



HARAMAYA UNIVERSITY
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ITEC 553
INFORMATION ASSURANCE AND
SECURITY
(LAB MANUAL)

MODULE: NETWORK BASICS

Lab Guide 1: WORKSTATION NETWORK
CONFIGURATION AND CONNECTIVITY

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This Lab Guide contains lab exercises designed to illustrate the various commands and methods used to establish workstation connectivity in a network based on Transmission Control Protocol/Internet Protocol (TCP/IP). The Lab Guide covers the basics necessary to achieve and monitor connectivity in a networking environment, using both Windows PCs and Linux-based PCs. In this chapter, you will be introduced to some basic commands and tools that will enable you to manipulate and monitor the network settings on a workstation. This is necessary as a first step toward learning how to secure connections.

The Lab Guide consists of basic lab exercises, mostly short and quick, that are designed to provide a basic foundation in network connectivity and tools. In later lab Guide of this module, you will use the skills from these lab exercises to perform functions that are necessary to secure a network from attack and investigate current conditions. Built upon the premise that one learns to crawl before walking, and walk before running, this chapter represents the crawling stage. Although basic in nature, this lab sheet is important because it provides the skills needed to “walk” and “run” in later stages of development.

Depending on your lab setup and other factors, you won't necessarily be performing all the lab exercises presented in this book. Therefore, to help you identify which lab exercises are relevant for you, each lab exercise number is appended with a letter: “w” labs are built using the Windows environment; “l” labs are built using the Linux environment; “m” labs are built using a combination of Windows and Linux; and “i” labs require an Internet connection.

After completing this lab, you will be able to:

- ✓ Retrieve IP address configuration information via the command line.
- ✓ List the switches that can be added to the ipconfig (Windows) or ifconfig (Linux) command to increase its functionality.
- ✓ Use the Windows graphical user interface (GUI) to configure a network card to use a given IP address.
- ✓ Determine your machine's MAC address.
- ✓ Determine your machine's assigned network resources, including its DNS address and gateway address.
- ✓ Use the ifconfig (Linux) command to configure a network card with a given IP address.
- ✓ Understand how to test network connectivity between two computers.
- ✓ List the options that can be added to the ping command to increase its functionality.
- ✓ Use the arp command to view and manage the ARP cache on a computer

Materials and Setup

You will need the following:

- ✓ Windows XP Professional
- ✓ Windows 2003 Server

Lab Steps at a Glance

Step 1: Start the Windows 2003 Server and Windows XP Professional PCs. Log on only to the

Windows XP machine.

Step 2: View the network card configuration using the ipconfig command.

Step 3: Change the IP address of the Windows XP machine.

Step 4: Verify the new IP address. Use the ipconfig command to verify that the IP address has changed.

Step 5: Change the IP address of the Windows XP machine back to the original address.

Step 6: Ping the Windows 2003 Server machine from the Windows XP PC.

Step 7: View and modify the ARP table.

Step 8: Log off from the Windows XP PC.

Lab Steps

Step 1: Start the Windows 2003 Server and Windows XP Professional PCs. Log on only to the Windows XP machine.

To log on to the Windows XP PC:

1. At the Login screen, click the Admin icon.
2. In the password text box, type the password **password** and press enter.

Step 2: View the network card configuration using the ipconfig command.

On the Windows XP PC, you will view the network card configuration using ipconfig. This utility allows

administrators to view and modify network card settings.

1. To open the command prompt, choose Start | Run, type **cmd** in the Open field, and press enter.

2. At the command prompt, type **ipconfig /?** and press enter.

a. Observe the options available for ipconfig.

b. Which options do you think would be most useful for an administrator?

c. Which option would you use to obtain an IP configuration from a Dynamic Host Configuration Protocol (DHCP) server?

3. Type **ipconfig** and press enter, as shown in Figure 1-1.

a. What is your IP address?

b. What is your subnet mask?

4. Type **ipconfig /all** and press enter.

a. Observe the new information.

b. What is the MAC address of your computer?

c. What is your DNS server address?

