TCP/IP Diagnostic Utilities

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TCP/IP Utilities

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.

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

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.

```
C:\Documents and Settings>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

Reply from 192.168.10.1: bytes=32 time<1ms TTL=127
Reply from 192.168.10.1: bytes=32 time<1ms TTL=127
Reply from 192.168.10.1: bytes=32 time<1ms TTL=127
Reply from 192.168.10.1: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Documents and Settings>
```

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.

```
C:\Documents and Settings>ping 192.168.10.3

Pinging 192.168.10.3 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.10.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\Documents and Settings>_
```

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.
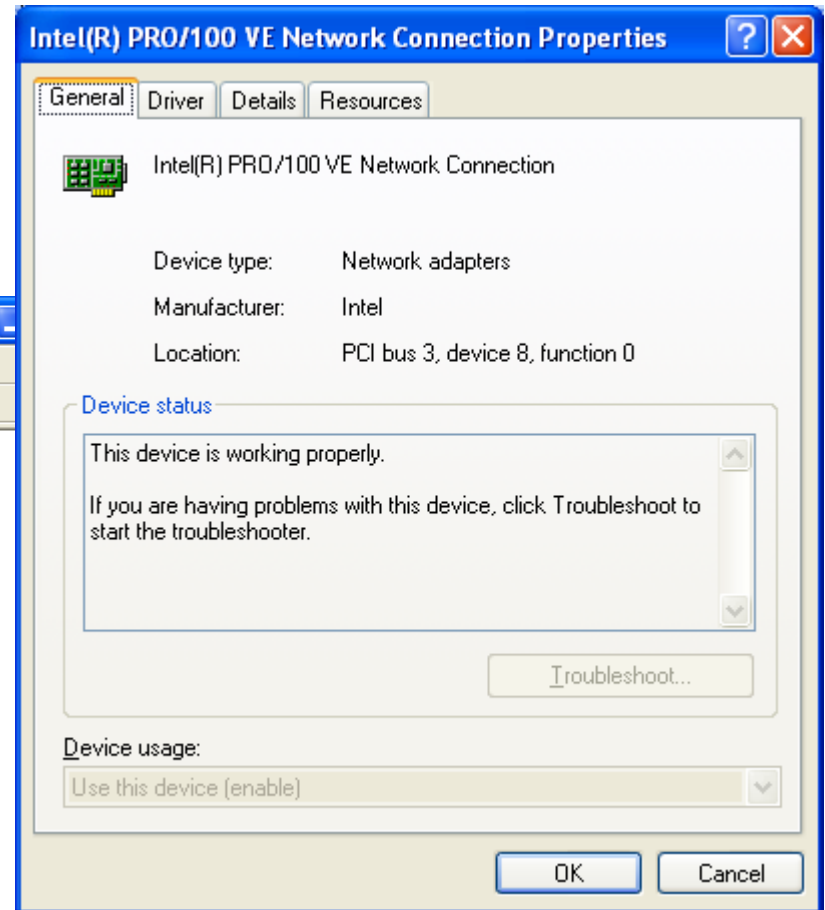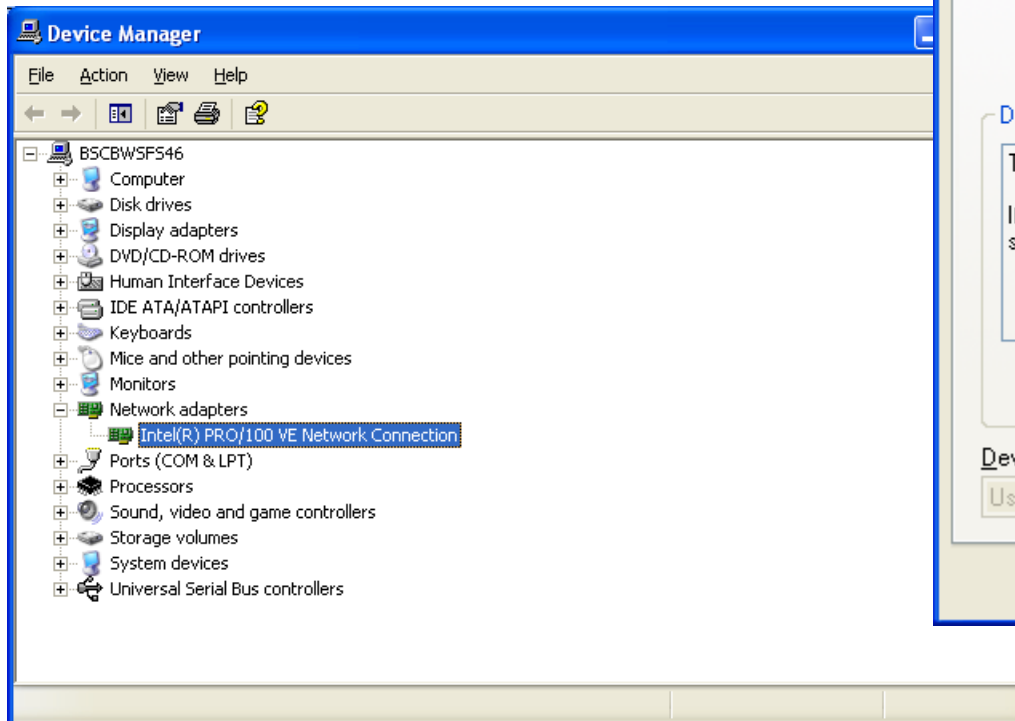
Ping by Name

