

**CCNA DISCOVERY v4.0  
WORKING AT A SMALL-TO-MEDIUM BUSINESS  
OR ISP  
INSTRUCTOR REFERENCE GUIDE**

**COMPARISON OF NEW CURRICULA WITH  
EXISTING CURRICULA**



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## **Working for a Small-to-Medium Business or ISP Summary**

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New CCNA Discovery curriculum has been created to motivate and excite students by matching curriculum with teaching methodologies, student interests, and goals. Features include:

- Learning by “doing”
- Introduction to advanced technologies and converged networks
- Updated course GUI
- More efficient translation

The CCNA Discovery curriculum can either be an Independent curriculum or possibly integrated into broader course of study at upper-secondary institutions, career and technical schools, and colleges.

## Working for a Small-to-Medium Business or ISP Course Outline

Following is the outline for this new course with indications as to which topics contain new content. Existing content listed in red text indicates that the topic number is from CCNA 1 v3.1, rather than CCNA 2. Existing content listed in black text indicates that the topic number is from CCNA 2 v3.1 (unless otherwise indicated).

Course Outline			New/ Existing Content
<b>1.0</b>		<b>The Internet and Its Uses</b>	
	1.1	<b>What is the Internet?</b>	
		1.1.1 Origins of the Internet	2.1.2
		1.1.2 History of the Internet	2.1.2
		1.1.3 Uses of the Internet	2.1.5
		1.1.4 Internet Standards	2.1.5
	1.2	<b>Internet Service Providers</b>	
		1.2.1 Delivering Internet Services to End Users	1.1.5
		1.2.2 Internet Hierarchy	New
		1.2.2 Connection Options	1.1.5
		1.2.3 Services Provided by an ISP	New
		1.2.4 Role and Responsibilities within an ISP	New
	1.3	<b>ISP Connectivity</b>	
		1.3.1 ISP Requirements	New
		1.3.1 ISP Tiers	New
		1.3.2 Roles and Responsibilities within an SP	New
	1.4	Chapter Summary	
		1.4.1 Summary	
	1.5	Chapter Quiz	
		1.5.1 Quiz	
<b>2.0</b>		<b>ISP Support</b>	
	2.1	<b>Helpdesk Operations</b>	
		2.1.1 Helpdesk Organization	New
		2.1.2 Roles of ISP Technicians	New
		2.1.1 Helpdesk Mission	New
		2.1.2 ISP Helpdesk Technician	New
		2.1.3 Interacting with Customers	New
	2.2	<b>OSI Model</b>	
		2.2.1 The OSI Model	2.3.3
		2.2.2 OSI Model Protocols and Technologies	2.3.3,9.2.3
		2.2.3 Troubleshooting using the OSI Model	9.2.3
	2.3	<b>ISP Troubleshooting</b>	
		2.3.1 Help Desk Scenarios	New