5. Type **exit** and press enter.

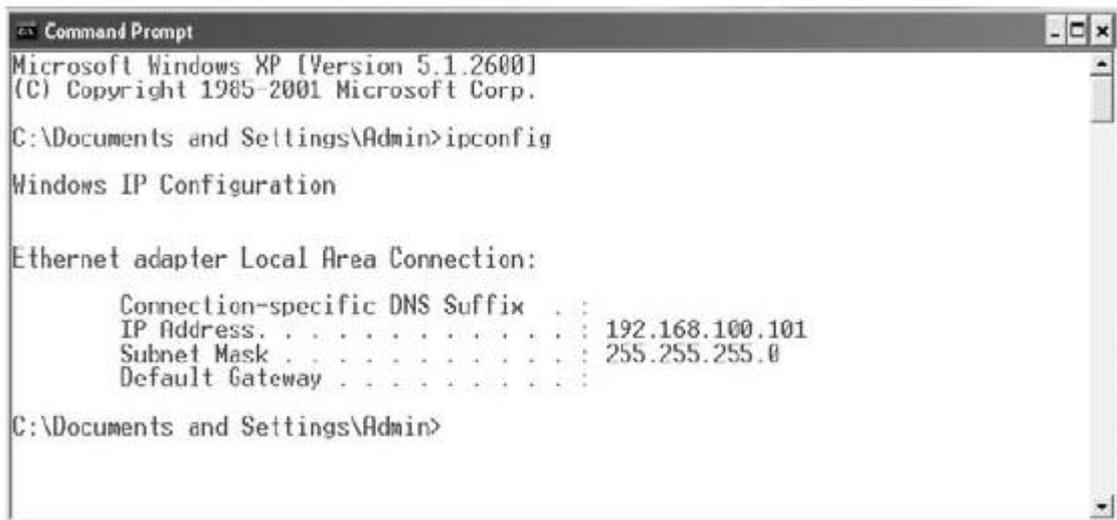
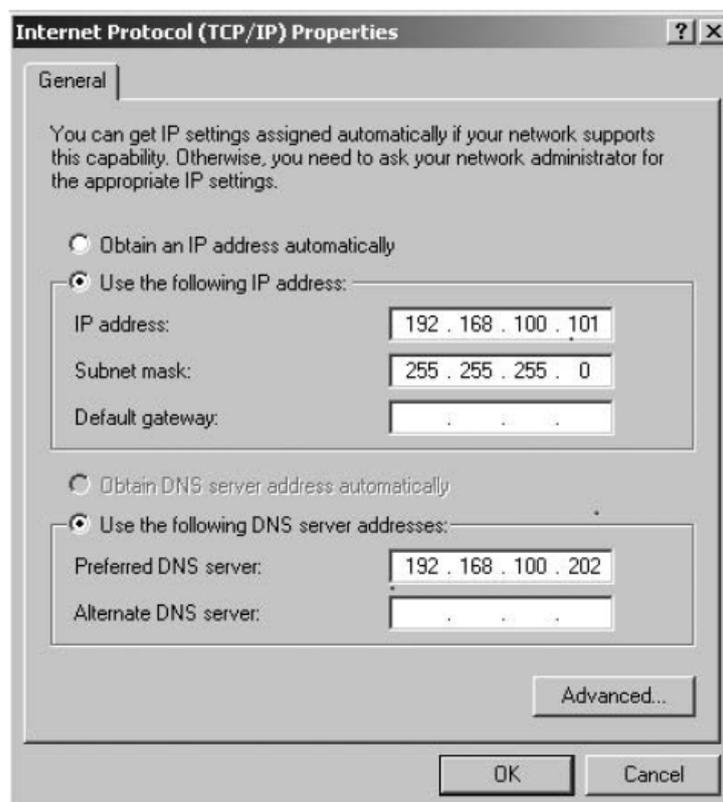


FIGURE 1-1 The ipconfig command

Step 3: Change the IP address of the Windows XP machine.

