CCNA R&S: Scaling Networks
Scope and Sequence

**Last updated September 5, 2018**

Target Audience

The Cisco CCNA® Routing and Switching curriculum is designed for Cisco Networking Academy® students who are seeking entry-level jobs in the ICT industry or hope to fulfill prerequisites to pursue more specialized ICT skills. CCNA Routing and Switching provides an integrated and comprehensive coverage of networking topics, from fundamentals to advanced applications and services, while providing opportunities for hands-on practical experience and career skills development.

The curriculum is appropriate for students at many education levels and types of institutions, including high schools, secondary schools, universities, colleges, career and technical schools, and community centers.

Curriculum Overview

The CCNA Routing and Switching curriculum consists of four courses that make up the recommended learning path. Students will be prepared to take the Cisco CCENT® certification exam after completing a set of two courses and the CCNA Routing and Switching certification exam after completing a set of four courses. The curriculum also helps students develop workforce readiness skills and builds a foundation for success in networking-related careers and degree programs. Figure 1 shows the different courses included in the CCNA Routing and Switching curriculum.

Figure 1.   CCNA Routing and Switching Courses
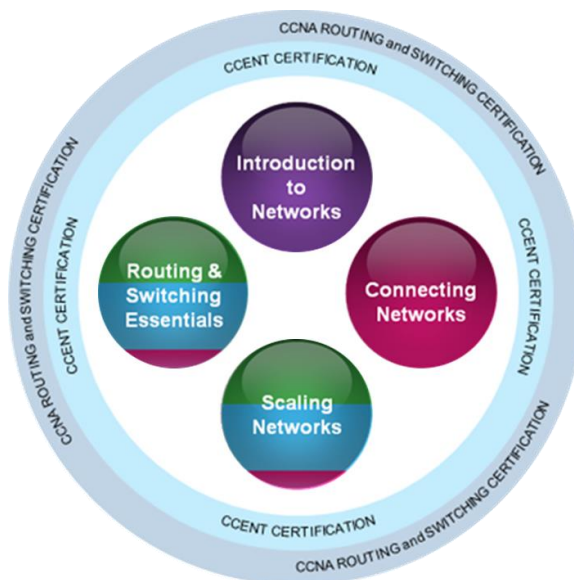
In each course, Networking Academy™ students will learn technology concepts with the support of interactive media and apply and practice this knowledge through a series of hands-on and simulated activities that reinforce their learning.

CCNA Routing and Switching teaches comprehensive networking concepts and skills, from network applications to the protocols and services provided to those applications by the lower layers of the network. Students will progress from basic networking to more complex enterprise and theoretical networking models later in the curriculum.

CCNA Routing and Switching includes the following features:

- Students learn the basics of routing, switching, and advanced technologies to prepare for the Cisco CCENT and CCNA certification exams, networking related degree programs, and entry-level networking careers.
- The language used to describe networking concepts is designed to be easily understood by learners at all levels and embedded interactive activities help reinforce comprehension.
- Courses emphasize critical thinking, problem solving, collaboration, and the practical application of skills.
- Multimedia learning tools, including videos, games, and quizzes, address a variety of learning styles and help stimulate learning and promote increased knowledge retention.
- Hands-on labs and Cisco® Packet Tracer simulation-based learning activities help students develop critical thinking and complex problem solving skills.
- Embedded assessments provide immediate feedback to support the evaluation of knowledge and acquired skills.

## Course Structure and Sequences

Market research and global employers have consistently indicated that the skills gap for general networking skills is shrinking, while the skills gap for essential networking technologies such as security, voice, and wireless, and for emerging technologies, such as data center, cloud, and video, is growing. As a global leader in technology and networking, Cisco developed the new CCENT and CCNA Routing and Switching certifications and curriculum to remain aligned with the rapidly changing global job market and trends.

As a result of the changes to the certification exams, students can choose to pursue Cisco advanced technology certifications after achieving the prerequisite CCENT certification. The recommended CCNA Routing and Switching course flow supports student flexibility by helping students prepare for the CCENT certification exam after the first two courses, and helps them prepare for the CCNA certification exam after completing all four courses.

Figure 2 shows the four courses that make up the recommended CCNA Routing and Switching course sequence: **Introduction to Networks**, **Routing and Switching Essentials**, **Scaling Networks**, and **Connecting Networks**.

Networking Academy strongly encourages all academies to teach this recommended course sequence, since these courses may significantly enhance employment opportunities by enabling students to acquire skills they can immediately use in their jobs, and may accelerate their ability to pursue advanced technology certifications.

