



Cisco Networking Academy

CCNA R&S: Introduction to Networks

Chapter 2:

Configuring a Network Operating System

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Upon completion of this chapter you will be able to:

- Explain the purpose of Cisco IOS.
- Explain how to access and navigate Cisco IOS to configure network devices.
- Describe the command structure of Cisco IOS software.
- Configure hostnames on a Cisco IOS device using the CLI.
- Use Cisco IOS commands to limit access to device configurations.
- Use Cisco IOS commands to save the running configuration.
- Explain how devices communicate across network media.
- Configure a host device with an IP address.
- Verify connectivity between two end devices.

- Home networks typically interconnect a wide variety of end devices.
- All of these end devices are usually connected to a home router. Home routers are actually four devices in one:

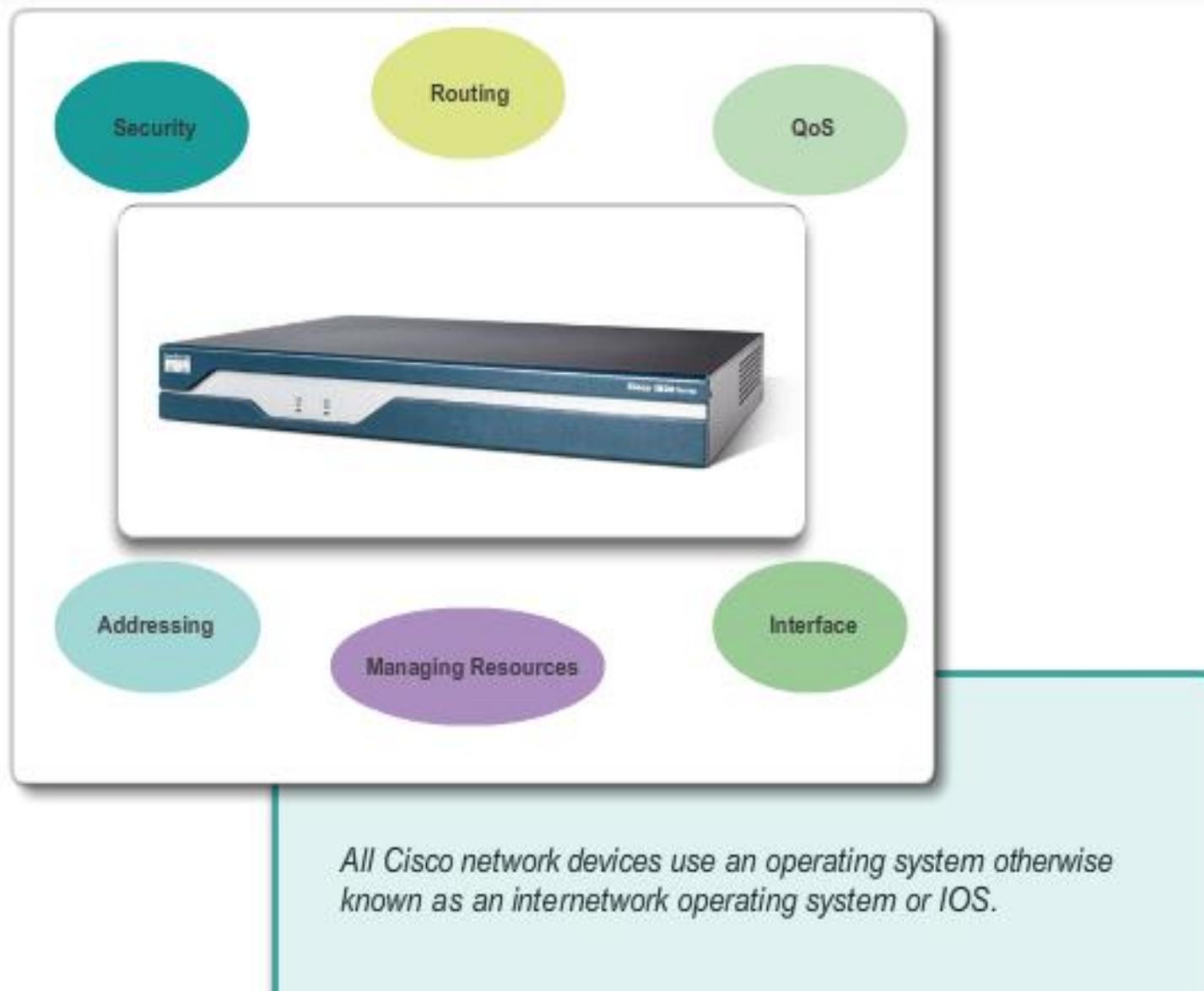
Router - Forwards data packets to and receives data packets from the Internet

Switch - Connects end devices using network cables

Wireless access point - Consists of a radio transmitter capable of connecting end devices wirelessly

Firewall appliance - Secures outgoing traffic and restricts incoming traffic

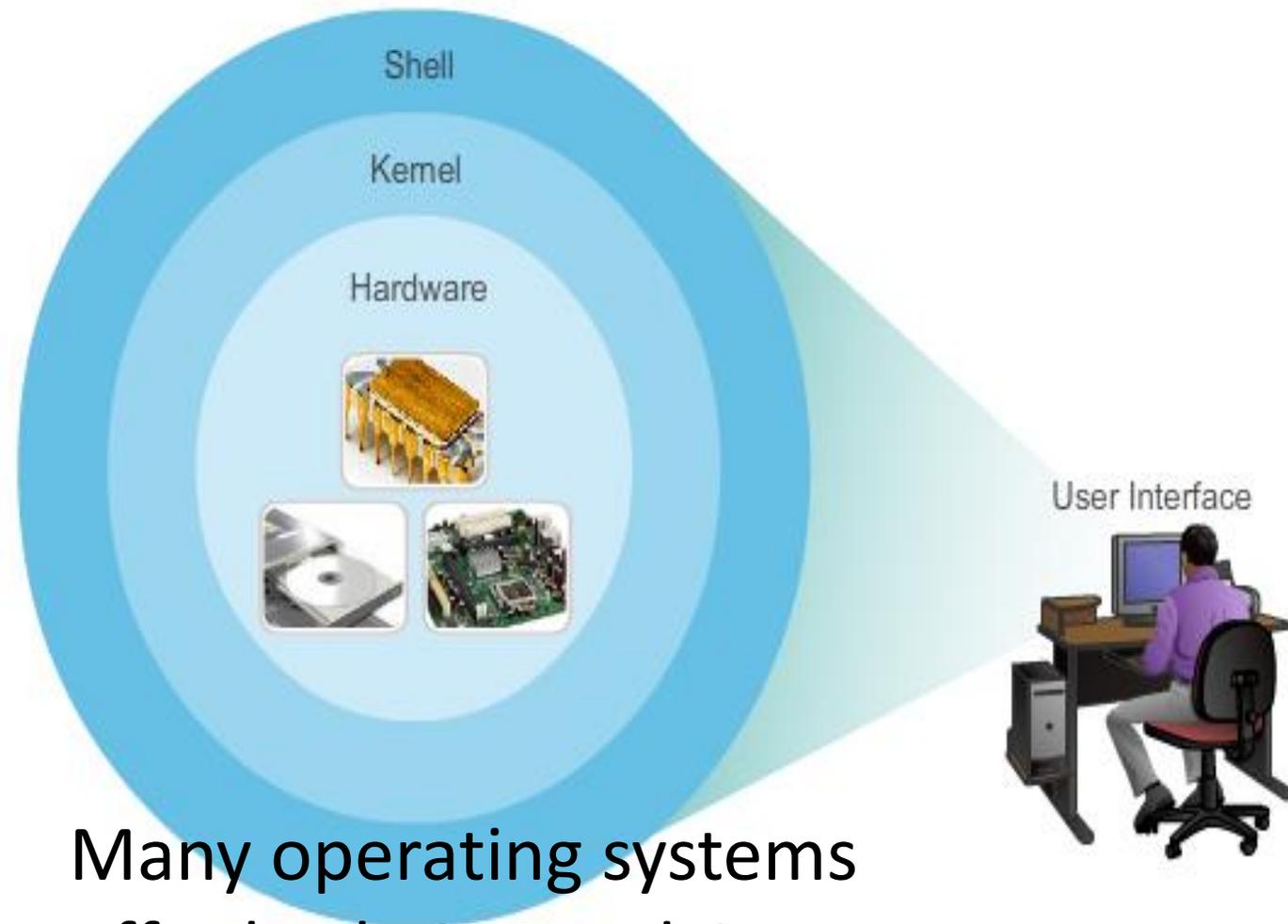
2.0.1.2 Class Activity - It Is Just an Operating System



All Cisco network devices use an operating system otherwise known as an internetwork operating system or IOS.

2.1.1.1 Operating Systems

Operating System



Many operating systems offer both GUI and CLI.

