

Routing

Cisco Networking Academy Program

CCNA 2: Routers and Routing Basics v3.0

Overview and Objectives

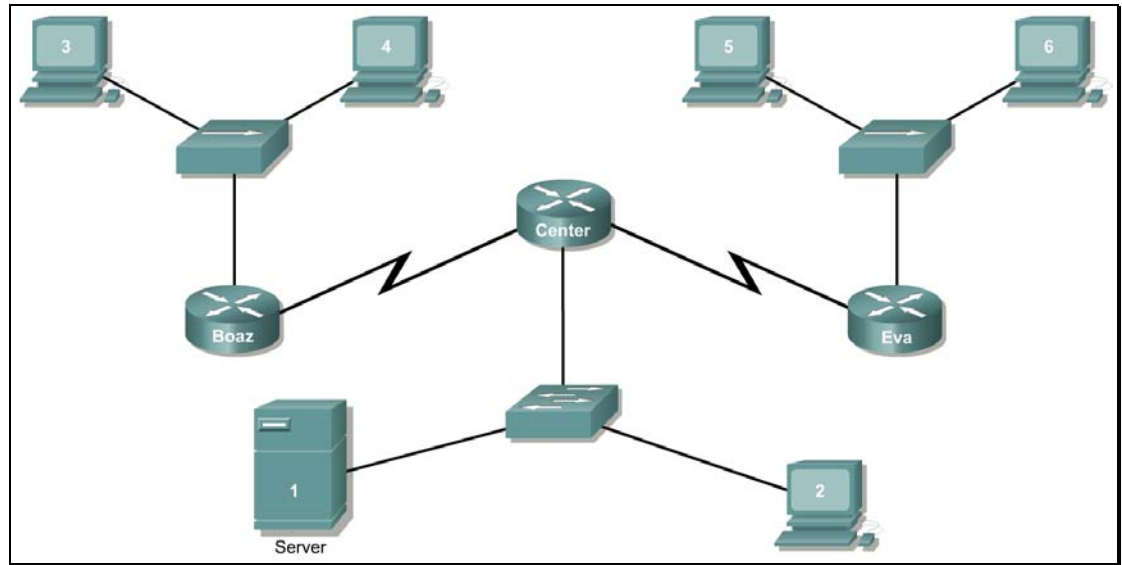
This case study will allow you to complete a network design, implementation, and troubleshooting project using skills gained in CCNA 2. You will use the skills that you have already developed to use, make, and connect the proper cabling to appropriate devices.

It is crucial that you read and understand the scenarios to make sure that you are fulfilling all requirements. Each scenario guides you through the proper steps to ensure that your project is completed properly.

This case study requires that you accomplish the following:

- Set up the physical layout of the network using the diagram and accompanying narrative
- Correctly configure the routers with a basic router configuration
- Set up a TFTP server on one of the workstations
- Create and apply access control lists on the appropriate router(s) and interface(s)
- Troubleshoot and test all connectivity and access control lists
- Provide detailed documentation in a prescribed form (listed in the Deliverables section)

Scenario and Phase 1: Project Description



Your company has several people who are responsible for maintaining various sections of your internetwork infrastructure. You have done an excellent job with the small portion for which you are responsible.

One of the other network associates who was responsible for a larger portion of the infrastructure suddenly left the company. This left redesign and implementation on this portion of the internetwork unfinished. You are given the task to complete this design and implementation.

After taking home the documentation to study over the weekend, you discover why the network associate left suddenly. The few documents that existed were poorly written. So, during the weekend, you reconstruct the above diagram from a diagram that you find. This represents the new internetwork design. It shows the planned routers, hubs/switches, circuits, and servers/workstations at each site. The server at the Center site is a file server that is accessed only by workstations on this internetwork. The workstation at the Center site is used to manage all routers on the internetwork.

After returning to work Monday morning, you show your diagram to the network infrastructure team leader, who assigned this project to you. After discussing the situation for some time you are tasked with **developing the documentation** for this project and having it approved by the team leader (your instructor). You are given the following information to use in this implementation.

