



# CCIE Routing and Switching v4.0 Configuration Practice Labs

Second Edition

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## Command Syntax Conventions

The conventions used to present command syntax in this book are the same conventions used in the IOS Command Reference. The Command Reference describes these conventions as follows:

- **Boldface** indicates commands and keywords that are entered literally as shown. In actual configuration examples and output (not general command syntax), boldface indicates commands that are manually input by the user (such as a **show** command).
- *Italics* indicate arguments for which you supply actual values.
- Vertical bars (|) separate alternative, mutually exclusive elements.
- Square brackets [ ] indicate optional elements.
- Braces { } indicate a required choice.
- Braces within brackets [ { } ] indicate a required choice within an optional element.

## Introduction

For more than ten years, the CCIE program has identified networking professionals with the highest level of expertise. Less than 3 percent of all Cisco certified professionals actually achieve CCIE status. The majority of candidates that take the exam fail at the first attempt because they are not fully prepared; they generally find that their study plan did not match what was expected of them in the exam. This practice exam has been designed to take you as close as possible to actually taking the real lab exam. It will show whether you are ready to schedule your lab, or if you need to reevaluate your study plan.

## Exam Overview

The CCIE qualification consists of two exams, a 2-hour written exam followed by an 8-hour hands-on lab exam that now includes a troubleshooting section. Written exams are computer-based, multiple choice exams lasting 2 hours and available at hundreds of authorized testing centers worldwide. The written exam is designed to test your theoretical

knowledge to ensure you are ready to take the lab exam; as such, you are only eligible to schedule the lab exam after you have passed the written exam. Having purchased this publication, it is assumed that you have passed the written exam and are ready to practice for the lab exam. The lab exam is a 5 1/2-hour, hands-on exam in which you are required to configure a series of complex scenarios in strict accordance to the questions; it's tough but achievable. Troubleshooting is now included for 2 hours, and you are also presented with a series of further questions for a 30-minute period of the exam. Current lab blueprint content information can be found on the following URL:

<https://learningnetwork.cisco.com/docs/DOC-4603>.

## Scoring Point System

In the actual exam a higher number of available points for certain questions would generally indicate that the required solution would take more time to achieve or that there would be multiple lines of configuration involved. This practice lab closely echoes the scoring system in place in the actual exam. If you find you are running short on time, try to get the smaller tasks completed and then return to the more complex questions.

## Study Roadmap

Taking the lab exam is all about experience; you can't expect to take it and pass after just completing your written exam, relying on your theoretical knowledge. You will need to spend countless hours of rack time configuring features and learning how protocols interact with one another. To be confident enough to schedule your lab exam, review the following outlined points.

## Assessing Your Strengths

Using the content blueprint, determine your experience and knowledge in the major topic areas. For areas of strength, practicing for speed should be your focus. For weak areas, you might need training or book study in addition to practice.

## Study Materials

Choose lab materials that provide configuration examples and take a hands-on approach. Look for materials approved or provided by Cisco and its Learning Partners.

## Hands-On Practice

Build and practice your lab scenarios on a per-topic basis. Go beyond the basics and practice additional features. Learn the **show** and **debug** commands along with each topic. If a protocol has multiple ways of configuring a feature, practice all of them.

## Cisco Documentation CD

Make sure you can navigate the Cisco documentation CD with confidence because this is the only resource you will be allowed during the lab (or restricted access to the same content on Cisco.com). Make the CD part of your regular study; if you are familiar with it, you can save time during the exam.

## Home Labs

Although acquiring a personal home lab is ideal, it can be costly to gather all the equipment you will need.

## Cisco 360 Program

The Cisco 360 Learning Program encompasses six stages of activity to support successful learning for students:

1. **Assessment:** Students take a diagnostic pre-assessment lab to benchmark their knowledge of various networking topics.
2. **Planning:** Based on the pre-assessment, students create a learning plan that uses a mix of learning components to focus their study.
3. **Learning:** Students learn by participating in lessons and lectures, reading materials, and working with peers and instructors.

4. **Practice:** Students use the practice exercises to apply learning on actual network equipment.
5. **Mastery:** Students measure their understanding by completing assessments of knowledge and skill for various approaches to solving network problems.
6. **Review:** Students review their work with a mentor or instructor and tune their skills with tips and best practices.

Detailed information on the 360 program can be found on the following URL:

[https://learningnetwork.cisco.com/community/learning\\_center/cisco\\_360/360-rs](https://learningnetwork.cisco.com/community/learning_center/cisco_360/360-rs).