You will access the Local Area Connection Properties dialog box and change the host portion of the IP address.

1. Click Start | Settings | Network Connections | Local Area Connection.
2. In the Local Area Connection Status window, click Properties.
3. Select Internet Protocol (TCP/IP) and click Properties.
4. In the IP Address text box, you will see the IP address 192.168.100.101, as shown in Figure 1-2.
- Change the last octet (101) to **110**.
5. Click OK.



In the Local Area Connection Properties window, click OK.

7. Click Close to close the Local Area Connection Status window.

Step 4: Verify the new IP address. Use the ipconfig command to verify that the IP address has changed

1. Choose Start | Run, type **cmd** in the Open field, and press enter.

2. At the command line, type **ipconfig \?** and press enter.

What option would you use to get an IP address from a DHCP server?

3. Type **ipconfig** and press enter.

4. Observe that your IP address has changed.

5. Type **exit** and press enter.

Step 5: Change the IP address of the Windows XP machine back to the original address.

1. Click Start | Settings | Network Connections | Local Area Connection.

2. In the Local Area Connection Status window, click Properties.

3. Select Internet Protocol (TCP/IP) and click Properties.

4. In the IP Address text box, you will see the IP address 192.168.100.110. Change the last octet (110) to **101**.

5. Click OK.

6. In the Local Area Connection Properties window, click OK.

7. Click Close to close the Local Area Connection Status window.

Step 6: Ping the Windows 2003 Server machine from the Windows XP PC.

1. On the Windows XP PC, choose Start | Run, type **cmd** in the Open field, and press enter.

2. To view the ping help file, type **ping /?** at the command line and then press enter.

3. To ping the IP address of the Windows 2003 Server computer, at the command line, type **ping**

192.168.100.102 and press enter, as shown in Figure 1-3.

a. Observe the information displayed.

b. What is the time value observed for all four replies?

c. What is the TTL observed?

d. What does this number refer to?

e. How can you be sure that this response is actually coming from the correct computer?

```
C:\Documents and Settings\Admin>ping 192.168.100.102

Pinging 192.168.100.102 with 32 bytes of data:

Reply from 192.168.100.102: bytes=32 time=1ms TTL=128
Reply from 192.168.100.102: bytes=32 time<1ms TTL=128
Reply from 192.168.100.102: bytes=32 time<1ms TTL=128
Reply from 192.168.100.102: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.100.102:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\Documents and Settings\Admin>
```

FIGURE 1-3 The ping command in Windows

Step 7: View and modify the ARP table.

At the Windows XP machine, you are now going to view the ARP cache, using the arp utility.

1. At the command line, type **arp /?** and press enter.
 - a. Observe the options for this command.
 - b. Which command displays the current ARP entries?

✓ Tip

When you need to type the same command several times with only slight changes, pressing

the up arrow key will show the previous command you just typed. You can then modify the command easily with the new options.

2. At the command line, type **arp -a** and press enter.
3. Observe the entry. Notice that the MAC address for the Windows 2003 Server machine is listed.
4. At the command line, type **arp -d** and press enter. (The **-d** option deletes the ARP cache.)
5. Observe the entries. (Do not worry if no entries are listed; you are simply deleting what is in the ARP cache.)
6. At the command line, type **arp -a** and press enter, as shown in Figure 1-4.
7. Observe that the ARP cache now has no entries.
8. At the command line, type **ping 192.168.100.102** and press enter

```
Command Prompt
C:\Documents and Settings\Admin>arp -a
Interface: 192.168.100.101 --- 0x2
Internet Address      Physical Address      Type
192.168.100.102      00-50-56-95-09-f3    dynamic

C:\Documents and Settings\Admin>arp -d
C:\Documents and Settings\Admin>arp -a
No ARP Entries Found

C:\Documents and Settings\Admin>
```

FIGURE 1-4 The arp command in Windows

At the command line, type **arp -a** and press enter.

