CCNA Routing and Switching Scope and Sequence (DRAFT)

Last updated 14 June 2013

This DRAFT Scope and Sequence for the Cisco CCNA® Routing and Switching curriculum is an evolving document that will be revised on a regular basis as we progress though the development and release cycles. Our objective is to share detailed information about the curriculum and the courses with academies and instructors as soon as possible. For the most recent version of this document, please view the CCNA Routing and Switching Instructor Resource Spotlight page in the Cisco NetSpace™ learning environment.

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 seven courses, with four courses that make up the recommended learning path and three additional courses that support the transition of CCNA Exploration instructors and students to the new CCNA Routing and Switching curriculum. No transitional courses are needed for CCNA Discovery instructors and students.

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 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
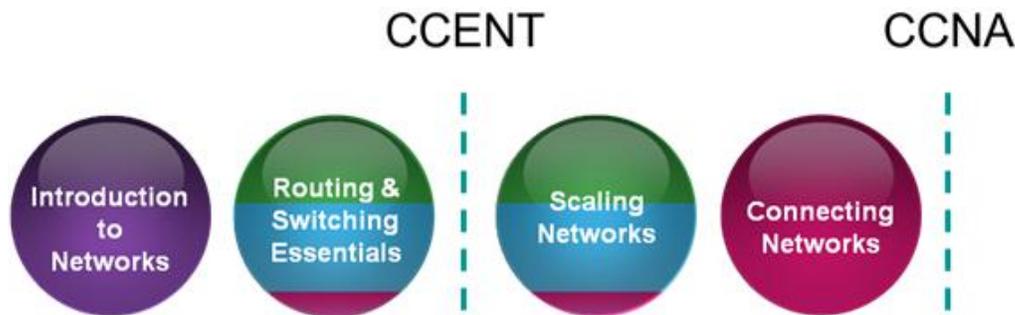
The three additional courses shown in Figure 3 are designed to support the transition of CCNA Exploration instructors and students to the new CCNA Routing and Switching curriculum.

Figure 3.   Additional CCNA Routing and Switching Courses to Support Transition

The three courses supporting transition, Network Basics, Routing Protocols, and Switched Networks, will be offered with the following conditions:

- The courses are being developed and released to support institutions that are not able to transition immediately to the recommended four courses.
- The courses will be retired one year after all of the new courses are released. Target retirement date for the three additional courses is December 2014.
- The courses will be offered in English only and will not be translated.
- The fourth course in this sequence is the same Connecting Networks course used in the recommended flow shown in Figure 2.

Lab Equipment Requirements

Detailed equipment information, including descriptions and part numbers, is available in the CCNA Equipment List, which is located on the Cisco NetSpace 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-C2960-24TT-L Cisco Catalyst switches
- 2 Linksys EA Series routers (2700, 3500, 4500) or equivalent
- Assorted Ethernet and Serial cables and hubs

Recommended Courses Outlines

Table 1.   Introduction to Networks and Routing and Switching Essentials Course Outlines

Chapter	Introduction to Networks	Routing and Switching Essentials
1	Exploring the Network	Introduction to Switched Networks
2	Configuring a Network Operating System	Basic Switching Configuration
3	Network Protocols and Communications	VLANs
4	Network Access	Routing Concepts
5	Ethernet	Inter-VLAN Routing
6	Network Layer	Static Routing
7	Transport Layer	Routing Dynamically
8	IP Addressing	Single-Area OSPF
9	Subnetting IP Networks	Access Control Lists
10	Application Layer	DHCP
11	It's a Network	Network Address Translation for IPv4

Introduction to Networks

This course introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum. By the end of the course, students will be able to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes.

