LAB PROCEDURE 36

Windows 2000 TCP/IP

Networking

OBJECTIVES

1. Configure the Command Prompt window to improve visibility.
2. Use the IPCONFIG utility to examine your current TCP/IP configuration.
3. Use the ARP utility to map IP addresses to physical MAC addresses.
4. Use the NETSTAT utility to examine all current network connections.
5. Use the NBTSTAT utility to resolve Windows computer names on the network.
6. Use the NET VIEW utility to list all shared devices on a network node.
7. Use the TRACERT utility to test data packet routing and timing.
8. Use the PING utility to test other network nodes.

RESOURCES

1. Marcraft 8000 Trainer with 128 MB RAM
2. Windows 2000 operating system (installed)
3. Network Interface Card (installed)
4. Internet access through a network connection or modem

DISCUSSION

As discussed in Lab Procedure 33 (Windows Me TCP/IP Utilities), Windows provides several networking tools, called TCP/IP utilities, which can assist you in troubleshooting networking problems and determining how your network is performing. These tools are also present in a similar manner for Windows 2000. The functionality of the utilities will change depending on whether you are using a network server, a direct network connection via a modem, or a network workstation. because of this variability, if a step does not function as described below, move on to the next step.

Networking

PROCEDURE

As before, you will access these tools through the *Command Prompt* window. In this lab procedure you will modify the *MS-DOS Command Prompt* window to increase the visibility of the displayed information. When completed, you will use the IPCONFIG /all command to list all current network parameters. The ARP command will map your network host's IP address to a NIC's MAC address. You will use the NETSTAT command to identify your current network connections, and the NBTSTAT command to resolve the Windows computer names of the other nodes you are connected to on the network. The NET VIEW command will list the nodes on your LAN and the shared devices on one of these nodes. You will use the TRACERT command to test data packet routing to a remote host, and to examine the time required for it to travel between points. Finally, the PING command will be used to test for responsiveness from a network node.

NOTE: The information actually displayed when running these utilities will vary greatly depending on your particular network configuration. The examples provided below will not match your results.

1. Modify the Command Prompt window to increase visibility

____a. Boot the computer into Windows 2000.

____b. Use the path Start/Programs/Accessories/Command Prompt to open the *MS-DOS Command Prompt* window.

____c. Right-click the Command Prompt title bar and select Properties from the pop-up contextual menu.

____d. Click the Colors tab.

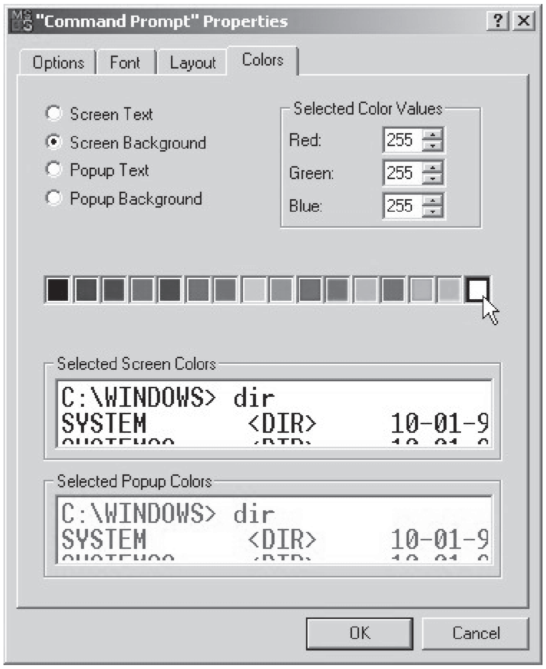
____e. Click the white color selector box, as seen in Figure 36-1, to change the background to white.