- a. Observe any entry. Notice that the MAC address is once again listed.
- b. How does using the ping utility cause the machine's MAC address to be populated in the ARP cache? (This is explored in "Lab 2.1, Network Communication Analysis," in Chapter 2.)
- c. How can you be sure that this is actually the correct MAC address for the computer?

Step 8: Log off from the Windows XP PC.

At the Windows XP PC:

1. Choose Start | Log Off.
2. In the Log Off Windows dialog box, click Log Off.

Netstat is an important utility for network administrators. It is used to display active TCP connections and UDP connections, Ethernet statistics, and the IP routing table. A port can be in any one of a number of states. When a TCP port is in a listening state, it is waiting for initiation and completion of a three-way handshake. This results in the port transforming to an established state.

Learning Objectives

After completing this lab, you will be able to

- ✓ Name the command used to display protocol statistics and current TCP/IP network connections.
- ✓ Understand how a computer can manage multiple communications through the use of ports.
- ✓ List the switches that can be added to the netstat command to increase its functionality.

Materials and Setup

You will need the following:

- Windows XP Professional
- Windows 2003 Server

Lab Steps at a Glance

Step 1: Log on to the Windows XP Professional and Windows 2003 Server PCs.

Step 2: Use the netstat command to look at the open ports on the Windows 2003 Server machine.

Step 3: From the Windows XP machine, establish an FTP connection and an HTTP connection to the Windows 2003 Server machine.

Step 4: Use the netstat command to look at the connections on the Windows 2003 Server machine.

Step 5: Log off from both the Windows 2003 Server and Windows XP PCs.

Lab Steps

Step 1: Log on to the Windows XP Professional and Windows 2003 Server PCs.

1. On the Windows XP PC, at the Login screen, click on the Admin icon, and then type **password**

in the password text box.

2. On the Windows 2003 Server PC, at the Login screen, press ctrl-alt-del, enter the username

administrator and the password **adminpass**, and then click OK.

Step 2: Use the netstat command to look at the open ports on the Windows 2003 Server machine.

A server will have several ports in a listening state. A port that is in a listening state is waiting for a request to connect.

To view the open ports on the Windows 2003 Server computer:

1. Choose Start | Run.
2. In the Open field, type **cmd** and click OK.
3. At the command line, type **netstat /?** and press enter.
 - a. Observe the display options for network connection.
 - b. What option displays the ports in use by number?
 - c. What option lists all connections and listening ports?
 - d. What option shows the programs that created each connection?
4. At the command line, type **netstat -na** and press enter.

If the text scrolls up off the screen, maximize the command prompt window and use the scroll

bar on the right to adjust your view of the text.

- a. Observe the ports that are in a listening state.
- b. How many ports are in a listening state?
- c. What port numbers are used for FTP and HTTP?
- d. Are those ports in a listening state?
- e. Why are so many ports open, and do they all need to be open?
- f. Should you be concerned that so many ports are open?

Step 3: From the Windows XP machine, establish an FTP connection and an HTTP connection

to the Windows 2003 Server machine.

From the Windows XP machine:

1. Choose Start | Run.
2. In the Open field, type **cmd** and click OK.
3. At the command line, type **ftp 192.168.100.102** and press enter.
4. At the login prompt, type **administrator** and press enter.
5. At the password prompt, type **adminpass** and press enter.

Leave the command line open to see the results.

6. Choose Start | Internet Explorer.
7. In the address box, type **192.168.100.102** and press enter.

Step 4: Use the netstat command to look at the connections on the Windows 2003 Server machine.

1. At the command line of the Windows 2003 Server machine, type **netstat**.
2. After a brief pause you should get output that looks like the following:

```
C:\>netstat
```

Active Connections

```
Proto Local Address Foreign Address State
```

```
TCP win2k3serv:ftp winxpro.security.local:1065 ESTABLISHED
```

```
TCP win2k3serv:http winxpro.security.local:1068 ESTABLISHED
```

Step 5: Log off from both the Windows 2003 Server and Windows XP PCs.