## Equipment List and IOS Requirements

The lab exam tests any feature that can be configured on the equipment and the IOS versions indicated here:

- 1841 Series routers—IOS 12.4(T) – Advanced Enterprise Services
- 3825 Series routers—IOS 12.4(T) – Advanced Enterprise Services
- Catalyst 3560 Series switches running IOS version 12.2—Advanced IP Services

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# Practice Lab 3—The VPN Lab

The CCIE exam commences with 2 hours of troubleshooting followed by 5 1/2 hours of configuration and a final 30 minutes of additional questions. This lab has been timed to last for 8 hours of configuration and self-troubleshooting, so aim to complete the lab within this period.

Then either score yourself at this point or continue until you feel you have met all the objectives. You now are going to be guided through the equipment requirements and pre-lab tasks in preparation for taking this practice lab.

If you don't own six routers and four switches, consider using the equipment available and additional lab exercises and training facilities that can be found within the CCIE R&S 360 program. Detailed information on the 360 program and CCIE R&S exam can be found on the following URLs, respectively:

[https://learningnetwork.cisco.com/community/learning\\_center/cisco\\_360/360-rs](https://learningnetwork.cisco.com/community/learning_center/cisco_360/360-rs)

[https://learningnetwork.cisco.com/community/certifications/ccie\\_routing\\_switching](https://learningnetwork.cisco.com/community/certifications/ccie_routing_switching)

## NOTE

The 3825s used in this lab were loaded with c3825-adventerprisek9-mz.124-6.T.bin, and the 3725 was loaded with c3725-adventerprisek9-mz.124-6.T.bin.

## Equipment List

You need the following hardware and software components to begin this practice lab:

- Six routers loaded with Cisco IOS Software Release 12.4 Advanced Enterprise image and the minimum interface configuration, as documented in Table 3-1

**TABLE 3-1** Hardware Required per Router

Router	Model	Ethernet I/F	Serial I/F
R1	3825	1	1
R2	3725	—	2
R3	3825	—	2
R4	3825	1	1
R5	3825	1	1
R6	3825	2	—

## NOTE

The 3550 in this lab was loaded with c3550-ipservicesk9-mz.122-25.SEE.bin, and the 3560s with c3560-ipservicesk9-mz.122-25.SEE.bin.

**NOTE**

Notice in the initial configurations supplied that some interfaces do not have IP addresses pre-configured. This is because either you do not use that interface or you need to configure this interface from default within the exercise. The initial configurations supplied should be used to preconfigure your routers and switches before the lab starts.

If your routers have different interface speeds than those used within this book, adjust the bandwidth statements on the relevant interfaces to keep all interface speeds in line. This ensures that you do not get unwanted behavior because of differing Interior Gateway Protocol (IGP) metrics.

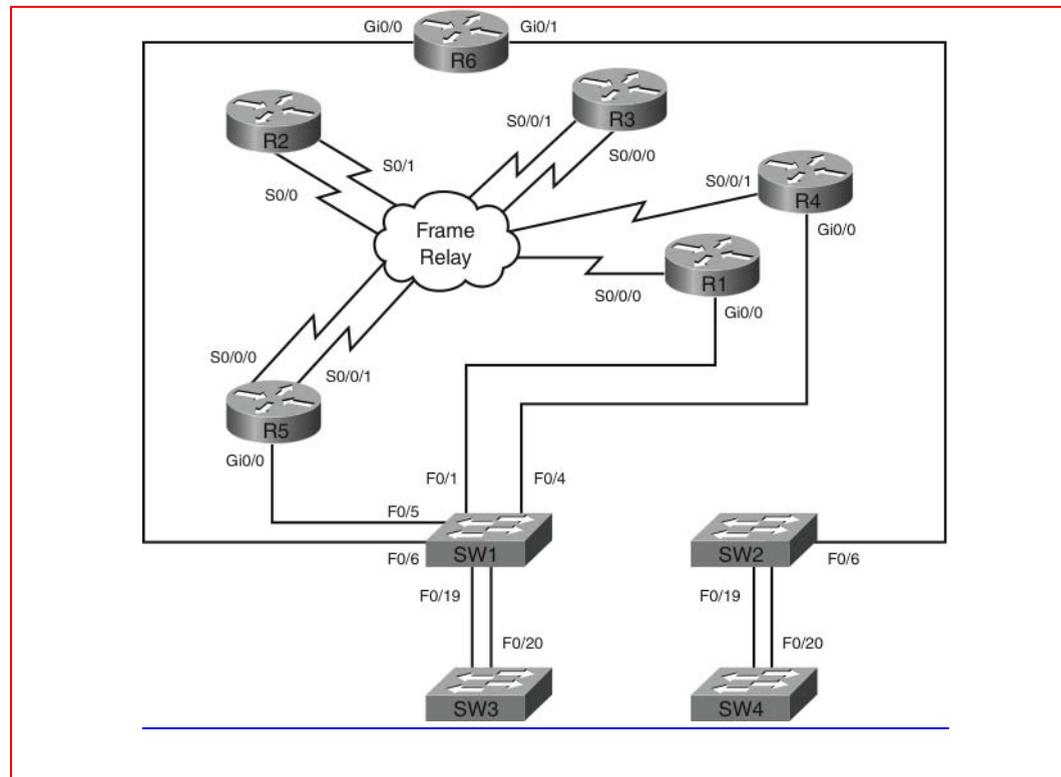
- One 3550 switch with Cisco IOS Software Release 12.2 IP Services and three 3560 switches with Cisco IOS Software Release 12.2 IP Services.

