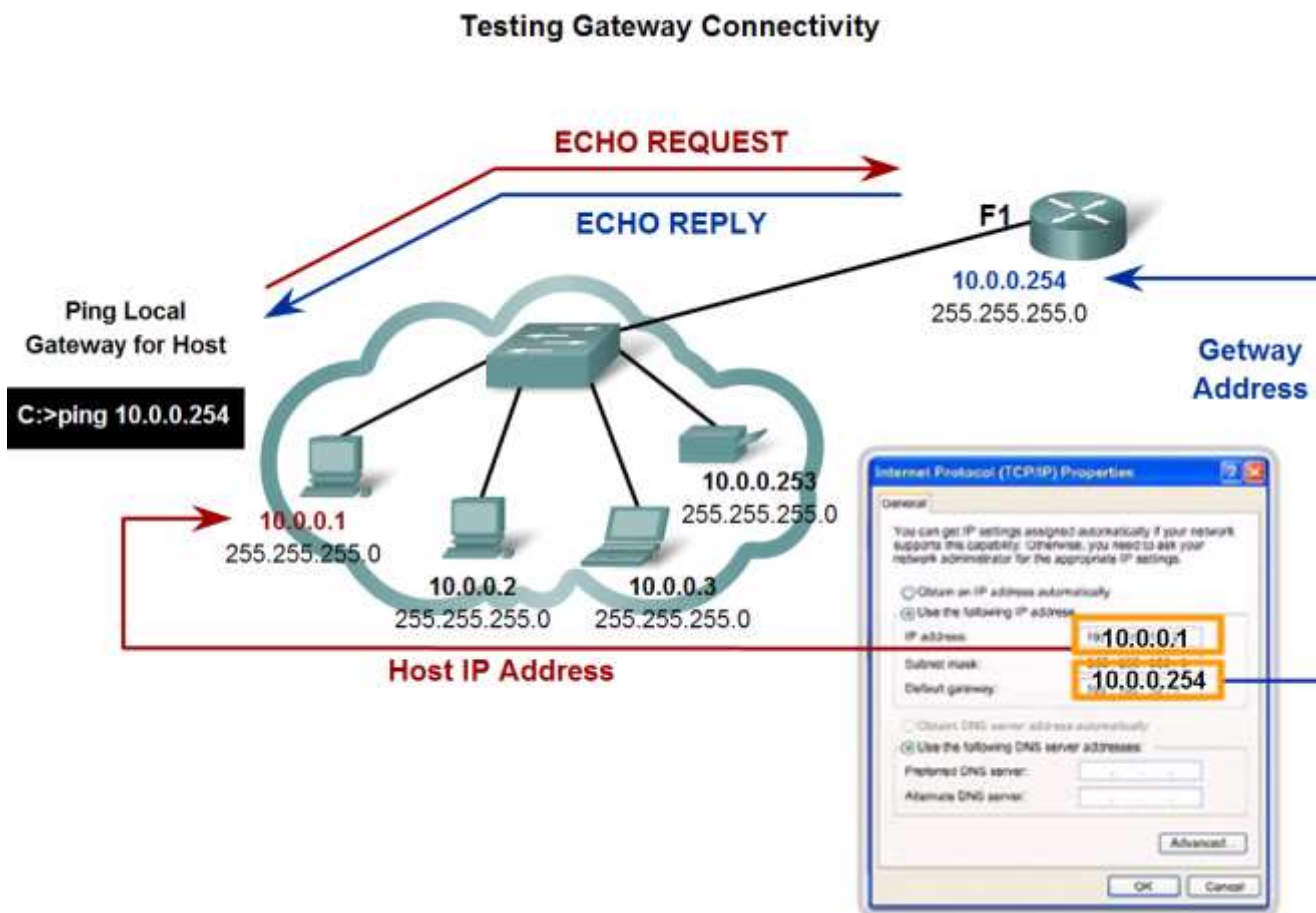
# Select, Apply, and Verify Appropriate Addressing Parameters to a Host

- Identify two ways parameters can be assigned to hosts



# Use Common Utilities to Verify Network Connectivity Between Hosts

- Use the ping command in the CLI to determine if the IP protocol is operational on a local host