Course Outline				New/ Existing Content
		2.3.2	Creating and Using Help Desk Records	New
		2.3.1	Diagnostic Guidelines	New
		2.3.2	Trouble Tickets	New
		2.3.3	Customer Site Procedures	New
	2.4		Chapter Summary	
		2.4.1	Summary	
	2.5		Chapter Quiz	
		2.5.1	Quiz	
<b>3.0</b>			<b>Planning a Network Upgrade</b>	
	3.1		<b>Common Issues</b>	
		3.1.1	Conducting a Site Survey	Case Study CCNA 1
		3.1.2	Physical vs. Logical Topology	Case Study CCNA 1
		3.1.3	Network Requirements Documentation	Case Study CCNA 1
	3.2		<b>Planning the Network Upgrade</b>	
		3.2.1	Network Upgrades	Case Study CCNA 1
		3.2.2	Physical Environment	Case Study CCNA 1
		3.2.3	Cabling Considerations	Case Study CCNA 1
		3.2.4	Structured Cable	Case Study CCNA 1
	3.3		<b>Purchasing and Maintaining Equipment</b>	
		3.3.1	Purchasing Equipment	New
		3.3.2	Selecting Network Devices	5.1.6,5.1.7,5.1.8, 5.1.9, 5.1.10,
		3.3.3	Selecting LAN Devices	5.1.6,5.1.7,5.1.8, 5.1.9, 5.1.10
		3.3.4	Selecting Internetworking Devices	New
		3.3.5	Networking Equipment Upgrades	New
		3.3.6	Reliability and Availability	New
	3.4		Chapter Summary	
		3.4.1	Summary	
	3.5		Chapter Quiz	
		3.5.1	Quiz	
<b>4.0</b>			<b>Planning the Addressing Structure</b>	
	4.1		<b>IP Addressing in the LAN</b>	
		4.1.1	Review of IP Addresses	9.2.1,
		4.1.2	Subnetting a Network	9.2.7
		4.1.3	Classful Subnetting	9.2.3, 9.2.4,
		4.1.4	Custom Subnet Masks	10.3.3
		4.1.5	Communicating between Subnets	10.3.6
		4.1.6	IPv6	New
	4.2		<b>NAT and PAT</b>	
		4.2.1	Basic Network Address Translation (NAT)	9.2.6
		4.2.2	IP NAT Terms	9.2.6

Course Outline			New/ Existing Content
	4.2.3	Static and Dynamic NAT	New (previously in CCNA 4)
	4.2.4	Port-Based Network Address Translation (PAT)	New (previously in CCNA 4)
	4.2.5	IP NAT Issues	New (previously in CCNA 4)
4.3		Chapter Summary	
	4.3.1	Summary	
4.4		Chapter Quiz	
	4.4.1	Quiz	
<b>5.0</b>		<b>Configuring Network Devices</b>	
	5.1	<b>Initial ISR Router Configuration</b>	
	5.1.1	ISR	New
	5.1.2	Physical Setup of the ISR Router	New,2.1.1
	5.1.3	In-band and Out-of-band Router Configuration	New, 1.2.5
	5.1.4	Cisco IOS Programs	2.1.1,2.1.2
	5.1.5	Device Configuration Files	2.2.1
	5.1.6	Document Your Router Configuration	3.2.8
	5.2	<b>Configuring an ISR with SDM</b>	
	5.2.1	Configuring an ISR with SDM	New
	5.2.2	SDM Express	New
	5.2.3	Configuring a Serial WAN Connection	New
	5.2.4	Cisco SDM and SDM Express	New
	5.2.5	Configuring Dynamic NAT Using Cisco SDM	New
	5.3	<b>Configuring a Router Using IOS CLI</b>	
	5.3.1	Command Line Interface and Modes	2.1.3
	5.3.2	Using the Cisco IOS CLI	3.1.1
	5.3.3	Using Show Commands	3.1.4
	5.3.4	Basic Configuration	3.1.2,3.1.3,3.1.4, 3.1.5, 3.1.5, 3.1.7, 3.2.4,3.2.5,3.2.6,3.2.7
	5.3.5	Configuring an Interface	3.1.7,3.2.2, 3.2.3
	5.3.6	Configure a Default Route	6.1.4
	5.3.7	Configuring a DHCP Services	New (previously in CCNA 4)
	5.3.8	Configuring Static NAT using Cisco IOS CLI	New (previously in CCNA 4)
	5.3.9	Backing up a Cisco Router Configuration to a TFTP Server	3.2.8, 3.2.9
	5.4	<b>Initial Cisco 2960 Switch Configuration</b>	
	5.4.1	Standalone Switches	New (previously in CCNA 3)
	5.4.2	Power up the Cisco 2960 Switch	New (previously in CCNA 3)
	5.4.3	Initial Switch Configuration	New (previously in