## Setting Up the Lab

You can use any combination of routers as long as you fulfill the requirements within the topology diagram, as shown in Figure 3-1. However, it is recommended that you use the same model of routers because this makes life easier if you load configurations directly from those supplied into your own devices.

## Lab Topology

This practice lab uses the topology as outlined in Figure 3-1, which you must re-create with your own equipment.



**FIGURE 3-1**  
Lab Topology Diagram

## Switch Instructions

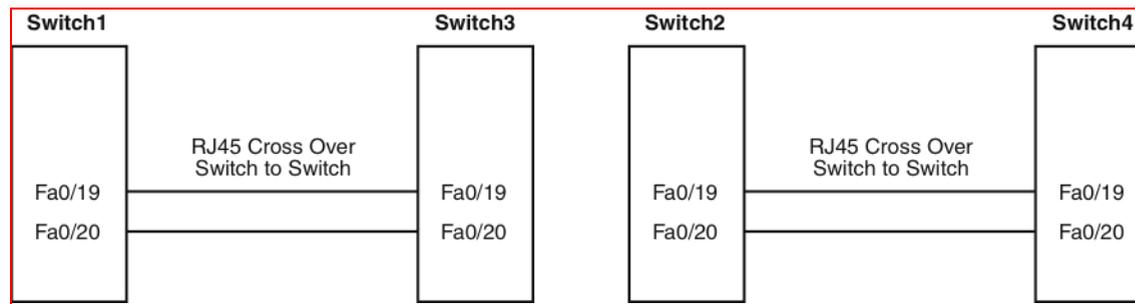
Configure VLAN assignments from the configurations supplied on the CD-ROM or from Table 3-2.

**TABLE 3-2** VLAN Assignment

VLAN	Switch1	Switch2	Switch3	Switch4
45	Fa0/4, Fa0/5, Fa0/6	—	—	—
200	Fa0/19	—	—	—
400	—	Fa0/19	—	—
Trunk	Fa0/1	Fa0/6	—	—
Trunk	Fa0/20	Fa0/20	Fa0/20	Fa0/20

Connect your switches with RJ45 Ethernet Cross Over cables, as shown in Figure 3-2.

**FIGURE 3-2**  
Switch-to-Switch Connectivity



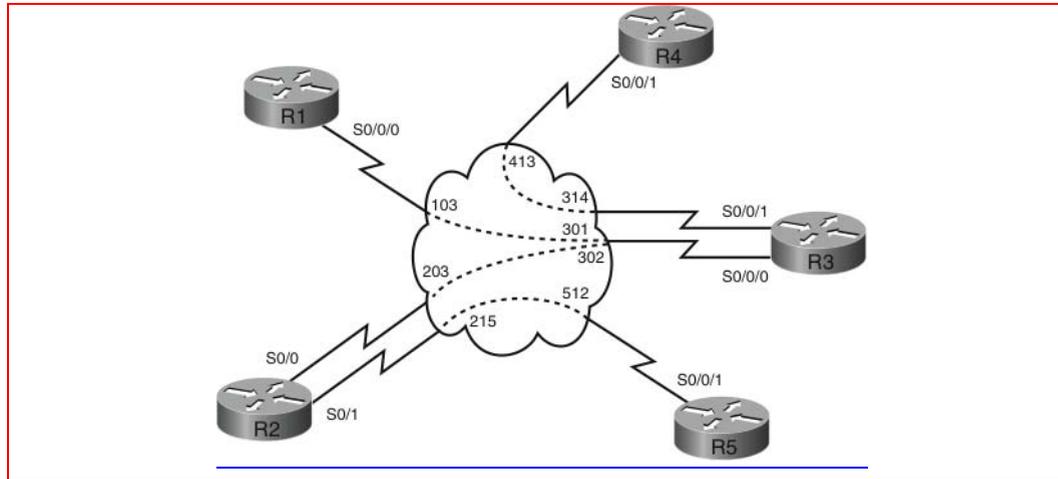
## Frame Relay Instructions

Configure one of the routers you are going to use in the lab as a Frame Relay switch, or have a dedicated router purely for this task. This lab uses a dedicated router for the Frame Relay switch. A fully meshed environment is configured between all the Frame Relay routers. Pay attention in the lab as to which permanent virtual circuits (PVC) are actually required. Keep the encapsulation and Local Management Interface (LMI) settings to default for this exercise, but experiment with the settings outside these labs because you could be required to configure the Frame Relay switching within your actual lab.

