Lab1 - Mapping the Internet

Objectives

Part 1: Test Network Connectivity Using Ping

Part 2: Trace a Route to a Remote Server Using Windows Tracert

Part 3: Trace a Route to a Remote Server Using Web-Based and Software Tools

Part 4: Compare Traceroute Results

Background

Route tracing software is used to list the networks that data must traverse from the user's originating end device to a distant destination network.

This network tool is typically executed at the command line as:

tracert <destination network name or end device address>

(Microsoft Windows systems)

or

traceroute <destination network name or end device address>

(Unix and similar systems)

Route tracing utilities allow a user to determine the path or routes as well as the delay across an IP network. Several tools exist to perform this function.

The **traceroute** (or **tracert**) tool is often used for network troubleshooting. By showing a list of routers traversed, it allows the user to identify the path taken to reach a particular destination on the network or across internetworks. Each router represents a point where one network connects to another network and through which the data packet was forwarded. The number of routers is known as the number of "hops" the data traveled from source to destination.

The displayed list can help identify data flow problems when trying to access a service such as a website. It can also be useful when performing tasks such as downloading data. If there are multiple websites (mirrors) available for the same data file, one can trace each mirror to get a good idea of which mirror would be the fastest to use.

Two trace routes between the same source and destination conducted some time apart may produce different results. This is due to the "meshed" nature of the interconnected networks that comprise the Internet and the Internet Protocol's ability to select different pathways over which to send packets.

Command-line-based route tracing tools are usually embedded within the operating system of the end device.

Other tools, such as VisualRoute™, are proprietary programs that provide extra information. VisualRoute uses available online information to graphically display the route.

This lab assumes the installation of VisualRoute. If the computer you are using does not have VisualRoute installed, you can download the program using the following link:

http://www.visualroute.com/download.html

Ensure that you download the Lite Edition.

VisualRoute Lite Edition	Windows XP\2003\Vista\7	4.0Mb	Download
	Mac OS X (dmg) 10.3+, universal binary	2.0Mb	Download

Scenario

Using an Internet connection, you will use three route tracing utilities to examine the Internet pathway to destination networks. This activity should be performed on a computer that has Internet access and access to the command line. First, you will use the Windows embedded tracert utility. Second, you will use a web-based traceroute tool (http://www.subnetonline.com/pages/network-tools/online-traceroute.php). Finally, you will use the VisualRoute traceroute program.

Required Resources

1 PC with Internet access

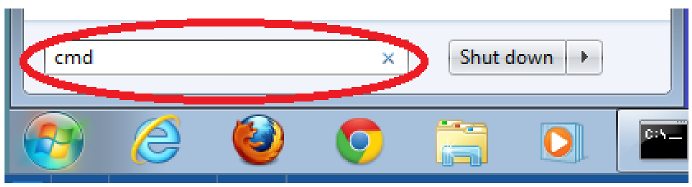
Part 1: Test Network Connectivity Using Ping

Step 1: Determine whether the remote server is reachable.

To trace the route to a distant network, the PC used must have a working connection to the Internet.

a. The first tool we will use is ping. Ping is a tool used to test if a host is reachable. Packets of information are sent to the remote host with instructions to reply. Your local PC measures if a response to each packet is received, and how long it takes for those packets to cross the network. The name ping comes from active sonar technology in which a pulse of sound is sent underwater to bounce off of terrain or other ships.

b. From your PC, search for "**cmd"**.



c. At the command-line prompt, type **ping www.cisco.com**.

```
C:\>ping www.cisco.com

Pinging e144.dscb.akamaiedge.net [23.1.48.170] with 32 bytes of data:
Reply from 23.1.48.170: bytes=32 time=56ms TTL=57
Reply from 23.1.48.170: bytes=32 time=55ms TTL=57
Reply from 23.1.48.170: bytes=32 time=54ms TTL=57
Reply from 23.1.48.170: bytes=32 time=54ms TTL=57

Ping statistics for 23.1.48.170:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 54ms, Maximum = 56ms, Average = 54ms
```

d. The first output line displays the Fully Qualified Domain Name (FQDN) e144.dscb.akamaiedge.net. This is followed by the IP address 23.1.48.170. Cisco hosts the same web content on different servers throughout the world (known as mirrors). Therefore, depending upon where you are geographically, the FQDN and the IP address will be different.

e. From this portion of the output:

```
Ping statistics for 23.1.48.170:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 54ms, Maximum = 56ms, Average = 54ms
```

Four pings were sent and a reply was received from each ping. Because each ping was responded to, there was 0% packet loss. On average, it took 54 ms (54 milliseconds) for the packets to cross the network. A millisecond is 1/1,000th of a second.

