



# ICND2

## Lab Guide

**200-101**

Interconnecting Cisco Networking Devices Part 2  
Version 2.0

Labs powered by

**NetSim**<sup>®</sup>  
NETWORK SIMULATOR<sup>®</sup>



# *Interconnecting Cisco Networking Devices Part 2*

*200-101 Lab Guide*



25 Century Blvd., Ste. 500, Nashville, TN 37214 | [Boson.com](http://Boson.com)

To perform the labs referenced in this book, please download and install the necessary files (refer to your purchase receipt for the download link), navigate to the appropriate lab in the lab menu in the Boson NetSim, and load the lab; all labs should work in NetSim 9 or later. To learn more about the Boson NetSim or to purchase and download the software, please visit [www.boson.com/netsim](http://www.boson.com/netsim).

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Please visit [www.boson.com](http://www.boson.com) for more information.

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## Boson NetSim Overview

The Boson NetSim® Network Simulator®, which includes the Boson Router Simulator®, is unique compared to all others on the market because of the functionality it supports and its features. NetSim utilizes Boson's proprietary Network Simulator, Router Simulator®, and EROUTER® software technologies, along with the Boson Virtual Packet Technology® engine, to create individual packets. These packets are routed and switched through the simulated network, allowing NetSim to build an appropriate virtual routing table and simulate true networking. Other simulation products on the market do not support this level of functionality.

NetSim is a Windows®-based product that simulates a wide variety of Cisco® routers, including the 2500 series, 2600 series, 2800 series, and 3600 series routers, as well as the Cisco Catalyst 1900 series, 2900 series, and 3500 series switches. NetSim supports multiple routing protocols, including RIP, IGRP, EIGRP, BGP, and OSPF. It supports different LAN/WAN protocols, including PPP/CHAP, ISDN, and Frame Relay. The labs in NetSim require only the devices and functionality included with NetSim—they do not require access to any external router or switch hardware. NetSim supports many, but not all, of the IOS commands available on a physical router or switch. All the commands referenced in the available labs are supported by NetSim. The labs included in this book have been selected as companions to the Boson Curriculum. However, you can perform any labs that are unlocked for additional practice.

Achieving Cisco CCENT®, CCNA®, or CCNP® certification is the goal of many people who use this product. The Boson NetSim covers not only the SWITCH, TSHOOT, and ROUTE certifications but also the ICND1, ICND2, and CCNA certifications, among others. The included labs guide you through the configuration of routers, switches, and workstations in a variety of scenarios. Installed labs are made available (unlocked) depending on the activation key used to activate the product. All labs are downloaded and kept up to date after installation regardless of the activation key used.

Activation keys unlock labs and increase the number of available commands. Beginning with the Demo version of NetSim, the command set is limited to those necessary to perform the steps in the lab. For example, if you start your studies with a CCENT activation key, you will have the command set and labs available that are necessary to study for that exam. When you are ready to study for either the CCNA or CCNP exam, you will need to purchase a new activation key and then activate with the new CCNA or CCNP activation key; then, more labs and a larger command set become available.

A small lock icon (🔒) is displayed next to unavailable labs. Higher-level activation keys allow you to work through all labs unlocked by lower-level activation keys. All labs included with NetSim are unlocked when a CCNP-level activation key is used; courseware labs are unlocked with the appropriate activation key.

After you load and complete an unlocked lab, you can use the grading function in NetSim to grade the lab so that you can determine whether you completed it correctly (click **Lab > Grade Lab**). As you progress through the labs, you will master the skills needed to pass the simulation questions in the Cisco certification exams. NetSim has the ability to guide and grade, and using it for practice can actually be more helpful than using real routers and switches. NetSim allows you to gain experience without requiring you to purchase expensive equipment.

The Boson NetSim can be used for additional purposes other than only working through labs. The included full version of the **NetMap** tool allows you to practice designing and planning a network. This tool's functionality goes beyond that of most tools because, once you have created a network topology, you can actually create the router configurations that are going to be used, save those configurations, and practice using them on simulated devices.

Routing protocol implementation is one of the more challenging tasks you may encounter. Troubleshooting a production network can be a frustrating experience. Fortunately, you can create a virtual copy of your network topology by using the Boson NetMap and troubleshoot the problems *without interfering with your production network*. Although you can use NetSim as an aid in troubleshooting, you should not rely only on NetSim to make decisions about a production network, because NetSim is not designed to test real networks. Instead, it is a tool that you can use to study for Cisco certification.