Figure 2.   Recommended CCNA Routing and Switching Course Flow
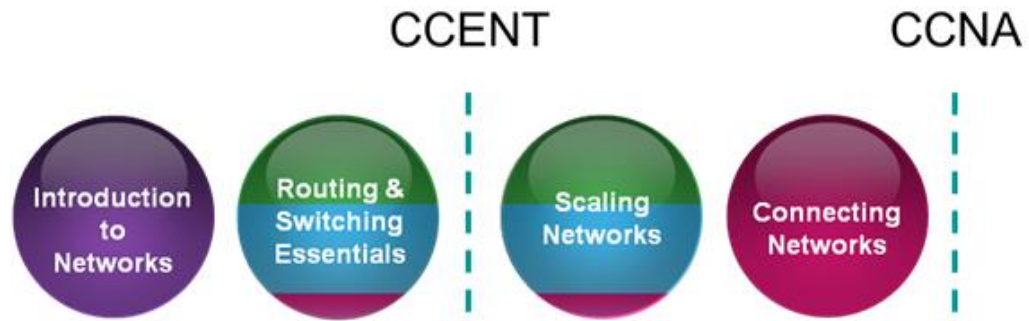
Lab Equipment Requirements

Detailed equipment information, including descriptions and part numbers, is available in the CCNA Equipment List, which is located on the Cisco NetAcad Equipment Information site. Please refer to that document for the latest information, which includes specifications for the following minimum equipment required:

- 3 CISCO1941/K9 Integrated Services Routers Generation 2 (ISR-G2)
- 3 HWIC-2T Serial WAN Interface Cards
- 3 WS-C2960-24TC-L Cisco Catalyst switches
- Assorted Ethernet and Serial cables

Scaling Networks 6.0 Course Outline

Table 1.   Scaling Networks 6.0

Chapter	Scaling Networks
1	LAN Design
2	Scaling VLANs
3	STP
4	Etherchannel and HSRP
5	Dynamic Routing
6	EIGRP
7	EIGRP Tuning and Troubleshooting
8	Single-Area OSPF
9	Multiarea OSPF
10	OSPF Tuning and Troubleshooting

Scaling Networks

This course describes the architecture, components, and operations of routers and switches in larger and more complex networks. Students learn how to configure routers and switches for advanced functionality. By the end of this course, students will be able to configure and troubleshoot routers and switches and resolve common issues with OSPF, EIGRP, and STP in both IPv4 and IPv6 networks. Students will also develop the knowledge and skills needed to implement a WLAN in a small-to-medium network.

Students who complete the Scaling Networks course will be able to perform the following functions:

- Determine how a router will forward traffic based on the contents of a routing table.
- Implement EIGRP.
- Implement OSPF.
- Implement VLANs.
- Implement enhanced switching technologies and first hop redundancy protocols.
- Design a small multi-site business network.

Scaling Networks Detailed Course Outline

Table 2. Scaling Networks Course Outline

Ch.		Scaling Networks	Objectives
1		LAN Design	
	1.1	Campus Wired LAN Designs	Explain why it is important to design a scalable hierarchial network.
	1.2	Selecting Network Devices	Select network devices based on feature compatibility and network requirement.
2		Scaling VLANs	
	2.1	VTP, Extended VLANs, and DTP	Configure enhanced inter-switch connectivity technologies.
	2.2	Troubleshoot Multi-VLAN Issues	Troubleshoot issues in an inter-VLAN routing environment.
	2.3	Layer 3 Switching	Implement inter-VLAN routing using Layer 3 switching to forward data in a small to medium-sized business LAN.
3		STP	
	3.1	Spanning Tree Concepts	Build a simple switched network with redundant links.
	3.2	Varieties of Spanning Tree Protocols	Explain how different varieties of spanning tree protocols operate.
	3.3	Spanning Tree Configuration	Implement PVST+ and Rapid PVST+ in a switched LAN environment.
4		Enterchannel and HSRP	
	4.1	Link Aggregation Concepts	Explain link aggregation operation in a switched LAN environment.
	4.2	Link Aggregation Configuration	Implement link aggregation to improve performance on high-traffic switch links.
	4.3	First Hop Redundancy Protocols	Implement HSRP.
5		Dynamic Routing	
	5.1	Dynamic Routing Protocols	Explain the features and characteristics of dynamic routing protocols.
	5.2	Distance Vector Dynamic Routing	Explain how distance vector routing protocols operate.
	5.3	Link-State Dynamic Routing	Explain how link-state protocols operate.
6		EIGRP	
	6.1	EIGRP Characteristics	Explain the features and characteristics of EIGRP.

Ch.	Scaling Networks		Objectives
	6.2	Implement EIGRP for IPv4	Implement EIGRP for IPv4 in a small to medium-sized business network.
	6.3	EIGRP Operation	Explain how EIGRP operates in a small to medium-sized business network.
	6.4	Implement EIGRP for IPv6	Implement EIGRP for IPv6 in a small to medium-sized business network.
7	EIGRP Tuning and Troubleshooting		
	7.1	Tune EIGRP	Configure EIGRP to improve network performance.
	7.2	Troubleshoot EIGRP	Troubleshoot common EIGRP configuration issues in a small to medium-sized business network.
8	Single-Area OSPF		
	8.1	OSPF Characteristics	Explain how single-area OSPF operates.
	8.2	Single-Area OSPFv2	Implement single-area OSPFv2.
	8.3	Single-Area OSPFv3	Implement single-area OSPFv3.
9	Multiarea OSPF		
	9.1	Multiarea OSPF Operation	Explain how multiarea OSPF operates in a small to medium-sized business network.
	9.2	Configuring Multiarea OSPF	Implement multiarea OSPFv2 and OSPFv3.
10	OSPF Tuning and Troubleshooting		
	10.1	Advanced Single-Area OSPF Configurations	Configure OSPF to improve network performance.
	10.2	Troubleshooting Single-Area OSPF Implementations	Troubleshoot common OSPF configuration issues in a small to medium-sized business network.