Streaming video and online games are two applications that suffer when there is packet loss, or a slow network connection. A more accurate determination of Internet connection speed can be determined by sending 100 pings, instead of the default 4. Here is how to do that:

```
C:\>ping -n 100 www.cisco.com
```

And here is what the output from that looks like:

```
Ping statistics for 23.45.0.170:
    Packets: Sent = 100, Received = 100, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 46ms, Maximum = 53ms, Average = 49ms
```

f. Now ping Regional Internet Registry (RIR) websites located in different parts of the world:

For Africa:

C:\> **ping www.afrinic.net**

```
C:\>ping www.afrinic.net

Pinging www.afrinic.net [196.216.2.136] with 32 bytes of data:
Reply from 196.216.2.136: bytes=32 time=314ms TTL=111
Reply from 196.216.2.136: bytes=32 time=312ms TTL=111
Reply from 196.216.2.136: bytes=32 time=313ms TTL=111
Reply from 196.216.2.136: bytes=32 time=313ms TTL=111

Ping statistics for 196.216.2.136:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 312ms, Maximum = 314ms, Average = 313ms
```

For Australia:

C:\> **ping www.apnic.net**

```
C:\>ping www.apnic.net

Pinging www.apnic.net [202.12.29.194] with 32 bytes of data:
Reply from 202.12.29.194: bytes=32 time=286ms TTL=49
Reply from 202.12.29.194: bytes=32 time=287ms TTL=49
Reply from 202.12.29.194: bytes=32 time=286ms TTL=49
Reply from 202.12.29.194: bytes=32 time=286ms TTL=49

Ping statistics for 202.12.29.194:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 286ms, Maximum = 287ms, Average = 286ms
```

For Europe:

C:\> **ping www.ripe.net**

```
C:\>ping www.ripe.net

Pinging www.ripe.net [193.0.6.139] with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 193.0.6.139:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

For South America:

C:\> **ping www.lacnic.net**

```
C:\>ping www.lacnic.net

Pinging www.lacnic.net [200.3.14.147] with 32 bytes of data:
Reply from 200.3.14.147: bytes=32 time=158ms TTL=51
Reply from 200.3.14.147: bytes=32 time=158ms TTL=51
Reply from 200.3.14.147: bytes=32 time=158ms TTL=51
Reply from 200.3.14.147: bytes=32 time=157ms TTL=51

Ping statistics for 200.3.14.147:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 157ms, Maximum = 158ms, Average = 157ms
```

All these pings were run from a computer located in the U.S. What happens to the average ping time in milliseconds when data is traveling within the same continent (North America) as compared to data from North America traveling to different continents?

Answer varies based on location. In the data above, the average ping time in milliseconds dramatically increases.

What is interesting about the pings that were sent to the European website?

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At the time that these pings were sent, the site was unreachable.

Part 2: Trace a Route to a Remote Server Using Tracert

Step 1: Determine what route across the Internet traffic takes to the remote server.

Now that basic reachability has been verified by using the ping tool, it is helpful to look more closely at each network segment that is crossed. To do this, the **tracert** tool will be used.

a. At the command-line prompt, type **tracert www.cisco.com**.