In summary, Boson NetSim is a flexible and powerful product that can help you become certified and, in some cases, can be used to create a simulation of the topology of your corporate network and help you practice troubleshooting without using devices on the production network.

### Using NetSim to Prepare for Your Certification

By incorporating NetSim as part of your process of achieving a Cisco certification, you can learn and master the skills necessary to help you successfully complete your certification track. The purpose of NetSim is to help you with the practical, hands-on portion of your education and to ensure that you not only understand the concepts of routing but can actually configure and implement routing on Cisco devices.

Mastering Cisco networking involves two fundamental tasks:

1. Learn the theory of routers and switches.
2. Gain the hands-on experience of implementing that theory by configuring the devices in a network and testing them in a lab.

Self-studying for a Cisco certification can be a daunting task. The amount of information a CCNA candidate is required to know and the skills that candidate is required to possess are quite extensive. To begin learning the theory of configuring a network, you can find a good reference book or listen to an instructor. But a reference book might not be enough. The book will not give you the practical, hands-on experience of routing and switching that you can learn from NetSim—experience that will help you build on the theoretical knowledge you learned from the reference book.

Real equipment gives you the ability to practice on actual routers and switches, but it also is a very costly way to practice and leaves a lot of room for error. The Boson NetSim, on the other hand, is an excellent tool to help you prepare for the CCNA ([www.boson.com/certification/CCNA](http://www.boson.com/certification/CCNA)) and CCNP ([www.boson.com/certification/CCNP](http://www.boson.com/certification/CCNP)) exams. NetSim simulates the behavior of a network and does not just return preprogrammed responses to expected command inputs. It allows you to create virtual packets and virtual frames that will be routed and switched through the simulated network. Aside from physically plugging in the cables and listening to the fan noise, your experience with the simulated network will be much the same as your experience with a fully functional lab rack without the expense of the hardware. NetSim will enable you to practice various configurations and master helpful skills.

Once you feel you have mastered the theory and the practical labs, you can test your knowledge by using the Boson ExSim-Max practice exam products available at the ExSim-Max home page ([www.boson.com/exsim-max-practice-exams](http://www.boson.com/exsim-max-practice-exams)). Boson ExSim-Max practice exam products can include complex multiple-choice questions, drag-and-drop questions, Boson NetSimX simulation questions, and trouble tickets that simulate the questions you will see on the live exam.

The Boson NetSim Network Simulator is the most comprehensive product on the market for learning how to configure a Cisco router. The Boson NetSim will not only help you become certified, it will actually help you learn and understand how to configure routers, switches, and networks.

For more information on how to use NetSim, please read the NetSim User Manual by clicking **Help > Users Manual** from within NetSim or by downloading the User Manual from the following link:

<http://www.boson.com/Files/Support/NetSim-10-User-Manual.pdf>

### Using NetSim at Home – Single User

The following steps are for installation and activation for a single user license and should not be performed on a classroom workstation.

#### Downloading and Installing NetSim

You can download NetSim from the Boson.com downloads page (account required):

<http://www.boson.com/download>

You must have a Boson account to download the NetSim Demo. To create a free account, visit the Boson Online Account page (<https://www.boson.com/account/default.aspx>) and enter a valid e-mail address to begin creating an account.

You should download the NetSim installer to your computer before beginning the installation. It is recommended that you disable antivirus and firewall software while installing and activating NetSim and then reactivate when the installation is complete. Double-click the downloaded installation file to begin the installation, and perform the steps described in the prompts during installation.

#### Activating NetSim – Single User

When you first open NetSim, you will be presented with a **Product Activation** dialog box. Enter your e-mail address and password, and then click **Next**. On the next screen, select whether you want to activate NetSim in Online Mode (recommended method) or Offline Mode. Click **Next**. Then type the activation key; this information should be in the purchase receipt you received via e-mail, or you can find the receipt online on your Boson Online Account page (<https://www.boson.com/account/default.aspx>). If you are a student, you might receive this information from your learning institution or your instructor. You must have an active Internet connection in order to activate the full version of NetSim.

