



Lesson Plans

Cisco's CCNA Cisco Certified Network Associate

(Exam 640-801)
Version 5.2

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Course Overview

This course prepares students for the Cisco Certification Exam 640-801 – CCNA 3.0.

The CCNA course focuses on LAN segmentation and internetworking with routers.

Before beginning this course, students should have experience with:

- PC hardware and software configuration.
- Local area networking theory and configuration.

Preferably, students should have completed another industry certification such as CompTIA's Network +.

Introduction

This module introduces the networking basics that will be covered in the course. It also explains how to use the router simulator and lists all the commands available for the simulations.

Module 1

Module 1 covers basic networking concepts. It uses the OSI Model to introduce internetworking, and emphasizes the concepts important for routing.

Module 2

Module 2 explains Ethernet network design, bridging and switching, and routing. It describes how to reduce congestion and increase performance through network segmentation.

Module 3

Module 3 discusses the basic router physical and logical characteristics and initial router configuration tasks. It also discusses the executable modes available to configure the router and the basic functions of the system startup.

Module 4

Module 4 covers all the elements to consider when performing an initial router configuration. Topics include, hostnames, system passwords, banners, interfaces, back-to-back routers, and Cisco Discovery Protocol.

Module 5

Module 5 describes the basics of managing switches. Topics also include VLANs, trunking, and spanning tree.

Module 6

Module 6 explains the fundamental elements you will have to manage in order to manage TCP/IP.

Module 7

Module 7 describes using access lists to manage the traffic through a router.

Module 8

Module 8 explains the basics of IP routings. Topics include static routes, IGRP, OSPF, and EIGRP.

Module 9

Module 9 discusses the details of Wide Area Networking (WAN). This includes WAN structures, services and encapsulation.

Module 10

Module 10 covers Point-to-Point Protocol (PPP) concepts and how to configure PPP encapsulation.

Module 11

Module 11 explains frame relay from basic facts, to configuring frame relay, and on to troubleshooting frame relay.

Module 12

Module 12 explains ISDN standards used to provide fast digital transmission over telephone lines. It also includes configuring and troubleshooting ISDN connections.

Section 0.1: Introduction

Preparation

Familiarize yourself with the courseware. Experiment with the router simulations so you will be able to demonstrate them in class. The first router simulations in the course are in Section 3-2: Command Line Interface.

Lecture Focus Questions:

- What are the required prerequisites for this course?
- What are the two different paths Cisco provides for obtaining the CCNA certification and which one is recommended?

Time

About 15 minutes

Section 1.1: OSI Model Layers

Preparation

This section introduces the OSI model and explains how it relates to network communication. Familiarize yourself with the table from 1.15 OSI Model Layers before discussing the OSI Model Layers. Optional: Use an overhead projector for the students to view the table as you discuss the OSI Model Layers or make paper copies for the students to refer to.

CCNA 3.0 Objectives

- 401. Describe network communications using layered models
- 405. Evaluate TCP/IP communication process and its associated protocols
- 407. Evaluate rules for packet control

Lecture Focus Questions:

- What is the OSI model and why is it important in understanding networking?
- How does the third OSI model layer relate to administering routers?
- Which OSI model layer is concerned with MAC addresses?
- What protocols correspond to the Presentation and Session layers?
- What is the difference between the TCP and UDP protocols?
- What is the EIA/TIA 232 protocol concerned with?

Time

About 1 hour

Section 1.2: TCP/IP

Preparation

This section compares the TCP/IP stack to the OSI model stack. It also discusses a variety of protocols in the TCP/IP suite and IP address classes and ranges.

CCNA 3.0 Objectives:

- 102. Design an IP addressing scheme to meet design requirements
- 401. Describe network communications using layered models
- 405. Evaluate TCP/IP communication process and its associated protocols

Lecture Focus Questions:

- How does the DOD model correspond to the OSI model?
- Which TCP/IP protocols allow for copying and moving files?
- What does the Telnet protocol allow you to do?
- Which protocol includes a set of messages that controls how data moves through a network?
- What is the role of the subnet mask?
- What is the default address class of the IP address 132.11.166.5?
- What three address ranges are used for private IP addresses?
- What is the broadcast address of network 132.11.0.0?

Time

About 1 hour

Section 1.3: Device Communication

Preparation

This section explains data encapsulation. Familiarize yourself with how a packet is addressed as it travels through an internetwork and be prepared to answer any questions the students may have on this subject.

CCNA 3.0 Objectives:

- 401. Describe network communications using layered models
- 405. Evaluate TCP/IP communication process and its associated protocols

Lecture Focus Questions:

- Which OSI model layer uses service data units called frames?
- When moving from top to bottom through the OSI model layers, which comes first, packets or segments?
- A computer needs to send a message to another computer on the same network. What MAC address would go in to the destination portion of the frame?
- A computer needs to send a message to another computer on a different network. What MAC address would go in to the destination portion of the frame?
- As a packet moves from device to device through an internetwork, do the Network layer addresses change or remain the same?