```
C:\>tracert www.cisco.com

Tracing route to e144.dscb.akamaiedge.net [23.1.144.170]
over a maximum of 30 hops:

  1    <1 ms    <1 ms    <1 ms  dslrouter.westell.com [192.168.1.1]
  2    38 ms    38 ms    37 ms  10.18.20.1
  3    37 ms    37 ms    37 ms  G3-0-9-2204.ALBYNY-LCR-02.verizon-gni.net [130.8
1.196.190]
  4    43 ms    43 ms    42 ms  so-5-1-1-0.NY325-BB-RTR2.verizon-gni.net [130.81
.22.46]
  5    43 ms    43 ms    65 ms  0.so-4-0-2.XT2.NYC4.ALTER.NET [152.63.1.57]
  6    45 ms    45 ms    45 ms  0.so-3-2-0.XL4.EWR6.ALTER.NET [152.63.17.109]
  7    46 ms    48 ms    46 ms  TenGigE0-5-0-0.GW8.EWR6.ALTER.NET [152.63.21.14]

  8    45 ms    45 ms    45 ms  a23-1-144-170.deploy.akamaitechnologies.com [23.
1.144.170]

Trace complete.
```

b. Save the tracert output in a text file as follows:

   1) Right-click the title bar of the Command Prompt window and choose **Edit** > **Select All**.
   2) Right-click the title bar of the Command Prompt window again and choose **Edit** > **Copy**.
   3) Search for and open **Notepad**.
   4) To paste the output into Notepad, choose **Edit** > **Paste**.
   5) Choose **File** > **Save As** and save the Notepad file to your desktop as **tracert1.txt**.

c. Run **tracert** for each destination website and save the output in sequentially numbered files.

   C:\> **tracert www.afrinic.net**

   C:\> **tracert www.lacnic.net**

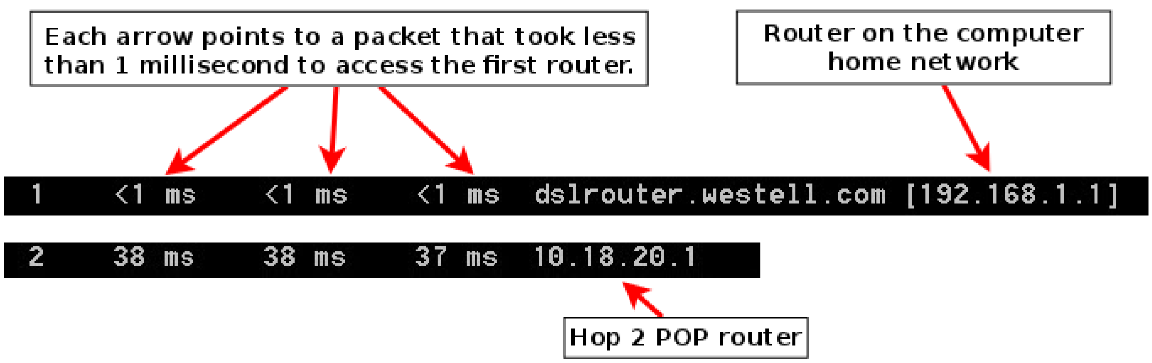
d. Interpreting **tracert** outputs.

   Routes traced can go through many hops and a number of different Internet Service Providers (ISPs), depending on the size of your ISP and the location of the source and destination hosts. Each “hop” represents a router.

   Because computers talk in numbers, rather than words, routers are uniquely identified using IP addresses (numbers with the format x.x.x.x for IPv4 addresses). The **tracert** tool shows you what path through the network a packet of information takes to reach its final destination. The **tracert** tool also gives you an idea of how fast traffic is going on each segment of the network. Three packets are sent to each router in the path, and the return time is measured in milliseconds. Now use this information to analyze the **tracert** results to www.cisco.com. Below is the entire traceroute:

```
C:\>tracert www.cisco.com

Tracing route to e144.dscb.akamaiedge.net [23.1.144.170]
over a maximum of 30 hops:

  1    <1 ms    <1 ms    <1 ms  dslrouter.westell.com [192.168.1.1]
  2    38 ms    38 ms    37 ms  10.18.20.1
  3    37 ms    37 ms    37 ms  G3-0-9-2204.ALBYNY-LCR-02.verizon-gni.net [130.8
1.196.190]
  4    43 ms    43 ms    42 ms  so-5-1-1-0.NY325-BB-RTR2.verizon-gni.net [130.81
.22.46]
  5    43 ms    43 ms    65 ms  0.so-4-0-2.XT2.NYC4.ALTER.NET [152.63.1.57]
  6    45 ms    45 ms    45 ms  0.so-3-2-0.XL4.EWR6.ALTER.NET [152.63.17.109]
  7    46 ms    48 ms    46 ms  TenGigE0-5-0-0.GW8.EWR6.ALTER.NET [152.63.21.14]

