



Chapter 2: Configure a Network Operating System



Introduction to Networks v6.0

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Chapter 2 - Sections & Objectives

- 2.1 IOS Bootcamp
 - Explain the purpose of Cisco IOS.
 - Explain how to access a Cisco IOS device for configuration purposes.
 - Explain how to navigate Cisco IOS to configure network devices.
 - Describe the command structure of Cisco IOS software.
- 2.2 Basic Device Configuration
 - Configure hostnames on a Cisco IOS device using the CLI.
 - Use Cisco IOS commands to limit access to device configurations.
 - Use IOS commands to save the running configuration.
- 2.3 Address Schemes
 - Explain how devices communicate across network media.
 - Configure a host device with an IP address.
 - Verify connectivity between two end devices.



2.1 IOS Bootcamp



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IOS Bootcamp

Cisco IOS

- Operating Systems
 - PC OS allows users to interact with the computer
 - User-computer interaction in PC OSs are often done via mouse, keyboard and monitor
 - Cisco IOS is also an Operating System
 - Cisco IOS allows users to interact with Cisco devices.

- Cisco IOS enables a technician to:
 - Use a keyboard to run CLI-based network programs.
 - Use a keyboard to enter text and text-based commands.
 - View output on a monitor.

- All Cisco networking devices come with a default IOS.

- It is possible to upgrade the IOS version or feature set.

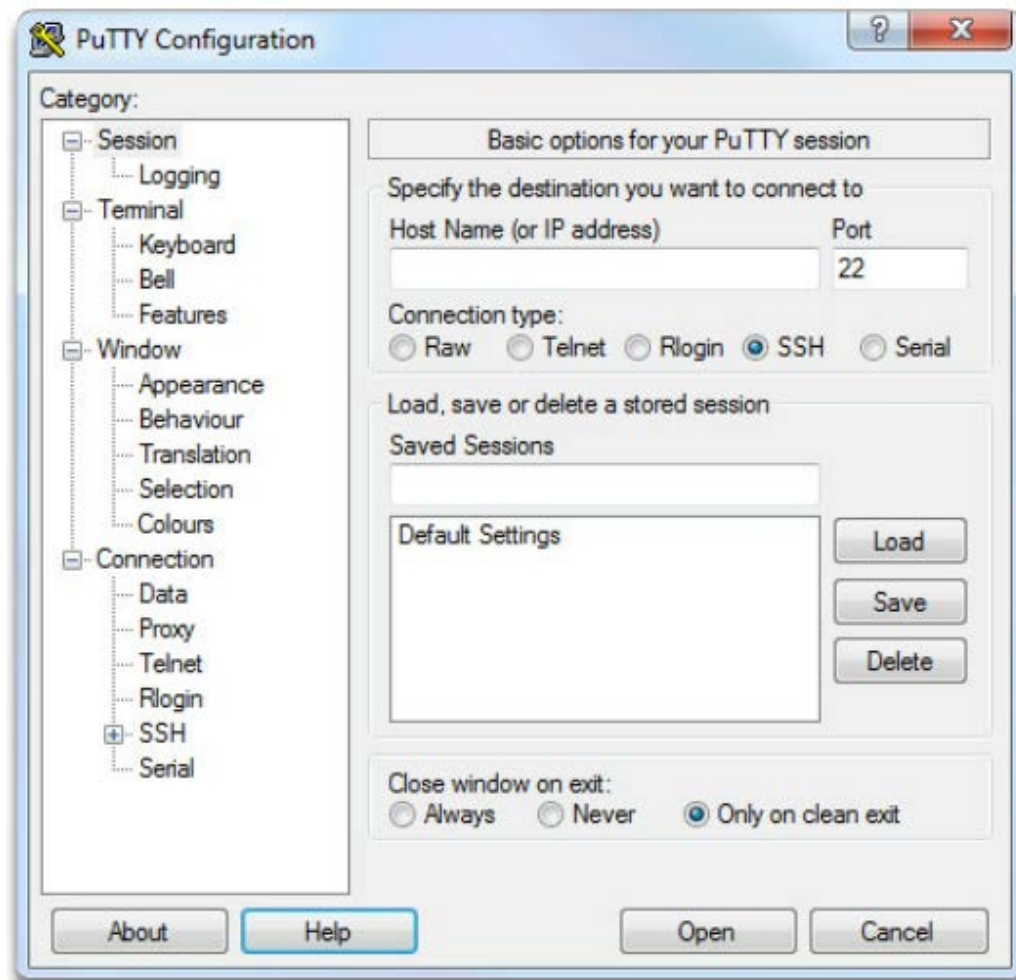




IOS Bootcamp

Cisco IOS Access

- Access Methods
 - Console
 - Auxiliar
 - Virtual Terminal (Telnet / SSH)
- Terminal Emulation Programs
 - PuTTY
 - Tera Term
 - SecureCRT