Time

About 1 hour

Section 2.1: Ethernet

Preparation

This section examines the standards and design of an Ethernet network. Before class collect Ethernet equipment for show and tell.

CCNA 3.0 Objectives:

- 101. Design a simple LAN using Cisco Technology
- 104. Design a simple internetwork using Cisco technology
- 205. Implement a LAN
- 403. Compare and contrast key characteristics of LAN environments
- 405. Evaluate TCP/IP communication process and its associated protocols
- 406. Describe the components of network devices

Lecture Focus Questions:

- What is the purpose of the jam signal and the back off in Ethernet communications?
- What is the rated speed of Cat3 cable?
- What is the maximum cable length allowed for 100BaseTX?
- Two devices are using full-duplex communications with the 1000BaseT standards. What is the amount of bandwidth available?
- Under what conditions can you disable collision detection on an Ethernet network?

Time

About 1 hour

Section 2.2: Bridging and Switching

Preparation

This section explains how bridges and switches work and the advantages of each. Become familiar with the different methods the switch uses to forward packets.

CCNA 3.0 Objectives:

101. Design a simple LAN using Cisco Technology
401. Describe network communications using layered models
403. Compare and contrast key characteristics of LAN environments
405. Evaluate TCP/IP communication process and its associated protocols
406. Describe the components of network devices

Lecture Focus Questions:

- What is the difference between a bridge and a switch?
- What is the 80/20 rule of network segmentation with bridges?
- How do bridges and switches learn MAC addresses?
- What is the difference between the store-and-forward and the fragment-free switching methods?
- Which switching method is the fastest?

Time

About 1 hour

Section 2.3: Routing

Preparation

This section explains how routers route packets from one network to another. Familiarize yourself with the routing table that routers use to maintain information about destination networks.

CCNA 3.0 Objectives:

- 401. Describe network communications using layered models
- 405. Evaluate TCP/IP communication process and its associated protocols
- 406. Describe the components of network devices

Lecture Focus Questions:

- What type of information is stored in the routing table?
- What is convergence?
- What is the function of a routing protocol?
- What is the hop count?

Time

About 20 minutes

Section 2.4: LAN Segmentation

Preparation

This section covers the devices used for LAN segmentation to increase network performance, maximize bandwidth, and reduce congestion. Be able to discuss the guidelines used to make decisions about the appropriate connectivity device.

CCNA 3.0 Objectives:

- 101. Design a simple LAN using Cisco Technology
- 104. Design a simple internetwork using Cisco technology
- 403. Compare and contrast key characteristics of LAN environments

Lecture Focus Questions:

- What is the difference between a collision domain and a broadcast domain?
- Your network uses only hubs as connection devices. What happens to the number of collisions on the network as you add devices?
- Your network uses only switches as connection devices. All devices have a dedicated switch port. What happens to the number of collisions on the network as you add devices?
- What happens to the collision and broadcast domains as you segment the network with routers?
- Which device provides guaranteed bandwidth between devices?
- Which device can you use to filter broadcast traffic?

Time

About 45 minutes

Section 3.1: Connecting Devices

Preparation

This section examines the types of cables used to connect different networking devices. Get acquainted with the proper cable implementation of each type of cable.

CCNA 3.0 Objectives:

205. Implement a LAN

Lecture Focus Questions:

- What type of cable do you use to connect a PC to a router console port?
- What HyperTerminal settings should you use to connect to the router console for the first time?
- What are the requirements for using a VTY (virtual terminal) connection to a Cisco device?

Time

About 20 minutes

Section 3.2: Command Line Interface

Preparation

This section introduces the executable modes and commands the Cisco IOS uses to configure routers. Familiarize yourself with how to enter and exit the modes, and what commands are available in each mode.

CCNA 3.0 Objectives:

- 203. Configure a router for additional administrative functionality
- 208. Perform an initial configuration on a router
- 305. Troubleshoot a device as part of a working network

Lecture Focus Questions:

- What router mode is indicated by the # prompt?
- How would you get a list of allowed keywords for a command?
- You use help to get a list of keywords for a command. In the list of options you see: A.B.C.D. What should you type?
- How can you move the cursor backwards one word?
- How do you turn off console configuration messages?

Time

About 1 hour

Lab/Activity

- Turn Off the Command History
- Turn On the Command History
- Change the Command History Size
- View the Command History

Section 3.3: System Startup

Preparation

This section discusses the boot process at startup. Acquaint yourself with the basic router configuration concepts and tasks.