  8    45 ms    45 ms    45 ms  a23-1-144-170.deploy.akamaitechnologies.com [23.
1.144.170]

Trace complete.
```

Below is the breakdown:



In the example output shown above, the tracert packets travel from the source PC to the local router default gateway (hop 1: 192.168.1.1) to the ISPs Point of Presence (POP) router (hop 2: 10.18.20.1). Every ISP has numerous POP routers. These POP routers are at the edge of the ISP's network and are the means by which customers connect to the Internet. The packets travel along the Verizon network for two hops and then jump to a router that belongs to alter.net. This could mean that the packets have traveled to another ISP. This is significant because sometimes there is packet loss in the transition between ISPs, or sometimes one ISP is slower than another.

There is an Internet tool known as Whois. The Whois tool allows us to determine who owns a domain name. A web-based Whois tool is found at http://whois.domaintools.com/. This domain is also owned by Verizon according to the web-based Whois tool.

```
Registrant:
       Verizon Business Global LLC
       Verizon Business Global LLC
       One Verizon Way
        Basking Ridge NJ 07920
       US
        domainlegalcontact@verizon.com +1.7033513164 Fax: +1.7033513669

    Domain Name: alter.net
```

To summarize, Internet traffic starts at a home PC and travels through the home router (hop 1). It then connects to the ISP and travels through its network (hops 2-7) until it arrives at the remote server (hop 8). This is a relatively unusual example in which there is only one ISP involved from start to finish. It is typical to have two or more ISPs involved as displayed in the following examples.

e. Now examine an example that involves Internet traffic crossing multiple ISPs. Below is the tracert for www.afrinic.net**:**

```
C:\>tracert www.afrinic.net

Tracing route to www.afrinic.net [196.216.2.136]
over a maximum of 30 hops:

  1     1 ms    <1 ms    <1 ms  dslrouter.westell.com [192.168.1.1]
  2    39 ms    38 ms    37 ms  10.18.20.1
  3    40 ms    38 ms    39 ms  G4-0-0-2204.ALBYNY-LCR-02.verizon-gni.net [130.8
1.197.182]
  4    44 ms    43 ms    43 ms  so-5-1-1-0.NY325-BB-RTR2.verizon-gni.net [130.81
.22.46]
  5    43 ms    43 ms    42 ms  0.so-4-0-0.XT2.NYC4.ALTER.NET [152.63.9.249]
  6    43 ms    71 ms    43 ms  0.ae4.BR3.NYC4.ALTER.NET [152.63.16.185]
  7    47 ms    47 ms    47 ms  te-7-3-0.edge2.NewYork2.level3.net [4.68.111.137
]
  8    43 ms    55 ms    43 ms  vlan51.ebr1.NewYork2.Level3.net [4.69.138.222]
  9    52 ms    51 ms    51 ms  ae-3-3.ebr2.Washington1.Level3.net [4.69.132.89]

 10   130 ms   132 ms   132 ms  ae-42-42.ebr2.Paris1.Level3.net [4.69.137.53]
 11   139 ms   145 ms   140 ms  ae-46-46.ebr1.Frankfurt1.Level3.net [4.69.143.13
7]
 12   148 ms   140 ms   152 ms  ae-91-91.csw4.Frankfurt1.Level3.net [4.69.140.14
]
 13   144 ms   144 ms   146 ms  ae-92-92.ebr2.Frankfurt1.Level3.net [4.69.140.29
]
 14   151 ms   150 ms   150 ms  ae-23-23.ebr2.London1.Level3.net [4.69.148.193]

 15   150 ms   150 ms   150 ms  ae-58-223.csw2.London1.Level3.net [4.69.153.138]