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

- Understand and describe the devices and services used to support communications in data networks and the Internet
- Understand and describe the role of protocol layers in data networks
- Understand and describe the importance of addressing and naming schemes at various layers of data networks in IPv4 and IPv6 environments
- Design, calculate, and apply subnet masks and addresses to fulfill given requirements in IPv4 and IPv6 networks
- Explain fundamental Ethernet concepts such as media, services, and operations

- Build a simple Ethernet network using routers and switches
- Use Cisco command-line interface (CLI) commands to perform basic router and switch configurations
- Utilize common network utilities to verify small network operations and analyze data traffic

Routing and Switching Essentials

This course describes the architecture, components, and operations of routers and switches in a small network. Students learn how to configure a router and a switch for basic functionality. By the end of this course, students will be able to configure and troubleshoot routers and switches and resolve common issues with RIPv1, RIPv2, single-area and multi-area OSPF, virtual LANs, and inter-VLAN routing in both IPv4 and IPv6 networks.

Students who complete the Routing and Switching Essentials course will be able to perform the following functions:

- Understand and describe basic switching concepts and the operation of Cisco switches
- Understand and describe enhanced switching technologies such as VLANs, VLAN Trunking Protocol (VTP), Rapid Spanning Tree Protocol (RSTP), Per VLAN Spanning Tree Protocol (PVSTP), and 802.1q
- Configure and troubleshoot basic operations of a small switched network
- Understand and describe the purpose, nature, and operations of a router, routing tables, and the route lookup process
- Configure and verify static routing and default routing
- Understand and describe how VLANs create logically separate networks and how routing occurs between them
- Understand and describe dynamic routing protocols, distance vector routing protocols, and link-state routing protocols
- Configure and troubleshoot basic operations of routers in a small routed network:
  - Routing Information Protocol (RIPv1 and RIPv2)
  - Open Shortest Path First (OSPF) protocol (single-area OSPF)
- Configure and troubleshoot VLANs and inter-VLAN routing
- Understand and describe the purpose and types of access control lists (ACLs)
- Configure, monitor, and troubleshoot ACLs for IPv4 and IPv6
- Understand and describe the operations and benefits of Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) for IPv4 and IPv6
- Understand and describe the operations and benefits of Network Address Translation (NAT)
- Configure and troubleshoot NAT operations

Table 2.   Scaling Networks and Connecting Networks Course Outlines

Chapter	Scaling Networks	Connecting Networks
1	Building a Small to Medium-Sized Network	Connecting to the WAN
2	DHCP	Configuring Serial Connections
3	The Spanning Tree Protocol	Broadband Solutions
4	Link Aggregation	Securing Site-to-Site Connectivity
5	Troubleshooting Layer 2 Issues	Monitoring the Network
6	Implementing EIGRP	Troubleshooting the Network
7	Implementing Multi-Area OSPF	Network Architectures
8	IOS File Management	

Scaling Networks

This course describes the architecture, components, and operations of routers and switches in a larger and more complex network. 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, STP, and VTP in both IPv4 and IPv6 networks. Students will also develop the knowledge and skills needed to implement DHCP and DNS operations in a network.

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

- Configure and troubleshoot DHCP and DNS operations for IPv4 and IPv6
- Understand and describe the operations and benefits of the Spanning Tree Protocol (STP)
- Configure and troubleshoot STP operations
- Understand and describe the operations and benefits of link aggregation and Cisco VLAN Trunk Protocol (VTP)
- Configure and troubleshoot VTP, STP, and RSTP
- Configure and troubleshoot basic operations of routers in a complex routed network for IPv4 and IPv6
  - Open Shortest Path First (OSPF) protocol (single-area OSPF and multi-area OSPF)
  - Enhanced Interior Gateway Routing Protocol (EIGRP)
- Configure and troubleshoot advanced operations of routers and implement RIP, OSPF, and EIGRP routing protocols for IPv4 and IPv6
- Manage Cisco IOS® Software licensing and configuration files

Connecting Networks

This course discusses the WAN technologies and network services required by converged applications in a complex network. The course enables students to understand the selection criteria of network devices and WAN technologies to meet network requirements. Students learn how to configure and troubleshoot network devices and resolve common issues with data link protocols. Students will also develop the knowledge and skills needed to implement IPSec and virtual private network (VPN) operations in a complex network.