CCNA 3.0 Objectives:

- 203. Configure a router for additional administrative functionality
- 208. Perform an initial configuration on a router
- 305. Troubleshoot a device as part of a working network

Lecture Focus Questions:

- If the router can't find an IOS image in flash, where will it look next?
- What happens if the router can't find a configuration file at startup?
- What is the role of the configuration register?
- What configuration register value tells the router to skip the startup-config file?

Time

About 20 minutes

Section 3.4: Managing System Files

Preparation

This section explains how to manage and manipulate configuration files and IOS images using the copy command.

CCNA 3.0 Objectives:

- 207. Manage system image and device configuration files
- 208. Perform an initial configuration on a router

Lecture Focus Questions:

- Where is the startup-config file stored? Where is the running-config file stored?
- What is stored in ROM?
- What is the generic syntax for loading a configuration file into RAM?
- What does the boot system command do?

Time

About 45 minutes

Section 3.5: Using Show Commands

Preparation

This section summarizes the router configuration information that is available using the most common show commands.

CCNA 3.0 Objectives:

- 207. Manage system image and device configuration files
- 208. Perform an initial configuration on a router
- 305. Troubleshoot a device as part of a working network

Lecture Focus Questions:

- What types of information can be displayed using the *show* command?
- What does the term *administratively down* mean?
- In what modes is the *show* command available?

Time

About 15 minutes

Section 4.1: Hostname and Interface Descriptions

Preparation

This section introduces how to set a host name for a router and identify the different interfaces available. Before class, practice setting a hostname and setting the description of an interface.

CCNA 3.0 Objectives:

208. Perform an initial configuration on a router

Lecture Focus Questions:

- What mode and command do you use to set the router name?
- How do you identify an interface in the configuration file?

Time

About 45 minutes

Lab/Activity

- Modify the Router Name
- Set an Interface Description
- Set Interface Descriptions
- Configure Router and Interface Identification

Section 4.2: System Passwords

Preparation

This section explains how to set system passwords. Before class, practice configuring router passwords and restricting console and VTY access to a Cisco device.

CCNA 3.0 Objectives:

- 203. Configure a router for additional administrative functionality
- 208. Perform an initial configuration on a router

Lecture Focus Questions:

- What is the difference between the enable and the enable secret passwords?
- How would you require a password when logging on through the console?
- You have configured the VTY lines on a router with a password but you did not use the login command. Will VTY login be allowed? Will a password be required?
- What must you do to disable VTY login?

Time

About 1 hour

Lab/Activity

- Set Privileged Mode Passwords
- Set Enable Passwords
- Exploring Enable Passwords
- Set the Console Password
- Set a Virtual Terminal Password
- Set Router Passwords
- Set Console and Line Passwords
- Prevent VTY Access
- Control Router Access

Section 4.3: Banners

Preparation

This section explains how to display a message when a user logs in, the types of banners available, when banners will display, and how to create each type of banner.

CCNA 3.0 Objectives:

208. Perform an initial configuration on a router

Lecture Focus Questions:

- When do each of the banners display?
- What banner do you configure if you use the banner command without specifying the banner type?
- What is the role of the delimiting character?
- You type the following command at the router: *banner exec this is it.* What will show following a successful login?

Time

About 20 minutes

Lab/Activity

- Modify Router Banners 1
- Modify Router Banners 2
- Modify Router Banners 3
- Modify Router Banners 4

Section 4.4: Interfaces

Preparation

This section explains how to configure interfaces and view interface information.

CCNA 3.0 Objectives:

208. Perform an initial configuration on a router

Lecture Focus Questions:

- You have added an IP address to a router interface. What else must you do before you can ping the interface?
- What is indicated by the status "*line protocol down*?"
- You examine the router interface status and see the interface and line protocol are up. Will a ping to the interface succeed? Why or why not?

Time

About 30 minutes

Lab/Activity

- Set an IP Address
- Assign IP Addresses
- Examining Interface Status
- Examining Serial Interface Status
- Exploring Ping

Section 4.5: Back-to-Back Routers

Preparation

This section explains how to configure and troubleshoot routers using a back-to-back serial connection. Familiarize yourself with the simulations to configure routers and troubleshoot serial connections.

CCNA 3.0 Objectives:

208. Perform an initial configuration on a router

Lecture Focus Questions:

- What is a DTE device?
- What is the function of the clock rate command? When do you not need to set the clock rate?
- On which device must you configure the clock rate when connecting two routers back-to-back with a serial connection?

Time

About 45 minutes

Lab/Activity

- Exploring the Clock Rate
- Configure Back-to-Back Routers 1
- Configure Back-to-Back Routers 2
- Troubleshoot Serial Connections 1
- Troubleshoot Serial Connections 2
- Troubleshoot Serial Connections 3

Section 4.6: Cisco Discovery Protocol (CDP)

Preparation

This section explains the basics of Cisco Discovery Protocol (CDP) and how to enable and disable CDP on devices.