1. To log off from the Windows 2003 Server PC, choose Start | Shutdown, select Log Off Administrator, and click OK.
2. To log off from the Windows XP PC, choose Start | Log Off | Log Off.

Most networks were developed and designed for sharing files. File Transfer Protocol (FTP) is a protocol used for this purpose. FTP is an important protocol to become familiar with because it is often utilized to upload and download files from a server; furthermore, it is often the target of attackers.

Hypertext Transfer Protocol (HTTP) is a lightweight and fast application layer protocol that can also be used to share files. Hypertext Markup Language (HTML) is the language in which files can be written to display specially formatted text or link to other files and resources.

In this lab, you will use the Windows FTP application to upload a simple web page to a server, and then you will view it from a browser.

Learning Objectives

After completing this lab, you will be able to

- Create a simple web page using HTML and a text editor.
- Upload a web page to a Windowsbased web server.
- View a page using a web browser.

Materials and Setup

You will need the following:

- Windows XP Professional
- Windows 2003 Server

Lab Steps at a Glance

Step 1: Start the Windows 2003 Server and Windows XP Professional machines. Only log on to the Windows XP machine.

Step 2: Create a simple web page.

Step 3: View the web page in Internet Explorer.

Step 4: Upload the web page.

Step 5: Use Internet Explorer to view the web page from the web server.

Step 6: Log off from the Windows XP Professional PC.

Lab Steps

Step 1: Start the Windows 2003 Server and Windows XP Professional machines. Only log on

to the Windows XP machine.

To log on to the Windows XP PC:

1. At the Login screen, click the Admin icon.
2. In the password text box, type **password** and press enter.

Step 2: Create a simple web page.

To create this web page, you are going to use HTML. HTML is not a programming language, but

rather a methodology that tells a web browser how to display text on the screen. HTML is composed

of tags that surround the text that the tag affects. All HTML files are saved with either an .htm

or .html file extension. In this exercise, you will create a web page with the message “This page is

under construction” using HTML. Pay careful attention to how the tags are written, as HTML is very

unforgiving of spelling errors, and will either display your web page incorrectly or not display it at all if

you misspell tags.

To create a simple web page using the Windows XP PC:

1. Choose Start | Run.
2. In the Open field, type **notepad** and press enter.
3. In Notepad, type the following text:

```
<html>
<head><title>Under construction</title>
<body><h1> This page is under construction. </h1>
<p>More information will be posted here </p></body>
```

</html>

4. In Notepad, choose File | Save.
5. In the File Name combo box, type **default.htm**.
6. In the Save In combo box, select My Documents from the drop-down list.
7. In the Save As Type combo box, select All Files from the drop-down list.
8. Click Save.

→ **Note**

The file must be saved as **default.htm** in order to be displayed by a web browser without having

to specify the name of the page. If the file is saved as anything else, viewing the web page in a

browser (see Step 5) will not work correctly.

9. Close Notepad by clicking x in the upper-right corner.

Step 3: View the web page in Internet Explorer.

1. Choose Start | My Documents.
2. In the My Documents window, double-click default.
You will see the web page that you will be uploading to the web server.
3. In the Internet Explorer window, click x to close the window
4. In the My Documents window, click x to close the window.

Step 4: Upload the web page.

To upload the web page using Windows XP Professional:

1. Choose Start | Run.
2. In the Open field, type **cmd** and click OK.
3. At the command line, type **cd c:\documents and settings\admin\my documents** and press enter.

→ **Note**

If your command prompt is C:\Documents and Settings\Admin>, then you can just type cd /my

documents at the prompt. This version uses a forward slash, not a backward slash.

4. At the command line, type **ftp 192.168.100.102** and press enter.
5. At User (192.168.100.102:none), type **administrator** and press enter.

6. At the password prompt, type **adminpass** and press enter.

Before you upload the file, take a look at some of the commands in FTP by following steps 7 and 8.