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

```
C:\Documents and Settings>ping computer1

Pinging computer1 [192.168.10.12] with 32 bytes of data:

Reply from 192.168.10.12: bytes=32 time<1ms TTL=128
Reply from 192.168.10.12: bytes=32 time<1ms TTL=128
Reply from 192.168.10.12: bytes=32 time<1ms TTL=128
Reply from 192.168.10.12: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.10.12:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Documents and Settings>
```

```
C:\Documents and Settings>ping www.google.com

Pinging www.l.google.com [74.125.225.19] with 32 bytes of data:

Reply from 74.125.225.19: bytes=32 time=34ms TTL=55
Reply from 74.125.225.19: bytes=32 time=41ms TTL=55
Reply from 74.125.225.19: bytes=32 time=36ms TTL=55
Reply from 74.125.225.19: bytes=32 time=34ms TTL=55

Ping statistics for 74.125.225.19:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 34ms, Maximum = 41ms, Average = 36ms

C:\Documents and Settings>
```

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.

```
C:\Documents and Settings>ipconfig

Windows IP Configuration

Ethernet adapter Wireless Network Connection:

        Connection-specific DNS Suffix  . : Instructor
        IP Address. . . . . . . . . . . . : 192.168.10.100
        Subnet Mask . . . . . . . . . . . : 255.255.255.0
        Default Gateway . . . . . . . . . : 192.168.10.1

Ethernet adapter Local Area Connection:

        Connection-specific DNS Suffix  . :
        IP Address. . . . . . . . . . . . : 192.168.10.12
        Subnet Mask . . . . . . . . . . . : 255.255.255.0
        Default Gateway . . . . . . . . . : 192.168.10.1

C:\Documents and Settings>_
```

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.

IPConfig/all

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.

```
C:\Documents and Settings>ipconfig/all

Windows IP Configuration

        Host Name . . . . . . . . . . . . : computer1
        Primary Dns Suffix  . . . . . . . :
        Node Type . . . . . . . . . . . . : Hybrid
        IP Routing Enabled. . . . . . . . : No
        WINS Proxy Enabled. . . . . . . . : No
        DNS Suffix Search List. . . . . . : Instructor

Ethernet adapter Wireless Network Connection:

        Connection-specific DNS Suffix  . : Instructor
        Description . . . . . . . . . . . : D-Link WDA-2320 Desktop Adapter
        Physical Address. . . . . . . . . : 00-1C-F0-93-AE-07
        Dhcp Enabled. . . . . . . . . . . : Yes
        Autoconfiguration Enabled . . . . : Yes
        IP Address. . . . . . . . . . . . : 192.168.10.100
        Subnet Mask . . . . . . . . . . . : 255.255.255.0
        Default Gateway . . . . . . . . . : 192.168.10.1
        DHCP Server . . . . . . . . . . . : 192.168.10.1
        DNS Servers . . . . . . . . . . . : 192.168.10.1
        Lease Obtained. . . . . . . . . . : Sunday, March 13, 2011 3:37:13 PM
        Lease Expires . . . . . . . . . . : Sunday, March 13, 2011 6:37:13 PM

Ethernet adapter Local Area Connection:

        Connection-specific DNS Suffix  . :
        Description . . . . . . . . . . . : Intel(R) PRO/100 VE Network Connecti
on
        Physical Address. . . . . . . . . : 00-13-20-A6-E5-79
        Dhcp Enabled. . . . . . . . . . . : No
        IP Address. . . . . . . . . . . . : 192.168.10.12
        Subnet Mask . . . . . . . . . . . : 255.255.255.0
        Default Gateway . . . . . . . . . : 192.168.10.1
        DNS Servers . . . . . . . . . . . : 209.18.47.61
                                            209.18.47.62
        Primary WINS Server . . . . . . . : 192.168.100.1
        Secondary WINS Server . . . . . . : 192.168.10.240

C:\Documents and Settings>_
```