After a successful activation, the lab packs will be updated and NetSim will be ready for you to use. Installed labs are made available (unlocked) depending on the activation key used to activate the product. A small lock icon (🔒) is displayed next to unavailable labs. To make additional labs available, you will need to purchase a new activation key and then reactivate with the new activation key; then, more labs and a larger command set become available.

If you have not purchased an activation key for NetSim or if you received an activation key from your learning institution, you will not be able to activate the full version of NetSim on your personal computer. However, you can choose to continue in Demo mode. When you are running the Demo mode, only the demo lab and a limited set of commands are functional. To purchase the full version of NetSim, visit the About NetSim page ([www.boson.com/support/netsim-support-topics](http://www.boson.com/support/netsim-support-topics)) of the Boson website.

### Loading a Lab

You can open NetSim from the shortcut installed during the download or from the Start menu by clicking **Boson Software > Boson NetSim > Boson NetSim**. If you are a student using NetSim at a learning institution, you should launch NetSim from the Start menu by clicking **Boson Software > Boson NetSim > Boson NetSim LS Client**. This will enable you to configure NetSim to authenticate with the Boson NetSim License Server.

1. You can begin a preloaded Boson NetSim lab by performing one of the following tasks:
  - On the navigation pane, click **Labs**; then, on the **Standard** tab of the **Labs** panel, double-click the lab you want to open.
  - Click to highlight a lab on the **Labs** pane, then click **Lab > Load lab**.
  - Select a lab from the list of **Recent Labs** or **Saved Labs** on the **Home** pane.
2. After you have loaded a lab, click the **Lab Instructions** tab and read through the lab instructions.
3. From the **Devices** drop-down menu on the **Consoles** section, select the device(s) that you need to configure in order to complete the lab and follow the steps in the lab. You can also select the device you want to configure by clicking the **NetMap** tab, right-clicking the device, and selecting **Configure in Simulator**.
4. When you have completed the lab, click **Lab > Grade Lab** to ensure that you have completed it successfully.
5. You can choose to save your single device configuration or multiple device configurations by selecting the appropriate option in the **File** menu.

You might also be instructed to open labs from a custom lab pack. If any custom labs are available, they will be on the **Custom** tab of the **Labs** pane. To open a custom lab, double-click the lab you want to load.

### Accessing NetSim in the Classroom – Boson LS Client

If you are using NetSim in the classroom, it should already be installed on your classroom workstation. You should perform the following steps to configure NetSim to access the NetSim License Server.

As a student using NetSim at a learning institution, you should launch NetSim from the Start menu by clicking **Boson Software > Boson NetSim > Boson NetSim LS Client**. This will enable you to configure NetSim to authenticate with the Boson NetSim License Server.

### Configuring NetSim to Authenticate with the Boson NetSim License Server

**Note:** Prior to using the Boson NetSim Client, you might need to associate your Boson.com account information with Boson NetSim. If you receive an activation key from your learning institution, activate Boson NetSim on your personal computer after creating a Boson.com account. Your network administrator/instructor can then add you as an authorized user to the license server application. You may need to provide your learning institution with the e-mail address associated with your Boson.com account. You should not give your Boson.com account password to your instructor or learning institution. Your instructor will assign you a password that he or she has configured on the License Server, which you will need for step 3.

1. Run the Boson NetSim LS Client by clicking **Start > All Programs > Boson Software > Boson NetSim > Boson NetSim LS Client**.

2. In the **Boson NetSim - License Agreement** dialog box, select **Yes** to agree to the **Authorized User Agreement**. If you do not agree to the Authorized User Agreement, you will not be able to use the Boson NetSim client.
3. Your instructor will provide you with the settings you need to enter in the **Boson NetSim Client** dialog box. Enter the IP address (or computer name if the client computer and the license server are on a Windows-based network) and the port number of the computer running the NetSim License Server software. Enter the user name/password combination for authentication to the server. The user name will be the login information you used to establish an account with Boson.com, or the user name provided by your instructor. Enter the password assigned to you by your network administrator/instructor.

4. Select either **CCNA** or **CCNP** from the **Version** drop-down list; the version you select must match the version that is the current license type configured on the NetSim License Server.

5. Click **Connect**.
6. If a license is available on the license server, the **Continue** button will be enabled. Click the **Continue** button to start using the Boson NetSim.