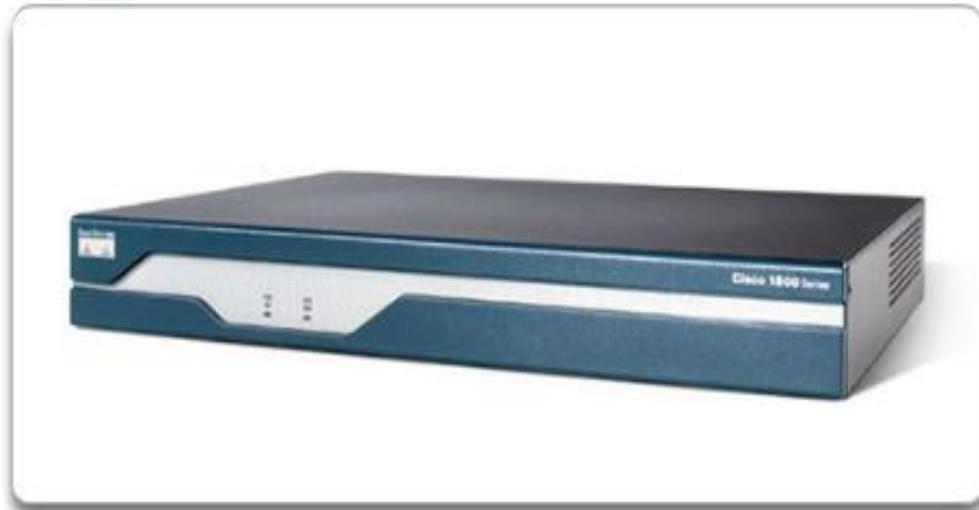
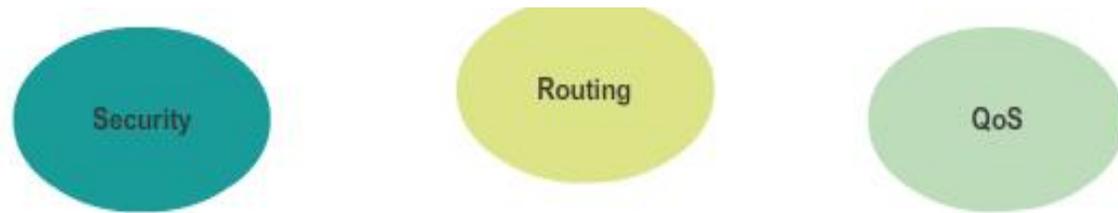
When using the CLI, the user interacts directly with the system in a text-based environment by entering commands on the keyboard at a command prompt. The system executes the command, often providing textual output.

- The "behind the scenes" functions for switches and routers are very similar.
- The IOS on a switch or router provides the network technician with an interface.
- The technician can enter commands to configure, or program, the device to perform various networking functions.
- The IOS operational details vary on internetworking devices, depending on the purpose of the device and the features supported.



- The IOS file itself is several megabytes in size and is stored in a semi-permanent memory area called flash.
- Flash memory provides non-volatile storage
- In many Cisco devices, the IOS is copied from flash into random access memory (RAM) when the device is powered on

2.1.1.4 IOS Functions



Internetwork Operating System for Cisco networking devices



- IP addressing
- Optimize use of media
- Routing
- Enabling quality of service (QoS)
- Supporting network

CONSOL PORT



There are several ways to access the CLI environment.

Console

Telnet or SSH

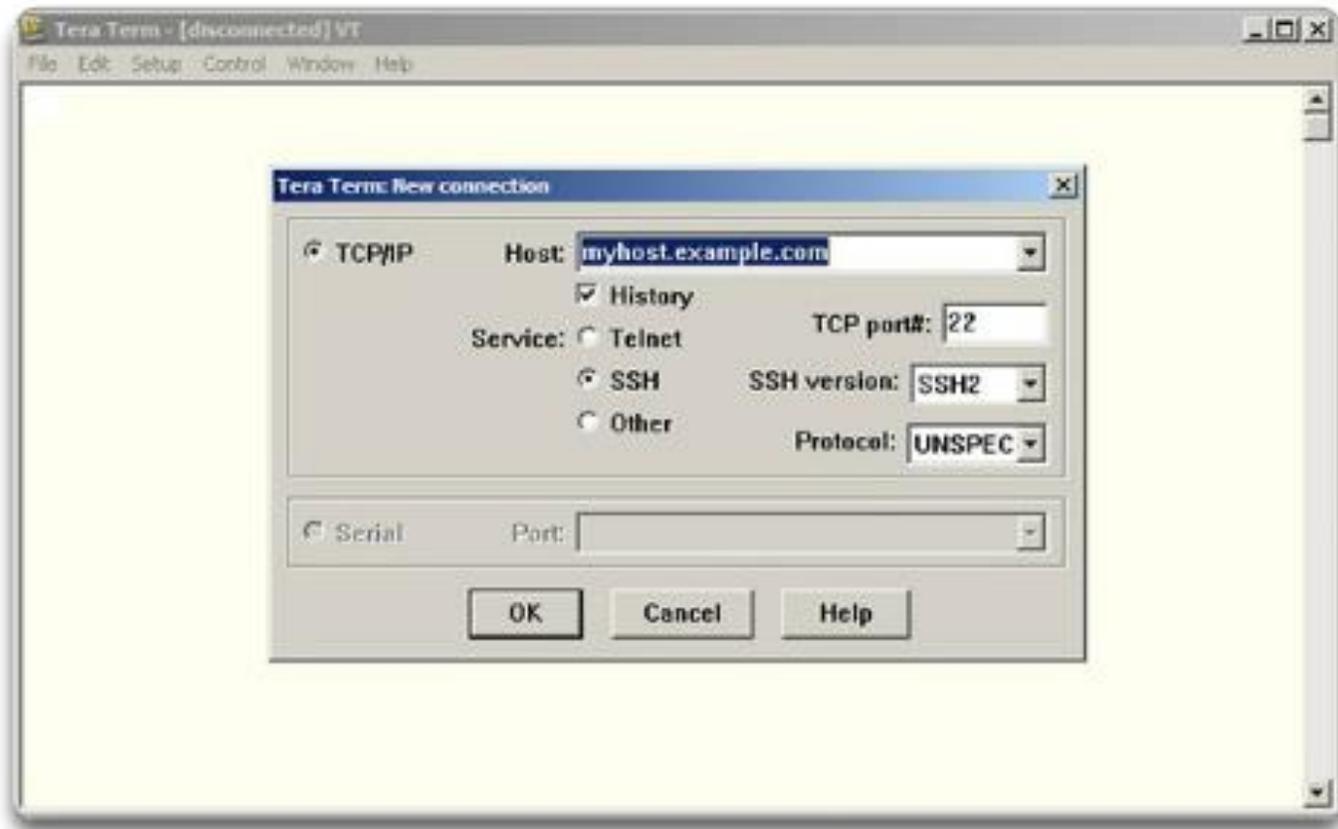
AUX port

AUX PORT



An older way to establish a CLI session remotely is via a telephone dialup connection using a modem connected to the auxiliary (AUX) port of a router

2.1.2.3 Terminal Emulation Programs



Terminal emulation programs

- PuTTY
- Tera Term
- SecureCRT
- HyperTerminal
- OS X Terminal

2.1.2.4 Activity – Accessing Devices

	Console	Telnet/SSH	AUX
1. You are in the equipment room with a new switch that needs to be configured.	✓		
2. The device you are configuring cannot be accessed by cable, because you are not in the building. You use a telephone to dial into it.			✓
3. Your manager gives you a special cable and tells you to use it to configure the switch.	✓		
4. You access the IOS by using another intermediary device over a network connection.		✓	
5. You are on vacation and need to check on one of your routers. The only access you have is your hotel analog phone.			✓
6. You do not need remote access services to the networking device to configure it because the device is physically accessible to you.	✓		
7. You call your manager to tell him you cannot access your router in another city over the Internet. He provides you with the information to access the switch through a telephone connection.			✓
8. The password for a device was changed. No one knows what the new password is and you need to reset a new password.	✓		

2.1.3.1 Cisco IOS Modes of Operation

IOS Mode Hierarchical Structure

User EXEC Command - Router>

```
ping  
show (limited)  
enable  
etcetera
```

Privileged EXEC Commands - Router#

```
all User EXEC commands  
debug commands  
reload  
configure  
etcetera
```

Global Configuration Commands - Router(config)#

```
hostname  
enable secret  
ip route
```

```
interface ethernet  
    serial  
    dsl  
    etcetera
```

```
router rip  
    ospf  
    eigrp  
    etcetera
```

```
line vty  
    console  
    etcetera
```

Interface Commands - Router(config-if)#

```
ip address  
ipv6 address  
encapsulation  
shutdown/no shutdown  
etcetera
```

Routing Engine Commands - Router(config-router)#

```
network  
version  
auto summary  
etcetera
```

Line Commands - Router(config-line)#

```
password  
login
```

2.1.3.2 Primary Modes

User EXEC Mode

Limited examination of router.
Remote access.

```
Switch>  
Router>
```

The **User EXEC** mode allows only a limited number of basic monitoring commands and is often referred to as view-only mode.

The **Privileged EXEC** mode, by default, allows all monitoring commands, as well as execution of configuration and management commands.