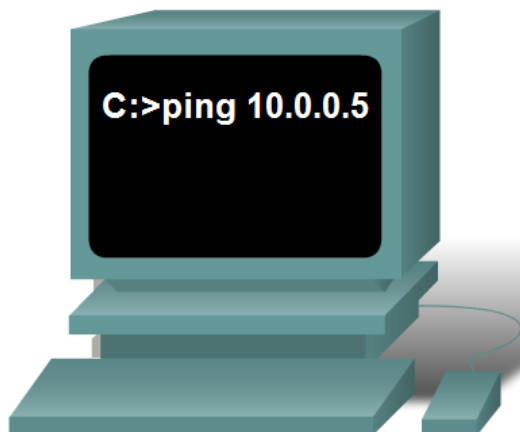


# Use Common Utilities to Verify Network Connectivity Between Hosts

- Use the ping command to determine if the IP protocol is properly bound to an NIC

## Testing the Local NIC Assignment

```
IP Address. . . . . : 10.0.0.5
Subnet Mask . . . . . :
255.255.255.0
```



**Verify the host NIC address is bound and ready for transmitting signals across the media by pinging its own IP address**

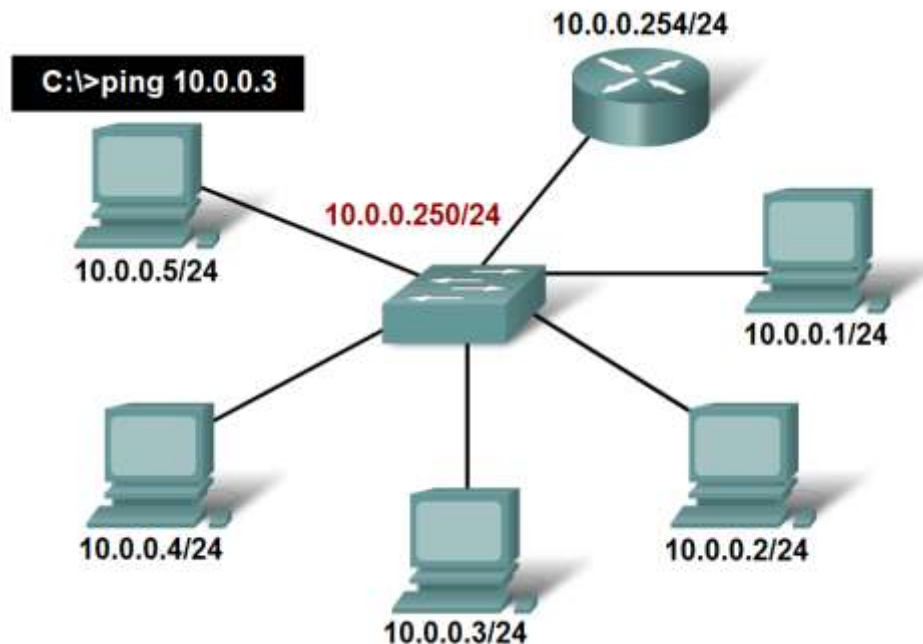


# Use Common Utilities to Verify Network Connectivity Between Hosts

- Use the ping command to determine if a host can actively communicate across the local network

## Testing Local Network

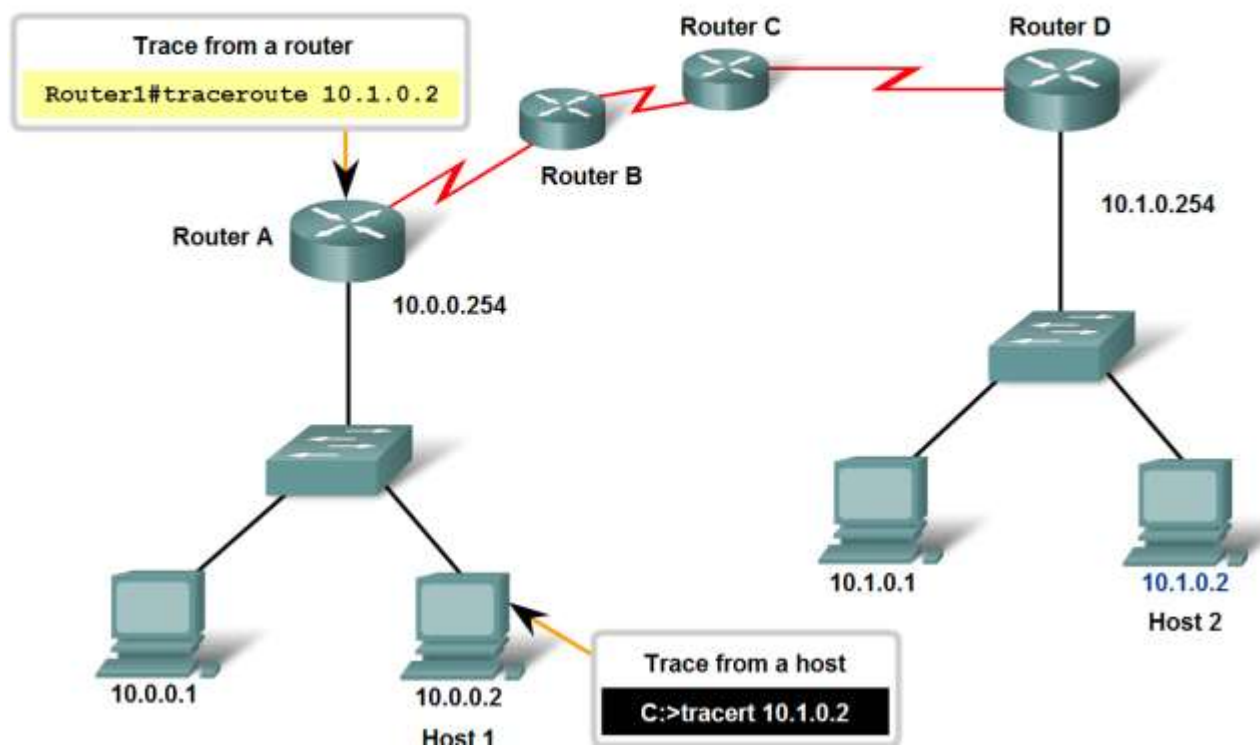
Successfully pinging the other host's IPv4 addresses will verify that not only the local host is configured properly but the other hosts are configured correctly as well.