IPConfig Release

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.

```
C:\Documents and Settings>ipconfig/release

Windows IP Configuration

Ethernet adapter Wireless Network Connection:

        Connection-specific DNS Suffix  . :
        IP Address. . . . . . . . . . . : 0.0.0.0
        Subnet Mask . . . . . . . . . . : 0.0.0.0
        Default Gateway . . . . . . . . :
```

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.

```
C:\Documents and Settings>ipconfig/renew

Windows IP Configuration


Ethernet adapter Wireless Network Connection:

        Connection-specific DNS Suffix  . : Instructor
        IP Address. . . . . . . . . . . . : 192.168.10.100
        Subnet Mask . . . . . . . . . . . : 255.255.255.0
        Default Gateway . . . . . . . . . : 192.168.10.1
```

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.

```
C:\Documents and Settings>nslookup
Default Server:  dns-cac-lb-01.rr.com
Address:  209.18.47.61

> exit

C:\Documents and Settings>_
```

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 www.l.google.com [74.125.225.18]
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.clmboh1-rtr2.columbus.rr.com [24.
95.87.25]
  4    10 ms    12 ms    13 ms  network-024-095-086-181.columbus.rr.com [24.95.8
6.181]
  5    23 ms    21 ms    28 ms  network-065-189-141-089.mwrtn.rr.com [65.189.141
.89]
  6    30 ms    28 ms    39 ms  ae-3-0.cr0.dca20.tbone.rr.com [66.109.6.70]
  7    31 ms    31 ms    39 ms  ae-1-0.pr0.dca10.tbone.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  209.85.242.208
 11    35 ms    41 ms    34 ms  64.233.174.173
 12    41 ms    34 ms    34 ms  74.125.225.18

Trace complete.
```

ARP-A

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.

```
C:\Documents and Settings>arp -a

Interface: 192.168.10.12 --- 0x3
  Internet Address        Physical Address        Type
  192.168.10.1            00-21-91-10-1c-87       dynamic

C:\Documents and Settings>
```

Hostname

The Hostname TCP/IP Utility will bring up our computer's name.

```
C:\Documents and Settings>hostname
computer1

C:\Documents and Settings>
```

NBTSTAT

The NBTSTAT TCP/IP Utility will show NETBIOS connections for each network card in our computer.

```
C:\Documents and Settings>nbtstat -n

Wireless Network Connection:
Node IpAddress: [192.168.10.100] Scope Id: []

            NetBIOS Local Name Table

        Name              Type         Status
    ---------------------------------------------------
        COMPUTER1      <00>  UNIQUE      Registered
        WORKGROUP      <00>  GROUP       Registered
        COMPUTER1      <20>  UNIQUE      Registered
        WORKGROUP      <1E>  GROUP       Registered

Local Area Connection:
Node IpAddress: [192.168.10.12] Scope Id: []

            NetBIOS Local Name Table

        Name              Type         Status
    ---------------------------------------------------
        COMPUTER1      <00>  UNIQUE      Registered
        WORKGROUP      <00>  GROUP       Registered
        COMPUTER1      <20>  UNIQUE      Registered
        WORKGROUP      <1E>  GROUP       Registered
        WORKGROUP      <1D>  UNIQUE      Registered
        ..__MSBROWSE__.<01>  GROUP       Registered

C:\Documents and Settings>
```

Pathping

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

```
U:\>pathping 172.30.56.13

Tracing route to bscbsv13.bradfordschools.adroot [172.30.56.13]
over a maximum of 30 hops:
  0  BSCBWSFS46.bradfordschools.adroot [172.30.58.228]
  1  bscbsv13.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                                             BSCBWSFS46.bradfordschools.adroot
[172.30.58.228]
                                0/ 100 =  0%   |
  1    0ms      0/ 100 =  0%    0/ 100 =  0%   bscbsv13.bradfordschools.adroot [1
72.30.56.13]

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 IPConfig and IPConfig/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?