IOS Bootcamp

Navigate the IOS

- Cisco IOS Modes of Operation
 - Initial configuration must be done via console connection
 - Configuration is then done via various CLI command modes.
- Primary Command Modes
 - User EXEC Mode
 - Privileged EXEC Mode
- Configuration Command Modes
 - The **Configure Terminal** command enters the Global Configuration Mode.
 - Sub-configuration modes are accessible from the Privileged EXEC Mode.
 - Examples are: **switch(config-line)#** and **switch(config-if)#**
- Navigate Between IOS Modes
 - Navigation between modes is also done via commands.
 - The **enable** command enters the Privileged EXEC Mode.
 - The **exit** commands exits to the parent command mode.





IOS Bootcamp

The Command Structure

- **Basic IOS Command Structure**
 - The general syntax for a command is the command followed by any appropriate keywords and arguments.
 - Keyword - a specific parameter defined in the operating system
 - Argument - not predefined; a value or variable defined by the user
- **IOS Command Syntax**
 - Provides the pattern or format that must be used when entering a command.
 - The Cisco IOS Command Reference is the ultimate source of information for a particular IOS command.
- **IOS Help Feature**
 - The IOS has two forms of help available: Context-Sensitive Help and Command Syntax Check.
- **Hotkeys and Shortcuts**
 - Commands and keywords can be shortened to the minimum number of characters that identify a unique selection.
 - Line editing keyboard shortcuts such as Ctrl-A are also supported.



2.2 Basic Device Configuration



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Basic Device Configuration

Hostnames

■ Device Names

- Hostnames allow devices to be identified by network administrators over a network or the Internet.
- Very important and should also be displayed in the topology.

■ Configure Hostnames

- IOS hostnames should:
 - Start with a letter
 - Contain no spaces
 - End with letter or digit
 - Use only letters, digits or dashes
 - Be less than 64 characters in length

```
Switch# configure terminal
Switch(config)# hostname SW-Floor-1
Sw-Floor-1(config)#
```



Basic Device Configuration

Limit Access to Device Configurations

■ Secure Device Access

- Secure privileged EXEC and user EXEC access with a password.
- Secure virtual terminal lines with a password.

■ Configure Passwords

- Use strong passwords.
- Avoid re-using passwords

■ Encrypt Passwords

- Cisco IOS displays passwords in plain text by default.
- Passwords should be encrypted.

■ Banner Messages

- Important part of the legal process in the event that someone is prosecuted for breaking into a device.
- Wording that implies that a login is "welcome" or "invited" is not appropriate.
- Often used for legal notification because it is displayed to all connected terminals.

```
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#
You successfully encrypted the plain text passwords.
```



Basic Device Configuration

Save Configurations

- Save the Running Configuration File
 - File stored in NVRAM that contains all of the commands that will be used upon startup or reboot
 - NVRAM does not lose its contents when the device is powered off.
- Alter the Running Configuration
 - File stored in RAM that reflects the current configuration, modifying affects the operation of a Cisco device immediately.
 - RAM loses all of its content when the device is powered off or restarted.
- Capture Configuration to a Text File
 - Configuration files can also be saved and archived to a text document.
 - The configuration can then be edited with any text editor and placed back in the device.

```
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>
!
```