For additional information on using Boson NetSim, please consult the Boson NetSim User Manual on Boson.com or click **Help > Users Manual**.

**Loading a Lab**

1. You can begin a preloaded Boson NetSim lab by performing one of the following tasks:
  - Expand the **Labs** panel; then, on the **Standard** tab of the **Labs** panel, double-click the lab you want to open.
  - Click to highlight a lab, then click **Lab > Load Lab**.
  - Select a lab from the list of **Recent Labs** or **Saved Labs** on the **Home** pane.
2. After you have loaded a lab, click the **Lab Instructions** tab and read through the lab instructions.
3. From the **Devices** drop-down menu on the **Consoles** section, select the device(s) that you need to configure in order to complete the lab and follow the steps in the lab. You can also select the device you want to configure by clicking the **NetMap** tab, right-clicking the device, and selecting **Configure in Simulator**.
4. When you have completed the lab, click **Lab > Grade Lab** to ensure that you have completed it successfully.
5. You can choose to save your single device configuration or multiple device configurations by selecting the appropriate option in the **File** menu.

You might also be instructed to open labs from a custom lab pack. If any custom labs are available, they will be on the **Custom** tab of the **Labs** pane. To open a custom lab, double-click the lab you want to load.

# Module 1

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## Cisco Device Management

### Lab 1.1 – Device Management

Labs powered by





## Lab 1.1 – Device Management

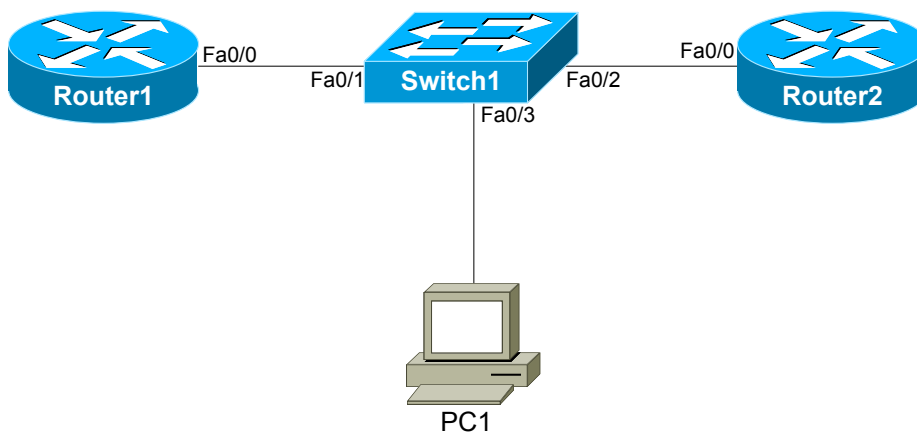
To perform this lab in the Boson NetSim, please download the necessary files (refer to your purchase receipt for the download link), navigate to the appropriate lab in the lab menu in NetSim, and load the lab. You can then accomplish the tasks below.

### Objective

This lab corresponds to ICND2 Module 1: Cisco Device Management, of Boson's CCNA Curriculum. In this lab, you will learn basic device management techniques including how to save and load router configurations from a Trivial File Transfer Protocol (TFTP) server and how to modify the configuration register.

### Lab Topology

The topology diagram below represents the NetMap in the Simulator:



The commands you will need to perform the tasks in this lab, along with their syntax and descriptions, are shown in the Command Summary table below:

### Command Summary

Command	Description
<b>configure terminal</b>	enters global configuration mode from privileged EXEC mode
<b>config-register</b> <i>value</i>	changes configuration register settings
<b>copy running-config</b> { <b>startup-config</b>   <b>tftp</b>   <i>device:filename</i> }	copies a device's running configuration file to another destination
<b>copy tftp</b> { <b>running-config</b>   <b>startup-config</b>   <i>device:filename</i> }	copies a file from a TFTP server to another destination
<b>enable</b>	enters privileged EXEC mode
<b>end</b>	ends and exits configuration mode
<b>exit</b>	exits one level in the menu structure
<b>hostname</b> <i>host-name</i>	sets the device name
<b>show running-config</b>	displays the active configuration file
<b>show tftp-configs</b>	is used in NetSim to display a list of files copied using TFTP and stored on a PC
<b>show version</b>	displays hardware platform and software versions



The IP addresses and subnet masks used in this lab are shown in the tables below:

### IP Addresses

Device	Interface	IP Address	Subnet Mask
Router1	FastEthernet 0/0	24.37.2.1	255.255.255.0
Router2	FastEthernet 0/0	24.37.2.2	255.255.255.0

Device	IP Address	Subnet Mask	Default Gateway
PC1	24.37.2.252	255.255.255.0	24.37.2.1

### Lab Tasks

#### Task 1: Save a Configuration to a TFTP Server

This task involves saving the current router configuration to the TFTP server.

