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Using Ping and Traceroute

All data sent over the internet is sent in packets. Consider the following analogy. The idea behind packets is very similar to the idea of the capsules used to send checking and savings information from your vehicle to tellers inside the bank via vacuum tubes. The emails you send and the files you download are all broken down into raw data and inserted into little packets. These packets are piped through your Internet connection. When a packet arrives at a destination computer, the data is extracted and reassembled into a file.

Ping and Traceroute are two programs that can be used to send packets of information to remote computers for the purpose of retrieving information. These programs are useful for testing your internet connection.

To use Ping and Traceroute you will need a command prompt:

Windows

- Click the Start button and select Run.
- Enter **command** or **cmd** into the Open field.
- Click OK. A windows command prompt screen should look like the example below:

```
Microsoft(R) Windows DOS
(C) Copyright Microsoft Corp 1990-2001.
C:\WINDOWS>
```

PING

Ping can test the speed of your connection, "distance" to target, and whether or not your connection is even up and running. It tells you how long a packet of data takes to travel from your computer to a specified host, and back again (in this case, the packet is 32 bytes in size).

To use Ping, type **ping** followed by a destination host (server name such as www.website.net) or a host IP address (e.g., 209.166.161.121).

Note for Macintosh OS X users: use the command ping -c 4 followed by the destination host to ping only 4 times. If you do not use the -c 4, the command will continue pinging until you break the connection (CTRL+C on the keyboard).

Ping Tests

Once you have your command prompt (or WhatRoute) open, enter **ping 127.0.0.1** and press **Enter**. You should receive 4 responses similar to the lines below. This ping test verifies the operation of the base TCP/IP stack. If TCP/IP is working correctly, there will be no problems with the ping. If you receive a timeout or error message, there is a problem with TCP/IP in which case you may have to uninstall and reinstall TCP/IP.

```
C:\WINDOWS>ping 127.0.0.1

Pinging 127.0.0.1 with 32 bytes of data:

Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
```

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```
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
```

Ping **your IP*** and press Enter. The "XXX" indicates your IP address and can be found by using the `ipconfig /all` command. Pinging your IP verifies that the physical network device can be addressed. If you cannot ping your own IP address, make sure the IP is correctly entered in the Network Control Panel (NCP). If it is correct, replace TCP/IP. If this does not work, the network card may not be properly installed or 'bad' in which case you may need to reinstall the NIC.

```
C:\WINDOWS>ping 209.166.xxx.xxx

Pinging 209.166.xxx.xxx with 32 bytes of data:

Reply from 209.166.xxx.xxx: bytes=32 time<1ms TTL=44
Reply from 209.166.xxx.xxx: bytes=32 time=1ms TTL=44
Reply from 209.166.xxx.xxx: bytes=32 time=2ms TTL=44
Reply from 209.166.xxx.xxx: bytes=32 time<1ms TTL=44

Ping statistics for 209.166.xxx.xxx:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 2ms, Average = 1ms
```

Enter **ping 209.166.161.121** and press Enter. This test checks that your connection to the Internet is active and that the network can be accessed. You should receive 4 responses similar to the lines below.

```
C:\WINDOWS>ping 209.166.161.121

Pinging 209.166.161.121 with 32 bytes of data:

Reply from 209.166.161.121: bytes=32 time<1ms TTL=44
Reply from 209.166.161.121: bytes=32 time=1ms TTL=44
Reply from 209.166.161.121: bytes=32 time=2ms TTL=44
Reply from 209.166.161.121: bytes=32 time<1ms TTL=44

Ping statistics for 209.166.161.121:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 2ms, Average = 1ms
```

Now enter **ping www.website.net** or another server name (e.g., `www.yahoo.com`) and press Enter. This test checks that your computer is able to translate name addresses (like `www.website.net` or `www.yahoo.com`) to numbers (like `209.166.165.174` or `64.58.76.224`) - DNS resolution. You should receive 4 responses similar to the lines below. If you do not receive responses, check your DNS configuration settings.