 16   156 ms   156 ms   156 ms  ae-227-3603.edge3.London1.Level3.net [4.69.166.1
54]
 17   157 ms   159 ms   160 ms  195.50.124.34
 18   353 ms   340 ms   341 ms  168.209.201.74
 19   333 ms   333 ms   332 ms  csw4-pkl-gi1-1.ip.isnet.net [196.26.0.101]
 20   331 ms   331 ms   331 ms  196.37.155.180
 21   318 ms   316 ms   318 ms  fa1-0-1.ar02.jnb.afrinic.net [196.216.3.132]
 22   332 ms   334 ms   332 ms  196.216.2.136

Trace complete.
```

What happens at hop 7? Is level3.net the same ISP as hops 2-6, or a different ISP? Use the Whois tool to answer this question.

The Internet traffic goes from being on alter.net to level3.net. The Whois tool reveals that this is a separate company/separate ISP.

What happens in hop 10 to the amount of time it takes for a packet to travel between Washington D.C. and Paris, as compared with hops 1-9?

In hops 1-9 most packets traverse their link in 50 ms or less. On the Washington D.C. to Paris link, the time increases to 132 ms.

What happens in hop 18? Do a Whois lookup on 168.209.201.74 using the Whois tool. Who owns this network?

The time to traverse one link in the network goes up from 159 ms to 340 ms. From the increased time, the traffic probably is moved to a different network from the Level3 backbone network. Using the Whois tool, IP address (168.209.201.74) is owned by the African Network Information Center.

f. Type **tracert www.lacnic.net**.

```
C:\>tracert www.lacnic.net

Tracing route to www.lacnic.net [200.3.14.147]
over a maximum of 30 hops:

  1    <1 ms    <1 ms    <1 ms  dslrouter.westell.com [192.168.1.1]
  2    38 ms    38 ms    37 ms  10.18.20.1
  3    38 ms    38 ms    39 ms  G3-0-9-2204.ALBYNY-LCR-02.verizon-gni.net [130.8
1.196.190]
  4    42 ms    43 ms    42 ms  so-5-1-1-0.NY325-BB-RTR2.verizon-gni.net [130.81
.22.46]
  5    82 ms    47 ms    47 ms  0.ae2.BR3.NYC4.ALTER.NET [152.63.16.49]
  6    46 ms    47 ms    56 ms  204.255.168.194
  7   157 ms   158 ms   157 ms  ge-1-1-0.100.gw1.gc.registro.br [159.63.48.38]
  8   156 ms   157 ms   157 ms  xe-5-0-1-0.core1.gc.registro.br [200.160.0.174]

  9   161 ms   161 ms   161 ms  xe-4-0-0-0.core2.nu.registro.br [200.160.0.164]

 10   158 ms   157 ms   157 ms  ae0-0.ar3.nu.registro.br [200.160.0.249]
 11   176 ms   176 ms   170 ms  gw02.lacnic.registro.br [200.160.0.213]
 12   158 ms   158 ms   158 ms  200.3.12.36
 13   157 ms   158 ms   157 ms  200.3.14.147

Trace complete.
```

What happens in hop 7?

The time it takes for a packet to traverse the network dramatically increases over fourfold from ~40 ms to ~180 ms. Did students do a Whois on registro.br using the web-based Whois tool: http://whois.domaintools.com/. If they did, the information they received was not that helpful. Did your students go to: http://translate.google.com/ to get a translation of Núcleo de Informação e Coordenação do Ponto? More helpful would have been a search engine request for “top domain .br” This would have revealed that we were now on a Brazilian network. Internet detective work can be fun!

Part 3: Trace a Route to a Remote Server Using Web-Based and Software Tools

Step 1: Use a web-based traceroute tool.

a. Use http://www.subnetonline.com/pages/network-tools/online-tracepath.php to trace the route to the following websites:

www.cisco.com

www.afrinic.net

Capture and save the output in Notepad.

www.cisco.com:

```
TracePath Output:

 1:  pera.subnetonline.com (141.138.203.105) 0.157ms pmtu 1500
 1:  gw-v130.xl-is.net (141.138.203.1)                     1.168ms
 2:  rt-eu01-v2.xl-is.net (79.170.92.19)                   0.566ms
 3:  akamai.telecity4.nl-ix.net (193.239.116.226)          1.196ms
```