____f. Click the Screen Text radio button to select it.

____g. Click the black color selector box to change the text color to black.

____h. Click the OK button to close the *Properties* window.

____i. Click the OK button to change the window properties for the current window only.



○ Screen Text
● Screen Background
○ Popup Text
○ Popup Background

Selected Color Values
Red: 255
Green: 255
Blue: 255

Selected Screen Colors

```
C:\WINDOWS> dir
SYSTEM        <DIR>      10-01-9
```

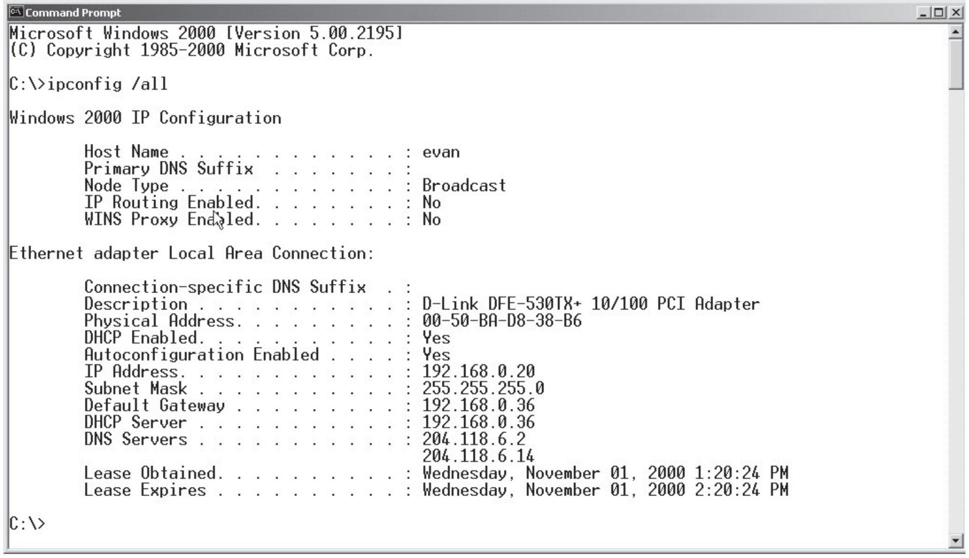
Selected Popup Colors

```
C:\WINDOWS> dir
SYSTEM        <DIR>      10-01-9
```

Figure 36-1: Command Prompt Properties Window

IPCONFIG

The IPCONFIG utility allows you to see your current IP address and other useful network configuration information. The command "IPCONFIG /all" will display the complete network information for the host computer you are using. As shown in Figure 36-2, this utility will identify the current network configuration, including the IP address and physical MAC address. If you are using DHCP to provide your IP address, you can use the "/release" and "/renew" switches to force the DHCP server to withdraw the current IP address lease, or drop the current lease and grab a new one.



```
Microsoft Windows 2000 [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.

C:\>ipconfig /all

Windows 2000 IP Configuration

        Host Name . . . . . . . . . . . . : evan
        Primary DNS Suffix  . . . . . . . :
        Node Type . . . . . . . . . . . . : Broadcast
        IP Routing Enabled. . . . . . . . : No
        WINS Proxy Enabled. . . . . . . . : No

Ethernet adapter Local Area Connection:

        Connection-specific DNS Suffix  . :
        Description . . . . . . . . . . . : D-Link DFE-530TX+ 10/100 PCI Adapter
        Physical Address. . . . . . . . . : 00-50-BA-D8-38-B6
        DHCP Enabled. . . . . . . . . . . : Yes
        Autoconfiguration Enabled . . . . : Yes
        IP Address. . . . . . . . . . . . : 192.168.0.20
        Subnet Mask . . . . . . . . . . . : 255.255.255.0
        Default Gateway . . . . . . . . . : 192.168.0.36
        DHCP Server . . . . . . . . . . . : 192.168.0.36
        DNS Servers . . . . . . . . . . . : 204.118.6.2
                                            204.118.6.14
        Lease Obtained. . . . . . . . . . : Wednesday, November 01, 2000 1:20:24 PM
        Lease Expires . . . . . . . . . . : Wednesday, November 01, 2000 2:20:24 PM

C:\>
```

Figure 36-2: IPCONFIG /all

NOTE: IPCONFIG /all is used to display the current network configuration.