Course Outline				New/ Existing Content
				CCNA 3)
		5.4.4	Connecting the LAN Switch to the Router	New (previously in CCNA 3)
	5.5		<b>Connecting the CPE to the ISP</b>	
		5.5.1	Installing the CPE	New
		5.5.2	Workplace Safety	Case Study CCNA 1
		5.5.3	Customer Connections over WAN	1.1.1, 1.1.2,1.1.4
		5.5.4	Choosing a WAN Connection	1.1.4
		5.5.5	Configuring a Cisco Router using SSH	New
		5.5.6	Configuring WAN Connections	New (previously in CCNA 4)
	5.6		Chapter Summary	
		5.6.1	Summary	
	5.7		Chapter Quiz	
		5.7.1	Quiz	
<b>6.0</b>			<b>Routing</b>	
	6.1		<b>Enabling Routing Protocols</b>	
		6.1.1	Routing	6.1.1,6.1.2,6.1.3, 6.1.4
		6.1.2	Routing Protocols	6.2.1,6.2.4
		6.1.3	Common Interior Routing Protocols	6.2.2, 6.3.1
		6.1.4	Routing Within an Organization	6.2.5, 6.2.6
		6.1.5	Configure and Verify RIP	7.2.1,7.2.2
	6.2		<b>Exterior Routing Protocols</b>	
		6.2.1	Autonomous System	6.2.3,6.3.4
		6.2.2	Routing Between Autonomous Systems	7.3.1
		6.2.3	Routing Across the Internet	6.1.1, 6.3.1
		6.2.4	Exterior Routing Protocols and the ISP	New
		6.2.5	Configure and Verify BGP	New
	6.3		Chapter Summary	
		6.3.1	Summary	
	6.4		Chapter Quiz	
		6.4.1	Quiz	
<b>7.0</b>			<b>ISP Services</b>	
	7.1		<b>Introducing ISP Services</b>	
		7.1.1	ISP Services	New
		7.1.2	Reliability and Availability	10.1.7
	7.2		<b>Protocols that Support a ISP</b>	
		7.2.1	Review of TCP/IP Protocols	10.1.1
		7.2.2	TCP	10.1.2,10.1.3, 10.1.4, 10.1.5,10.1.6
		7.2.3	Differences between TCP and UDP	10.1.7
		7.2.4	Support Multiple Services	10.2.1,10.2.5

Course Outline			New/ Existing Content
	7.3	<b>Domain Name Service</b>	
		7.3.1 TCP/IP Host Name	11.2.2
		7.3.2 DNS	11.2.2
		7.3.3 DNS Name Resolution	New
		7.3.4 Provisioning DNS Servers	New
	7.4	<b>Services and Protocols</b>	
		7.4.1 Services	11.2.1
		7.4.2 Supporting HTTP and HTTPS	New, 11.2.2
		7.4.3 Supporting FTP	New, 11.2.3
		7.4.4 Supporting SMTP, POP3, and IMAP	New, 11.2.5
	7.5	Chapter Summary	
		7.5.1 Summary	
	7.6	Chapter Quiz	
		7.6.1 Quiz	
<b>8.0</b>		<b>ISP Responsibility</b>	
	8.1	<b>ISP Security Considerations</b>	
		8.1.1 ISP Security	New
		8.1.2 Best Practices for Security	New
		8.1.3 Data Encryption	New CCNA 1
	8.2	<b>Security Tools</b>	
		8.2.1 Access Lists and Port Filtering	11.1.1
		8.2.2 Firewalls	11.2.5
		8.2.3 IDS and IPS	New
		8.2.4 Wireless Security	New, 3.3.4
		8.2.5 Host Security	New
	8.3	<b>Monitoring and Managing the ISP</b>	
		8.3.1 Service Level Agreements	New
		8.3.2 Monitoring Network Link Performance	New
		8.3.3  Selecting In-Band and Out-of-Band Tools	New, 11.2.6,  6.2.3, 6.2.4, 6.2.5, 6.2.6 (previously in CCNA 4)
	8.4	<b>Backups and Disaster Recovery</b>	
		8.4.1 Backup Media	New
		8.4.2 Methods of File Backup	New
		8.4.3 Best Practices for Disaster Recovery	New
	8.5	Chapter Summary	
		8.5.1 Summary	
	8.6	Chapter Quiz	
		8.6.1 Quiz	
<b>9.0</b>		<b>Putting It All Together</b>	

Course Outline			New/ Existing Content
		<b>9.0.1</b>	<b>Summary</b>

## Working for a Small-to-Medium Business or ISP Summary of Skills and Equipments Changes

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There are new skills as well as new equipment being introduced in the CCNA Discovery curriculum.