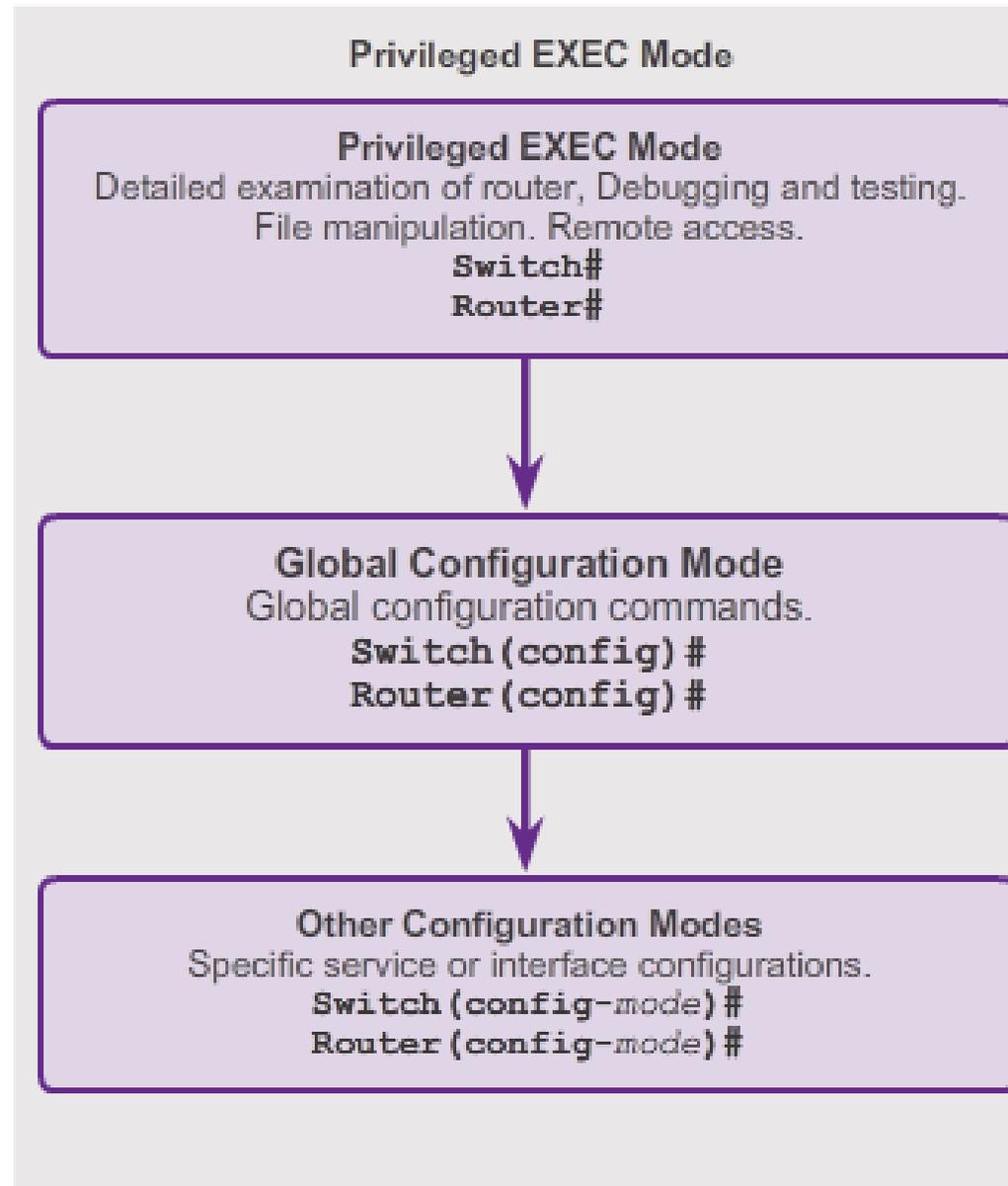
Privileged EXEC Mode

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

```
Switch#  
Router#
```

2.1.3.3 Global Configuration Mode and Submodes

Within Privileged EXEC mode, network administrators can access the global configuration mode and all other sub-configuration modes.



2.1.3.3 Global Configuration Mode and Submodes

Global Configuration Mode and Submodes

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
```

2.1.3.4 Navigating between IOS Modes

```
Router con0 is now available.
```

```
Press RETURN to get started.
```

```
User Access Verification
```

```
Password:
```

```
Router> ← User EXEC Mode Prompt
```

```
Router>enable
```

```
Password:
```

```
Router# ← Privileged EXEC Mode Prompt
```

```
Router#disable
```

```
Router> ← User EXEC Mode Prompt
```

```
Router>exit
```

```
Switch con0 is now available.
```

```
Press RETURN to get started.
```

```
User Access Verification
```

```
Password:
```

```
Switch> ← User EXEC Mode Prompt
```

```
Switch>enable
```

```
Password:
```

```
Switch# ← Privileged EXEC Mode Prompt
```

```
Switch#disable
```

```
Switch> ← User EXEC Mode Prompt
```

```
Switch>exit
```

2.1.3.5 Navigating between IOS Modes (Cont.)

```
Switch> enable
Switch# configure terminal
Enter configuration commands, one per line.
End with CNTL/Z.
Switch(config)# interface vlan 1
Switch(config-if)# exit
Switch(config)# exit
Switch#
```

```
Switch# configure terminal
Enter configuration commands, one per line.
End with CNTL/Z.
Switch(config)# vlan 1
Switch(config-vlan)# end
Switch#
```

2.1.3.5 Navigating between IOS Modes (Cont.)

```
Switch# configure terminal
Enter configuration commands, one per line.
End with CNTL/Z.
Switch(config)# line vty 0 4
Switch(config-line)# interface fastethernet 0/1
Switch(config-if)# end
Switch#
```

- **The number 0 4 is the number of the line vty:**
- **line vty 0, line vty 1,**
- **for telnet per default, there is five lines, 0 to 4,**
- **and for the console , there is one line the number 0**

2.1.3.6 Video Demonstration - Navigating the IOS

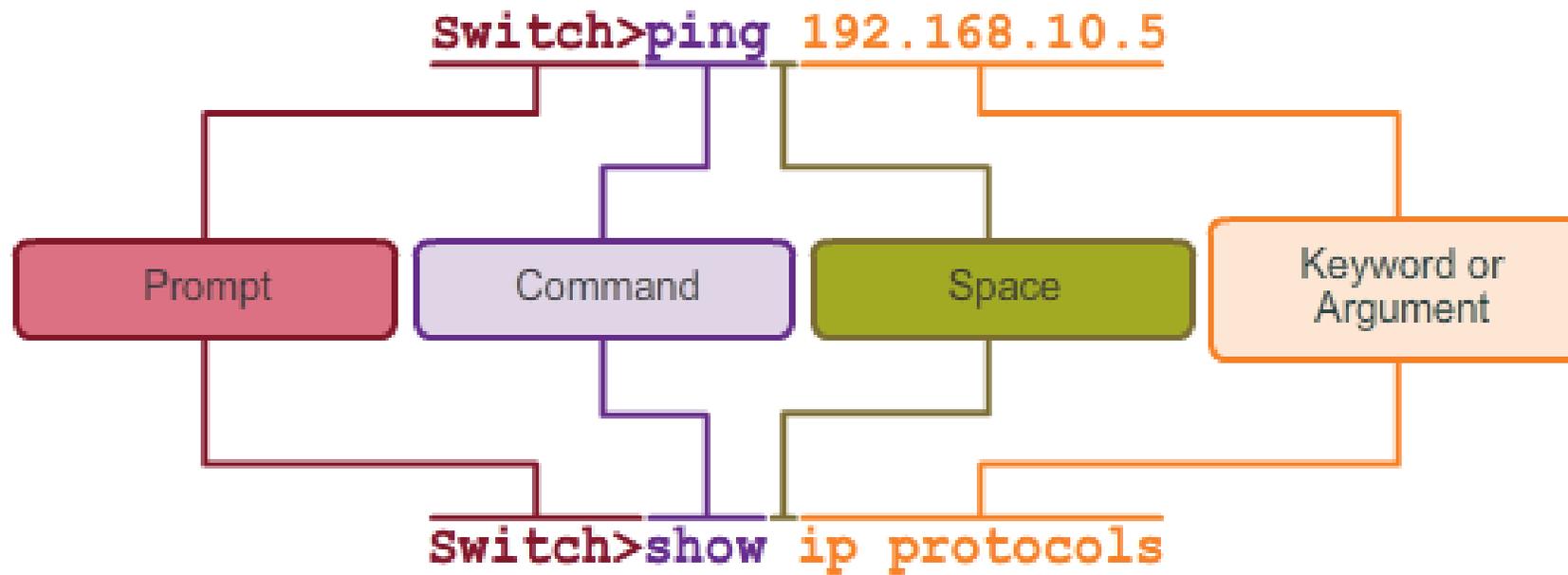
A screenshot of a video player window titled "Navigating the Cisco IOS". The video content shows a terminal window with a yellow background displaying Cisco IOS configuration commands. A large red play button is overlaid on the center of the terminal. The terminal text includes:

```
control-plane
|
|
|
line con 0
 logging synchronous
 login
line aux 0
line 2
 no activation-character
 no exec
 transport preferred none
 transport input all
 transport output pad telnet rlogin lppb-ta m ssh
 stopbits 1
line vty 0 4
 login
 transport input all
|
scheduler allocate 20000 1000
|
end

Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R1
```

This video demonstrates navigation through the different CLI command modes of both a router and a switch using Cisco IOS

Basic IOS Command Structure



IOS Command Conventions

When describing the use of commands, we generally use these conventions.

Convention	Description
boldface	Boldface text indicates commands and keywords that you enter literally as shown.
<i>italics</i>	Italic text indicates arguments for which you supply values.
[x]	Square brackets indicate an optional element (keyword or argument).
{x}	Braces indicate a required element (keyword or argument).
[x {y z}]	Braces and vertical lines within square brackets indicate a required choice within an optional element.

The screenshot shows the Cisco IOS 15.05 Command References page. The page has a blue header with the Cisco logo and navigation links: Products & Services, Support, How to Buy, Training & Events, and Partners. Below the header, the page title is "Cisco IOS 15.05 Command References". On the left, there is a navigation menu with links for HOME, SUPPORT, PRODUCT SUPPORT, CISCO IOS AND NX-OS SOFTWARE, CISCO IOS 15.05, and REFERENCE GUIDES. The "Command References" link is highlighted. The main content area features a search bar and a dropdown menu labeled "View documents by topics: Choose Topic". Below this, there are several sections of links, each representing a different category of commands: Broadband, Debug, Dial and Access, Embedded Management, Intelligent Service Gateway (ISG), and IP. Each section contains one or more links to specific command reference documents. For example, the IP section includes links for First Hop Redundancy Protocols, Addressing Services, Application Services, Multicast, Routing (RIP, EIGRP, ISIS, OSPF, Protocol Independent, and BGP), and Switching.

CISCO

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Cisco IOS 15.05

Command References

HOME
SUPPORT
PRODUCT SUPPORT
CISCO IOS AND NX-OS SOFTWARE
CISCO IOS 15.05
REFERENCE GUIDES
Command References

Some links below may open a new browser window (C^2) to display the document you selected.

View documents by topics: Choose Topic

Broadband
[Cisco IOS Broadband Access Aggregation and DSL Command Reference](#)

Debug
[Cisco IOS Debug Command Reference - Commands A to C](#)
[Cisco IOS Debug Command Reference - Commands E through H](#)
[Cisco IOS Debug Command Reference - Commands I through L](#)
[Cisco IOS Debug Command Reference - Commands M through R](#)
[Cisco IOS Debug Command Reference - Commands S through Z](#)

Dial and Access
[Cisco IOS VPDN Command Reference](#)

Embedded Management
[Cisco IOS Embedded Business Manager Command Reference](#)

Intelligent Service Gateway (ISG)
[Cisco IOS Intelligent Services Gateway Command Reference](#)

IP
[Cisco IOS First Hop Redundancy Protocols Command Reference](#)
[Cisco IOS IP Addressing Services Command Reference](#)
[Cisco IOS IP Application Services Command Reference](#)
[Cisco IOS IP Multicast Command Reference](#)
[Cisco IOS IP Routing: RIP Command Reference](#)
[Cisco IOS IP Routing: EIGRP Command Reference](#)
[Cisco IOS IP Routing: ISIS Command Reference](#)
[Cisco IOS IP Routing: OSPF Command Reference](#)
[Cisco IOS IP Routing: Protocol Independent Command Reference](#)
[Cisco IOS IP Routing: BGP Command Reference](#)
[Cisco IOS IP Switching Command Reference](#)

Related Tools
[TAC Service Request Tool](#)
[Tools & Resources](#)
[My Tech Support](#)

This module explains various ways you can receive help with the IOS Commands

Context-Sensitive Help

```
Switch#cl?  
clear clock
```

Command options - display a list of commands or keywords that start with the characters **cl**

```
Switch#clock set ?  
hh:mm:ss Current Time
```

Command explanation - the IOS displays what command arguments or variables can be next, and provides an explanation of each

```
Switch#clock set 19:50:00 ?  
<1-31> Day of the month  
MONTH Month of the year
```

Command explanation with more than one argument or variable option

```
Switch#clock set 19:50:00 25 June 2012  
Switch#
```

Command Syntax Check Help

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

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

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

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

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

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

Down Arrow - Allows the user to scroll forward through former commands

Up Arrow - Allows the user to scroll backward through former commands

Tab - Completes the remainder of a partially typed command or keyword

Ctrl-A - Moves to the beginning of the line

Ctrl-E - Moves to the end of the line

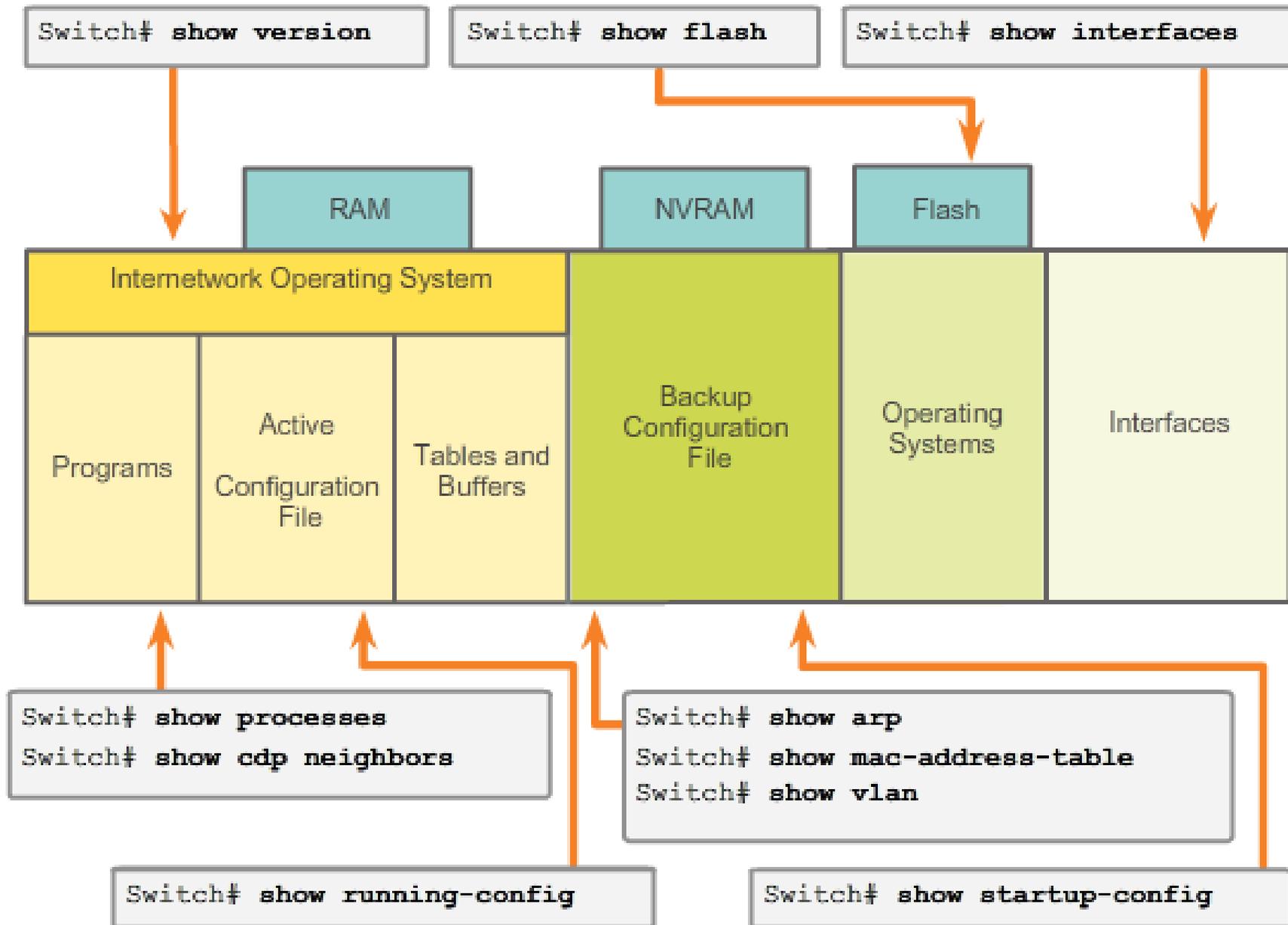
Ctrl-R - Redisplays a line

Ctrl-Z - Exits the configuration mode and returns to user EXEC

Ctrl-C - Exits the configuration mode or aborts the current command

Ctrl-Shift-6 - Allows the user to interrupt an IOS process such as ping or traceroute

2.1.4.6 IOS Examination Commands



IOS show commands provide information about the configuration and status of parts of a Cisco Switch or Router

2.1.4.7 The show version Command

```
Router# show version
Cisco IOS Software, C1900 Software (C1900-UNIVERSALK9-M), Version
15.2(4)M1, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2012 by Cisco Systems, Inc.
Compiled Thu 26-Jul-12 19:34 by prod_rel_team

ROM: System Bootstrap, Version 15.0(1r)M15, RELEASE SOFTWARE (fc1)

cisco1941 uptime is 41 minutes
System returned to ROM by power-on
System image file is ""flash0:c1900-universalk9-mz.SPA.152-
4.M1.bin""
Last reload type: Normal Reload
Last reload reason: power-on

This product contains cryptographic features and is subject to
United
States and local country laws governing import, export, transfer
and
use. Delivery of Cisco cryptographic products does not imply
third-party authority to import, export, distribute or use
encryption.
```

Switch or Router