1. Run IPCONFIG to display your network configuration

____a. At the MS-DOS command prompt, type **ipconfig ?**, and press the ENTER key. Review the usage notes for IPCONFIG.

____b. At the command prompt, type **ipconfig /all**, and press the ENTER key.

____c. Record the listed information for your client workstation in Table 36-1.

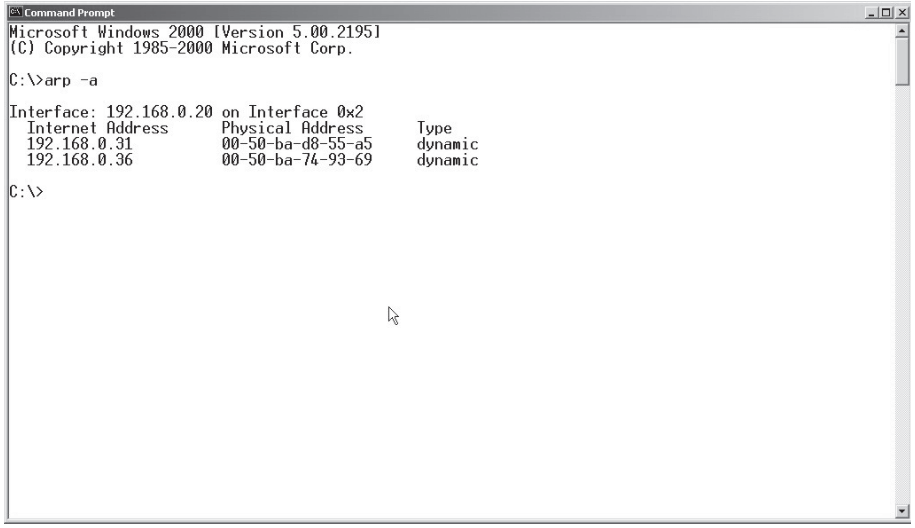
ARP

The Address Resolution Protocol (ARP) utility can be used to identify addressing information by examining the contents of the ARP caches on either the client or the server. It is primarily used to map IP addresses to physical MAC addresses.

1. Run ARP to resolve your client and current network connections

____a. At the command prompt, type **arp**, and press the ENTER key. Review the usage notes for ARP.

___b. At the command prompt, type **arp -a**, and press the ENTER key. This will show information similar to Figure 36-3.



```
Microsoft Windows 2000 [Version 5.00.2195]
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C:\>arp -a

Interface: 192.168.0.20 on Interface 0x2
  Internet Address      Physical Address      Type
  192.168.0.31          00-50-ba-d8-55-a5     dynamic
  192.168.0.36          00-50-ba-74-93-69     dynamic

C:\>
```

Figure 36-3: arp - a Command Prompt Window

NOTE: ARP is used to map IP addresses and physical MAC addresses.

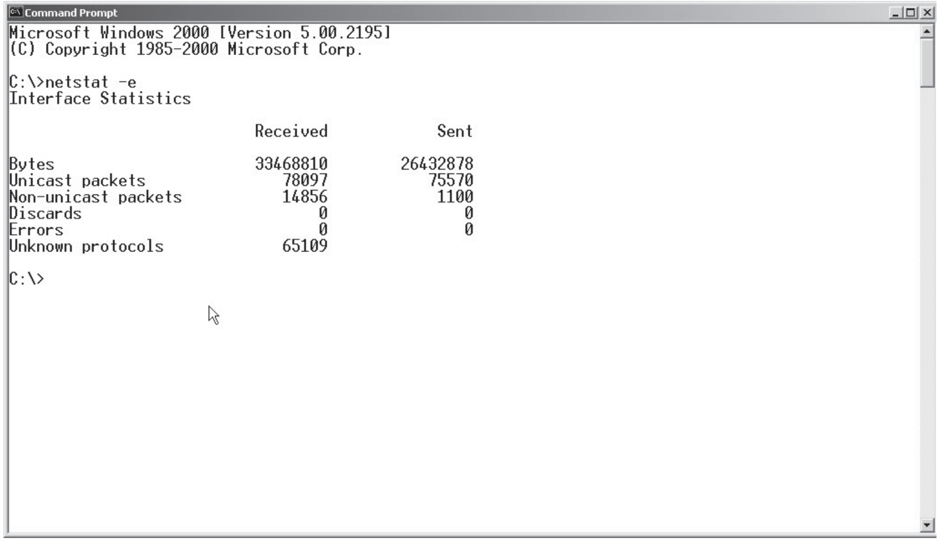
___c. Record the IP address of your host computer, as shown in the Interface line, in Table 36-2.

___d. Record the IP and MAC addresses in Table 36-3.

NETSTAT

The command "netstat -e" displays the number of data packets transmitted and received, and the number of errors generated, as shown in Figure 36-4. The command "netstat -r" displays a list of all of the current connections and show which are active.

NOTE: NETSTAT is used to display statistics about the current session.



```
Microsoft Windows 2000 [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.

C:\>netstat -e
Interface Statistics

                           Received            Sent

Bytes                      33468810        26432878
Unicast packets               78097           75570
Non-unicast packets           14856            1100
Discards                          0               0
Errors                            0               0
Unknown protocols             65109

C:\>
```