### **NEW SKILLS REQUIRED**

Following is a list of the new skills that shall be required for the Working for a Small-to-Medium Business or ISP course:

- Creating Help Desk Documentation
- Installing a Cisco ISR device
- Use of the SDM router and security configuration
- Planning for Networking Upgrades
- Configuration of NAT/PAT
- Configuration of DHCP
- Configuration of SSH
- Configuration of EIGRP and BGP
- Understand AAA security
- Switch configuration
- Contrast IDS and IPS systems
- Disaster Recovery Planning including running backups

### **EQUIPMENT REQUIRED**

#### **Academies adopting all CCNA Discovery courses and/or all CCNA Exploration courses - Minimum Required Equipment Bundle:**

In order to be able to implement the different topologies that are used in the lab exercises of the CCNA curricula, Academies teaching the four courses of either CCNA Discovery and/or CCNA Exploration require as a minimum the following equipment:

- 3 Cisco 1841 Integrated Routers with Base IP IOS 12.4
- 3 2960 switches
- 2 Linksys wireless routers (Linksys 300N is preferred but 54G is alternative) or SOHO equivalent

Note: The routers and switches in this equipment bundles can be substituted by other models of Cisco routers and switches with equal or higher specifications.



**Academies adopting CCNA Discovery: Networking for Home and Small Businesses and Working for a Small-to-Medium Business or ISP courses ONLY- Minimum Required Equipment Bundle:**

Academies that decide to offer only Networking for Home and Small Businesses and Working for a Small-to-Medium Business or ISP do not require the full functionality of the 2960 switches and can substitute them with Ethernet Switch Interface Cards for the Cisco 1841 Integrated Routers. The following is the minimum equipment required:

- 3 Cisco 1841 Integrated Routers with Base IP IOS 12.4
- 3 four port Ethernet Switch Interface Cards for the 1841 Routers
- 2 Linksys wireless routers (Linksys 300N is preferred but 54G is alternative) or SOHO equivalent

Note: The routers and switches in this equipment bundles can be substituted by other models of Cisco routers and switches with equal or higher specifications.

**Additional Lab Equipment Required:**

In addition to the networking equipment specified above, the lab topologies of CCNA Discovery and Exploration require the use of the following equipment and accessories:

- 1 PC acting as an Application Server
- 2 desktop/laptop PCs acting as clients
- NIC Cards for the PC server and PC clients
- 2 Wireless LAN Adapters for the client PCs
- Ethernet cables and Serial Cables
- Cable-making and testing equipment

**IOS Option:**

In order to keep equipment investment to a minimum, the Product Development team designed all lab exercises for both CCNA Discovery and Exploration using the BASE IP IOS 12.4. For those Academies that wish to drill deeper into some of the routing functionalities, Cisco recommends an upgrade of the BASE IP IOS to the Advanced Services IOS. In addition to the software itself, this upgrade requires additional DRAM and Flash memories for the 1841 Routers. Details of the upgrade can be found in the Advanced IP Options tab of this document.