If you are using your own equipment, keep the data circuit-terminating equipment (DCE) cables at the frame switch end for simplicity and provide a clock rate to all links from this end.

After configuration, the Frame Relay connectivity represents the logical Frame Relay network, as shown in Figure 3-3.

**FIGURE 3-3**  
Frame Relay Logical  
Connectivity



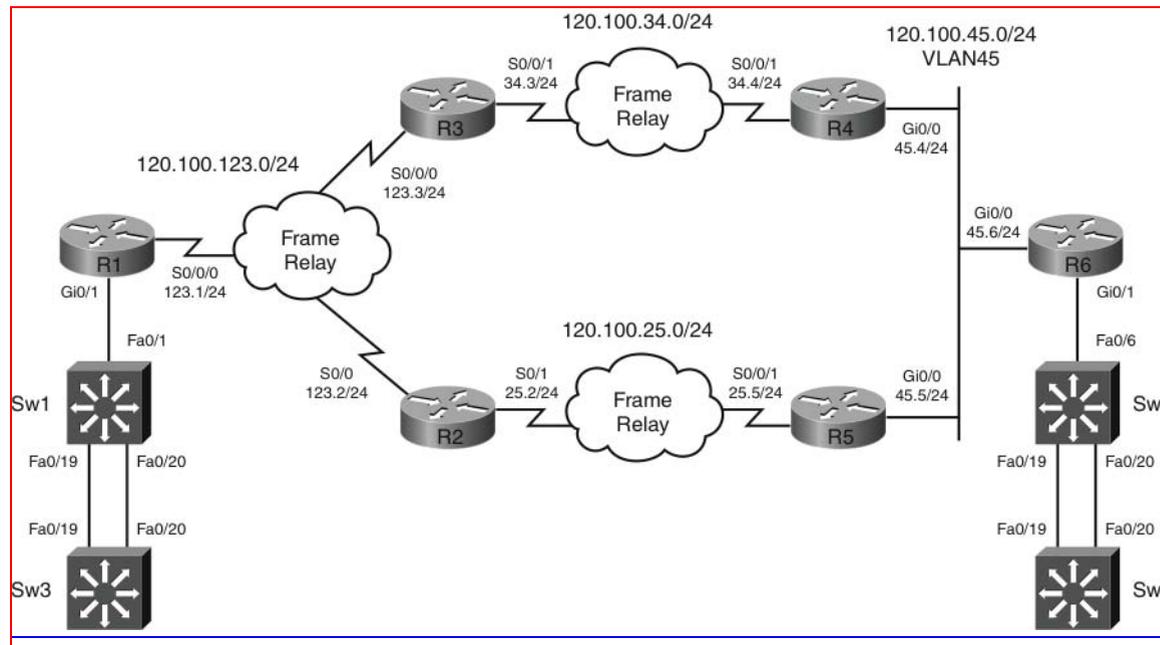
## IP Address Instructions

In the actual CCIE lab, you find that the majority of your IP addresses are preconfigured. For this exercise you are required to configure your IP addresses as shown in Figure 3-4 or to load the initial router configurations supplied. If you are manually configuring your equipment, be sure you include the following loopback addresses:

```
R1 Lo0 120.100.1.1/32
R2 Lo0 120.100.2.1/32
R3 Lo0 120.100.3.1/32
R4 Lo0 120.100.4.1/32
R5 Lo0 120.100.5.1/32
R6 Lo0 120.100.6.1/32
SW1 Lo0 10.1.1.1/24
    Lo1 10.1.2.1/24
    Lo2 10.1.3.1/24
SW2 Lo0 10.2.2.1/24
```

Lo1 10.2.3.1/24  
 Lo2 10.2.4.1/24  
 SW3 Lo0 10.33.33.1/24  
 Lo1 10.33.34.1/24  
 Lo2 10.33.35.1/24  
 SW4 Lo0 10.44.44.1/24  
 Lo1 10.44.45.1/24  
 Lo2 10.44.46.1/24

**FIGURE 3-4**  
 IP Addressing Diagram



## Pre-Lab Tasks

- Build the lab topology per Figure 3-1 and Figure 3-2.
- Configure your Frame Relay switch router to provide the necessary data-link connection identifiers (DLCI) per Figure 3-3.