```
www.afrinic.com:
TracePath Output:

 1:  pera.subnetonline.com (141.138.203.105)               0.175ms pmtu 1500
 1:  gw-v130.xl-is.net (141.138.203.1)                     0.920ms
 2:  rt-eu01-v2.xl-is.net (79.170.92.19)                   0.556ms
 3:  xl-internetservices.nikhef.openpeering.nl (217.170.0.225)  10.679ms
 4:  r22.amstnl02.nl.bb.gin.ntt.net (195.69.144.36)       asymm  5   4.412ms
 5:  ae-5.r23.londen03.uk.bb.gin.ntt.net (129.250.5.197)   49.349ms
 6:  ae-2.r02.londen03.uk.bb.gin.ntt.net (129.250.5.41)   asymm  7   8.842ms
 7:  dimensiondata-0.r02.londen03.uk.bb.gin.ntt.net (83.231.235.222)  18.080ms
 8:  168.209.201.74 (168.209.201.74)                      196.375ms
 9:  csw4-pkl-gi1-1.ip.isnet.net (196.26.0.101)           asymm 10 186.855ms
10:  196.37.155.180 (196.37.155.180)                      185.661ms
11:  fa1-0-1.ar02.jnb.afrinic.net (196.216.3.132)         197.912ms
```

How is the traceroute different when going to www.cisco.com from the command prompt (see Part 2) rather than from the online website? (Your results may vary depending upon where you are located geographically, and which ISP is providing connectivity to you.)

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The tracert from the command prompt in Part 1 ended up at a server in Cambridge, Massachusetts. The traceroute from the website in the Netherlands went to a mirror server in the Netherlands. The domain cisco.com is hosted on many websites or mirrors throughout the world. This is done so that access time to the site will be fast from anywhere in the world.

Compare the tracert from Part 1 that goes to Africa with the tracert that goes to Africa from the web interface. What difference do you notice?

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The route across Europe is on a different ISP. There is not a single backbone to the Internet, rather there are many backbones to the Internet. They all connect at Peering Points. Performance on the network on one ISP could be very different than performance on the network with a different ISP.

Some of the traceroutes have the abbreviation **asymm** in them. Any guesses as to what this means? What is its significance?

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This is an abbreviation for asymmetric. It means that the test packet took one path to reach the destination, and a different path to return. Imagine someone driving from their home to New York City. On the way to New York City, they noticed that the highway was congested and traffic was slow. They might decide to return home by a different or asymmetric path.