1. On Router2, copy the running configuration to the TFTP server on PC1.
2. When prompted for the address or name of the TFTP server, provide PC1's IP address (**24.37.2.252**), press the Enter key, and then provide the name of the configuration file that will be stored on PC1. Name the configuration file **router2\_config**. After you press Enter, the router will take a few seconds to establish the connection; then you will see it copy the configuration file.
3. On PC1, issue the **show tftp-configs** command in order to display the configurations that are stored on the TFTP server. You should see the configuration you just saved.

**Note:** The **show tftp-configs** command does not work on real PCs; it works only in NetSim.

#### Task 2: Load a Configuration from a TFTP Server

This task involves loading the configuration from the TFTP server onto Router2. Perform the following steps on Router2.

1. Change the host name of the router to **Bad\_Router**.
2. Copy the configuration you stored on the TFTP server into the running configuration.
3. When the router prompts you for a name or an IP address, enter the IP address of the TFTP server (**24.37.2.252**).
4. Enter the name of the configuration file (**router2\_config**) that should be obtained from the TFTP server.
5. After the configuration is copied to Router2, what do you observe? \_\_\_\_\_

### **Task 3: Modify the Configuration Register**

This task involves changing how Router1 boots. Perform the following steps on Router1.

1. View the current configuration register settings for Router1.
2. Modify the configuration register to configure the device to boot to a `rommon>` prompt.
3. Verify that the configuration register setting for Router1 will be applied on reload.
4. Copy the running configuration to the startup configuration file.

## Lab Solutions

### Task 1: Save a Configuration to a TFTP Server

You might need to upgrade IOS on a Cisco router or switch when you need additional features that are not available in the version of IOS that you are currently using. Before you can upgrade IOS, you must configure a TFTP server at a network location that can be accessed by the router or switch. The TFTP server can be run from any supported device on the network as long as the router or switch to be upgraded can connect to the device. In this lab, the TFTP server has been configured for you.

1. On Router2, issue the following commands to copy the running configuration to the TFTP server on PC1:

```
Router2>enable
Router2#copy running-config tftp
```

2. When prompted for the address or name of the TFTP server, provide PC1's IP address, press Enter, and then provide the name of the configuration file that will be stored on PC1. Name the configuration file **router2\_config**. After you press Enter, the router will take a few seconds to establish the connection; then you will see it copy the configuration file. Sample output is below:

```
Address or name of remote host[]? 24.37.2.252
Destination filename [temp.rtr]? router2_config
!!!!
```

3. On PC1, issue the **show tftp-configs** command in order to display the configurations that are stored on the TFTP server. You should see the configuration you just saved. Sample output from PC1 is below:

```
C:>show tftp-configs

Filename                File Size
router2_config          2481 bytes
```

Note: The **show tftp-configs** command does not work on real PCs; it works only in NetSim.

### Task 2: Load a Configuration from a TFTP Server

1. On Router2, issue the following commands to change the host name of the router to **Bad\_Router**:

```
Router2#configure terminal
Router2(config)#hostname Bad_Router
```

2. On Router2, issue the following commands to copy the configuration you stored on the TFTP server into the running configuration:

```
Bad_Router(config)#end
Bad_Router#copy tftp running-config
```

3. When Router2 prompts you for a name or an IP address, enter the IP address of the TFTP server:

```
Address or name of remote host[]? 24.37.2.252
```

4. When prompted, enter the name of the configuration file that should be obtained from the TFTP server:

```
Source filename[]? router2_config
```

5. The router will download the configuration and load it into the running configuration. You can verify that the load was successful because the host name will be restored to what it was when the configuration was saved.

```
Router2#
```