```
Router# show version
```

2.1.4.7 The show version Command

- Software version - IOS software version (stored in flash)
- Bootstrap version - Bootstrap version (stored in Boot ROM)
- System up-time - Time since last reboot
- System restart info - Method of restart (e.g., power cycle, crash)
- Software image name - IOS filename stored in flash
- Router type and processor type - Model number and processor type
- Memory type and allocation (shared/main) - Main Processor RAM and Shared Packet I/O buffering
- Software features - Supported protocols/feature sets
- Hardware interfaces - Interfaces available on the device
- Configuration register - Sets bootup specifications, console speed setting, and related parameters



Navigating the IOS



In this activity, you will practice skills necessary for navigating the Cisco IOS, including different user access modes, various configuration modes, and common commands you use on a regular basis. You also practice accessing the context-sensitive help by configuring the clock command

2.1.4.9 Lab - Establishing a Console Session with Tera Term



Establishing a Console Session with Tera Term



In this lab, you will complete the following objectives:

- Part 1: Access a Cisco Switch through the Serial Console Port
- Part 2: Display and Configure Basic Device Settings
- Part 3: (Optional) Access a Cisco Router Using a Mini-USB Console Cable

Cisco IOS 2960 Switch

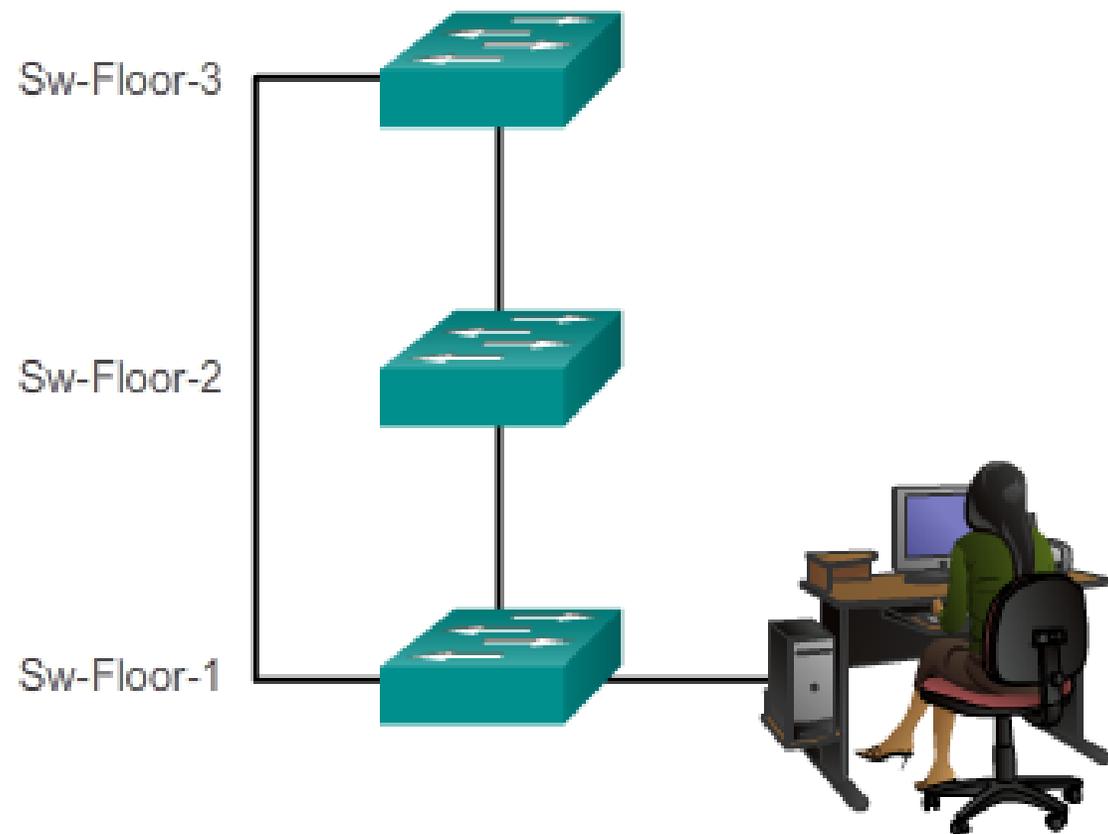


Cisco switches and Cisco routers have many similarities. They support a similar modal operating system support similar command structures, and support many of the same commands. In addition, both devices have identical initial configuration steps when implementing them in a network.

However, a Cisco IOS switch is one of the simplest devices that can be configured on a network. This is because there are no configurations that are required prior to the device functioning. At its most basic, a switch can be plugged in with no configuration, but it will still switch data between connected devices.

A switch is also one of the fundamental devices used in the creation of a small network. By connecting two PCs to a switch, those PCs will instantly have connectivity with one another

Configuring Device Names



Configure a Hostname

Configure the switch hostname to be 'Sw-Floor-1'.

```
Switch# configure terminal
```

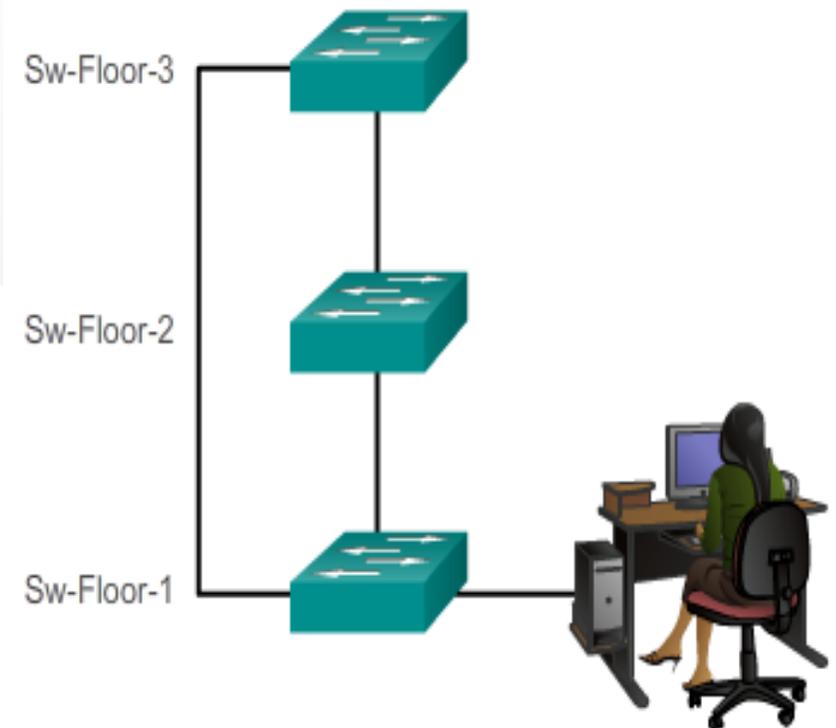
```
Enter configuration commands, one per line. End with CNTL/Z.
```

```
Switch(config)#hostname Sw-Floor-1
```

```
Sw-Floor-1(config)#
```

You successfully configured the switch hostname.

Configuring Device Names



Limiting Device Access



Limiting Device Access

- Secure privileged EXEC access
- Secure user EXEC access
- Secure Telnet access
- Encrypt all passwords

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

Limiting Device Access

```
Sw-Floor-1>enable
Sw-Floor-1#
Sw-Floor-1#conf terminal
Sw-Floor-1(config)#enable secret class
Sw-Floor-1(config)#exit
Sw-Floor-1#
Sw-Floor-1#disable
Sw-Floor-1>enable
Password:
Sw-Floor-1#
```

```
Sw-Floor-1 (config) #line console 0
Sw-Floor-1 (config-line) #password cisco
Sw-Floor-1 (config-line) #login
Sw-Floor-1 (config-line) #exit
Sw-Floor-1 (config) #
Sw-Floor-1 (config) #line vty 0 15
Sw-Floor-1 (config-line) #password cisco
Sw-Floor-1 (config-line) #login
Sw-Floor-1 (config-line) #
```

Configuring Password Encryption

```
Enter the command to encrypt the plain text passwords.
Switch(config)#service password-encryption
Exit global configuration mode and view the running configuration.
Switch(config)#exit

Switch# show running-config
!
<output omitted>
!
line con 0
 password 7 094F471A1A0A
 login
!
line vty 0 4
 password 7 03095A0F034F38435B49150A1819
 login
!
!
end

Switch#
```

Another useful command prevents passwords from showing up as plain text when viewing the configuration files. This is the `service password-encryption` command

Limiting Device Access - MOTD Banner

```
Sw1-Floor-1 (config) #banner motd # This is a secure system. Authorized Access ONLY!!! #
```

This configuration results in this message of the day banner.

Delimiting characters are not included in the message.