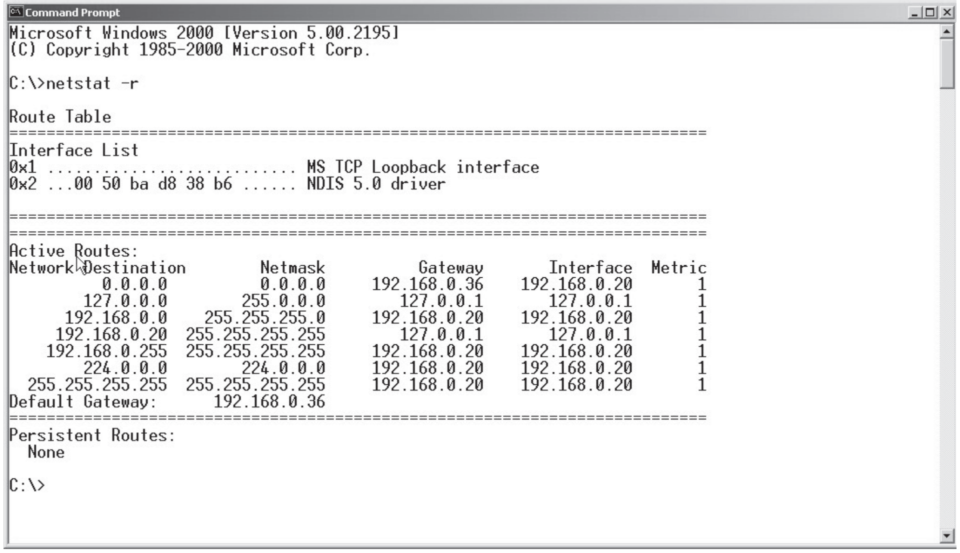
Figure 36-4: netstat - e Command Prompt Window

1. Run NETSTAT to examine the current network connection

____a. At the command prompt, type **netstat ?**, and press the ENTER key. Review the usage notes for NETSTAT.

____b. At the command prompt, type **netstat -e**, and press the ENTER key to display packet statistics.

____c. At the command prompt, type **netstat -r**, and press the ENTER key. This will show your network connection information similar to Figure 36-5.



```
Microsoft Windows 2000 [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.

C:\>netstat -r

Route Table
===========================================================================
Interface List
0x1 ........................... MS TCP Loopback interface
0x2 ...00 50 ba d8 38 b6 ...... NDIS 5.0 driver

===========================================================================
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0     192.168.0.36    192.168.0.20       1
        127.0.0.0        255.0.0.0        127.0.0.1       127.0.0.1       1
      192.168.0.0    255.255.255.0     192.168.0.20    192.168.0.20       1
     192.168.0.20  255.255.255.255        127.0.0.1       127.0.0.1       1
    192.168.0.255  255.255.255.255     192.168.0.20    192.168.0.20       1
        224.0.0.0        224.0.0.0     192.168.0.20    192.168.0.20       1
  255.255.255.255  255.255.255.255     192.168.0.20    192.168.0.20       1
Default Gateway:      192.168.0.36
===========================================================================
Persistent Routes:
  None

C:\>
```

Figure 36-5: netstat -r Command Prompt Window

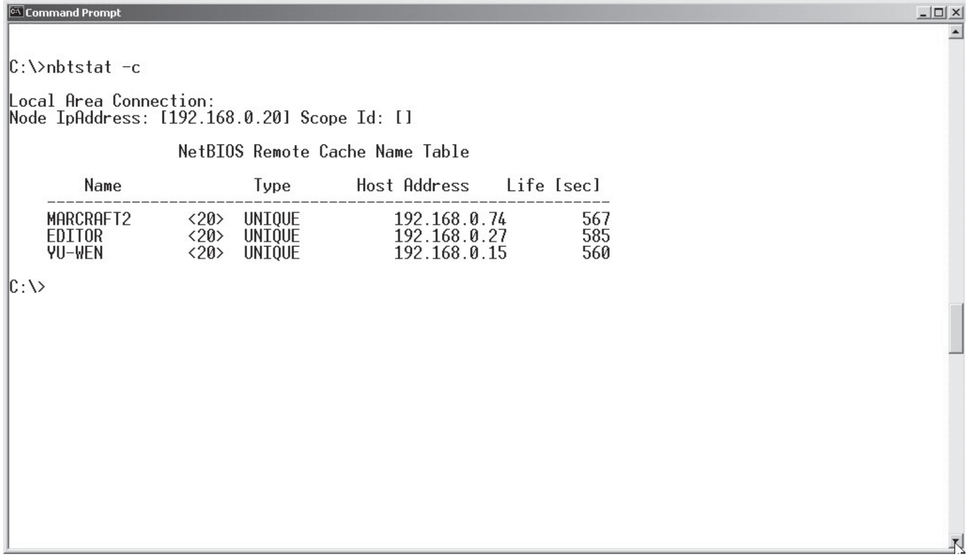
NBTSTAT

The NBTSTAT (NetBIOS over TCP STATistics) utility shows the Windows NetBIOS names for the connected computers, and lists their IP addresses and the status of the connection. This allows you to check connections made with the Windows Network Neighborhood tool. The "nbtstat -c" command displays the NetBIOS names of the hosts you are connected to, and the IP addresses they map to.

