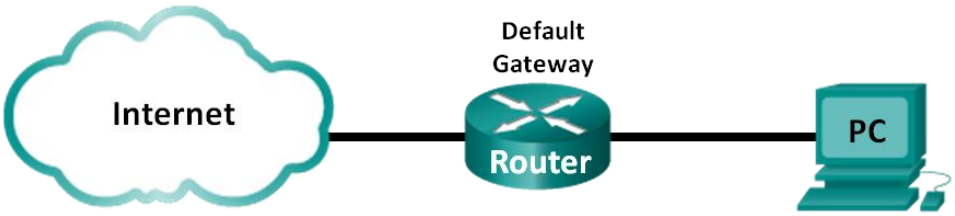
Lab - Testing Network Latency with Ping and Traceroute (Instructor Version)

Instructor Note: Red font color or Gray highlights indicate text that appears in the instructor copy only.

Topology



Objectives

Part 1: Use Ping to Document Network Latency

Part 2: Use Traceroute to Document Network Latency

Background / Scenario

To obtain realistic network latency statistics, this activity must be performed on a live network. Be sure to check with your instructor for any local security restrictions against using the **ping** command on the network.

Instructor Note: Some institutions disable ICMP echo replies throughout the network. Before students begin this activity, make sure there are no local restrictions related to ICMP datagrams. This activity assumes that ICMP datagrams are not restricted by any local security policy.

The purpose of this lab is to measure and evaluate network latency over time, and during different periods of the day to capture a representative sample of typical network activity. This will be accomplished by analyzing the return delay from a distant computer with the **ping** command. Return delay times, measured in milliseconds, will be summarized by computing the average latency (mean) and the range (maximum and minimum) of the delay times.

Required Resources

- 1 PC (Windows 7, Vista, or XP with Internet access)

Part 1: Use Ping to Document Network Latency

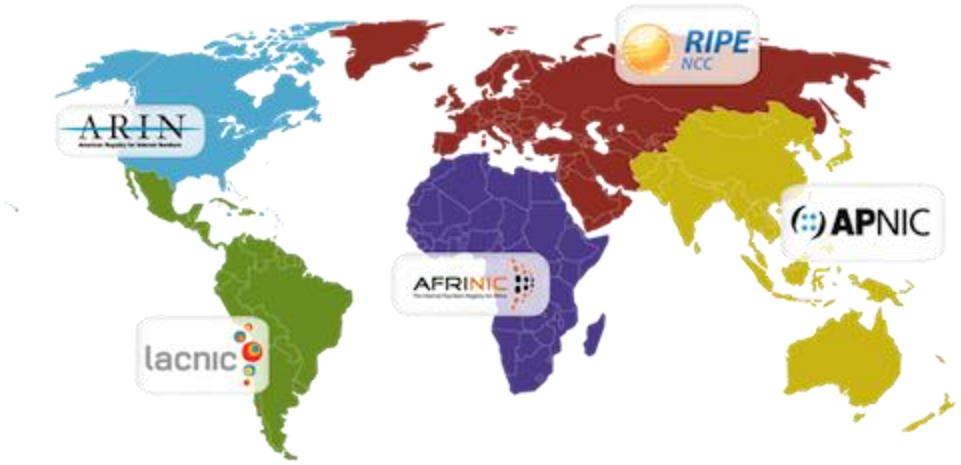
In Part 1, you will examine network latency to several websites in different parts of the globe. This process can be used in an enterprise production network to create a performance baseline.

Step 1: Verify connectivity.

Ping the following Regional Internet Registry (RIR) websites to verify connectivity:

```
C:\Users\User1> ping www.arin.net
C:\Users\User1> ping www.lacnic.net
C:\Users\User1> ping www.afrinic.net
C:\Users\User1> ping www.apnic.net
```

Note: Because www.ripe.net does not reply to ICMP requests, it cannot be used for this lab.



Step 2: Collect network data.

You will collect a sufficient amount of data to compute statistics on the **ping** output by sending out 25 echo requests to each address listed in Step 1. Record the results for each website to text files.

a. At the command prompt, type **ping** to list the available options.

```
C:\Users\User1> ping

Usage: ping [-t] [-a] [-n count] [-l size] [-f] [-i TTL] [-v TOS]
            [-r count] [-s count] [[-j host-list] | [-k host-list]]
            [-w timeout] [-R] [-S srcaddr] [-4] [-6] target_name

Options:
    -t             Ping the specified host until stopped.
                   To see statistics and continue - type Control-Break;
                   To stop - type Control-C.
    -a             Resolve addresses to hostnames.
    -n count       Number of echo requests to send.
    -l size        Send buffer size.
    -f             Set Don't Fragment flag in packet (IPv4-only).
    -i TTL         Time To Live.
    -v TOS         Type Of Service (IPv4-only. This setting has been deprecated
<output omitted>
```

b. Using the **ping** command with the count option, you can send 25 echo requests to the destination as illustrated below. Furthermore, it will create a text file with filename of **arin.txt** in the current directory. This text file will contain the results of the echo requests.

```
C:\Users\User1> ping –n 25 www.arin.net > arin.txt
```

Note: The terminal remains blank until the command has finished, because the output has been redirected to a text file, **arin.txt**, in this example. The **>** symbol is used to redirect the screen output to the file and overwrite the file if it already exists. If appending more results to the file is desired, replace **>** with **>>** in the command.

c. Repeat the **ping** command for the other websites.

```
C:\Users\User1> ping –n 25 www.afrinic.net > afrinic.txt
C:\Users\User1> ping –n 25 www.apnic.net > apnic.txt
C:\Users\User1> ping –n 25 www.lacnic.net > lacnic.txt
```

Step 3: Verify data collection.