Step 2: Use VisualRoute Lite Edition.

VisualRoute is a proprietary traceroute program that can display the tracing path results graphically.

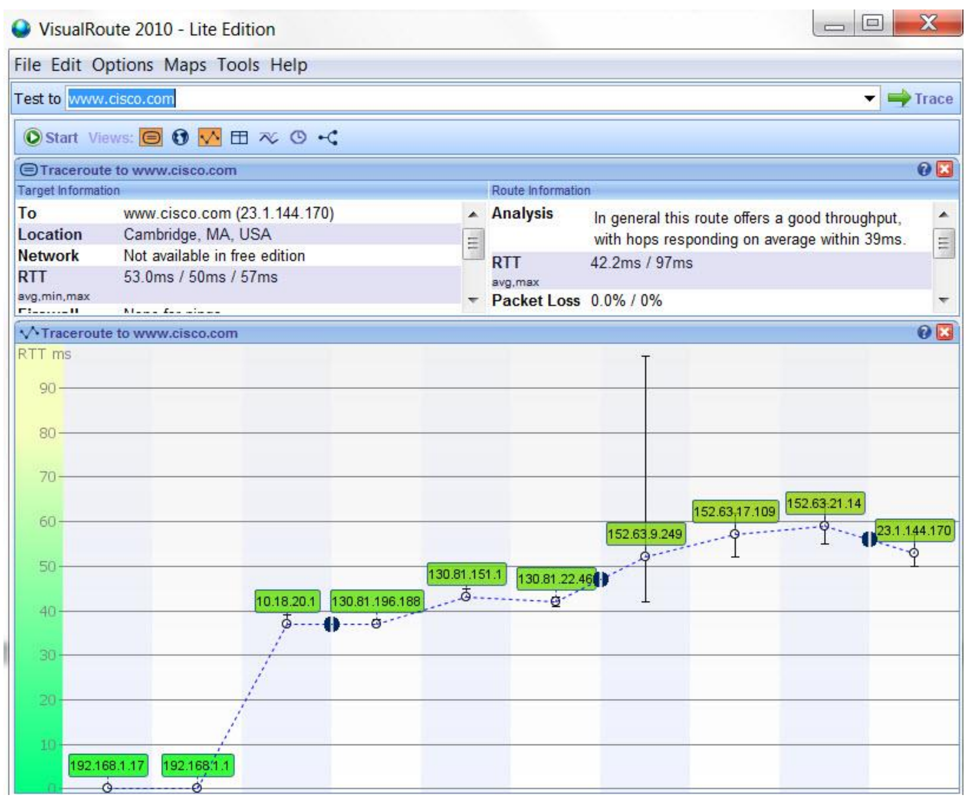
a. Please download the VisualRoute Lite Edition from the following link if it is not already installed:

http://www.visualroute.com/download.html

If you have any trouble downloading or installing VisualRoute, ask your instructor for assistance. Ensure that you download the Lite Edition.

b. Using VisualRoute, trace the routes to **www.cisco.com**.

c. Record the IP addresses in the path in Notepad.



Part 4: Compare Traceroute Results

Compare the traceroute results to www.cisco.com from Parts 2 and 3.

Step 1: List the path to www.cisco.com using tracert.

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192.168.1.1 > 10.18.20.1 > 130.81.196.190 > 130.81.22.46 > 152.63.1.57 > 152.63.17.109 > 152.63.21.14 > 23.1.144.170

Step 2: List the path to www.cisco.com using the web-based tool on subnetonline.com.

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141.138.203.105 > 141.138.203.1 > 79.170.92.19 > 19.239.116.226

Step 3: List the path to www.cisco.com using VisualRoute Lite edition.

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192.168.1.17 > 192.168.1.1 > 10.18.20.1 130.81.196.188 > 130.81.151.1 130.81.22.46 > 152.63.9.249 > 152.63.17.109 > 152.63.21.14 > 23.1.144.170

Did all the traceroute utilities use the same paths to www.cisco.com? Explain.

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Traceroutes between the same source and destination conducted at different times may produce different results. This is due to the "meshed" nature of the interconnected networks that comprise the Internet and the Internet protocols ability to select different pathways over which to send packets.

Reflection

Having now viewed traceroute through three different tools (tracert, web interface, and VisualRoute), are there any insights that using VisualRoute provided that the other two tools did not?

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Answers will vary. One possible insight is that VisualRoute highlights graphically the amount of time it takes to travel between hops on the internet. By highlighting slower times in yellow and red, it becomes more obvious that there are network issues along these links.

Appendix A