CCNA 3.0 Objectives:

- 203. Configure a router for additional administrative functionality
- 307. Perform simple WAN troubleshooting

Lecture Focus Questions:

- What are the requirements for using CDP?
- You have not yet configured an IP address on a Cisco router, but the interface is up. Will the router be able to use CDP to discover neighboring device information?
- You want to view information about a router that is two hops away? How can you view this information?
- How do you turn off CDP advertisements for a single interface? How do you disable CDP on a router?

Time

About 45 minutes

Lab/Activity

- Exploring CDP
- Disable CDP on an Interface
- Disable CDP on the Router
- Configure CDP
- Configure CDP Advertisements
- Reset CDP Timers

Section 5.1: Switch Basics

Preparation

This section explains the elements of managing and configuring switches. Before class, practice configuring the basic switch parameters.

CCNA 3.0 Objectives:

- 202. Configure IP addresses, subnet masks, and gateway addresses on routers and hosts
- 204. Configure a switch with VLANs and inter-switch communication
- 206. Customize a switch configuration to meet specified network requirements
- 209. Perform an initial configuration on a switch

Lecture Focus Questions:

- How does switch configuration differ from router configuration?
- What configuration modes are unique to switches?

Time

About 1½ hours

Lab/Activity

- Configure the Enable Password
- Configure the Hostname and Password
- Configure Port Descriptions
- Configure a Switch
- Configure CDP Parameters
- Disable CDP for a Port
- Configure the Switch IP Address
- Exploring Ping from a Switch
- Exploring the Default Gateway
- Exploring Switch Port Status

Section 5.2: Virtual LANS (VLANs)

Preparation

In this section, students will learn the details of Virtual LANs (VLANs). Before class, practice creating and configuring VLANs. .

CCNA 3.0 Objectives:

- 204. Configure a switch with VLANS and inter-switch communication
- 206. Customize a switch configuration to meet specified network requirements
- 403. Compare and contrast key characteristics of LAN environments

Lecture Focus Questions:

- Which frame tagging protocol is an industry-standard protocol?
- You have two VLANs configured on a single switch. How many broadcast domains are there? How many collision domains are there?
- What happens if two devices on the same switch are assigned to different VLANs?
- What two methods can you use to define a new VLAN?

Time

About 1 hour

Lab/Activity

- Create a VLAN
- Create a VLAN with a Name
- Modify VLAN Membership
- Exploring VLAN Communication

Section 5.3: Trunking

Preparation

In this section, students will learn the fundamentals of connecting switches together. Before class, practice configuring trunking on a switch port.

CCNA 3.0 Objectives:

- 204. Configure a switch with VLANs and inter-switch communication
- 206. Customize a switch configuration to meet specified network requirements

Lecture Focus Questions:

- What is the function of the VTP protocol?
- A switch in transparent mode. Will the switch learn VLAN information from other switches? Will the switch propagate information to other switches?
- Why is trunking important to VLAN configuration?
- What trunking protocols are supported on a Cisco 2950 switch?
- What protocol does a Cisco switch use to automatically detect trunk ports?

Time

About 45 minutes

Lab/Activity

- Configure Trunking
- Exploring VTP Modes
- Configure the Access Mode

Section 5.4: Spanning Tree

Preparation

In this section, students will learn how to add and remove VLANs from spanning tree.

CCNA 3.0 Objectives:

- 206. Customize a switch configuration to meet specified network requirements
- 302. Perform LAN and VLAN troubleshooting
- 402. Describe the Spanning Tree process

Lecture Focus Questions:

- What is the purpose of the spanning tree protocol?
- What is the role of designated bridges?
- What are BPDUs and when are they exchanged?
- A switch port is in blocking state. Will it learn MAC addresses? Will it send and receive frames?
- A switch port is in learning state. Will it learn MAC addresses? Will it send and receive frames?
- A switch port is identified as a backup port. What state is it in?
- Why must EtherChannel be used to create multiple links between switches that can be used at the same time?

Time

About 1 hour

Lab/Activity

- Enable and Disable STP

Section 5.5: Advanced Switching

Preparation

In this section, students will learn how to configure the switch port security.

CCNA 3.0 Objectives:

- 204. Configure a switch with VLANS and inter-switch communication
- 206. Customize a switch configuration to meet specified network requirements

Lecture Focus Questions:

- How does switch port security increase the security of your network?
- What does the sticky keyword do when used with the switchport port-security command?
- What is the default switching mode and VTP configuration of a 2950 switch?
- What methods can you use to route packets between VLANs (in either a single- or multi-switched network)?

Time

About 25 minutes

Section 6.1: Subnetting

Preparation

This section covers how to calculate subnetting solutions. Before class, become proficient with converting decimal and binary numbers.

