

# CCENT Study Guide

## Chapter 6

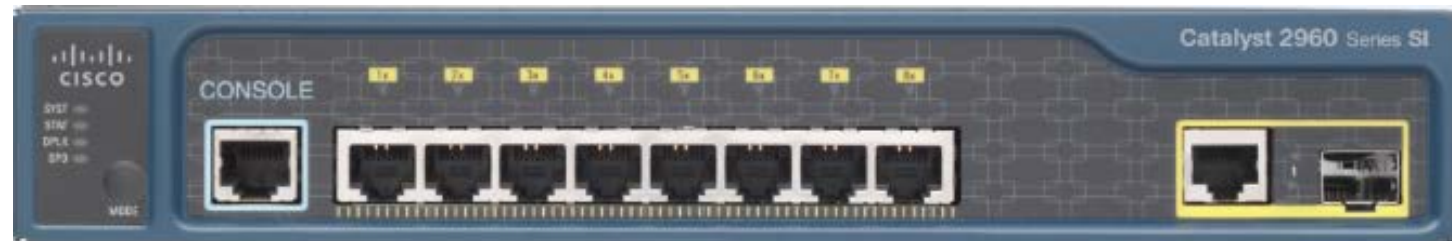
### Cisco's Internetworking Operating System (IOS)

# Chapter 6 Objectives

The CCENT Topics Covered in this chapter include:

- **2.0 LAN Switching Technologies**
- **2.3 Troubleshoot interface and cable issues (collisions, errors, duplex, speed).**
- **5.0 Infrastructure Management**
- **5.3 Configure and verify initial device configuration.**
- **5.4 Configure, verify, and troubleshoot basic device hardening.**
- **5.4.a Local authentication**
- **5.4.b Secure password**
- **5.4.c Access to device**
- 5.4.c. (i) Voice
- 5.4.c. (ii) Video
- **5.4.c. (iii) Data**
- **5.4.d Source address Telnet/SSH**
- **5.4.e Login banner**
- **5.6 Use Cisco IOS tools to troubleshoot and resolve problems.**
- 5.6.a Ping and traceroute with extended option
- 5.6.b Terminal monitor
- 5.6.c Log events

# Cisco 2960 switch and 1900 series router



# Bringing Up a Switch

When you first bring up a Cisco IOS device, it will run a power-on self-test—a POST. Upon passing that, the machine will look for and then load the Cisco IOS from flash memory if an IOS file is present, then expand it into RAM.

As you probably know, flash memory is electronically erasable programmable read-only memory—an EEPROM. The next step is for the IOS to locate and load a valid configuration known as the startup-config that will be stored in *nonvolatile RAM (NVRAM)*.

Once the IOS is loaded and up and running, the startup-config will be copied from NVRAM into RAM and from then on referred to as the running-config.

But if a valid IOS isn't found in NVRAM, your switch will enter setup mode, giving you a step-by-step dialog to help configure some basic parameters on it.

# Command-Line Interface (CLI)

After the interface status messages appear and you press Enter, the `Switch>` prompt will pop up. This is called *user exec mode*, or user mode for short, and although it's mostly used to view statistics, it is also a stepping stone along the way to logging in to *privileged exec mode*, called privileged mode for short.

You can view and change the configuration of a Cisco router only while in privileged mode, and you enter it via the `enable` command like this:

```
Switch>enable  
Switch#
```

# Defining Router Terms

Table 6.1 defines some of the terms I've used so far.

**Table 6.1: Router terms**

Mode	Definition
User exec mode	Limited to basic monitoring commands
Privileged exec mode	Provides access to all other router commands
Global configuration mode	Commands that affect the entire system [AU: Includes commands that affect...? Also in the next one? Doesn't seem like the mode is commands.]leavee
Specific configuration modes	Commands that affect interfaces/processes only
Setup mode	Interactive configuration dialog

# Table 6.2: Enhanced editing commands

Table 6.2 lists the enhanced editing commands available on a Cisco router.

**Table 6.2: Enhanced editing commands**

Command	Meaning
Ctrl+A	Moves your cursor to the beginning of the line
Ctrl+E	Moves your cursor to the end of the line
Esc+B	Moves back one word
Ctrl+B	Moves back one character
Ctrl+F	Moves forward one character
Esc+F	Moves forward one word
Ctrl+D	Deletes a single character
Backspace	Deletes a single character
Ctrl+R	Redisplays a line
Ctrl+U	Erases a line
Ctrl+W	Erases a word
Ctrl+Z	Ends configuration mode and returns to EXEC
Tab	Finishes typing a command for you

# Table 6.3: Router-command history

You can review the router-command history with the commands shown in Table 6.3.

