In this lesson, we will learn about how to use the TCP/IP utilities to test our network. These functions come in handy when troubleshooting problems on a network.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ping</td>
<td>A utility to test connectivity with a network device</td>
</tr>
<tr>
<td>Ipconfig</td>
<td>Gives the technician the complete listing of addresses for our device’s Network Interface Card</td>
</tr>
<tr>
<td>Nslookup</td>
<td>Returns the DNS server IP address</td>
</tr>
<tr>
<td>Tracert</td>
<td>Shows the number of hops from our device to the IP address requested</td>
</tr>
<tr>
<td>ARP</td>
<td>Address Resolution Protocol utility that returns the MAC address of the gateway router or server</td>
</tr>
<tr>
<td>Hostname</td>
<td>Returns our computer name</td>
</tr>
<tr>
<td>Nbtstat</td>
<td>Shows NETBIOS connections</td>
</tr>
<tr>
<td>Pathping</td>
<td>Acts as a Ping and Tracert utility</td>
</tr>
</tbody>
</table>
Ping

Ping is a TCP/IP Utility is designed to test for connectivity to another device on the network. We can use the function to test to see if we are connected to a router or to see if the cable is functioning.

We can type “ping”, then a space and then a IP address that exists on our network. In this example, we ping 192.168.10.1. We receive from 192.168.10.1 four times in 1 millisecond. There is a summary report showing the number of packets sent, received, and the approximate round trip time. The minimum, maximum and average round trip is shown.
Request Timed Out

If the device being pinged is not on or maybe the cable is defective or unplugged, we will get a “request timed out” return four times as we see in our example.

If we get a request timed out, we should always check that the cable is connected to the personal computer. Next, we should check the computer’s Device manager to see if the network interface card is operating. Between these two checks, we typically can determine why the ping to the server is not working.
Checking the Device Manager

In the Device Manager, we can see the Network Adapter is loaded and when we double click on the device, we can see that the device is working properly in the status report.
Ping by Name

We can ping a device by its name on the network or we can ping a web server by typing the Internet address such as www.google.com.

In our example, we pinged a device called computer1. We can check the computer name of another device on the network and ping that machine.
IPConfig

The IPConfig function will give us the IP address of our network interface cards and of the gateway. A gateway could be a router or a server. After opening the command line, we type “ipconfig” and Enter. We can see the wireless network connection of 192.168.10.100 and subnet mask of 255.255.255.0. The default gateway of the wireless router is 192.168.10.1.

We also can observe the wired network adapter has an IP address of 192.168.10.12, a subnet mask of 255.255.255.0 and a default gateway of 192.168.10.1 for the router.
A more complete report about our computer and the devices we are connected to is the Ipconfig/all report. This report also contains the network card’s Media Access Control (MAC) address that is unique. This complete report is more helpful when troubleshooting client server connections.
When we are connecting to router using Dynamic Host Control Protocol (DHCP), we can change our IP address by using ipconfig/release at the command line. The report will show the IP address and subnet mask as 0.0.0.0.
IPConfig Renew

To get a new IP address for the wireless network interface card, we type `ipconfig/renew` at the command line. The request is sent to the router and in a few seconds, the NIC is assigned an IP address.
NSLookup

We can locate the DNS server supporting our computer by using the NSLookup utility.

We type “nslookup” at the command line and the default DNS server name and IP address is shown. We type exit to leave the command.
Tracert

When we want to obtain the route that our computer is taking to communicate with another network device, we use the Tracert TCP/IP utility.

In our example, we trace route the Google server by typing “tracert www.google.com” at the command line. Starting at our location we can see each hop to the Google web server.

```
C:\Documents and Settings>tracert www.google.com
Tracing route to www1.google.com (94.125.225.18) over a maximum of 30 hops:
 1    5 ms  5 ms  5 ms  cpe-65-24-96-1.columbus.res.rr.com [65.24.96.1]
 2    6 ms  7 ms 15 ms  cpe-65-24-96-1.columbus.res.rr.com [65.24.96.1]
 3   11 ms 11 ms 11 ms  gig11-0-0-1313.elmboh1-rtr2.columbus.rr.com [24.95.87.251]
 4  10 ms 12 ms 13 ms  network-024-095-086-181.columbus.rr.com [24.95.86.181]
 5  23 ms 21 ms 28 ms  network-085-189-141-089.mwtn.rr.com [65.189.141.89]
 6  30 ms 28 ms 39 ms  ae-3-6.cr0.dca20.thone.rr.com [66.109.6.70]
 7  31 ms 31 ms 39 ms  ae-l-0.pr0.dca10.thone.rr.com [66.109.6.165]
 8  27 ms 25 ms 25 ms  66.109.9.66
 9  28 ms 27 ms 27 ms  216.239.48.112
10  43 ms 40 ms 33 ms  209.85.242.200
11  35 ms 41 ms 34 ms  64.233.174.173
12  41 ms 34 ms 34 ms  74.125.225.18
Trace complete.
```
The ARP (Address Resolution Protocol) TCP/IP Utility will find the server or router gateway’s IP address, MAC address and type of IP address, whether static or dynamic.
Hostname

The Hostname TCP/IP Utility will bring up our computer’s name.
The NBTSTAT TCP/IP Utility will show NETBIOS connections for each network card in our computer.
Pathping

The Pathping TCP/IP Utility will conduct a ping test and tracert test simultaneously.

```
U:\>pathping 172.30.56.13
Tracing route to bscbrsv13.bradfordschools.adroot [172.30.56.13]
over a maxum of 30 hops:
  0  BSCBWSFS46.bradfordschools.adroot [172.30.56.228]
  1  bscbrsv13.bradfordschools.adroot [172.30.56.13]
Computing statistics for 25 seconds...
      Source to Here    This Node/Link        Hop  RTT  Lost/Sent = Pct  Lost/Sent = Pct  Address
    0                  172.30.56.228          0         0/100 = 0%         0/100 = 0%  bscbrsv13.bradfordschools.adroot [172.30.56.13]
Trace complete.
```
Review

1. How do we open the command window to run a TCP/IP Utility?
2. What TCP/IP Utilities will give us the number of hops to a IP address destination?
3. What TCP/IP Utility will give us the DNS server address for our network?
4. What TCP/IP Utility will tell us our computer’s name?
5. What TCP/IP Utility will give us the gateway’s MAC address?
6. What TCP/IP Utility will give us the NETBIOS names of our connections?
7. What is the difference between the IPCconfig and IPCconfig/all report?
8. What happens to the Ping report if the cable is unplugged?
9. How do we change our IP address on a DHCP router?
10. When we are in the NSlookup function, what do we type to close out the report?