CCNA 3.0 Objectives:

102. Design an IP addressing scheme to meet design requirements
202. Configure IP addresses, subnet masks, and gateway addresses on routers and hosts

Lecture Focus Questions:

- What elements do you use to find the network address?
- How do you calculate the subnet mask?
- What factors do you take into consideration to identify a valid subnet address?

Time

About 1 1/2 hour

Section 6.2: Configuring IP

Preparation

This section explains how to configure IP on router interfaces. Practice using the commands to configure the IP parameters.

CCNA 3.0 Objectives:

202. Configure IP addresses, subnet masks, and gateway addresses on routers and hosts
305. Troubleshoot a device as part of a working network

Lecture Focus Questions:

- What is the decimal form of a /21 mask?
- What is the function of the *ip host* command

Time

About 25 minutes

Lab/Activity

- Configure an IP Address 1
- Configure an IP Address 2
- Configure IP Addresses

Section 6.3: Address Resolution

Preparation

This section explains how to configure NAT on a router. Familiarize yourself with the configuration steps and commands for the different methods available to configure NAT on a Cisco router.

CCNA 3.0 Objectives:

202. Configure IP addresses, subnet masks, and gateway addresses on routers and hosts
405. Evaluate TCP/IP communication process and its associated protocols

Lecture Focus Questions:

- What is the difference between the ARP and RARP protocols?
- What is the difference between the BootP and DHCP protocols?
- How does NAT work to conserve the IP address space?

Time

About 45 minutes

Section 6.4: Troubleshooting IP

Preparation

This section explains how to troubleshoot IP. Familiarize yourself with the symptoms and solutions of common communication problems. Practice using troubleshooting tools; ping, traceroute, and Telnet.

CCNA 3.0 Objectives:

- 202. Configure IP addresses, subnet masks, and gateway addresses on routers and hosts
- 301. Utilize the OSI model as a guide for systematic network troubleshooting
- 304. Troubleshoot IP addressing and host configuration
- 305. Troubleshoot a device as part of a working network
- 407. Evaluate rules for packet control

Lecture Focus Questions:

- What is the difference between Ping and Traceroute?
- You can ping a device but can't open a Telnet session with that device. What is the problem?
- Which utility can you use to test upper-layer protocols as well as lower-layer connectivity?
- What does the source quench message do?

Time

About 20 minutes

Section 7.1: Access Lists Concepts

Preparation

This section explains how access lists are used to control traffic through a router. Become familiar with the two general types of access lists available.

CCNA 3.0 Objectives:

210. Implement access lists

Lecture Focus Questions:

- You want to create an access list that restricts traffic from host 12.0.15.166. What type of access list can you use?
- You want to create an access list that restricts ICMP traffic. What type of access list would you choose?
- How many access lists can be applied to a single interface?
- What is the last statement in every access list?

Time

About 20 minutes

Section 7.2: Configuring Access Lists

Preparation

This section explains how to configure both standard IP and extended IP access lists. Familiarize yourself with how to create both types of access lists.

CCNA 3.0 Objectives:

- 105. Develop an access list to meet user specifications
- 210. Implement access lists
- 306. Troubleshoot an access list

Lecture Focus Questions:

- What are the two general steps to creating and configuring access lists?
- When creating an access list how do you differentiate between a Standard IP access list and an Extended IP access list?

Time

About 1 hour

Lab/Activity

- Deny traffic from Specific Hosts
- Deny traffic from Specific Networks
- Permit Traffic
- Permit Traffic from Specific Hosts
- Permit Traffic from Specific Networks
- Apply a List to an Interface
- Remove a List from an Interface
- Apply Access Lists to Interfaces

Section 7.3: Working with Wild Card Masks

Preparation

This section explains how to use wildcard masks in access lists statements to control traffic based on network addresses.

CCNA 3.0 Objectives:

- 105. Develop an access list to meet user specifications
- 210. Implement access lists

Lecture Focus Questions:

- How do you identify a network address in an access list statement?
- What does a 0 in a wildcard mask indicate?

Time

About 45 minutes

Lab/Activity

- Use Wildcard Masks 1
- Use Wildcard Masks 2
- Use Wildcard Masks 3
- Use Wildcard Masks 4

Section 7.4: Designing and Monitoring Access Lists

Preparation

This section explains how to apply an existing access list to the appropriate router and interface. Practice using the commands used to monitor specific access list information.

CCNA 3.0 Objectives:

- 105. Develop an access list to meet user specifications
- 210. Implement access lists
- 306. Troubleshoot an access list

Lecture Focus Questions:

- How do you identify where to place an access list (on a specific router, a specific interface, and a specific direction)?
- Why should each access list contain at least one allow statement?

Time

About 30 minutes

Lab/Activity

- Access List Design Practice 1
- Access List Design Practice 2
- Access List Design Practice 3
- Access List Design Practice 4

Section 8.1: Routing Concepts

Preparation

This section overviews the fundamentals of routing. Get acquainted with the 3 different routing protocols and be able to explain the characteristics of each to the students.