1. Run NBTSTAT to resolve your client's current network connections

____a. At the command prompt, type **nbtstat**, and press the ENTER key. Review the usage notes for NBTSTAT.

____b. At the command prompt, type **nbtstat -c**, and press the ENTER key. This will show you remote host identification information similar to Figure 36-6.



```
C:\>nbtstat -c

Local Area Connection:
Node IpAddress: [192.168.0.20] Scope Id: []

                  NetBIOS Remote Cache Name Table

        Name              Type       Host Address    Life [sec]
    ------------------------------------------------------------
    MARCRAFT2      <20>  UNIQUE          192.168.0.74        567
    EDITOR         <20>  UNIQUE          192.168.0.27        585
    YU-WEN         <20>  UNIQUE          192.168.0.15        560

C:\>
```

Figure 36-6: nbtstat -c Command Prompt Window

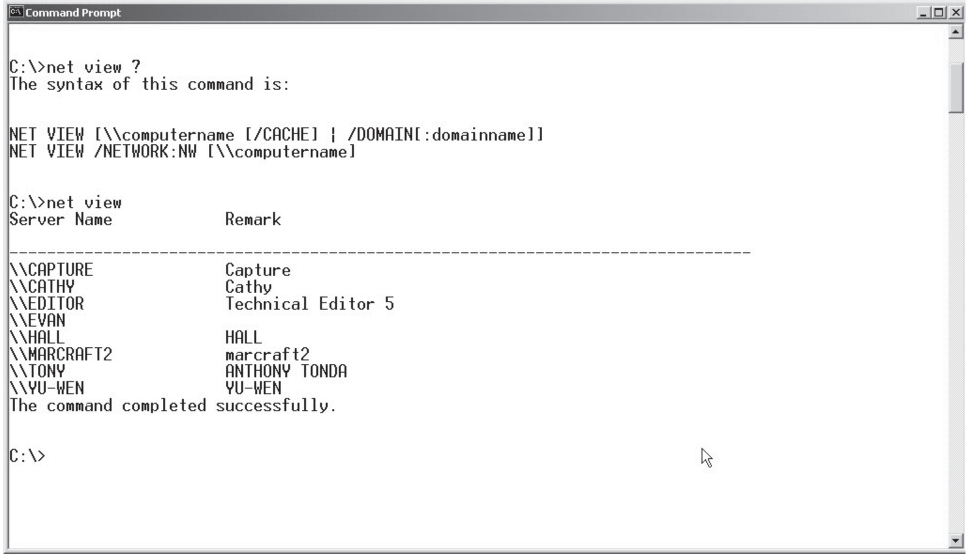
NET VIEW

The NET VIEW command lists all of the computers currently connected to your Local Area Network (LAN). It can also display all of the shared devices associated with a particular network host. The format for displaying shared devices is "net view \\your server name", where the server name is the actual NetBIOS name of the workstation or server you are connected to. For example, "net view \\accounting" will resolve a list of all of the shared devices supported by the server named "accounting".

1. Run NET VIEW to list the nodes on the LAN and display the shared devices on a node

___a. At the command prompt, type **net view ?**, and press the ENTER key. Review the usage notes for NET VIEW.

___b. At the command prompt, type **net view**, and press the ENTER key to list all of the nodes connected to your LAN. Your results should be similar to Figure 36-7.

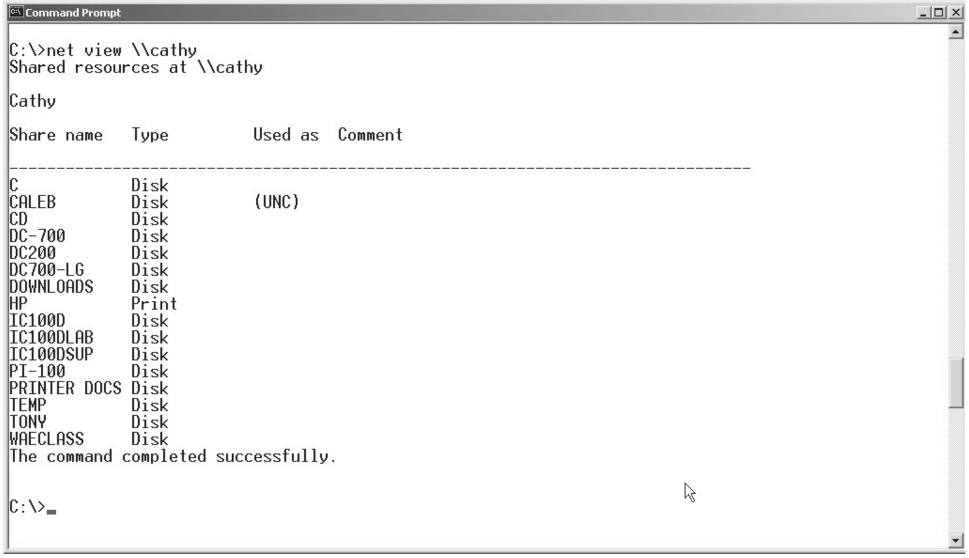


```
C:\>net view ?
The syntax of this command is:


NET VIEW [\\computername [/CACHE] | /DOMAIN[:domainname]]
NET VIEW /NETWORK:NW [\\computername]


C:\>net view
Server Name            Remark

-------------------------------------------------------------------------------
\\CAPTURE              Capture
\\CATHY                Cathy
\\EDITOR               Technical Editor 5
\\EVAN
\\HALL                 HALL
\\MARCRAFT2            marcraft2
\\TONY                 ANTHONY TONDA
\\YU-WEN               YU-WEN
The command completed successfully.


C:\>
```