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

- Understand and describe different WAN technologies and their benefits
- Understand and describe the operations and benefits of virtual private networks (VPNs) and tunneling
- Configure and troubleshoot serial connections

- Configure and troubleshoot broadband connections
- Configure and troubleshoot IPSec tunneling operations
- Monitor and troubleshoot network operations using syslog, SNMP, and NetFlow
- Design network architectures:
  - Borderless networks
  - Data centers and virtualization
  - Collaboration technology and solutions

Additional Courses Supporting Transition Outlines

Table 3.   CCNA Routing and Switching Additional Courses Outlines

Ch	Network Basics	Routing Protocols	Switched Networks
1	Exploring the Network	Routing Concepts	Introduction to Switched Networks
2	Configuring a Network Operating System	Static Routing	Basic Switching Concepts and Configuration
3	Network Protocols and Communications	Routing Dynamically	VLANs
4	Application Layer	EIGRP	LAN Redundancy
5	Transport Layer	EIGRP Advanced Configuration	Link Aggregation
6	Network Layer	Single-Area OSPF	Inter-VLAN Routing
7	IP Addressing	Adjust and Troubleshoot Single-Area OSPF	DHCP
8	Subnetting IP Networks	Multi-Area OSPF	Wireless LANs
9	Network Access	Access Control Lists	
10	Ethernet	IOS File Management	
11	It's a Network		

Network Basics

This course introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum. By the end of this course, students will be able to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes.

Students who complete Network Basics will be able to perform the following functions:

- Understand and describe the devices and services used to support communications in data networks and the Internet
- Understand and describe the role of protocol layers in data networks
- Understand and describe the importance of addressing and naming schemes at various layers of data networks in IPv4 and IPv6 environments
- Design, calculate, and apply subnet masks and addresses to fulfill given requirements in IPv4 and IPv6 networks
- Explain fundamental Ethernet concepts such as media, services, and operations
- Build a simple Ethernet network using routers and switches

- Use Cisco command-line interface (CLI) commands to perform basic router and switch configurations
- Utilize common network utilities to verify small network operations and analyze data traffic

Routing Protocols

This course describes the architecture, components, and operations of routers, and explains the principles of routing and routing protocols. Students learn how to configure a router for basic and advanced functionality. By the end of this course, students will be able to configure and troubleshoot routers and resolve common issues with RIPv1, RIPv2, EIGRP, and OSPF in both IPv4 and IPv6 networks.

Students who complete the Routing Protocols course will be able to perform the following functions:

- Understand and describe the purpose, nature, and operations of a router, routing tables, and the route lookup process
- Configure and verify static routing and default routing
- Understand and describe dynamic routing protocols, distance vector routing protocols, and link-state routing protocols
- Configure and troubleshoot basic operations of routers in a complex routed network for IPv4 and IPv6:
    ◦ Routing Information Protocol (RIPv1 and RIPv2)
    ◦ Open Shortest Path First (OSPF) protocol (single-area OSPF and multi-area OSPF)
    ◦ Enhanced Interior Gateway Routing Protocol (EIGRP)
- Configure and troubleshoot advanced operations of routers and implement RIP, OSPF, and EIGRP routing protocols for IPv4 and IPv6
- Understand and describe the purpose and types of access control lists (ACLs)
- Configure, monitor, and troubleshoot ACLs for IPv4 and IPv6
- Manage Cisco IOS Software licensing and configuration files

Switched Networks

This course describes the architecture, components, and operations of a converged switched network. Students learn about the hierarchical network design model and how to configure a switch for basic and advanced functionality. By the end of this course, students will be able to troubleshoot and resolve common issues with Virtual LANs, VTP, and inter-VLAN routing in a converged network. Students will also develop the knowledge and skills needed to implement a WLAN in a small-to-medium network.