CCNA 3.0 Objectives:

103. Select an appropriate routing protocol based on user requirements
404. Evaluate the characteristics of routing protocols

Lecture Focus Questions:

- What is the difference between a routing protocol and a routed protocol?
- What is the difference between distance vector routing and link state routing?
- What is a flash update?
- What is poison reverse?
- Why don't link state protocols use hold down timers, split horizon, or poison reverse?
- What is in an LSP?
- What is a designated router?

Time

About 1 hour

Section 8.2: Static Routes

Preparation

This section introduces static routes. They are used to specify the route that will be used by packets to enable communication between networks.

CCNA 3.0 Objectives:

- 201. Configure routing protocols given user requirements
- 303. Troubleshoot routing protocols

Lecture Focus Questions:

- In what cases would you use a static route rather than a routing protocol?
- What does a route to network 0.0.0.0 identify?

Time

About 45 minutes

Lab/Activity

- Configure Static Routes 1
- Configure Static Routes 2
- Configure Static Routes 3

Section 8.3: Configuring RIP

Preparation

This section describes how to configure RIP networks. Practice using the RIP commands before class.

CCNA 3.0 Objectives:

- 201. Configure routing protocols given user requirements
- 404. Evaluate the characteristics of routing protocols

Lecture Focus Questions:

- Why is RIP not suited for large networks?
- What mode must you enter to add the network when configuring dynamic routing?

Time

About 1 hour

Lab/Activity

- Examining the Routing Table
- Configure RIP Networks 1
- Configure RIP Networks 2
- Disable IP Routing
- Configure RIP Routing 1
- Configure RIP Routing 2
- Configure RIP Routing (3 routers)
- Exploring Network Addressing

Section 8.4: Troubleshooting RIP

Preparation

This section provides opportunities for the students to practice troubleshooting RIP using the common troubleshooting tools provided by Cisco.

CCNA 3.0 Objectives:

- 303. Troubleshoot routing protocols
- 307. Perform simple WAN troubleshooting

Lecture Focus Questions:

- When using the *show ip route* command, what is indicated by a route tagged with the letter C?
- Which command would you use to view RIP update timer information?

Time

About 1 hour

Lab/Activity

- Troubleshoot RIP 1
- Troubleshoot RIP 2
- Troubleshoot RIP 3
- Troubleshoot RIP 4
- Troubleshoot RIP 5
- Troubleshoot RIP 6

Section 8.5: Additional Configuration Practice

Preparation

This section contains additional labs the students can use to practice the router configuration tasks they have learned to this point in the course. No specific objectives or focus questions are linked to this section.

Time

About 30 minutes

Lab/Activity

- Configure the LAX router
- Configure the SFO router
- Configure the SEA router
- Configure the BOI router
- Configure the DEN router

Section 8.6: Configuring IGRP

Preparation

This section explains the basics of IGRP and how to configure IGRP. Practice using the IGRP commands.

CCNA 3.0 Objectives:

201. Configure routing protocols given user requirements

Lecture Focus Questions:

- What are the differences between RIP and IGRP?
- What is the default update timer of IGRP?
- What is the purpose of the AS number in IGRP configuration? What happens if this number is different on two routers?
- What happens if you configure RIP and IGRP on the same router?

Time

About 45 minutes

Lab/Activity

- Configure IGRP Networks
- Configure IGRP Routing 1
- Configure IGRP Communication
- Configure IGRP Routing 2
- Exploring the AS Number
- Exploring RIP and IGRP Interaction

Section 8.7: Troubleshooting IGRP

Preparation

This section provides opportunities for the students to practice troubleshooting IGRP and correct IGRP routing problems.

CCNA 3.0 Objectives:

303. Troubleshoot routing protocols

Lecture Focus Questions:

- What elements would you want to monitor when troubleshooting IGRP?
- What are the common commands used when troubleshooting IGRP?

Time

About 20 minutes

Lab/Activity

- Troubleshoot IGRP 1
- Troubleshoot IGRP 2
- Troubleshoot IGRP 3

Section 8.8: OSPF

Preparation

This section explains the fundamentals of OSPF and how to configure OSPF routing. Practice using the OSPF commands.

CCNA 3.0 Objectives:

201. Configure routing protocols given user requirements
302. Perform LAN and VLAN troubleshooting
303. Troubleshoot routing protocols
404. Evaluate the characteristics of routing protocols

Lecture Focus Questions:

- How does the process ID number used with OSPF compare with the AS number used with IGRP?
- Must the process ID number used on different routers match?
- What is Area 0 in an OSPF implementation?
- How many areas can a single subnet be in?