Figure 36-7: net view ? Command Prompt Window

___c. Record the host names listed by NET VIEW in Table 36-4.

___d. At the command prompt, type **net view \\*host name***, and press the ENTER key. In this command, you should replace *host name* with the NetBIOS name of one of the hosts listed in Table 36-4. This will show the shared devices on a particular host computer as seen in the example shown in Figure 36-8.



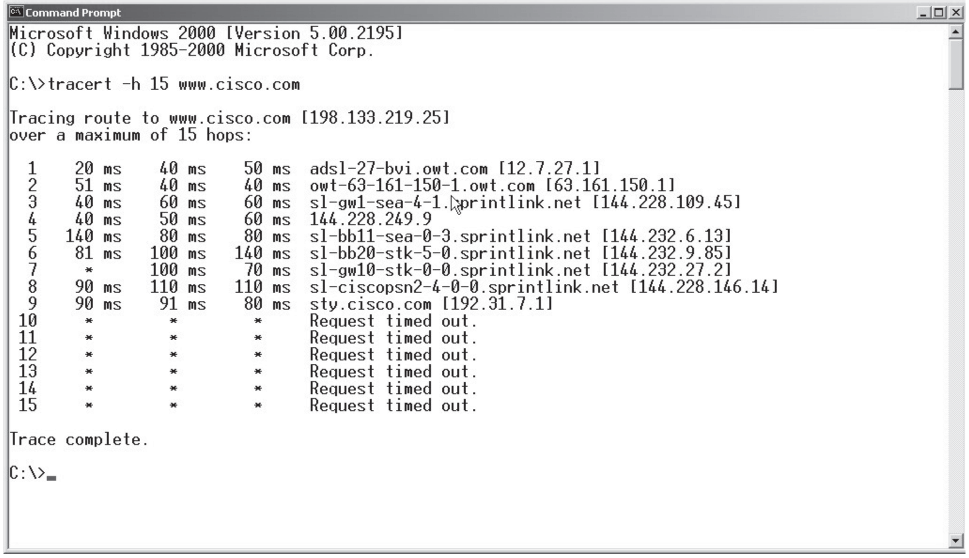
```
C:\>net view \\cathy
Shared resources at \\cathy

Cathy

Share name   Type        Used as  Comment

-------------------------------------------------------------------------------
C            Disk
CALEB        Disk        (UNC)
CD           Disk
DC-700       Disk
DC200        Disk
DC700-LG     Disk
DOWNLOADS    Disk
HP           Print
IC100D       Disk
IC100DLAB    Disk
IC100DSUP    Disk
PI-100       Disk
PRINTER DOCS Disk
TEMP         Disk
TONY         Disk
WAECLASS     Disk
The command completed successfully.


C:\>
```

Figure 36-8: NET VIEW Command Prompt Window

TRACERT

The command "tracert *hostname*", where *hostname* is the IP address or DNS name of a host, will trace the path of a network connection to that remote host. This command will display the number of hops and the IP addresses of the routers that a data packet has traveled through in order to reach the remote host. It will also measure the time (in milliseconds) it takes for the data packet to travel from point to point on this route.

