

Chapter 6: Cisco Device Basics

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Text Book(s)



Glen E. Clarke, Richard Dea

CCT/CCNA Routing and Switching

Complete Study Guide: Exam 100-490

Exam 200-301

McGraw-Hill Education



Todd Lammle

CCNA Routing and Switching

Complete Study Guide: Exam 100-105

Exam 200-105

Exam 200-125

SYBEX Publication

Talk Flow

- 1 Working with Cisco Devices and Software
- 2 Understanding Memory Types
- 3 Starting the Cisco Device
- 4 System Configuration Dialog
- 5 Service-Related Tasks for Technicians
- 6 Connect and Verify the Status of the Device Interface

Types of Software:

CISCO IOS:

- The Cisco Internetwork Operating System (IOS) is one of the more common operation systems used with Cisco devices.
- This IOS provides the device with networking functions, protocols, and security features.

CISCO IOS XE:

- This operating system was originally released with the ASR 1000 and Catalyst 3850 Series routers.
- It differs from the IOS in that IOS XE is a Linux kernel that runs a version of the IOS on top of the kernel (which is why our IOS commands work with IOS XE).

Types of Software

CISCO IOS XR:

- This Unix-based OS is totally different from the Cisco IOS, but it uses many commands similar to those used on the Cisco IOS.
- This OS is geared toward service providers and is used with devices such as Cisco XR 12000 Series routers.

CISCO NX-OS:

- This operating system is for Cisco Nexus series switches.
- It is built on a Linux kernel and supports Python as a scripting language for automating changes to the device.

Working with Cisco Devices and Software

Working with Ports on Cisco Devices

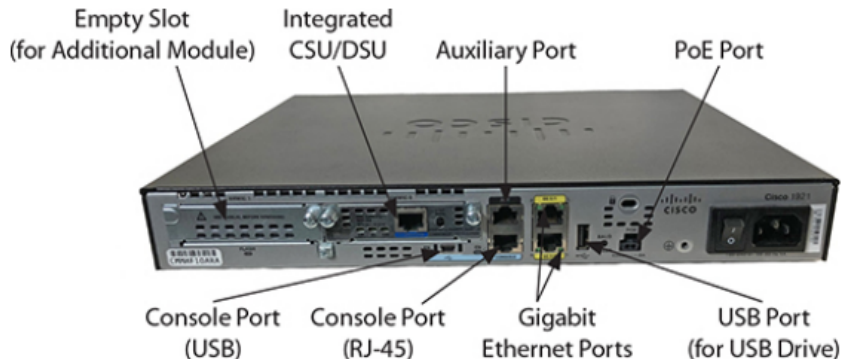


Figure 1: Ports on Cisco Devices

Working with Ports on Cisco Devices

Console Port:

- To connect administrative workstation to the console port to administer the Cisco device locally, which means we are performing administrative tasks at the device.
- To identify the console port on a Cisco device, usually labeled “Console” or “Con0.”

Auxiliary Port:

- The auxiliary port, AUX port, is also used to connect to our Cisco router for administrative purposes.
- Using this setup, we can dial into the router if it loses its Internet connection.

Working with Ports on Cisco Devices

LAN Ports:

- Cisco devices also include some Ethernet port to connect to the LAN—interfaces.
- It is important that we should know what type of Ethernet port we are working with because the command to administer the port will be different depending on the type.

Port Type	Speed	Label Identifier Example
Ethernet	10 Mbps	Ethernet0 or Eth0
Fast Ethernet	100 Mbps	FastEthernet0/0 or FE0/0
Gigabit Ethernet	1000 Mbps / 1 Gbps	GigabitEthernet0/0 or Gig0/0
10 Gigabit Ethernet	10 Gbps	TenGigabitEthernet0/0

Figure 2: LAN Port Speeds and Label Identifiers

Types of Cisco Device Cables

Console Cable

- The console cable is typically a light-blue cable with a serial port (RS-232) connector on one end and an RJ-45 connector on the opposite.
- This cable connects our computer to the Cisco device so that we can configure the device locally.

Ethernet Cable

- A straight-through Ethernet cable connects the workstation to the switch or the router to the switch.
- Crossover cables are used to connect similar devices, such as two switches.

Types of Cisco Device Cables

Serial Cable

- Use a back-to-back serial cable to connect two routers using the routers' serial ports.
- There are several different types of serial ports, so make sure we have the correct cables for those ports.

Read-Only Memory (ROM)

ROM contains the firmware necessary to boot up our router and typically has the following three components:

- **Power-on self-test (POST):** Performs tests on the device's hardware components.
- **Bootstrap program:** Brings the router up and determines how the IOS image and configuration files will be found and loaded.
- **ROM Monitor (ROMMON):** A mini-OS that enables us to perform low-level testing and troubleshooting; for instance, ROMMON is used during the password recovery procedure.