Time

About 1 hour

Lab/Activity

- Configure OSPF Networks
- Exploring OSPF
- Configure OSPF Routing
- Troubleshoot OSPF 1
- Troubleshoot OSPF 2
- Troubleshoot OSPF 3

Section 8.9: EIGRP

Preparation

This section explains the basics of Enhanced IGRP (EIGRP) and how to configure EIGRP routing. Practice using the EIGRP commands. Familiarize yourself with the show commands used to manage and monitor EIGRP routing.

CCNA 3.0 Objectives:

201. Configure routing protocols given user requirements
303. Troubleshoot routing protocols
404. Evaluate the characteristics of routing protocols

Lecture Focus Questions:

- What type of routing protocol is EIGRP?
- How does EIGRP configuration compare to IGRP configuration?

Time

About 45 minutes

Lab/Activity

- Configure EIGRP Networks
- Exploring EIGRP Routing
- Troubleshoot EIGRP 1
- Troubleshoot EIGRP 2
- Troubleshoot EIGRP 3

Section 8.10: Routing Protocol Comparison

Preparation

This section compares various characteristics of the routing protocols; RIP, IGRP, OSPF, and EIGRP.

CCNA 3.0 Objectives:

103. Select an appropriate routing protocol based on user requirements
404. Evaluate the characteristics of routing protocols

Lecture Focus Questions:

- Which routing protocols support route summarization and variable length subnet masks (VLSM)?
- Which routing protocols are public-standard protocols?
- Which routing protocol uses areas for configuration?
- Which routing protocol uses wildcard masks for configuration?
- If a router learns of a route to network B through both IGRP and OSPF, which route will it prefer?

Time

About 15 minutes

Section 9.1: WAN Concepts

Preparation

This section explains the basics of Wide Area Networks (WANs). Familiarize yourself with the WAN components and terminology.

CCNA 3.0 Objectives:

- 104. Design a simple internetwork using Cisco technology
- 106. Choose WAN services to meet customer requirements
- 211. Implement simple WAN protocols
- 307. Perform simple WAN troubleshooting
- 408. Evaluate key characteristics of WANs

Lecture Focus Questions:

- Who is responsible for the local loop, the customer or the service provider?
- Which WAN service option uses fixed length cells?
- Which WAN service options use digital signals over regular telephone lines?
- What is the maximum bandwidth of ISDN BRI?
- Which Data Link encapsulation method is used with ISDN? X.25? Which method would you choose for dial-up lines to provide the most compatibility with other systems?

Time

About 20 minutes

Section 10.1: PPP

Preparation

In this section students will learn how to configure Point-to-Point Protocol (PPP) encapsulation on serial links and authentication including username and password combinations.

CCNA 3.0 Objectives:

- 211. Implement simple WAN protocols
- 307. Perform simple WAN troubleshooting
- 401. Describe network communications using layered models
- 408. Evaluate key characteristics of WANs

Lecture Focus Questions:

- What is the purpose of LCPs in PPP communications?
- Which authentication method is more secure, PAP or CHAP?
- How do you configure the password used with PPP authentication?

Time

About 30 minutes

Lab/Activity

- Exploring Serial Encapsulation
- Configure PPP

Section 11.1: Frame Relay Concepts

Preparation

This section explains the basics of Frame Relay. Familiarize yourself with the Frame Relay facts and protocols.

CCNA 3.0 Objectives:

- 211. Implement simple WAN protocols
- 401. Describe network communications using layered models
- 408. Evaluate key characteristics of WANs

Lecture Focus Questions:

- What is the CIR?
- What does "locally significant" mean in relation to the DLCI number?
- What functions are performed by LMI?
- What is the difference between a point-to-point and a multipoint link?

Time

About 15 minutes

Section 11.2: Enabling Frame Relay

Preparation

In this section students will learn the steps to configuring Frame Relay on an interface. Familiarize yourself the commands used to perform these steps.

CCNA 3.0 Objectives:

- 211. Implement simple WAN protocols
- 307. Perform simple WAN troubleshooting

Lecture Focus Questions:

- What is the function of the DLCI number when configuring a router for Frame Relay?
- When configuring Frame Relay on an interface, why could configuring the LMI settings be optional?

Time

About 30 minutes

Lab/Activity

- Exploring Inverse ARP
- Configure Frame Relay Encapsulation
- Configure Frame Relay Communication
- Disable Inverse ARP

Section 11.3: Static Mappings

Preparation

This section contains additional labs the students can use to practice configuring static mappings. No focus questions are linked to this section.

CCNA 3.0 Objectives:

211. Implement simple WAN protocols

Time

About 20 minutes

Lab/Activity

- Exploring Static Mappings
- Add a Static Map
- Configure Static Mappings
- Configure Frame Relay Links

Section 11.4: Subinterfaces

Preparation

In this section students will learn the basics of subinterfaces, the two types of subinterfaces and how to configure them. Familiarize yourself the commands used to perform these steps.