If you are having trouble connecting to a specific destination, the question then becomes: Is the problem at the destination, or at one of the routers along the way? TRACERT will detect whether a particular router along the current path is not functioning. If a router does not respond, the response time values are marked with an asterisk [*], indicating that the data packet timed out. TRACERT will also indicate if a router is slow. You can determine this by looking at the time it takes for a packet to get through a particular router. As you can see in Figure 36-9, the time delay is calculated three times for each router in the chain. The median of the three values should be used to evaluate the time it took to get the data packet through the router.



```
Microsoft Windows 2000 [Version 5.00.2195]
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C:\>tracert -h 15 www.cisco.com

Tracing route to www.cisco.com [198.133.219.25]
over a maximum of 15 hops:

  1    20 ms    40 ms    50 ms  adsl-27-bvi.owt.com [12.7.27.1]
  2    51 ms    40 ms    40 ms  owt-63-161-150-1.owt.com [63.161.150.1]
  3    40 ms    60 ms    60 ms  sl-gw1-sea-4-1.sprintlink.net [144.228.109.45]
  4    40 ms    50 ms    60 ms  144.228.249.9
  5   140 ms    80 ms    80 ms  sl-bb11-sea-0-3.sprintlink.net [144.232.6.13]
  6    81 ms   100 ms   140 ms  sl-bb20-stk-5-0.sprintlink.net [144.232.9.85]
  7     *      100 ms    70 ms  sl-gw10-stk-0-0.sprintlink.net [144.232.27.2]
  8    90 ms   110 ms   110 ms  sl-ciscopsn2-4-0-0.sprintlink.net [144.228.146.14]
  9    90 ms    91 ms    80 ms  sty.cisco.com [192.31.7.1]
 10     *        *        *     Request timed out.
 11     *        *        *     Request timed out.
 12     *        *        *     Request timed out.
 13     *        *        *     Request timed out.
 14     *        *        *     Request timed out.
 15     *        *        *     Request timed out.

Trace complete.

C:\>
```

Figure 36-9: TRACERT Command Prompt Window

1. Run TRACERT to check a remote network connection

____a. At the command prompt, type **tracert**, and press the ENTER key. Review the usage notes for TRACERT.

____b. At the command prompt, type **tracert www.mic-inc.com**, and press the ENTER key to trace the route to the Marcraft server.

____c. Record the IP address associated with www.mic-inc.com in Table 36-5.

PING

The PING command is one of the key tools for troubleshooting TCP/IP. PING causes a data packet to be sent to a specified IP address and returned to your machine. If the IP address is not currently active, you will receive a message stating that the transaction has timed out. If you are having trouble connecting to a network, PING can be used to test the functionality of TCP/IP on your own machine. If you are able to PING the loopback address (127.0.0.1) and your own network IP address, you can be fairly sure that TCP/IP on your host computer is working properly. The next step is to test the IP address for your network server and/or your default gateway. As a final test you can PING the IP address of a remote host server.

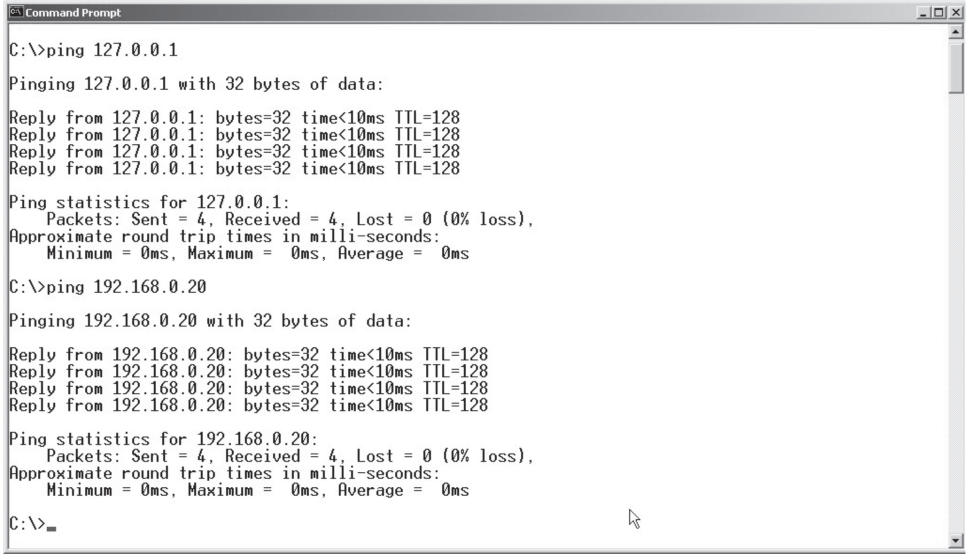
NOTE: Can't remember your IP address, or the IP address of the local server? Run IPCONFIG to get your IP address and the address of the host DNS server and gateway, or you can look up the your data in Table 36-1.

1. Run PING to check the status of a TCP/IP connection

____a. At the command prompt, type **ping**, and press the ENTER key. Review the usage notes for PING.

____b. At the command prompt, type **ping 127.0.0.1**, and press the ENTER key to test TCP/IP on your local host computer.