# Use Common Utilities to Verify Network Connectivity Between Hosts

- Use the ping command to verify that the local host can communicate across the internetwork to a given remote host.

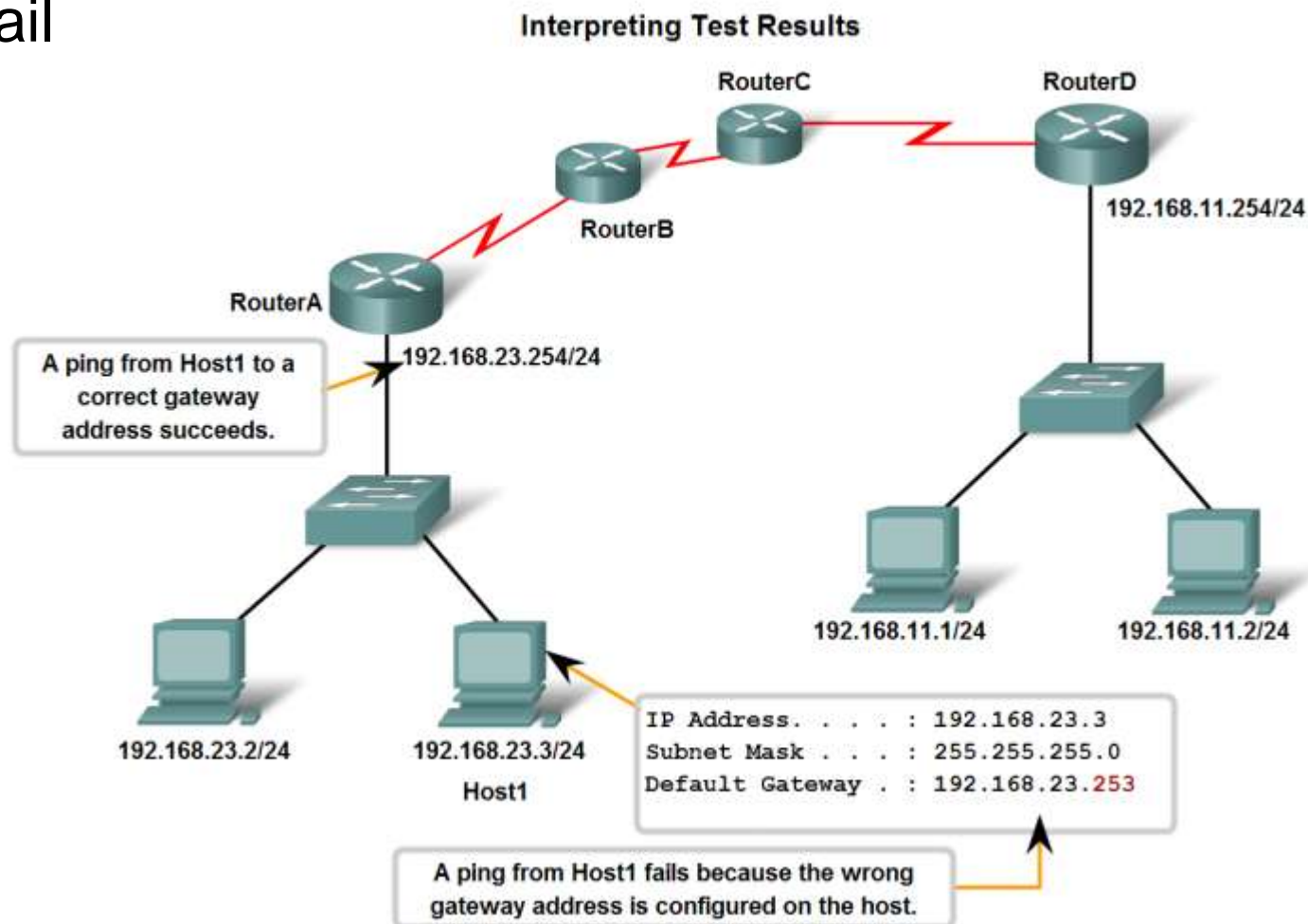
Testing the Path to a Remote Host





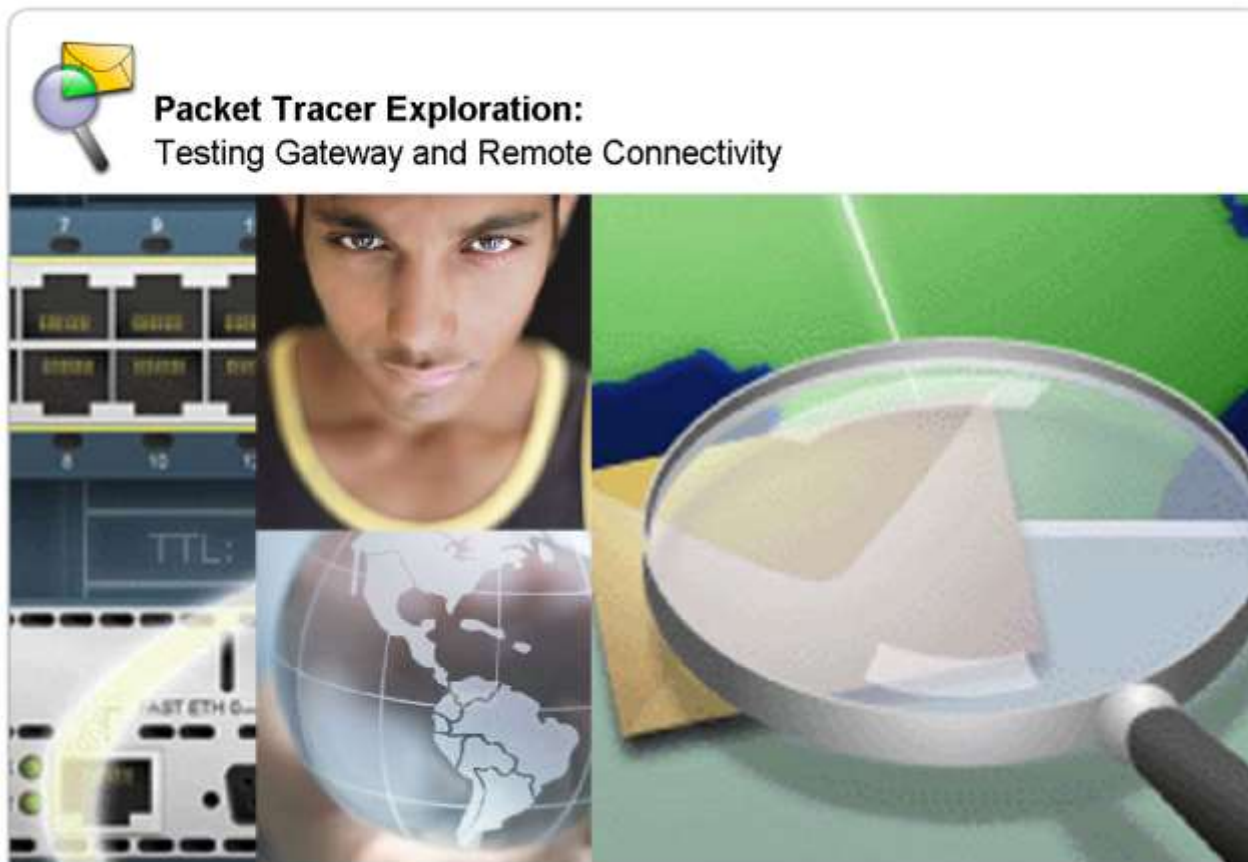
# Use Common Utilities to Verify Network Connectivity Between Hosts