**Table 6.3: Router-command history**

Command	Meaning
Ctrl+P or up arrow	Shows last command entered
Ctrl+N or down arrow	Shows previous commands entered
show history	Shows last 20 commands entered by default
show terminal	Shows terminal configurations and history buffer size
terminal history size	Changes buffer size (max 256)



# Administrative Functions

You can configure the following administrative functions on a router and switch:

- Hostnames
- Banners
- Passwords
- Interface descriptions

# Hostnames/Banner

We use the hostname command to set the identity of the router. This is only locally significant, meaning it doesn't affect how the router performs name lookups or how the device actually works on the internetwork.

```
Switch#config t  
Switch(config)#hostname Todd
```

Message of the day (MOTD) banners are the most widely used banners because they give a message to anyone connecting to the router via Telnet or an auxiliary port or even through a console port as seen here:

```
Todd(config)#banner motd ?  
LINE c banner-text c, where 'c' is a delimiting character  
Todd(config)#banner motd #  
Enter TEXT message. End with the character '#'.  
$ Acme.com network, then you must disconnect immediately.  
#  
Todd(config)#^Z (Press the control key + z keys to return to privileged mode)
```

# Passwords

## Enable password/enable secret

```
Todd(config)#enable secret todd
```

```
Todd(config)#enable password todd
```

The enable password you have chosen is the same as your enable secret. This is not recommended. Re-enter the enable password.

- You wont use the older enable password in today's networks.

# Console/VTY passwords

User-mode passwords are assigned via the line command like this:

Todd(config)#**line** ?

<0-16> First Line number

console Primary terminal line

vtty Virtual terminal

# SSH

1. Set your hostname:

```
Router(config)#hostname Todd
```

2. Set the domain name—both the hostname and domain name are required for the encryption keys to be generated:

```
Todd(config)#ip domain-name Lammle.com
```

3. Set the username to allow SSH client access:

```
Todd(config)#username Todd password Lammle
```

4. Generate the encryption keys for securing the session:

```
Todd(config)#crypto key generate rsa
```

5. Enable SSH version 2 on the router—not mandatory, but strongly suggested:

```
Todd(config)#ip ssh version 2
```

6. Connect to the VTY lines of the switch:

```
Todd(config)#line vty 0 15
```

7. Configure your access protocols:

```
Todd(config-line)#transport input ?
```

```
all  All protocols
none No protocols
ssh  TCP/IP SSH protocol
telnet TCP/IP Telnet protocol
```

```
Todd(config-line)#transport input ssh ?
```

```
telnet TCP/IP Telnet protocol
<cr>
```

But if you want to go with Telnet, here's how you do that:

```
Todd(config-line)#transport input ssh telnet
```

# Encrypting Your Passwords

To manually encrypt your passwords, use the `service password-encryption` command. Here's how:

```
Todd#config t
Todd(config)#service password-encryption
Todd(config)#exit
Todd#show run
Building configuration...
!
!
enable secret 4
ykw.3/tgsOuy9.6qmgG/EeYOYgBvfx4v.S8UNA9Rddg
enable password 7 1506040800
```

# Descriptions

Setting descriptions on an interface is another administratively helpful thing, and like the hostname, it's also only locally significant.

```
Todd#config t
```

```
Todd(config)#int fa0/1
```

```
Todd(config-if)#description Sales VLAN Trunk  
Link
```

```
Todd(config-if)#^Z
```

```
Todd#
```

And on a router serial WAN:

```
Router#config t
```

```
Router(config)#int s0/0/0
```

```
Router(config-if)#description WAN to Miami
```

```
Router(config-if)#^Z
```

# Verifying interfaces

```
Todd#sh ip interface brief
```

Interface	IP-Address	OK?	Method	Status	Protocol
Vlan1	192.168.255.8	YES	DHCP	up	up
FastEthernet0/1	unassigned	YES	unset	up	up
FastEthernet0/2	unassigned	YES	unset	up	up
FastEthernet0/3	unassigned	YES	unset	down	down
FastEthernet0/4	unassigned	YES	unset	down	down
FastEthernet0/5	unassigned	YES	unset	up	up
FastEthernet0/6	unassigned	YES	unset	up	up
FastEthernet0/7	unassigned	YES	unset	down	down
FastEthernet0/8	unassigned	YES	unset	down	down
GigabitEthernet0/1	unassigned	YES	unset	down	down