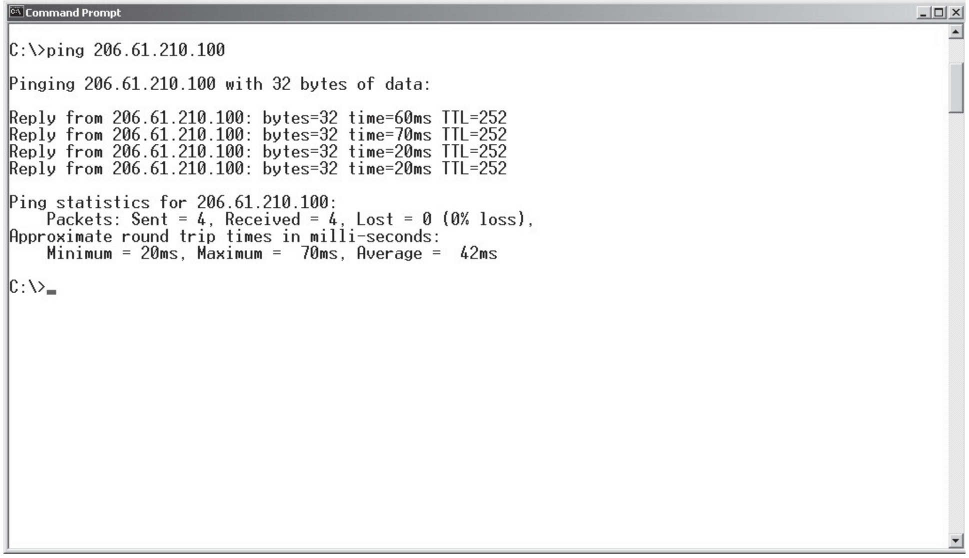
___c. At the command prompt, type **ping xxx.xxx.xxx.xxx**, where *xxx.xxx.xxx.xxx* is the host IP address listed in Table 36-1. Now press the ENTER key to test your local TCP/IP connection. Your screen should appear similar to Figure 36-10.



```
C:\>ping 127.0.0.1

Pinging 127.0.0.1 with 32 bytes of data:

Reply from 127.0.0.1: bytes=32 time<10ms TTL=128
Reply from 127.0.0.1: bytes=32 time<10ms TTL=128
Reply from 127.0.0.1: bytes=32 time<10ms TTL=128
Reply from 127.0.0.1: bytes=32 time<10ms TTL=128

Ping statistics for 127.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum =  0ms, Average =  0ms

C:\>ping 192.168.0.20

Pinging 192.168.0.20 with 32 bytes of data:

Reply from 192.168.0.20: bytes=32 time<10ms TTL=128
Reply from 192.168.0.20: bytes=32 time<10ms TTL=128
Reply from 192.168.0.20: bytes=32 time<10ms TTL=128
Reply from 192.168.0.20: bytes=32 time<10ms TTL=128

Ping statistics for 192.168.0.20:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum =  0ms, Average =  0ms

C:\>_
```

Figure 36-10: PING Command Prompt Window

___d. At the command prompt, type **ping xxx.xxx.xxx.xxx**, where *xxx.xxx.xxx.xxx* is the IP address listed in Table 36-5. Press the ENTER key to test your connection to the remote server at Marcraft. You should see a screen similar to Figure 36-11.



```
C:\>ping 206.61.210.100

Pinging 206.61.210.100 with 32 bytes of data:

Reply from 206.61.210.100: bytes=32 time=60ms TTL=252
Reply from 206.61.210.100: bytes=32 time=70ms TTL=252
Reply from 206.61.210.100: bytes=32 time=20ms TTL=252
Reply from 206.61.210.100: bytes=32 time=20ms TTL=252

Ping statistics for 206.61.210.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 20ms, Maximum =  70ms, Average =  42ms

C:\>_
```

Figure 36-11: PINGing Command Prompt Window

___e. Close all open windows, and shut down the computer.

TABLES

Table 36-1

Host Name:	
Primary DNS Suffix:	
Node Type:	
IP Routing Enabled:	
WINS Proxy Enabled:	
Description:	
Physical Address:	
DHCP Enabled:	
Autoconfiguration Enabled:	
IP Address:	
Subnet Mask:	
Default Gateway:	
DHCP Server:	
DNS Servers:	
Lease Obtained:	
Lease Expires:	

Table 36-2

Host Computer Interface IP Address:	

Table 36-3

IP and MAC Addresses		
IP Address	**Physical MAC Address**	**Type**

Table 36-4

Net View Host Names:	

Table 36-5

IP Address for www.mic-inc.com:	

Feedback

LAB QUESTIONS

1. What command will display the connection path from your terminal to a remote Internet address?
2. Where do you enter the command to run a TCP/IP utility program?
3. What TCP/IP utility can be used to locate a slow router on a Wide Area Network such as the Internet?
4. Which command will resolve the IP and physical MAC addresses of the nodes connected to your network?
5. What TCP/IP utility can be used to identify the IP address of a site when given a DNS name?