**Mounting Rack Accessories:**

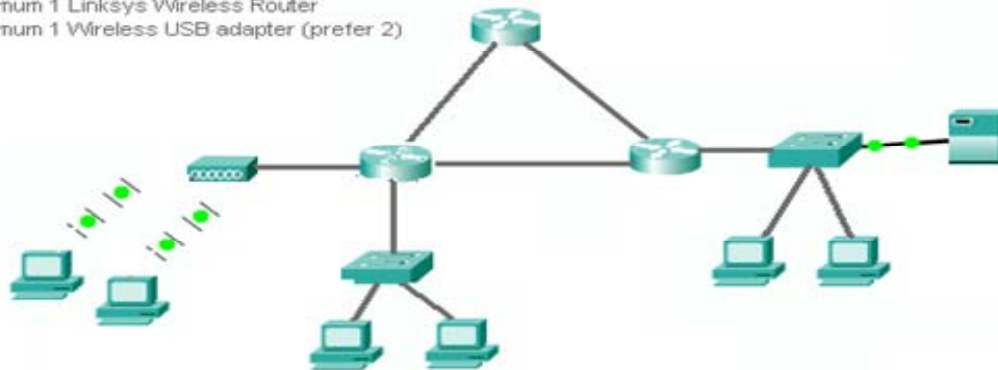
The 1841 is a desktop router. Academies that prefer to install lab equipment in standard 19" racks can use the optional Rack Kit for the 1841.

**Topologies:**

**CCNA Discovery 2 – Networking at an SMB or ISP  
Lab Topology (Preliminary)**

Students will configure RIPv2 routing in a three router topology. There is no specific configuration of the 2960 switches, other than basic setup. Topology will be reconfigured during the course. Recommended 6 to 8 students per pod.

: Pod  
3 1841 ISR routers  
2 2960 Switches  
minimum 1 Linksys Wireless Router  
minimum 1 Wireless USB adapter (prefer 2)



## Summary of Changes

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The CCNA Discovery curriculum has some pedagogical changes that have been applied to make the learning process more effective. Working for a Small-to-Medium Business or ISP takes the point of view of the ISP and the technician working with the ISP to deliver the customer (home and small business) a high speed secure network connection. The changes impact the following:

- Three-layer model
- OSI model
- IP Addresses
- Network design
- Packet Tracer

### THREE-LAYER MODEL

The basic three-layer model of network design (Access, Distribution, and Core) is currently in CCNA 4 v3.1. In the CCNA Discovery v4.0 curriculum, it is presented very early in Networking for Home and Small Businesses, to provide a framework for students to learn the concepts of the different types of network topologies, broadcast domains, and the purposes and function of switching and routing.

### OSI MODEL

The OSI model is referenced throughout CCNA Discovery curriculum, but is not presented at the beginning of Networking for Home and Small Businesses as the instructional framework of the course. The model is presented in the Networking for Home and Small Businesses material when the student is learning the TCP/IP protocol suite to enable the student to visualize the hierarchy of protocol operation within a host computer and to illustrate the encapsulation process. In Working for a Small-to-Medium Business, the OSI and TCP/IP models are discussed in more detail and used in the network troubleshooting procedures.

### IP ADDRESSES

When providing instruction on IP addresses, CCNA Discovery will introduce the concept of the default subnet mask as the subnet mask that the system will use if you do not specify a subnet mask. Students will be taught how to take the subnet mask and calculate the IP address information. The concepts of classes of IP addresses will not be included. Binary math will not be emphasized.

### NETWORK DESIGN

Network design is incorporated throughout CCNA Discovery. Networking for Home and Small Businesses includes a planning component. Working for a Small-to-Medium Business and the third CCNA Discovery course includes design concepts. The fourth CCNA Discovery course emphasizes the topic.

## **NETWORK SECURITY**

Network security is incorporated into the design of the network. The Security Device Manager (SDM) is used for the configuration on the Cisco Integrated Routers, helping setup firewalls and intrusion detection system (IDS) and intrusion prevention system (IPS) concepts. The concepts of AAA model (Authentication, Authorization, and Accounting) is used from the point of view of the ISP.

## **ROUTER CONFIGURATION**

The use of the Cisco SDM and the CLI (Command Line Interface) is compared and contrasted. The introduction of network services that were introduced in CCNA 3 and 4 v3.1 are now incorporated into SDM configuration and then observed with the CLI configuration. This allows the student to use the GUI first and then compare it to the command lines needed for the same configuration.

## **PACKET TRACER**

The use of Packet Tracer is integrated throughout CCNA Discovery. The new challenges for instructors will include how to keep students focused on the task at hand in PT.