7. At the ftp prompt, type **help** and press enter.

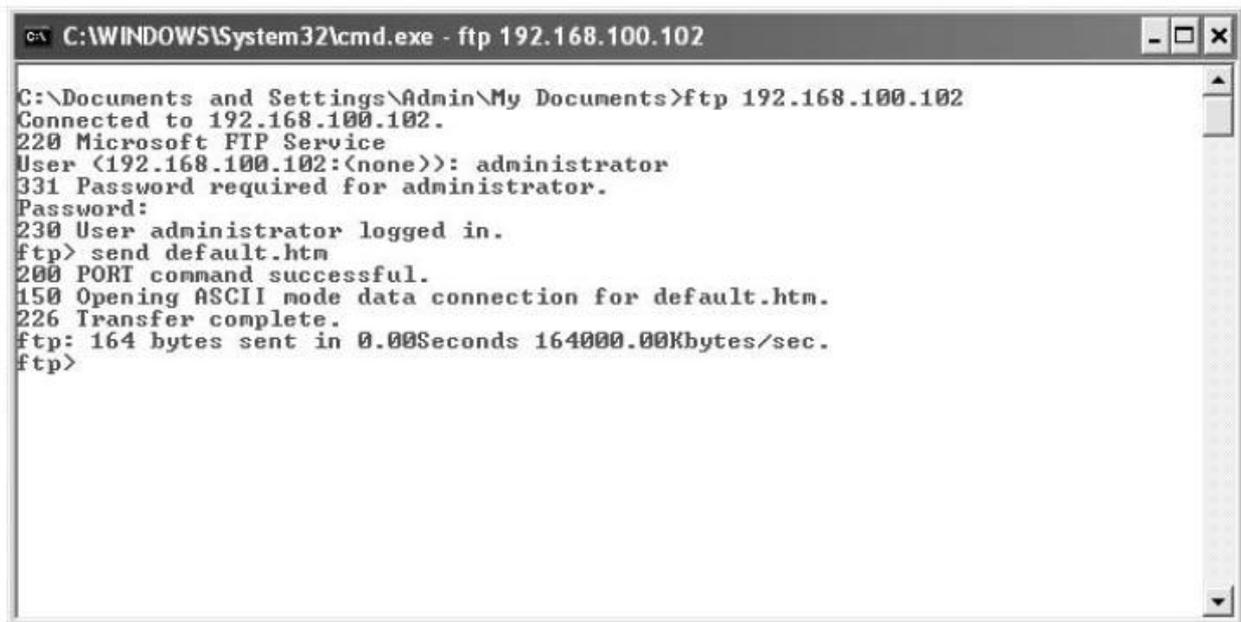
a. Observe the list of commands.

b. To find out more about an individual command, insert a question mark in front of the command.

8. At the ftp prompt, type **? ls** and press enter.

a. What does typing the ls command at the ftp prompt do? After you use ? at the ftp prompt, which command do you use to change the local working directory?

b. Which command is used to upload a file?



```
C:\WINDOWS\System32\cmd.exe - ftp 192.168.100.102
C:\Documents and Settings\Admin\My Documents>ftp 192.168.100.102
Connected to 192.168.100.102.
220 Microsoft FTP Service
User (192.168.100.102:(none)): administrator
331 Password required for administrator.
Password:
230 User administrator logged in.
ftp> send default.htm
200 PORT command successful.
150 Opening ASCII mode data connection for default.htm.
226 Transfer complete.
ftp: 164 bytes sent in 0.00Seconds 164000.00Kbytes/sec.
ftp>
```

FIGURE 3-1 Uploading a web page with the ftp command in Windows

9. At the ftp prompt, type **send default.htm** and press enter. Refer to Figure 3-1.

10. At the ftp prompt, type **bye** and press enter to exit the FTP session.

Step 5: Use Internet Explorer to view the web page from the web server.

1. Choose Start | Internet Explorer.

2. In the Internet Explorer address bar, type **http://192.168.100.102** and press enter. Refer to

Figure 3-2.

a. You should now see the web page that was just uploaded.

b. What might an attacker use the FTP program and FTP server to do?