- Identify several conditions that might cause the test to fail



# Use Common Utilities to Verify Network Connectivity Between Hosts

- Use trace commands to identify network connectivity problem



# Use Common Utilities to Establish a Relative Performance Baseline for the Network

- Use the output of the ping command, saved into logs, and repeated over time, to establish relative network performance

## Baseline with ping

FEB 2, 2007 08:14:43

```
C:\host1>ping 10.66.254.159

Pinging 10.66.254.159 with 32 bytes of data:

Reply from 10.66.254.159: bytes=32 time<1ms TTL=128
Reply from 10.66.254.159: bytes=32 time<1ms TTL=128
Reply from 10.66.254.159: bytes=32 time<1ms TTL=128
Reply from 10.66.254.159: bytes=32 time<1ms TTL=128
```

MAR 17, 2007 14:41:06

```
C:\host1>ping 10.66.254.159

Pinging 10.66.254.159 with 32 bytes of data:

Reply from 10.66.254.159: bytes=32 time<6ms TTL=128
Reply from 10.66.254.159: bytes=32 time<6ms TTL=128
Reply from 10.66.254.159: bytes=32 time<6ms TTL=128
Reply from 10.66.254.159: bytes=32 time<6ms TTL=128
```

# Use Common Utilities to Establish a Relative Performance Baseline for the Network

- Use the output of the traceroute command, saved into logs, and repeated over time, to establish relative network performance

## Capturing Trace Route

```
C:\>tracert www.cisco.com

Tracing route to www.cisco.com [198.133.219.25]
over a maximum of 30 hops:

  1    1 ms    <1 ms    <1 ms    192.168.0.1
  2    20 ms    20 ms    20 ms    nexthop.wa.ii.net [203.59.14.16]
  3    20 ms    19 ms    20 ms    gi2-4.per-qvl-bdrl.ii.net [203.215.4.32]
  4    79 ms    78 ms    78 ms    gi0-14-0-0.syd-ult-core1.ii.net [203.215.20.2]
  5    79 ms    81 ms    79 ms    202.139.19.33
  6   227 ms   228 ms   227 ms    203.208.148.17
  7   227 ms   227 ms   227 ms    203.208.149.34
  8   225 ms   225 ms   226 ms    208.30.205.145
  9   236 ms   249 ms   233 ms    sl-bb23-ana-8-0-0.sprintlink.net [144.232.9.23]

 10   241 ms   244 ms   240 ms    sl-bb25-sj-9-0.sprintlink.net [144.232.20.159]
 11   238 ms   238 ms   239 ms    sl-gw8-sj-10-0.sprintlink.net [144.232.3.114]
 12   238 ms   239 ms   240 ms    144.228.44.14
 13   240 ms   242 ms   248 ms    sjce-dmzbb-gw1.cisco.com [128.107.239.89]
```

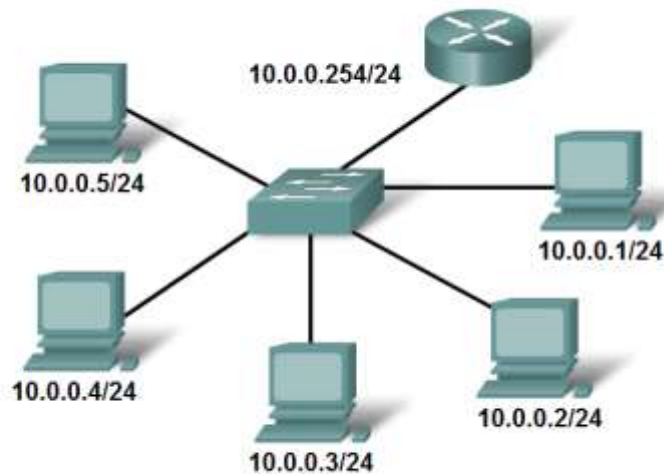
## Sample trace output



# Use Common Utilities to Establish a Relative Performance Baseline for the Network

- Trace the steps for verifying the physical addresses of the hosts

Learning About the Nodes on the Network



```

C:\>arp -a
Internet Address      Physical Address      Type
10.0.0.2              00-08-a3-b6-ce-04    dynamic
10.0.0.3              00-0d-56-09-fb-d1    dynamic
10.0.0.4              00-12-3f-d4-6d-1b    dynamic
10.0.0.254           00-10-7b-e7-fa-ef    dynamic
  
```

IP- MAC Address Pair



# Summary

## In this chapter, you learned 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.