Understanding Memory Types

Flash Memory

- Flash is a form of nonvolatile memory, like ROM.
- Routers store their IOS image in flash, but other information can also be stored here, such as a secondary configuration file.
- Flash is slower than RAM, a fact that can create performance issues.

Volatile RAM (VRAM)

- Volatile RAM (VRAM) on a Cisco device is like RAM in our computer.
- It contains the running IOS image, the active configuration file, any tables (including routing, ARP, and internal buffers) for temporarily storing information such as interface input and output buffers and logging messages.

Nonvolatile RAM (NVRAM)

- NVRAM is like flash in that its contents are not erased when we turn off your router.
- Routers (and switches) use NVRAM to store the configuration files, including the startup-config, which is applied to the device during bootup after loading the IOS.

Starting the Cisco Device

Boot Process

A router typically goes through six steps when booting up:

1. The router loads and runs POST (located in ROM), testing its hardware components, including memory and interfaces.
2. The bootstrap program is loaded and executed.
3. The configuration register is checked to determine how to boot up (where to find the IOS image and configuration file).
4. The bootstrap program finds and loads an IOS image. Possible locations of IOS images include flash or a TFTP server.
5. Once the IOS is loaded, the IOS attempts to find and load a configuration file, which is normally stored in NVRAM. If the IOS cannot find a configuration file, it starts the System Configuration Dialog.
6. After the configuration is loaded, we are presented with the CLI.

Starting the Cisco Device

Bootstrap Program

The bootstrap program goes through the following steps when trying to locate and load the IOS image:

1. It examines the configuration register value. This value is a set of four hexadecimal digits. The last digit affects the bootup process. The router proceeds to the next step if the last digit is between 0x2 and 0xF.
2. It examines the configuration file in NVRAM for boot system commands, which tells the bootstrap program where to find the IOS. These commands are shown shortly
3. If no boot system commands are found in the configuration file in NVRAM, it uses the first valid IOS image found in flash.
4. If no valid IOS images are in flash, it generates a TFTP local broadcast to locate a TFTP server.

Bootstrap Program

5. If no TFTP server is found, it loads the Mini-IOS in ROM (RXBOOT mode).
6. If there is a Mini-IOS in ROM, it loads the Mini-IOS and enters RXBOOT mode; otherwise, the router either retries to find an IOS image or loads ROMMON and goes into ROMMON mode.

System Configuration Dialog

Running the System Configuration Dialog

- One way to access the System Configuration Dialog is to boot up a router without a configuration in NVRAM.
- The second way is to use the setup privileged EXEC mode command,

Status and Global Configuration Information

- At the beginning of the script, we are asked whether or not we want to continue.
- If we answer yes, the script will continue; otherwise, if we answer no, the script is aborted, and we are returned to privileged EXEC mode. Next we are asked whether we want to see the status of the router's interfaces. If we answer yes, we'll see all of the interfaces on the router, the interfaces' IP addresses, and the status of the interfaces.

Protocol and Interface Configuration Information

- After configuring the router's global information, we are led through questions about which interfaces we want to use and how they should be configured.
- The System Configuration Dialog script is started when the router boots up and there is no configuration in NVRAM, or we can use the setup command from privileged EXEC mode.

System Configuration Dialog

Exiting Setup Mode

- After we answer all of the script's configuration questions, we are shown the router configuration the script created using your answers to the script's questions.
- Note that the IOS hasn't yet activated the configuration file. Examine the configuration closely and then make one of the three choices shown in Table:

Option	Description
0	Discard the script's configuration and return to privileged EXEC mode.
1	Return to the beginning of the script.
2	Activate the script's configuration, save the configuration to NVRAM, and return to privileged EXEC mode.

Figure 3: Options at the End of the System Configuration Dialog

Using a Text Editor

Use a text editor to prepare configuration commands and then paste them into the CLI to execute the command:

Launching Text Editor in Windows

1. Click the Start button.
2. Type notepad.
2. In the Best Match section of the search results, choose Notepad.

Launching Text Editor in Linux

1. Click the Applications button (the Kali Linux icon) in the top-left corner.
2. Choose Usual Applications.
3. Choose Text Editor.

Launching a Command Prompt

Run a few of the troubleshooting commands from there:

- **ping** Use to verify that a device or system is up and running on the network.
- **tracert** Use to verify the pathway that a packet takes to reach the destination.
- **nslookup** Use to send a query to DNS.
- **arp** Use to view the ARP cache of the system.
- **pathping** Use to combines the ping and tracert commands.

Connect and Verify the Status of the Device Interface

Commands to verify interfaces

- **show ip interface brief** Use this great show command to get a list of all of the interfaces on the device.
- **show interfaces** Use this command to view a list of all the interfaces.
- **show interfaces g0/0** Use this command to view the details of a specific interface.
- **show controllers s0/3/0** Use the show controllers command on serial interfaces to view information such as the DCE and DTE details.