2.3 Address Schemes



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Address Schemes

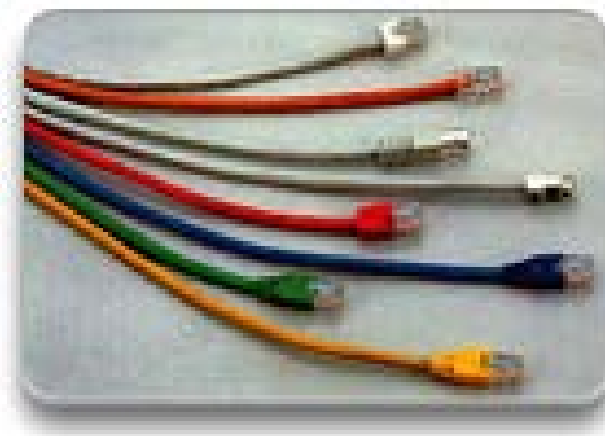
Ports and Addresses

■ IP Addresses

- Each end device on a network must be configured with an IP address.
- Enable devices to establish end-to-end communication on the Internet.
- The structure of an IPv4 address is called dotted decimal notation and is represented by four decimal numbers between 0 and 255.
- IPv6 is the most recent version of IP and the replacement for the more common IPv4.

■ Interface and Ports

- Network communications depend on interfaces and the cables that connect them.
- Different types of network media have different features and benefits.
- Ethernet is the most common local area network (LAN) technology.
- SVI provides a means to remotely manage a switch over a network.





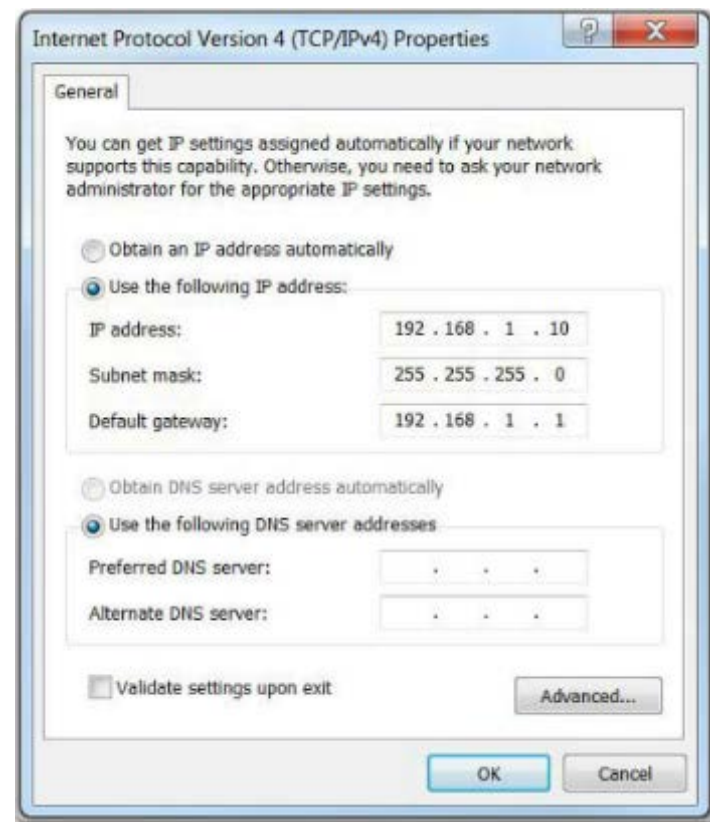
Address Schemes

Configure IP Addressing

- Manual IP Address Configuration for End Devices
 - To manually configure an IPv4 address on a Windows host, open the Control Panel > Network Sharing Center > Change adapter settings and choose the adapter.
 - Next right-click and select Properties to display the Local Area Connection Properties shown in Figure 1.

- Automatic IP Address Configuration for End Devices
 - DHCP enables automatic IPv4 address configuration for every end device that has DHCP enabled. No extra configuration is needed.

- Switch Virtual Interface Configuration
 - To configure an SVI on a switch, use the interface vlan 1 global configuration command. Vlan 1 is not an actual physical interface but a virtual one.





Address Schemes

Verifying Connectivity

- Interface Addressing Verification
 - Cisco IOS supports commands to allow IP configuration verification.

- End-To-End Connectivity Test
 - The ping command can be used to test connectivity to another device on the network or a website on the Internet.

```
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

```
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

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
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C:\>
```



2.4 Chapter Summary



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Chapter Summary

Summary

- Explain the features and functions of Cisco IOS Software.
- Configure initial settings on a network device using the Cisco IOS software.
- Given an IP addressing scheme, configure IP address parameters on end devices to provide end-to-end connectivity in a small to medium-sized business network.

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