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

- Understand and describe basic switching concepts and the operation of Cisco switches
- Understand and describe enhanced switching technologies such as VLANs, VLAN Trunking Protocol (VTP), Rapid Spanning Tree Protocol (RSTP), Per VLAN Spanning Tree Protocol (PVSTP), and 802.1q
- Configure and troubleshoot basic operations of a small switched network
- Understand and describe how VLANs create logically separate networks and how routing occurs between them
- Configure and troubleshoot VLANs, trunking on Cisco switches, inter-VLAN routing, VTP, and RSTP
- Understand and describe the operations and benefits of Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) for IPv4 and IPv6

- Configure and troubleshoot DHCP and DNS operations for IPv4 and IPv6
- Understand and describe the purpose of the components in a small wireless network:
  - Service Set Identification (SSID)
  - Basic Service Set (BSS)
  - Extended Service Set (ESS)
- Compare and contrast Wi-Fi Protected Access (WPA) security features and the capabilities of open, Wired Equivalent Privacy (WEP), and WPA1/2 networks
- Configure and troubleshoot basic operations of a small wireless network

Recommended Courses Detailed Outlines

Table 4.   Introduction to Networks and Routing and Switching Essentials Detailed Course Outlines

Ch.	Introduction to Networks		Routing and Switching Essentials	
1	Exploring the Network		Introduction to Switched Networks	
	1.1	Globally Connected	1.1	LAN Design
	1.2	LANs, WANs, and the Internet	1.2	The Switched Environment
	1.3	The Network as a Platform		
	1.4	The Changing Network Environment		
2	Configuring a Network Operating System		Basic Switching Concepts and Configuration	
	2.1	IOS Bootcamp	2.1	Basic Switch Configuration
	2.2	Getting Basic	2.2	Switch Security: Management and Implementation
	2.3	Addressing Schemes		
3	Network Protocols and Communications		VLANs	
	3.1	Rules of Communications	3.1	VLAN Segmentation
	3.2	Network Protocols and Standards	3.2	VLAN Implementations
	3.3	Moving Data in the Network	3.3	VLAN Security and Design
4	Network Access		Routing Concepts	
	4.1	Physical Layer Protocols	4.1	Initial Configuration of a Router
	4.2	Network Media	4.2	Routing Decisions
	4.3	Data Link Layer Protocols	4.3	Router Operation
	4.4	Media Access Control	4.4	VLAN Best Practices
5	Ethernet		Inter-VLAN Communication	
	5.1	Ethernet Protocol	5.1	Inter-VLAN Routing Configuration
	5.2	Address Resolution Protocol	5.2	Troubleshoot Inter-VLAN Routing
	5.3	LAN Switches	5.3	Layer 3 Switching
6	Network Layer		Static Routing	
	6.1	Network Layer Protocols	6.1	Static Routing Implementation
	6.2	Routing	6.2	Configure Static and Default Routers
	6.3	Routers	6.3	Review of CIDR and VLSM
	6.4	Configuring a Cisco Router	6.4	Configure Summary and Floating Static Routes
			6.5	Troubleshoot Static and Default Route Issues

7	Transport Layer			Routing Dynamically	
	7.1	Transport Layer Protocols		7.1	Dynamic Routing Protocols
	7.2	TCP and UPD		7.2	Distance Vector Routing Protocols
				7.3	RIP and RIPng Routing
				7.4	Link-State Dynamic Routing
				7.5	The Routing Table
8	IP Addressing			Single-Area OSPF	
	8.1	IPv4 Network Addresses		8.1	Characteristics of OSPF
	8.2	IPv6 Network Addresses		8.2	Configuring Single-Area OSPFv2
	8.3	Connectivity Verification		8.3	Configuring Single-Area OSPFv3
9	Subnetting IP Networks			Access Control Lists	
	9.1	Subnetting an IPv4 Network		9.1	IP ACL Operation
	9.2	Addressing Schemes		9.2	Standard IPv4 ACLs
	9.3	Design Considerations for IPv6		9.3	Extended IPv4 ACLs
				9.4	Debug with ACLs
				9.5	Troubleshoot ACLs
				9.6	IPv6 ACLs
10	Application Layer			DHCP	
	10.1	Application Layer Protocols		10.1	Dynamic Host Configuration Protocol v4
	10.2	Well-Known Application Layer Protocols and Services		10.2	Dynamic Host Configuration Protocol v6
	10.3	The Message Heard Around The World			
11	It's a Network			Network Address Translation for IPv4	
	11.1	Create and Grow		11.1	NAT Operation
	11.2	Keeping the Network Safe		11.2	Configuring NAT
	11.3	Basic Network Performance		11.3	Troubleshooting NAT
	11.4	Managing IOS Configuration Files			
	11.5	Integrated Routing Services			