```
C:\WINDOWS>ping www.website.net

Pinging corp01.web.pitdcl.website.net [208.40.175.241] with 32 bytes of
data:

Reply from 208.40.175.241: bytes=32 time<1ms TTL=44
Reply from 208.40.175.241: bytes=32 time=1ms TTL=44
Reply from 208.40.175.241: bytes=32 time=2ms TTL=44
Reply from 208.40.175.241: bytes=32 time<1ms TTL=44

Ping statistics for 208.40.175.241:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 2ms, Average = 1ms
```

UNDERSTANDING THE OUTPUT

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The first line is the command we typed: "ping www.website.net". Note the space between the command "ping" and the host computer "www.website.net."

The next line shows the full name of the host, as found by the ping program. The number 208.40.175.241 is the IP address of the host. An IP address is similar to your zip code. You may live in Washington, PA; but to the Post office, you are 15301-xxxx. The same goes for the internet, "www.website.net" is "208.40.175.241".

The next four lines show whether or not the host replied, with how many bytes (size of packet), round trip time (in milliseconds), and the TTL is how many routers the packet will go through before giving up trying to find the host.

The last lines show the statistics from pinging the host. They include how many packets were sent, received, and lost. Also shown are round trip times and averages.

INTERPRETING THE RESULTS

If all 4 packets sent are received, then the connection is working fine. Any lost packets may indicate slow connection problems. If no packets are received, you'll see like that say something like "Destination Host unreachable" or "Request Timed Out". This can indicate that your connection is not routing properly.

Note: For security reasons, some servers do not allow you to ping them - you will get "Request Timed Out" errors. You should try multiple servers if you are testing your connection.

If you can not ping a domain name (i.e. www.website.net), try the IP address (i.e. 208.40.175.241). If pinging an IP address generates replies, but the domain name doesn't, then there is probably a DNS issue.

TRACEROUTE

Traceroute tracks the path that a packet takes from your computer to a destination address. A traceroute also shows how many times your packets are being rebroadcast by other servers until it gets to the final destination. For windows users, the command is **tracert**. For Macintosh OS X users, its **traceroute**.

In this example we will trace the hops from a computer to yahoo.com:

```
C:\WINDOWS>tracert yahoo.com
Tracing route to yahoo.com [66.218.71.198] over a maximum of 30 hops:

  0  <1 ms <1 ms <1 ms 208.170.243.1
  1  44 ms 14 ms 18 ms sl-gw15-rly-6-0-1.sprintlink.net [144.232.246.165]
  2  31 ms 25 ms 13 ms sl-bb22-rly-1-0.sprintlink.net [144.232.25.232]
  3  21 ms 17 ms 17 ms sl-st20-ash-15-1.sprintlink.net [144.232.20.106]
  4  15 ms 17 ms 19 ms so-0-0-0.edge1.Washington1.Level3.net
    [209.244.219.169]
  5  16 ms 17 ms 15 ms so-5-0-0.gar1.Washington1.Level3.net [209.244.11.9]
  6  82 ms 82 ms 82 ms so-3-0-0.mp2.SanJose1.Level3.net [64.159.1.130]
  7  87 ms 87 ms 83 ms gige10-0.ipcolo3.SanJose1.Level3.net [64.159.2.41]
  8  87 ms 84 ms 93 ms unknown.Level3.net [64.152.69.30]
  9  90 ms 88 ms 92 ms w1.rc.vip.scd.yahoo.com [66.218.71.198]

Trace complete.
```

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The first line is the command we typed: `tracert yahoo.com`. Note the space between the command "ping" and the host computer "yahoo.com."

The next line shows the traceroute program acquiring the ip address from the domain. "Maximum of 30 hops" is how many routers the packet will go through before giving up trying to find the host.

The next lines show each server the packets traveled through to get to the destination yahoo.com. These show both the IP address and domain name of the actual servers that the packets passed through.

INTERPRETING THE RESULTS

Traceroutes allow you to see the path your packets take over the Internet. Sometimes, they will also allow you to "see" how your information traveled over the world: Many companies will name their servers based on where the server is located. From our example above, our information passed from our computer to servers in Washington DC then through servers in San Jose before reaching its destination (yahoo.com).

Traceroutes can show where there is a break in your connection. This allows you to determine exactly where your packets are being dropped or lost. Dropped or lost packets on a traceroute will usually show as asterisks (*).

Note: Just like ping, some servers do not allow you to traceroute all the way to them - you will get timeouts and sometimes errors. You should try multiple servers if you are testing your connection.

Ping and Traceroute allow you to diagnose problems with your Internet connection. These utilities allow you to determine if a problem is on your computer, out on the network, or at the server you're trying to reach.

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