Step 6: Log off from the Windows XP Professional PC.

At the Windows XP PC:

1. Choose Start | Log Off.

2. At the Log Off Windows screen, click Log Off.

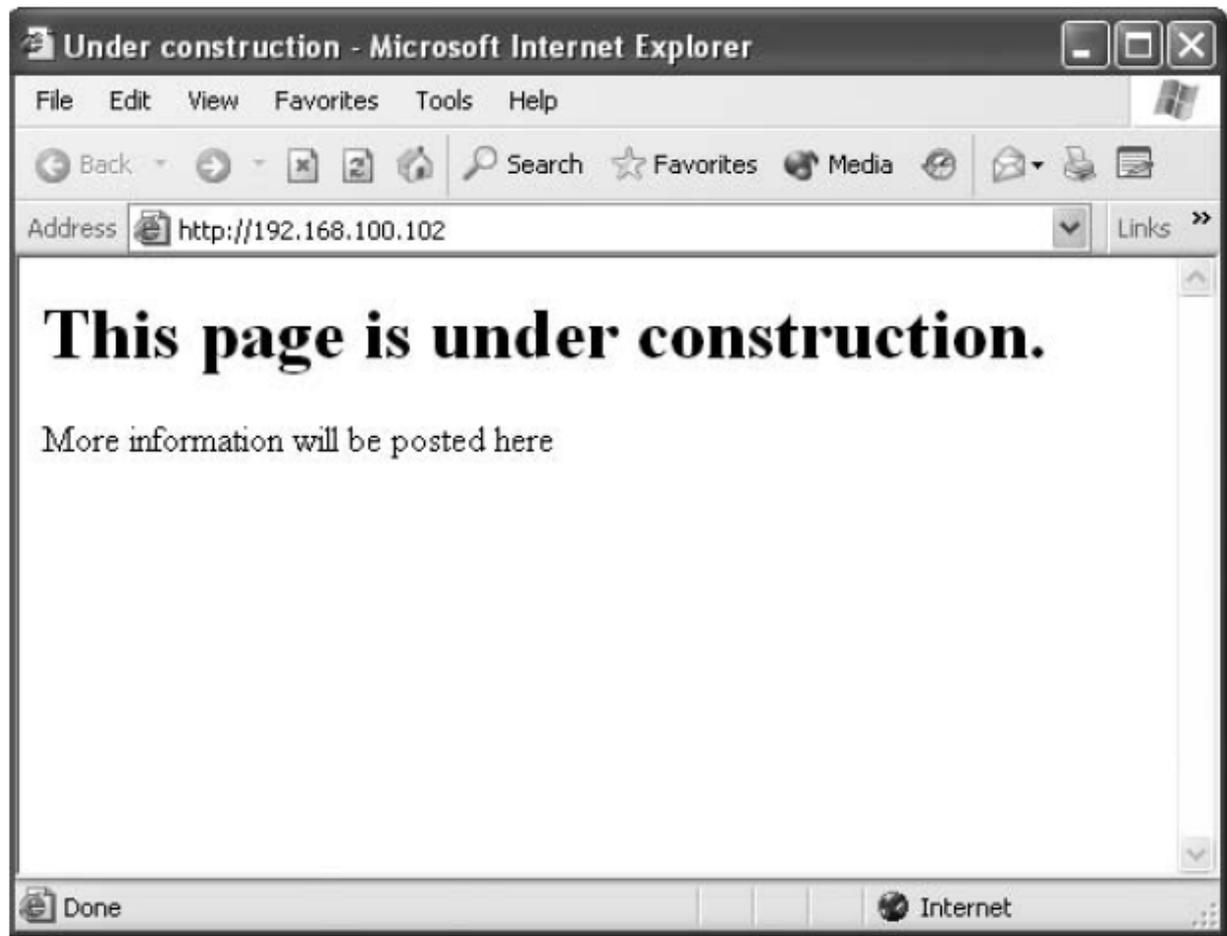


FIGURE 3-2 Viewing the web page over the network