```
Sw1-Floor-1 con0 is now available
Press RETURN to get started.
This is a secure system. Authorized
Access ONLY!!!
User Access Verification
password:
Sw1-Floor-1>enable
Password:
Sw1-Floor-1#
```

Banners can be an important part of the legal process in the event that someone is prosecuted for breaking into a device. Some legal systems do not allow prosecution, or even the monitoring of users, unless a notification is visible

Saving and Erasing the Configuration

```
Switch#show running-config
```

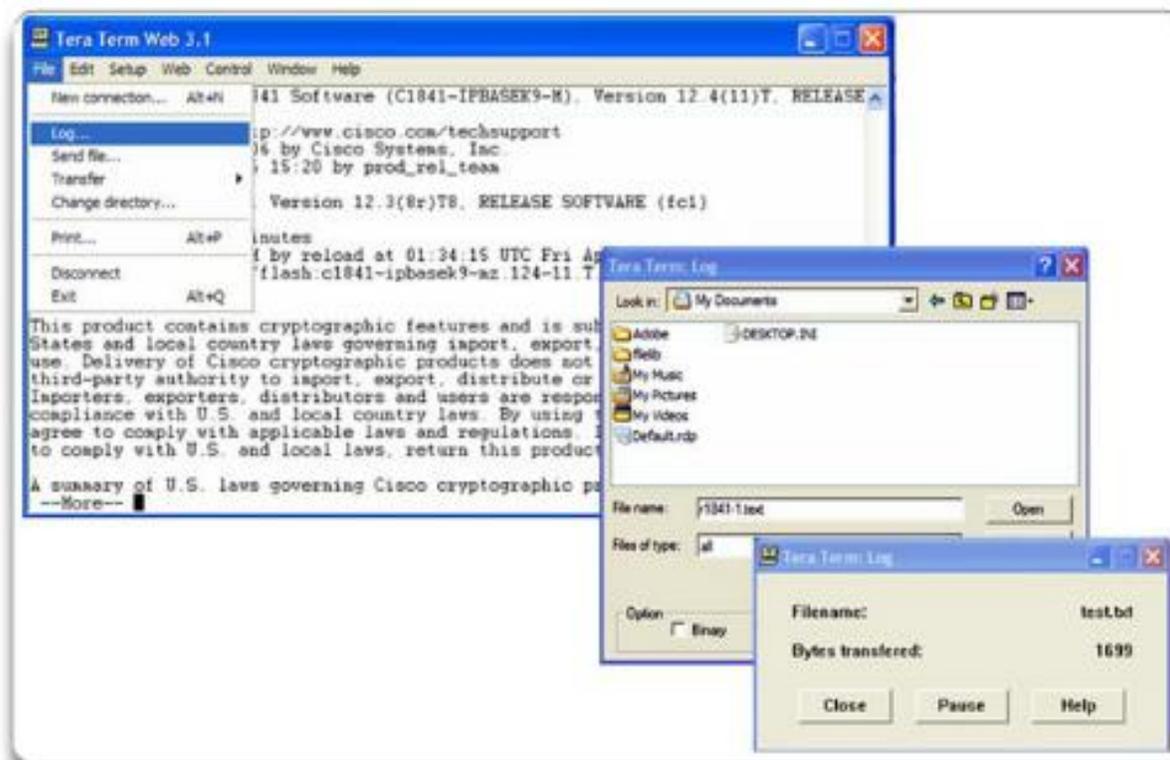
Lists the complete configuration currently active in RAM.

```
Switch#show running-config  
Building configuration...  
Current configuration : 2904 bytes  
!  
! Last configuration change at 00:02:32  
UTC Mon Mar 1 1993  
!  
version 15.0  
no service pad  
service timestamps debug datetime msec  
service timestamps log datetime msec  
no service password-encryption  
!  
<output omitted>  
!
```

The active configuration can be copied to NVRAM.

```
Switch#copy running-config startup-config
```

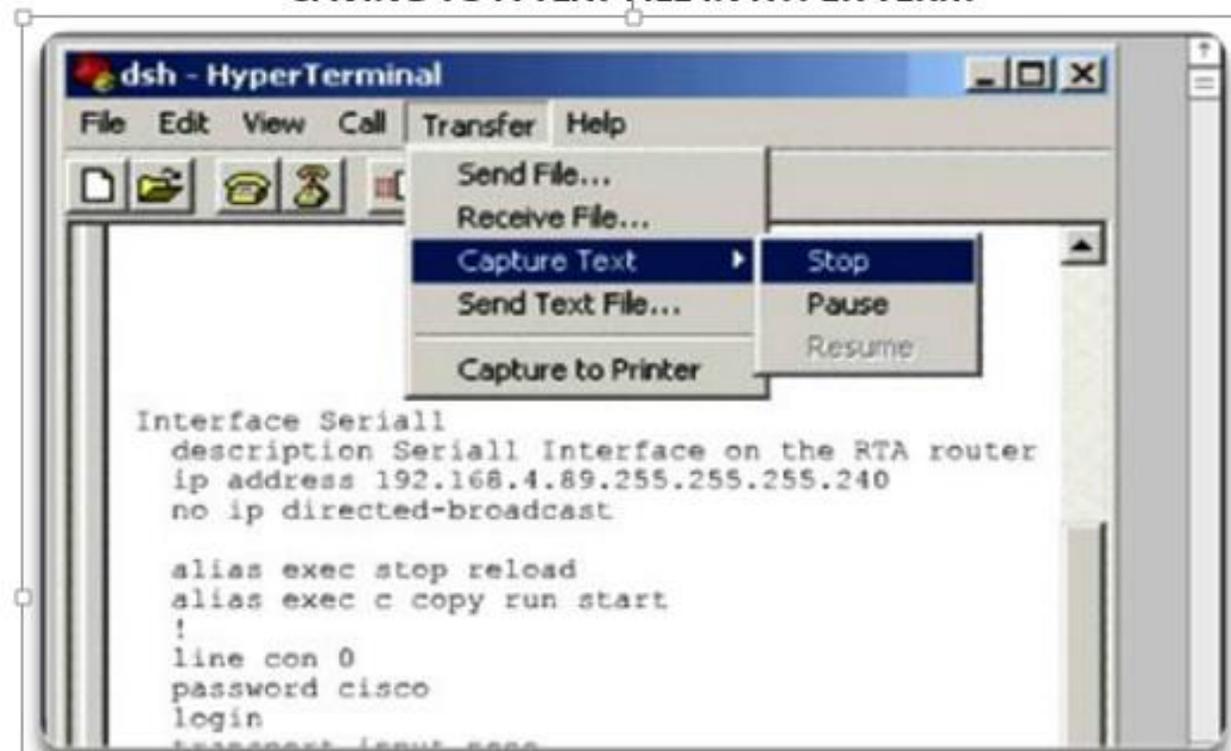
SAVING TO A TEXT FILE IN TERA TERM



In the terminal session:

1. Start the log process
2. Issue a **show running-config** command
3. Close the log

SAVING TO A TEXT FILE IN HYPER TERM



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

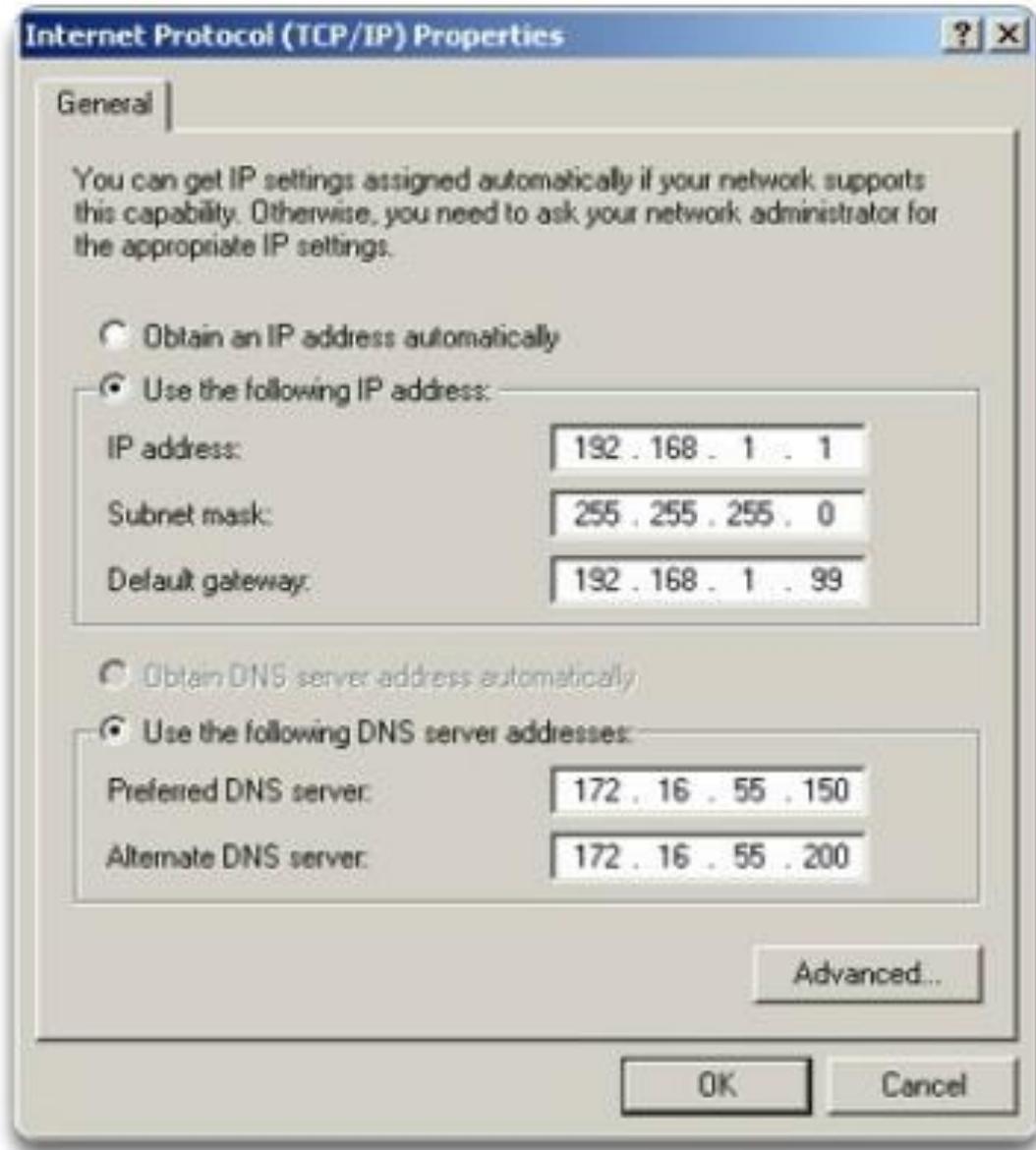


Configuring Initial Switch Settings



In this activity, you will perform basic switch configurations. You will secure access to the command-line interface (CLI) and console ports using encrypted and plain text passwords. You will also learn how to configure messages for users logging into the switch. These banners are also used to warn unauthorized users that access is prohibited.

2.3.1.1 IP Addressing of Devices



Each end device on a network must be configured with IP addresses. Some examples of end devices are:

- Computers (work stations, laptops, file servers, web servers)
- Network printers
- VoIP phones
- Security cameras
- Smart phones
- Mobile handheld devices (such as wireless barcode scanners)

2.3.1.2 Interfaces and Ports



Copper



Fiber Optics



Wireless



Cisco IOS switches have physical ports for devices to connect to, but also have one or more switch virtual interfaces (SVIs). These are virtual interfaces, because there is no physical hardware on the device associated with it; an SVI is created in software. The virtual interface provides a means to remotely manage a switch over a network using IPv4. Each switch comes with one SVI appearing in the default configuration "out-of-the-box." The default SVI is interface VLAN1

Configuring a Switch Virtual Interface

Enter interface configuration mode for VLAN 1.