Table 5. Scaling Networks and Connecting Networks Detailed Course Outlines

Ch.	Scaling Networks			Connecting Networks	
1	Building a Small to Medium-Sized Network			Connecting to the WAN	
	1.1	Switch Hardware		1.1	Hierarchical Network Design
	1.2	Router Hardware		1.2	WAN Technologies
2	DHCP			Configuring Serial Connections	
	2.1	Implementing DHCP Options		2.1	Configuring PPP
	2.2	DHCP Operation		2.2	Configuring Frame Relay
	2.3	Troubleshooting DHCP		2.3	Troubleshooting WAN Connectivity
3	The Spanning Tree Protocol			Broadband Solutions	
	3.1	Spanning Tree Operation		3.1	Compare Broadband Solutions
	3.2	Configuring Spanning Tree		3.2	Configuring xDSL Connectivity

4	Link Aggregation			Securing Site-to-Site Connectivity	
	4.1	Link Aggregation Configuration	4.1	Tunneling	
	4.2	Link Aggregation Concepts	4.2	Configuring IPSec VPN	
	4.3	Troubleshooting Link Aggregation			
5	Troubleshooting Layer 2 Issues			Monitoring the Network	
	5.1	Troubleshooting Switching	5.1	Syslog Operation	
			5.2	SNMP Operation	
6	Implementing EIGRP			Troubleshooting the Network	
	6.1	Characteristics of EIGRP	6.1	Troubleshooting with a Systematic Approach	
	6.2	Configuring EIGRP for IPv4	6.2	Interpreting Network Monitoring Output	
	6.3	Operation of EIGRP			
	6.4	Configuring EIGRP for IPv6			
	6.5	Troubleshooting EIGRP Implementation			
7	Implementing Multi-Area OSPF			Network Architectures	
	7.1	Multi-Area OSPFv2	7.1	Borderless Networks	
	7.2	Multi-Area OSPF Operation	7.2	Virtualization	
	7.3	Configuring Multi-Area OSPFv3	7.3	Collaboration	
	7.4	Troubleshooting Complex OSPF Networks			
8	IOS File Management				
	8.1	Managing IOS System Files			
	8.2	IOS Licensing			

Additional Courses Supporting Transition Detailed Outlines

Table 6.   Network Basics, Routing Protocols, and Switched Networks Detailed Course Outlines

Ch.	Network Basics		Routing Protocols		Switched Networks	
1	Exploring the Network		Routing Concepts		Introduction to Switched Networks	
	1.1	Communicating in a Network-Centric World	1.1	Initial Configuration of a Router	1.1	LAN Design
	1.2	The Network as a Platform	1.2	Routing Decisions	1.2	Convergence in Switched Networks
	1.3	LANs, WANs, and the Internet	1.3	Router Operation	1.3	Selecting LAN Switches
	1.4	The Expanding Network				
2	Configuring a Network Operating System		Static Routing		Basic Switching Concepts and Configuration	
	2.1	IOS Bootcamp	2.1	Static Routing Implementation	2.1	Frame Forwarding
	2.2	Getting Basic	2.2	Configuring Static and Default Routes	2.2	Basic Switch Port Configuration
	2.3	Addressing Schemes	2.3	Review of CIDR and VLSM	2.3	Connecting to a Switch Remotely
			2.4	Configure Summary and Floating Static Routes	2.4	Implementing Switch Security
			2.5	Troubleshoot Static and Default Route Issues		