### Task 3: Modify the Configuration Register

1. On Router1, issue the **show version** command to view the current configuration register settings. The configuration register is currently set to 0x2102, which is the default. Sample output is below:

```
Router1>enable
Router1#show version

Boson Operating Simulation Software
BOSS (tm) C2800 Software (C2800-Enterprise), Version 12.3, RELEASE SOFTWARE
Copyright (c) 1998-2013 by Boson Software, Inc.

BOSS ROM: System Bootstrap, Version 12.3, RELEASE SOFTWARE
Router Uptime Is 0 days, 1 hour, 52 minutes
System restarted by power-on
System image file is ""flash:c2800-enterprise.12.2.boss"". booted via flash
2 Fast Ethernet/IEEE 802.3 interface(s)
2 Serial network interface(s)

32K bytes of simulated non-volatile configuration memory.
8192K bytes of simulated System flash (Read/Write)

Configuration register is 0x2102
```

2. By default, when a Cisco device is unable to locate a valid Cisco IOS image in flash memory during the boot process, it will attempt to locate a valid IOS image on a TFTP server on the local network. If it cannot locate a TFTP server, it will enter ROM monitor (ROMmon) mode. When a router enters ROMmon mode, the `rommon>` prompt will be displayed instead of the standard prompt that is displayed on devices that are properly configured. The device will then load a limited version of the IOS from ROM. On Router1, issue the following commands to modify the configuration register to set the device to boot to a `rommon>` prompt:

```
Router1#configure terminal
Router1(config)#config-register 0x2120
```

3. Issue the **show version** command to view the configuration register settings for Router1. The configuration register will be configured to 0x2120 on the next reload. Sample output from Router1 is below:

```
Router1(config)#end
Router1#show version
```

```
Boson Operating Simulation Software
BOSS (tm) C2800 Software (C2800-Enterprise), Version 12.3, RELEASE SOFTWARE
Copyright (c) 1998-2013 by Boson Software, Inc.
```

```
BOSS ROM: System Bootstrap, Version 12.3, RELEASE SOFTWARE
Router Uptime Is 0 days, 1 hour, 52 minutes
System restarted by power-on
System image file is ""flash:c2800-enterprise.12.2.boss"". booted via flash
2 Fast Ethernet/IEEE 802.3 interface(s)
2 Serial network interface(s)
```

```
32K bytes of simulated non-volatile configuration memory.
8192K bytes of simulated System flash (Read/Write)
```

```
Configuration register is 0x2102 (will be 0x2120 on next reload)
```

4. On Router1, issue the **copy running-config startup-config** command to copy the running configuration to the startup configuration file. On a real router, you could then reboot the device to ROMmon mode. ROM does not contain a full version of the Cisco IOS. The boot image loaded from ROM will enable you to download a valid IOS image from a specific TFTP server. This process is not currently supported in NetSim.

## Sample Configuration Scripts

Router1	Router2
<pre> Router1#show running-config Building configuration... Current configuration : 689 bytes ! Version 12.3 service timestamps debug uptime service timestamps log uptime no service password-encryption ! hostname Router1 ! ip subnet-zero ! ip cef no ip domain-lookup ! interface Serial0/0  no ip address  no ip directed-broadcast  shutdown ! interface Serial0/1  no ip address  no ip directed-broadcast  shutdown ! interface FastEthernet0/0  ip address 24.37.2.1 255.255.255.0  no ip directed-broadcast ! interface FastEthernet0/1  no ip address  no ip directed-broadcast  shutdown ! ip classless no ip http server ! line con 0 line aux 0 line vty 0 4 ! no scheduler allocate end </pre>	<pre> Router2#show running-config Building configuration... Current configuration : 689 bytes ! Version 12.3 service timestamps debug uptime service timestamps log uptime no service password-encryption ! hostname Router2 ! ip subnet-zero ! ip cef no ip domain-lookup ! interface Serial0/0  no ip address  no ip directed-broadcast  shutdown ! interface Serial0/1  no ip address  no ip directed-broadcast  shutdown ! interface FastEthernet0/0  ip address 24.37.2.2 255.255.255.0  no ip directed-broadcast ! interface FastEthernet0/1  no ip address  no ip directed-broadcast  shutdown ! ip classless no ip http server ! line con 0 line aux 0 line vty 0 4 ! no scheduler allocate end </pre>

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