```
Switch(config)#interface vlan 1
```

Configure the IP address as '192.168.10.2' and the subnet mask as '255.255.255.0'.

```
Switch(config-if)#ip address 192.168.10.2 255.255.255.0
```

Activate the interface.

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

```
%LINK-5-CHANGED: Interface Vlan1, changed state to up
```

```
Switch(config-if)#
```

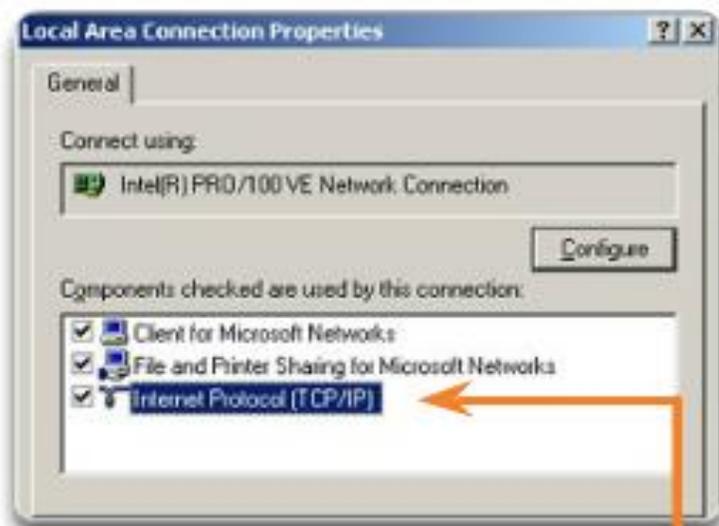
You successfully configured the VLAN 1 interface.

To access the switch remotely, an IP address and a subnet mask must be configured on the SVI:

- IP address - Together with subnet mask, uniquely identifies end device on the internetwork
 - Subnet mask - Determines which part of a larger network is used by an IP address
- For now the focus is IPv4; later you will explore IPv6

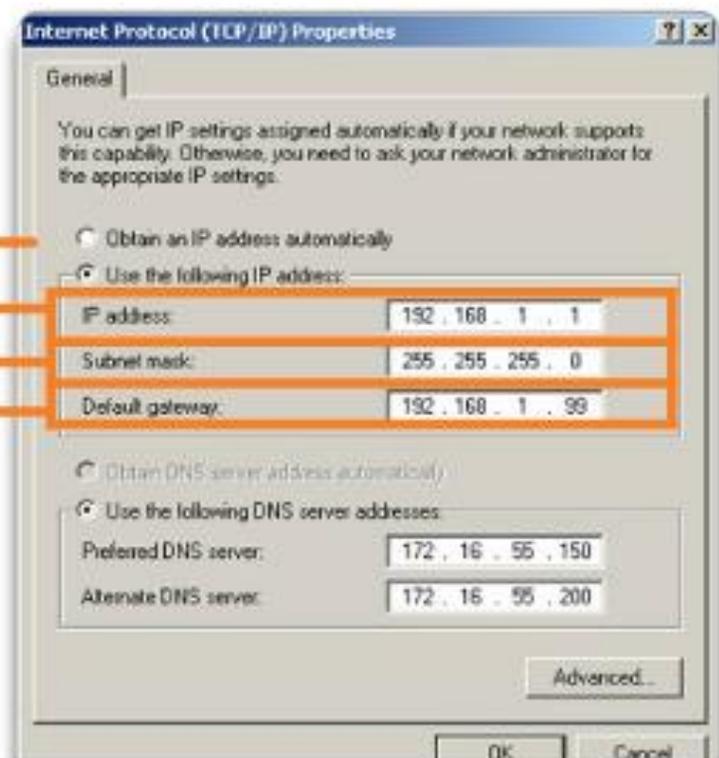
2.3.2.2 Manual IP Address Configuration for End Devices

Addressing End Devices



For manual static assignments, enter addresses:

IP address
Subnet mask
Default gateway



In order for an end device to communicate over the network, it must be configured with the correct IP address information. Much like a switch SVI, the end device must be configured with an IP address and subnet mask. This information is configured on the PC settings.

Assigning Dynamic Addresses



This property will set the device to obtain an IP address automatically.

Verifying Windows PC IP Configuration

Enter the command to display the IP configuration on a Windows PC.

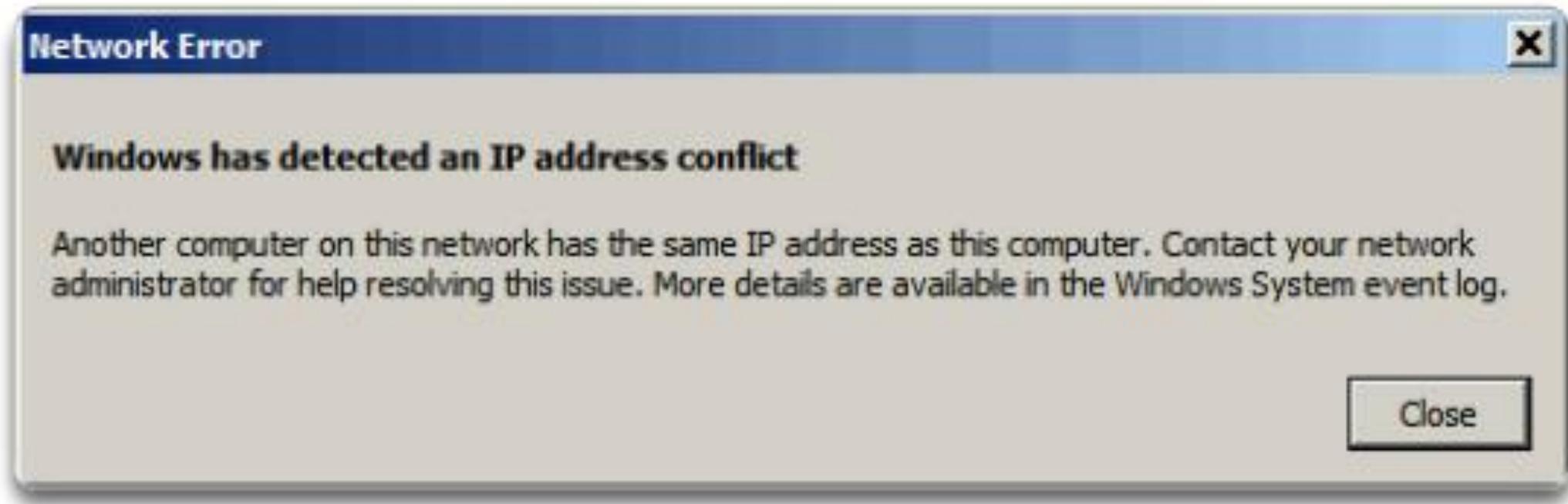
```
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.
C:\> ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix . : cisco.com
    Link-local IPv6 Address . . . . . : fe80::b0ef:ca42:af2c:c6c7%16
    IPv4 Address. . . . . : 10.82.240.197
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 10.82.240.198
```

You successfully displayed the IP configuration on a Windows PC.



- To resolve such an IP addressing conflict convert the network device with the static IP address to a DHCP client; or on the DHCP server, exclude the static IP address of the end device from the DHCP scope.
- The second solution requires that you have administrative privileges on the DHCP server and that you are familiar with configuring DHCP on a server

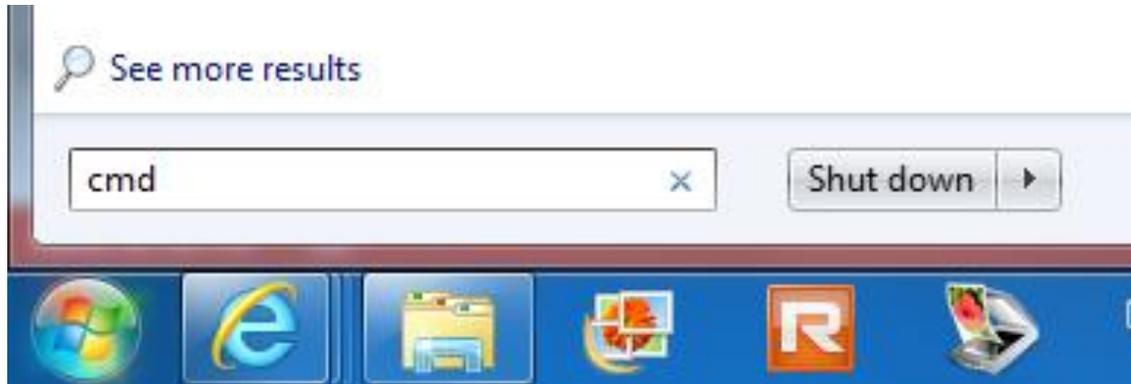


Implementing Basic Connectivity



In this activity, you will first perform basic switch configurations. Then you will implement basic connectivity by configuring IP addressing on switches and PCs. When the IP addressing configuration is complete, you will use various show commands to verify configurations and use the ping command to verify basic connectivity between devices.

2.3.3.1 Test the Loopback Address on an End Device