```
C:\> tracert www.cisco.com

Tracing route to e144.dscb.akamaiedge.net [23.1.144.170]
over a maximum of 30 hops:
```

```
  1    <1 ms    <1 ms    <1 ms  dslrouter.westell.com [192.168.1.1]
  2    38 ms    38 ms    37 ms  10.18.20.1
  3    37 ms    37 ms    37 ms  G3-0-9-2204.ALBYNY-LCR-02.verizon-gni.net
[130.81.196.190]
  4    43 ms    43 ms    42 ms  so-5-1-1-0.NY325-BB-RTR2.verizon-gni.net
[130.81.22.46]
  5    43 ms    43 ms    65 ms  0.so-4-0-2.XT2.NYC4.ALTER.NET [152.63.1.57]
  6    45 ms    45 ms    45 ms  0.so-3-2-0.XL4.EWR6.ALTER.NET [152.63.17.109]
  7    46 ms    48 ms    46 ms  TenGigE0-5-0-0.GW8.EWR6.ALTER.NET [152.63.21.14]
  8    45 ms    45 ms    45 ms  a23-1-144-170.deploy.akamaitechnologies.com
[23.1.144.170]

Trace complete.

C:\> tracert www.afrinic.net

Tracing route to www.afrinic.net [196.216.2.136]
over a maximum of 30 hops:

  1     1 ms    <1 ms    <1 ms  dslrouter.westell.com [192.168.1.1]
  2    39 ms    38 ms    37 ms  10.18.20.1
  3    40 ms    38 ms    39 ms  G4-0-0-2204.ALBYNY-LCR-02.verizon-gni.net
[130.81.197.182]
  4    44 ms    43 ms    43 ms  so-5-1-1-0.NY325-BB-RTR2.verizon-gni.net
[130.81.22.46]
  5    43 ms    43 ms    42 ms  0.so-4-0-0.XT2.NYC4.ALTER.NET [152.63.9.249]
  6    43 ms    71 ms    43 ms  0.ae4.BR3.NYC4.ALTER.NET [152.63.16.185]
  7    47 ms    47 ms    47 ms  te-7-3-0.edge2.NewYork2.level3.net [4.68.111.137]
  8    43 ms    55 ms    43 ms  vlan51.ebr1.NewYork2.Level3.net [4.69.138.222]
  9    52 ms    51 ms    51 ms  ae-3-3.ebr2.Washington1.Level3.net [4.69.132.89]
 10   130 ms   132 ms   132 ms  ae-42-42.ebr2.Paris1.Level3.net [4.69.137.53]
 11   139 ms   145 ms   140 ms  ae-46-46.ebr1.Frankfurt1.Level3.net [4.69.143.137]
 12   148 ms   140 ms   152 ms  ae-91-91.csw4.Frankfurt1.Level3.net [4.69.140.14]
 13   144 ms   144 ms   146 ms  ae-92-92.ebr2.Frankfurt1.Level3.net [4.69.140.29]
 14   151 ms   150 ms   150 ms  ae-23-23.ebr2.London1.Level3.net [4.69.148.193]
 15   150 ms   150 ms   150 ms  ae-58-223.csw2.London1.Level3.net [4.69.153.138]
 16   156 ms   156 ms   156 ms  ae-227-3603.edge3.London1.Level3.net [4.69.166.154]
 17   157 ms   159 ms   160 ms  195.50.124.34
 18   353 ms   340 ms   341 ms  168.209.201.74
 19   333 ms   333 ms   332 ms  csw4-pkl-gi1-1.ip.isnet.net [196.26.0.101]
 20   331 ms   331 ms   331 ms  196.37.155.180
 21   318 ms   316 ms   318 ms  fa1-0-1.ar02.jnb.afrinic.net [196.216.3.132]
 22   332 ms   334 ms   332 ms  196.216.2.136

Trace complete.

C:\> tracert www.lacnic.net
```

```
Tracing route to lacnic.net [200.3.14.10]
over a maximum of 30 hops:

1     <1 ms    <1 ms    <1 ms  dslrouter.westell.com [192.168.1.1]
2     38 ms    37 ms    37 ms  10.18.20.1
3     37 ms    38 ms    40 ms  G3-0-9-2204.ALBYNY-LCR-02.verizon-gni.net
[130.81.196.190]
4     43 ms    42 ms    43 ms  so-5-1-1-0.NY325-BB-RTR2.verizon-gni.net
[130.81.22.46]
5     46 ms    75 ms    46 ms  0.ae2.BR3.NYC4.ALTER.NET [152.63.16.49]
6     43 ms    43 ms    43 ms  204.255.168.194
7    178 ms   182 ms   178 ms  ge-1-1-0.100.gw1.gc.registro.br [159.63.48.38]
8    172 ms   180 ms   182 ms  xe-5-0-1-0.core1.gc.registro.br [200.160.0.174]

9    177 ms   172 ms   181 ms  xe-4-0-0-0.core2.nu.registro.br [200.160.0.164]

10    173 ms   180 ms   176 ms  ae0-0.ar3.nu.registro.br [200.160.0.249]
11    184 ms   183 ms   180 ms  gw02.lacnic.registro.br [200.160.0.213]
12    180 ms   179 ms   180 ms  200.3.12.36
13    182 ms   180 ms   180 ms  www.lacnic.net [200.3.14.10]

Trace complete.
```