Network address _____

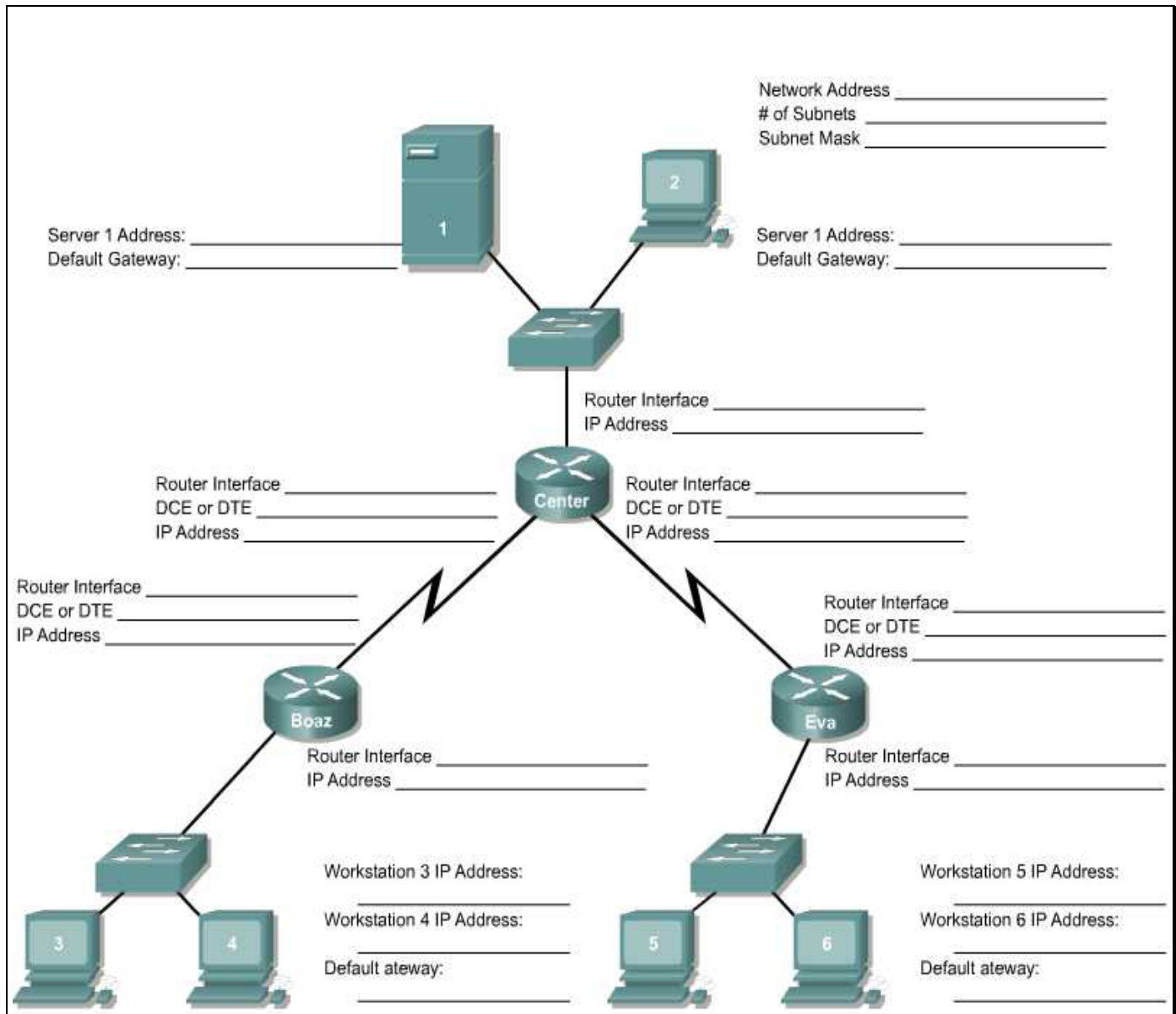
Required number of subnets _____

Routing protocol _____

Phase 2: IP Addressing

Now that your basic plan is in place, the team leader asks you to develop a prototype for the new internetwork. Using the network address that was assigned along with the subnetting requirements, you are to subnet the network. From the IP addressing scheme, assign IP addresses to the appropriate interfaces on all routers and computers in your internetwork, using the worksheet diagram on the following page as a guide. Obtain approval of this phase of development from your team leader before proceeding further.