```
C:\windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Frank Schneemann>ping 127.0.0.1

Pinging 127.0.0.1 with 32 bytes of data:
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128

Ping statistics for 127.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\Frank Schneemann>
```

Verifying the VLAN Interface Assignment

Enter the command to verify the interface configuration on S1.

```
S1# show ip interface brief
```

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/1	unassigned	YES	manual	up	up
FastEthernet0/2	unassigned	YES	manual	up	up
<output omitted>					
Vlan1	192.168.10.2	YES	manual	up	up

You are now on S2. Enter the command to verify the interface configuration on S2.

```
S2# show ip interface brief
```

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/1	unassigned	YES	manual	up	up
FastEthernet0/2	unassigned	YES	manual	up	up
<output omitted>					
Vlan1	192.168.10.3	YES	manual	up	up

You successfully verified the interface assignment on S1 and S2.

2.3.3.3 Testing End-to-End Connectivity

You are on the command line for PC1. Enter the command to verify connectivity to the S1 VLAN interface at '192.168.10.2'.

```
C:\> ping 192.168.10.2
```

```
Pinging 192.168.10.2 with 32 bytes of data:
```

```
Reply from 192.168.10.2: bytes=32 time=838ms TTL=35
```

```
Reply from 192.168.10.2: bytes=32 time=820ms TTL=35
```

```
Reply from 192.168.10.2: bytes=32 time=883ms TTL=36
```

```
Reply from 192.168.10.2: bytes=32 time=828ms TTL=36
```

```
Ping statistics for 192.168.10.2:
```

```
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

```
Approximate round trip times in milli-seconds:
```

```
    Minimum = 820ms, Maximum = 883ms, Average = 842ms
```

Enter the command to verify connectivity to PC2 at '192.168.10.11'.

```
C:\> ping 192.168.10.11
```

```
Pinging 192.168.10.11 with 32 bytes of data:
```

```
Reply from 192.168.10.11: bytes=32 time=838ms TTL=35
```

```
Reply from 192.168.10.11: bytes=32 time=820ms TTL=35
```

```
Reply from 192.168.10.11: bytes=32 time=883ms TTL=36
```

```
Reply from 192.168.10.11: bytes=32 time=828ms TTL=36
```

```
Ping statistics for 192.168.10.11:
```

```
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

```
Approximate round trip times in milli-seconds:
```

```
    Minimum = 820ms, Maximum = 883ms, Average = 842ms
```

```
C:\>
```

You successfully verified connectivity to S1 and PC2.

- The ping command can be used on a PC, just as on a Cisco IOS device. The figure shows that a ping from PC1 to the IP address of the S1 VLAN 1 interface, 192.168.10.2, should be successful.
- Testing End-to-End Connectivity
- The IP address of PC1 is 192.168.10.10, with subnet mask 255.255.255.0, and default gateway 192.168.10.1.
- The IP address of PC2 is 192.168.10.11, with subnet mask 255.255.255.0, and default gateway 192.168.10.1.
- A ping from PC1 to PC2 should also be successful. A successful ping from PC1 to PC2 verifies end-to-end connectivity in the network!



Building a Simple Network





Configuring a Switch Management Address



2.4.1.1 Class Activity - Tutor Me



The CLI commands the Cisco IOS!

2.4.1.2 Packet Tracer - Skills Integration Challenge



Skills Integration Challenge



As a recently hired LAN technician, your network manager has asked you to demonstrate your ability to configure a small LAN. Your tasks include configuring initial settings on two switches using the Cisco IOS and configuring IP address parameters on host devices to provide end-to-end connectivity. You are to use two switches and two hosts/PCs on a cabled and powered network.

2.4.1.3 Summary

User EXEC Command - Router>

```
ping
show (limited)
enable
etcetera
```

Privileged EXEC Commands - Router#

```
all User EXEC commands
debug commands
reload
configure
etcetera
```

Global Configuration Commands - Router(config)#

```
hostname
enable secret
ip route
```

```
interface ethernet
serial
dsl
etcetera
```

```
router rip
ospf
eigrp
etcetera
```

```
line vty
console
etcetera
```

Interface Commands - Router(config-if)#

```
ip address
ipv6 address
encapsulation
shutdown/no shutdown
etcetera
```

Routing Engine Commands - Router(config-router)#

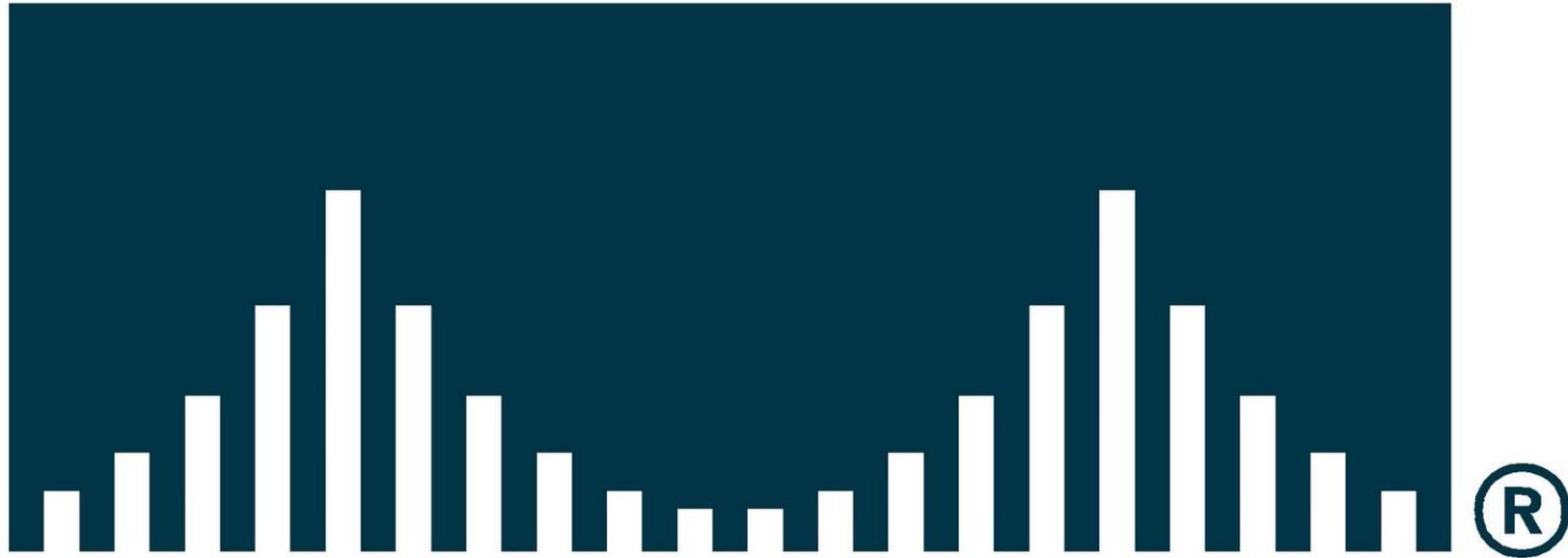
```
network
version
auto summary
etcetera
```

Line Commands - Router(config-line)#

```
password
login
modem commands
etcetera
```

Cisco IOS is a term that encompasses a number of different operating systems, which runs on various networking devices. The technician can enter commands to configure, or program, the device to perform various networking functions. Cisco IOS routers and switches perform functions that network professionals depend upon to make their networks operate as expected

CISCO SYSTEMS



Thank you for your attention!

