**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.
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**
   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.

![Figure 36-1: Command Prompt Properties Window](image-url)
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.

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.

**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.

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**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.*

**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.

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.
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. 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.

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**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.
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.

![Figure 36-10: PING Command Prompt Window](image)

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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.

![Figure 36-11: PINGing Command Prompt Window](image)

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e. Close all open windows, and shut down the computer.
### TABLES

**Table 36-1**

<table>
<thead>
<tr>
<th>Host Name:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary DNS Suffix:</td>
<td></td>
</tr>
<tr>
<td>Node Type:</td>
<td></td>
</tr>
<tr>
<td>IP Routing Enabled:</td>
<td></td>
</tr>
<tr>
<td>WINS Proxy Enabled:</td>
<td></td>
</tr>
<tr>
<td>Description:</td>
<td></td>
</tr>
<tr>
<td>Physical Address:</td>
<td></td>
</tr>
<tr>
<td>DHCP Enabled:</td>
<td></td>
</tr>
<tr>
<td>Autoconfiguration Enabled:</td>
<td></td>
</tr>
<tr>
<td>IP Address:</td>
<td></td>
</tr>
<tr>
<td>Subnet Mask:</td>
<td></td>
</tr>
<tr>
<td>Default Gateway:</td>
<td></td>
</tr>
<tr>
<td>DHCP Server:</td>
<td></td>
</tr>
<tr>
<td>DNS Servers:</td>
<td></td>
</tr>
<tr>
<td>Lease Obtained:</td>
<td></td>
</tr>
<tr>
<td>Lease Expires:</td>
<td></td>
</tr>
</tbody>
</table>

**Table 36-2**

| Host Computer Interface IP Address: |                              |

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10 - LAB GROUP 4
### Table 36-3

<table>
<thead>
<tr>
<th>IP Address</th>
<th>Physical MAC Address</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 36-4

**Net View Host Names:**

- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]

### Table 36-5

<table>
<thead>
<tr>
<th>IP Address for <a href="http://www.mic-inc.com">www.mic-inc.com</a>:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
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?