Instructor approval _____ Date _____



Phase 3: Basic Router and Workstation Configuration

After the team leader inspects the prototype cabling, you are asked to do a basic configuration on the router and workstations.

Using the diagram and planning sheets, create a basic configuration in the router. The checklist below will help keep you on track.

	Boaz	Centre	Eva
Hostname			
Console password			
Secret password			
VTY password			
Serial 0/0 IP address			
Serial 0/1 IP address			
*Serial 0/0 clock rate			
*Serial 0/1 clock rate			
Fa 0/0 IP address			
Fa 0/1 IP address			
Enable the interfaces			
Add routing protocol			
Add network statements			

Note: * indicates as needed

Continued on next page.

	Boaz	Centre	Eva
*Host table			
Message of the day			
Serial 0/0 description			
Serial 0/1 description			
Fa 0/0 description			
Fa 0/1 description			

* Note: Should contain all routers and servers.

Instructor approval _____ Date _____

Phase 4: Access Control Lists

While testing the network, the team leader discovers that there has been no security planning. If the network configuration were installed as designed, any network user would be able to access all network devices and workstations.

The team leader asks you to add access control lists (ACLs) to the routers. The team leader has a couple of warnings for you. You should Backup the current configurations before you begin adding ACLs. Also, make sure that you have complete connectivity throughout the network before you apply any ACLs.

The following conditions must be taken into consideration when creating the ACLs:

- Workstation 2 and File Server 1 are on the management network. Any device on the management network can access any other device on the entire network.
- Workstations on Eva and Boaz LANs are not permitted outside of their subnet, except to access File Server 1.
- Each router can Telnet to the other routers and access any device on the network.

The team leader asks you to write a short summary of the purpose of each list you create, the interfaces upon which they will be applied, and the direction of the traffic. Then, you are to list the exact commands that will be used to create and apply the ACLs.

Before you configure the routers with the ACLs, walk through the following test conditions and make sure that your ACLs will perform as expected.

Telnet from Boaz to Eva:	SUCCESSFUL
Telnet from Workstation 4 to Eva:	BLOCKED
TELNET from Workstation 5 to Boaz:	BLOCKED
TELNET from Workstation 2 to Boaz:	SUCCESSFUL
TELNET from Workstation 2 to Boaz:	SUCCESSFUL
Ping from Workstation 5 to File Server 1:	SUCCESSFUL
Ping from Workstation 3 to File Server 1:	SUCCESSFUL
Ping from Workstation 3 to Workstation 4:	SUCCESSFUL
Ping from Workstation 5 to Workstation 6:	SUCCESSFUL
Ping from Workstation 3 to Workstation 5:	BLOCKED
Ping from Workstation 2 to Workstation 5:	SUCCESSFUL
Ping from Workstation 2 to Workstation 3:	SUCCESSFUL
Ping from Router Eva to Workstation 3:	SUCCESSFUL
Ping from Router Boaz to Workstation 5:	SUCCESSFUL

Phase 5: Documenting the Network

You know that it takes documentation to support the network properly, so you decide to create the documentation. All the documentation should be logically organized to make troubleshooting easier.

Configuration Management documentation

	Boaz	Centre	Eva
<code>show cdp neighbors</code>			
<code>show ip route</code>			
<code>show ip protocol</code>			
<code>show ip interface brief</code>			
<code>show version</code>			
<code>show hosts</code>			
<code>show startup config</code>			

Security Management documentation

	Boaz	Centre	Eva
<code>show ip interface</code>			
<code>show ip access lists</code>			

Instructor approval _____ Date _____

Case Study Deliverables

The key lesson of this case study is the importance of thorough and clear documentation. You should complete two types of documentation.