# Bringing Up an Interface

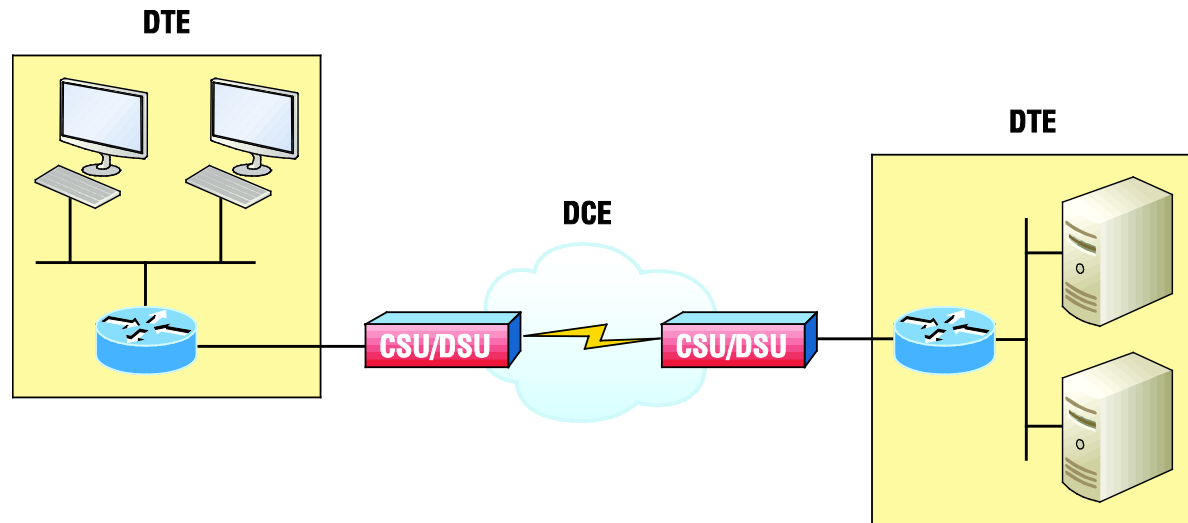
If an interface is shut down, it'll display as administratively down when you use the `show interfaces` command (`sh int` for short):

```
Router#sh int f0/0
FastEthernet0/1 is administratively down, line protocol is
down
[output cut]
```

You can bring up the router interface with the `no shutdown` command (`no shut` for short):

```
Router(config)#int f0/0
Router(config-if)#no shutdown
*August 21 13:45:08.455: %LINK-3-UPDOWN: Interface
FastEthernet0/0,
    changed state to up
Router(config-if)#do show int f0/0
FastEthernet0/0 is up, line protocol is up
[output cut]
```

# Serial Interface Commands

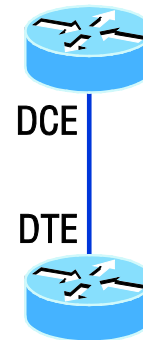


**Figure 6.3: A typical WAN connection. Clocking is typically provided by a DCE network to routers. In nonproduction environments, a DCE network is not always present.**

# Figure 6.4: Providing clocking on a nonproduction network

Set clock rate if needed

```
Todd# config t  
Todd(config)# interface serial 0  
Todd(config-if)#clock rate 1000000
```



DCE side determined by the cable.  
Add clocking to DCE side only.

**>show controllers *int*** will show the cable connection type

# Viewing, Saving, and Erasing Configurations

You can manually save the file from DRAM, which is usually just called RAM, to NVRAM by using the copy running-config startup-config command. You can use the shortcut copy run start as well:

```
Todd#copy running-config startup-config  
Destination filename [startup-config]? [press enter]  
Building configuration...  
[OK]  
Todd#  
Building configuration...
```

When you see a question with an answer in [], it means that if you just press Enter, you're choosing the default answer.

# Show running-config

You can view the files by typing **show running-config** or **show startup-config** from privileged mode. The **sh run** command, which is a shortcut for **show running-config**, tells us that we're viewing the current configuration:

```
Todd#sh run
```

```
Building configuration...
```

```
Current configuration : 855 bytes
```

```
!
```

```
! Last configuration change at 23:20:06 UTC Mon Mar  
1 1993
```

```
!
```

```
version 15.0
```

```
[output cut]
```

NOTE: You can see the version of IOS with the **show running-config** command.

# Show startup-config

The `sh start` command—one of the shortcuts for the `show startup-config` command—shows us the configuration that will be used the next time the router is reloaded. It also tells us how much NVRAM is being used to store the startup-config file.

```
Todd#sh start
```

```
Using 855 out of 524288 bytes
```

```
!
```

```
! Last configuration change at 23:20:06 UTC Mon Mar 1 1993
```

```
!
```

```
version 15.0
```

```
[output cut]
```

But beware—if you try and view the configuration and see

```
Todd#sh start
```

```
startup-config is not present
```

you have not saved your running-config to NVRAM, or you've deleted the backup configuration! Let me talk about just how you would do that now.

# Written Labs and Review Questions

- Read through the Exam Essentials section together in class.
- Open your books and go through all the written labs and the review questions.
- Review the answers in class.