#	Section		#	Section		#	Section
3	Network Protocols and Communications			Routing Dynamically			VLANs
	3.1	Network Protocols and Standards	3.1	Dynamic Routing Protocols		3.1	VLAN Segmentation
	3.2	Using Requests for Comments	3.2	Distance Vector Dynamic Routing		3.2	Configuring VLANs
	3.3	Moving Data in the Network	3.3	RIP and RIPng Routing		3.3	VLAN Security
			3.4	Link-State Dynamic Routing		3.4	VTP Configuration
			3.5	The Routing Table			
4	Application Layer			EIGRP			LAN Redundancy
	4.1	Application Layer Protocols	4.1	Characteristics of EIGRP		4.1	Spanning Tree Concepts
	4.2	Well-Known Application Layer Protocols and Services	4.2	Configuring EIGRP for IPv4		4.2	Per VLAN Spanning Tree
			4.3	Operation of EIGRP		4.3	Spanning Tree Configuration
			4.4	Configuring EIGRP for IPv6		4.4	First Hop Redundancy Protocol
5	Transport Layer			EIGRP Advanced Configurations and Troubleshooting			Link Aggregation
	5.1	Transport Layer Protocols	5.1	Advanced EIGRP Configurations		5.1	Link Aggregation Concepts
	5.2	TCP and UPD	5.2	Troubleshoot EIGRP Implementation		5.2	Link Aggregation Configuration
6	Network Layer			Single-Area OSPF			Inter-VLAN Routing
	6.1	Network Layer Protocols	6.1	Characteristics of OSPF		6.1	Inter-VLAN Routing Configuration
	6.2	Routing	6.2	Configuring Single-Area OSPFv2		6.2	Layer 3 Switching
	6.3	Routers	6.3	Configuring Single-Area OSPFv3		6.3	Troubleshooting Switching Implementations
	6.4	Configuring a Cisco Router					
7	IP Addressing			Adjust and Troubleshoot Single-Area OSPF			DHCP
	7.1	IPv4 Network Addresses	7.1	Advanced Single-Area OSPF Configurations		7.1	Dynamic Host Configuration Protocol v4
	7.2	IPv6 Network Addresses	7.2	Troubleshooting Single-Area OSPF Implementations		7.2	Dynamic Host Configuration Protocol v6
	7.3	Connectivity Verification					
8	Subnetting IP Networks			Multi-Area OSPF			Wireless LANs
	8.1	Subnetting an IPv4 Network	8.1	Multi-Area OSPF Operation		8.1	Wireless LAN Concepts
	8.2	Addressing Schemes	8.2	Configuring Multi-Area OSPF		8.2	Wireless LAN Standards
	8.3	Design Considerations for IPv6					8.3	Wireless LAN Security
						8.4	Wireless LAN Configuration
9	Network Access			Access Control Lists			
	9.1	Data Link Layer	9.1	IP ACL Operation			
	9.2	Media Access Control	9.2	Standard IPv4 ACLs			
	9.3	Physical Layer	9.3	Extended IPv4 ACLs			
	9.4	Network Media	9.4	Debug with ACLs			
			9.5	Troubleshooting ACLs			

			9.6	IPv6 ACLs		
10	Ethernet		IOS File Management			
	10.1	Ethernet Protocol	10.1	Managing IOS System Files		
	10.2	Address Resolution Protocol	10.2	IOS Licensing		
	10.3	LAN Switches				
11	It's a Network					
	11.1	Create and Grow				
	11.2	Keeping the Network Safe				
	11.3	Basic Network Performance				
	11.4	Managing IOS Configuration Files				