General documentation:

- A complete narrative of the project should be typed using word processing software. Because the scenarios break the entire task into pieces, take care to address each scenario task so that a layperson could understand that particular task.
- Microsoft Excel or another spreadsheet program could be used to simply list the equipment and serial numbers.
- Cisco Network Designer, Visio, or any paint program could be used to draw the network for this documentation.
- This general documentation should also include information about how the security has been tested. A plan for monitoring this network should also be included.

Technical documentation:

- This documentation should include details of the network topology (using CND, Visio, or Paint).
- Referring to the tables in the working copy of the case study, all table information should be entered into a spreadsheet program such as Microsoft Excel. This would include IP addressing of all interfaces, DCE/DTE information, router passwords, and interface descriptions. Be sure to include IP addressing and gateway assignments for all computers on the network.
- The access control lists (router commands sequence) should be typed in this documentation using a word processing program, including application on the router interface.
- Document the use of routing protocol.
- Router output should be captured and placed in this documentation from the following commands:
 - **show cdp neighbors**
 - **show ip route**
 - **show ip protocol**
 - **show ip interface**
 - **show version**
 - **show hosts**
 - **show startup-config**
 - **show ip access lists**

Instructor Notes

Phase 1: Project Description

(This part can begin early in the semester, as students should be familiar with subnetting)

The entire case study should be discussed in class so that all students understand that the purpose of this study is not only to practice configuration and troubleshooting, but also to learn how to document their work. Some good web sites that will help the students' understanding of documentation are as follows:

<http://www.ittoolkit.com/articles/tech/importofdocs.htm>

<http://www.serverwatch.com/tutorials/article.php/1475021>

http://www.ethermanage.com/ethernet/100quickref/ch14qr_16.html

<http://tampabay.bizjournals.com/tampabay/stories/1997/11/24/smallb2.html>

The network address assigned should be one of the private IP address ranges or a subnet of the following:

Class	Range
A	10.0.0.0 – 10.255.255.255
B	172.16.0.0 – 172.31.255.255
C	192.168.0.0 – 192.168.255.255

The routing protocol should be IGRP. The first part of Phase 1 should be done as a class so that students understand the purpose of the case study. Along with a discussion of Phase 1, the deliverables portion should also be covered. The instructor should decide whether this is a group project. Each student should be capable of deciding the IP addresses of interfaces after the IP scheme has been chosen.

The form on page 2 of the case study should be the first form that the instructor signs off.

Phase 2: IP Addressing

(This section should be due after Module 4 or 5)

Students should re-create the drawing at this point using Visio, a paint program, or Cisco Network Designer. They would then need to insert the appropriate interface connections on the routers. This would be a sign-off point.

Phase 3: Basic Router and Workstation Configuration

(This section should be done after students feel comfortable with basic router configuration. Suggested time line: after Module 7.)

By now, the students should be somewhat familiar with router configuration and understand the basic pieces that must be present. Including the essentials on this chart would help organize their thoughts. The student should select which workstation is to be the TFTP server. He would need to understand which devices need access to the TFTP server. Students should be guided to fill out the charts on pages 4 and 5, and then the instructor should sign off on their work.

The students should enter their configurations and test them on the routers.

Phase 4: Access Control lists

(This portion can be done after the chapter on ACLs.)

This is a most critical portion. Students must develop an access control list on paper first.

Phase 5: Documenting the network

(If the students understand the requirements ahead of time, this part should be done throughout the life of the case study. This would reiterate the purpose of documentation – to be done continually and revisited – not only once.)

This last phase is when the student creates the documentation – which is the whole point of the case study. The deliverables list should be discussed again to make sure that the student understands the requirements.

Optional

It would be good to have a reflection portion so that the student can objectively look at this study. Questions might include the following:

- Why do I need two types of documentation?
- What happens when a piece of equipment fails?