To see the results in the file created, use the **more** command at the command prompt.

```
C:\Users\User1> more arin.txt

Pinging www.arin.net [192.149.252.76] with 32 bytes of data:
Reply from 192.149.252.76: bytes=32 time=108ms TTL=45
Reply from 192.149.252.76: bytes=32 time=114ms TTL=45
Reply from 192.149.252.76: bytes=32 time=112ms TTL=45
<output omitted>
Reply from 192.149.252.75: bytes=32 time=111ms TTL=45
Reply from 192.149.252.75: bytes=32 time=112ms TTL=45
Reply from 192.149.252.75: bytes=32 time=112ms TTL=45

Ping statistics for 192.149.252.75:
    Packets: Sent = 25, Received = 25, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 107ms, Maximum = 121ms, Average = 111ms
```

Note: Press the Spacebar to display the rest of the file or press **q** to exit.

To verify that the files have been created, use the **dir** command to list the files in the directory. Also the wildcard ***** can be used to filter only the text files.

```
C:\Users\User1> dir *.txt
Volume in drive C is OS
 Volume Serial Number is 0A97-D265

 Directory of C:\Users\User1

02/07/2013  12:59 PM             1,642 afrinic.txt
02/07/2013  01:00 PM             1,615 apnic.txt
02/07/2013  12:40 PM             1,641 arin.txt
02/07/2013  12:58 PM             1,589 lacnic.txt
               4 File(s)          6,487 bytes
               0 Dir(s)  34,391,453,696 bytes free
```

Record your results in the following table.

	Minimum	Maximum	Average
www.afrinic.net	359 ms	389 ms	369 ms
www.apnic.net	201	210	204
www.arin.net	107	121	112
www.lacnic.net	216	226	218

Compare the delay results. How is delay affected by geographical location?

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In most instances, the response time is longer when compared to the physical distance to the destination.

Part 2: Use Traceroute to Document Network Latency

The routes traced may go through many hops and a number of different ISPs depending on the size of the ISPs and the location of the source and destination hosts. The **traceroute** commands can also be used to observe network latency. In Part 2, the **tracert** command is used to trace the path to the same destinations in Part 1.

The **tracert** command uses ICMP TTL Exceed packets and ICMP echo replies to trace the path.

Step 1: Use the tracert command and record the output to text files.

Copy the following commands to create the traceroute files:

```
C:\Users\User1> tracert www.arin.net > traceroute_arin.txt
C:\Users\User1> tracert www.lacnic.net > traceroute_lacnic.txt
C:\Users\User1> tracert www.afrinic.net > traceroute_afrinic.txt
C:\Users\User1> tracert www.apnic.net > traceroute_apnic.txt
```

Step 2: Use the more command to examine the traced path.

a. Use the **more** command to access the content of these files:

```
C:\Users\User1> more traceroute_arin.txt

Tracing route to www.arin.net [192.149.252.75]
over a maximum of 30 hops:

  1    <1 ms    <1 ms    <1 ms  192.168.1.1
  2    11 ms    12 ms    11 ms  10.39.0.1
  3    10 ms    15 ms    11 ms  172.21.0.116
  4    19 ms    10 ms    11 ms  70.169.73.90
  5    13 ms    10 ms    11 ms  chnddsrj01-ae2.0.rd.ph.cox.net [70.169.76.229]
  6    72 ms    71 ms    70 ms  mrfddsrj02-ae0.0.rd.dc.cox.net [68.1.1.7]
  7    72 ms    71 ms    72 ms  68.100.0.146
  8    74 ms    83 ms    73 ms  172.22.66.29
  9    75 ms    71 ms    73 ms  172.22.66.29
 10    74 ms    75 ms    73 ms  wsip-98-172-152-14.dc.dc.cox.net [98.172.152.14]
 11    71 ms    71 ms    71 ms  host-252-131.arin.net [192.149.252.131]
 12    73 ms    71 ms    71 ms  www.arin.net [192.149.252.75]

Trace complete.
```

In this example, it took less than 1 ms to receive a reply from the default gateway (192.168.1.1). In hop count 6, the round trip to 68.1.1.7 took an average of 71 ms. For the round trip to the final destination at www.arin.net took an average of 72 ms.

Between lines 5 and 6, there is more network delay as indicated by the round trip time increase from an average of 11 ms to 71 ms

b. Perform the same analysis with the rest of the tracert results.

What can you conclude regarding the relationship between the roundtrip time and geographical location?

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In most instances, the response time is longer when compared to the physical distance to the destination.

Reflection

1. The **tracert** and **ping** results can provide important network latency information. What do you need to do if you want an accurate baseline picture regarding network latency for your network?

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   Answers will vary. You will need to perform careful delay analysis over successive days and during different periods of the day.

2. How can you use the baseline information?

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   You can compare baseline data against current data to determine if there has been a change in network response times. This analysis may assist with troubleshooting network issues and scheduling of routine data transfer during off-peak hours.