

CCNA R&S: Connecting Networks Scope and Sequence

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Target Audience

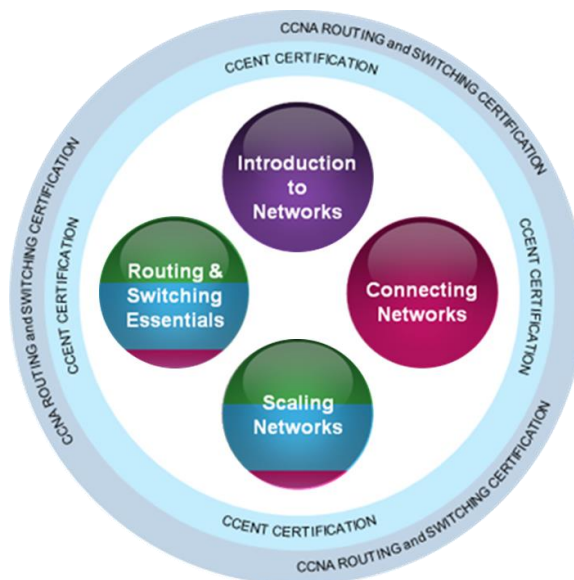
The Cisco CCNA® Routing and Switching curriculum is designed for Cisco Networking Academy® students who are seeking entry-level jobs in the ICT industry or hope to fulfill prerequisites to pursue more specialized ICT skills. CCNA Routing and Switching provides an integrated and comprehensive coverage 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

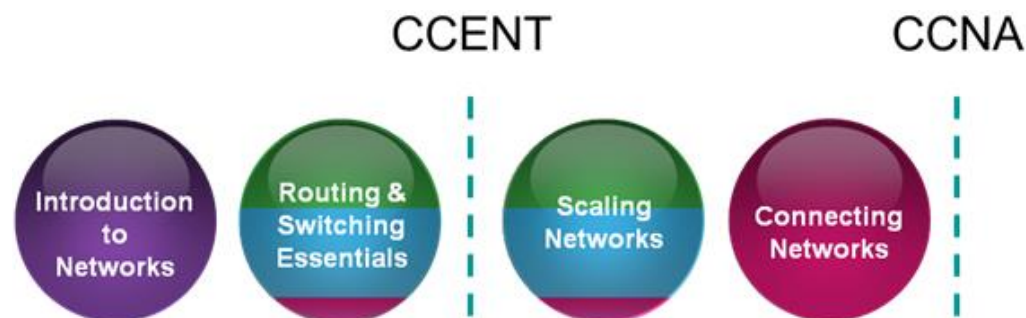
Market research and global employers have consistently indicated that the skills gap for general networking skills is shrinking, while the skills gap for essential networking technologies such as security, voice, and wireless, and for emerging technologies, such as data center, cloud, and video, is growing. 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

Connecting Networks 6.0 Course Outline

Table 1. Connecting Networks 6.0

Chapter	Connecting Networks
1	WAN Concepts
2	Point-to-Point Connections
3	Branch Connections
4	Access Control Lists
5	Network Security and Monitoring
6	Quality of Service
7	Network Evolution
8	Network Troubleshooting

Connecting Networks

This course focuses on the WAN technologies and network services required by converged applications in a complex network. By the end of this course, students will be able to configure PPPoE, GRE, single-homed eBGP, extended IPv4 and IPv6 ACLs. Students will also develop the knowledge and skills needed to implement a WLAN in a small-to-medium network. For LANs, students will be able to configure SNMP and Cisco SPAN. Students will also develop knowledge about QoS and the trends in networking including Cloud, virtualization, and SDN.

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

- Explain network technologies.

- Implement access control lists (ACLs) to filter traffic.
- Configure Ethernet switch ports.
- Design a small multi-site business network.
- Select WAN access technologies.
- Configure a serial interface to enable WAN communication.
- Configure an Ethernet interface to enable broadband communication given service provider requirements.
- Implement remote access and site-to-site VPNs.
- Use monitoring tools and network management protocols to troubleshoot data networks.
- Configure monitoring tools available for small to medium-sized business networks.
- Configure initial settings on a network device.
- Explain how quality of service (QoS) mechanism support network communication requirements.

Connecting Networks Detailed Course Outline

Table 2. Connecting Networks Course Outline

Ch.	Connecting Networks		Objectives
1	WAN Concepts		
	1.1	WAN Technologies Overview	Explain WAN access technologies available to small to medium-sized business networks.
	1.2	Selecting a WAN Technology	Select WAN access technologies to satisfy business requirements.
2	Point-to-Point Connections		
	2.1	Serial Point-to-Point Overview	Configure HDLC encapsulation.
	2.2	PPP Operation	Explain how PPP operates across a point-to-point serial link.
	2.3	Configure PPP	Configure PPP encapsulation.
	2.4	Troubleshooting PPP	Troubleshoot PPP.
3	Branch Connections		
	3.1	Remote Access Connections	Select broadband remote access technologies to support business requirements.
	3.2	PPPoE	Configure a Cisco router with PPPoE.
	3.3	VPNs	Explain how VPNs secure site-to-site and remote access connectivity.
	3.4	GRE	Implement a GRE tunnel.
	3.5	eBGP	Implement eBGP in a single-homed remote access network.
4	Access Control Lists		
	4.1	Standard ACL Operation and Configuration Review	Configure standard IPv4 ACLs.

	4.2	Extended IPv4 ACLs	Configure extended IPv4 ACLs.
	4.3	IPv6 ACLs	Configure IPv6 ACLs.
	4.4	Troubleshoot ACLs	Troubleshoot ACLs.
5	Network Security and Monitoring		
	5.1	LAN Security	Explain how to mitigate common LAN security attacks.
	5.2	SNMP	Configure SNMP to monitor network operations in a small to medium-sized business network.
	5.3	Cisco Switch Port Analyzer (SPAN)	Troubleshoot a network problem using SPAN.
6	Quality of Service		
	6.1	QoS Overview	Explain the purpose and characteristics of QoS.
	6.2	QoS Mechanisms	Explain how networking devices implement QoS.
7	Network Evolution		
	7.1	Internet of Things	Explain the value of the Internet of Things.
	7.2	Cloud and Virtualization	Explain why cloud computing and virtualization are necessary for evolving networks.
	7.3	Network Programming	Explain why network programmability is necessary for evolving networks.
8	Network Troubleshooting		
	8.1	Troubleshooting Methodology	Explain troubleshooting approaches for various network problems.
	8.2	Troubleshooting Scenarios	Troubleshoot end-to-end connectivity in a small to medium-sized business network, using a systematic approach.



Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV Amsterdam,
The Netherlands

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