CCNA 3.0 Objectives:

- 211. Implement simple WAN protocols
- 408. Evaluate key characteristics of WANs

Lecture Focus Questions:

- What is a subinterface?
- Why would you use a subinterface?
- When configuring subinterfaces, what should you not configure on the main interface?

Time

About 30 minutes

Lab/Activity

- Configure Point-to-Point Frame Relay
- Configure Multipoint Frame Relay
- Configure a Subinterface 1
- Configure a Subinterface 2

Section 11.5: Troubleshooting Frame Relay

Preparation

This section provides opportunities for the students to practice troubleshooting Frame Relay using the commands used to monitor Frame Relay. Practice using the commands that are used to identify problems with Frame Relay.

CCNA 3.0 Objectives:

307. Perform simple WAN troubleshooting

Lecture Focus Questions:

- Which command would you use to view the DLCI numbers for each interface?
- Why wouldn't you use the DLCI number included in the show interfaces command to identify assigned DLCIs?
- Which commands can you use to view the LMI type used on your router?

Time

About 40 minutes

Lab/Activity

- Troubleshoot Frame Relay 1
- Troubleshoot Frame Relay 2
- Troubleshoot Frame Relay 3
- Troubleshoot Frame Relay 4
- Troubleshoot Frame Relay 5

Section 12.1: ISDN Concepts

Preparation

This section describes the basics of Integrated Services Digital Network (ISDN) types, characteristics and standards.

CCNA 3.0 Objectives:

- 106. Choose WAN services to meet customer requirements
- 211. Implement simple WAN protocols
- 401. Describe network communications using layered models
- 406. Describe the components of network devices
- 408. Evaluate key characteristics of WANs

Lecture Focus Questions:

- How many data channels are in an ISDN BRI link?
- What topics are defined by ISDN Q standards?
- What type of devices are TE2 devices? TE1 devices?
- What is the function of the TEI and SPIDs? Which do you manually configure?
- You have a router with a U interface. To which other devices would the interface connect?
- Which switch types are most commonly used in North America?

Time

About 30 minutes

Section 12.2: Configuring BRI Interfaces

Preparation

This section explains how to configure ISDN switch types and SPIDs. Become familiar with the commands used to configure an ISDN connection and to view the ISDN link status.

CCNA 3.0 Objectives:

- 211. Implement simple WAN protocols
- 408. Evaluate key characteristics of WANs

Time

About 45 minutes

Lab/Activity

- Configure the Switch Type
- Configure SPIDs
- Exploring BRI Status
- Configure BRI Connections
- Configure BRI Communications

Section 12.3: Dial-on-Demand Routing (DDR)

Preparation

This section explains the fundamentals of Dial-on-Demand Routing (DDR) communications. It discusses when you would choose DDR and the basic steps used to configure DDR.

CCNA 3.0 Objectives:

- 211. Implement simple WAN protocols
- 408. Evaluate key characteristics of WANs

Lecture Focus Questions:

- What is interesting traffic?
- If a link is down, what happens to un-interesting traffic?
- What is the relationship between a dialer string, dialer group, and dialer map?
- How do you identify routers to call?

Time

About 1 hour

Lab/Activity

- Configure a Dialer Group
- Exploring Dialer Strings and Maps
- Configure Dialer Strings
- Configure Dialer Maps
- Configure a DDR Connection
- Configure DDR Communications 1
- Configure Static DDR Routes
- Configure DDR Communications 2

Section 12.4: DDR Timers

Preparation

This section explains various types of timers and how to configure them.

CCNA 3.0 Objectives:

- 211. Implement simple WAN protocols
- 307. Perform simple WAN troubleshooting

Lecture Focus Questions:

- Which DDR timer identifies how long to keep a link up in the absence of interesting traffic?
- What function does the fast-idle timer perform?

Time

About 30 minutes

Lab/Activity

- Set the Idle Timer
- Set the Fast Idle Timer
- Configure DDR Timers
- Reset the DDR Timers

Section 12.5: Complete ISDN Configuration

Preparation

This section contains additional labs the students can use to combine all the tasks learned previously and practice configuring a complete ISDN link. No specific objectives or focus questions are linked to this section.

Time

About 20 minutes

Lab/Activity

- Configure ISDN/DDR Communications
- Configure ISDN/DDR Routing

Section 12.6: Troubleshooting ISDN BRI

Preparation

This section provides opportunities for the students to practice troubleshooting ISDN BRI connections. Familiarize yourself with the show commands used to monitor ISDN configurations. No focus questions are assigned to this section.

CCNA 3.0 Objectives:

- 307. Perform simple WAN troubleshooting

Time

About 30 minutes

Lab/Activity

- Exploring ISDN Status
- Troubleshoot BRI Connections1
- Troubleshoot BRI Connections 2
- Troubleshoot BRI Connections 3
- Troubleshoot BRI Connections 4
- Troubleshoot BRI Connections 5