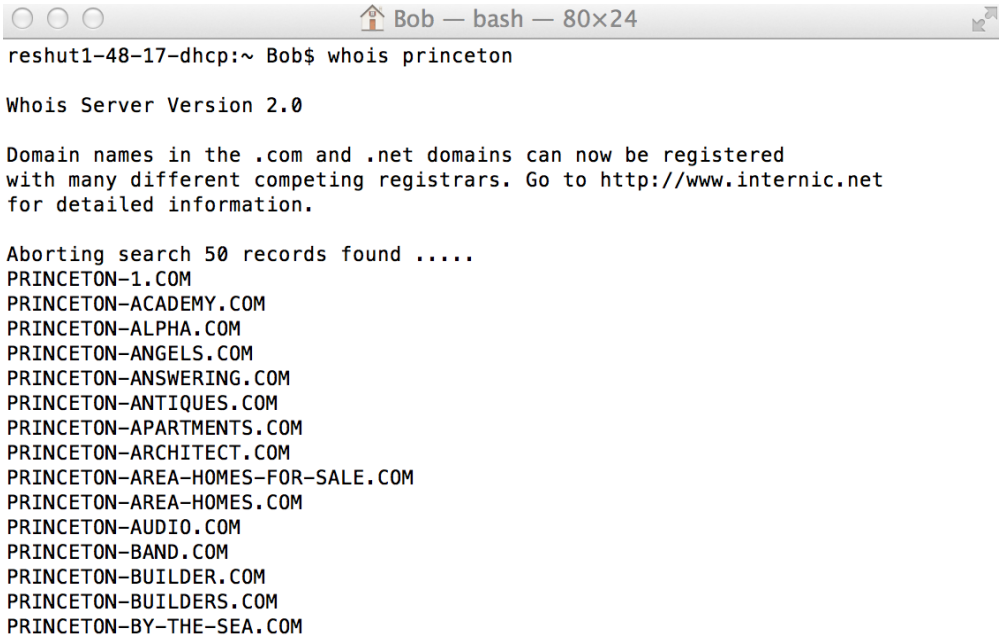
CSCI 4273: Homework One

1. Exercise 2

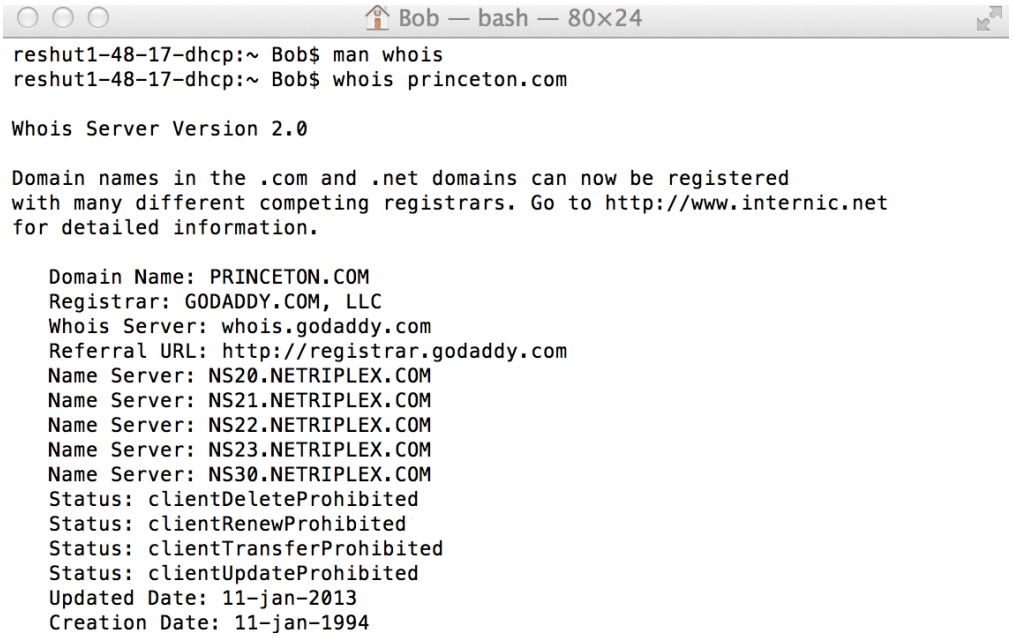
    a. whois princeton

    i.



    b. whois princeton.com

    i.



2. Exercise 3

a. Transfer time = RTT + Transfer Size/ Bandwidth
    i. Bandwidth = 1.5 Mbps, Transfer Size = 1000-KB, RTT = 50 ms
    ii. 1 KB = 2^10 bytes * 8 = 8 * 2^10 bits = 8 Mb
    iii. Transfer Size/ Bandwidth = 8 Megabits/ 1.5 Megabits per second = 5.3 s = 5300 ms
    iv. Transfer time = 50 ms + 5300 ms = 5350 ms + 2*RTT = 5450 ms
b. Transfer time = 5450 ms + 1000*RTT = 55450 ms
c. Transfer time = 2*RTT (initial handshake) + 0 (Transmit time) + 1000/20 * RTT = 100 ms + 50 * 100 = 5100 ms
d. Transfer time = 2* RTT (initial handshake) + 0 (Transmit time) + 9.5*RTT = 100 ms + 475 ms = 575 ms

3. Exercise 9
    a. Multicast addresses might be beneficial when you need to send data to multiple hosts but not all hosts on a network. An example would be podcasts when many people subscribe to one person's service. The podcaster doesn't want to transmit to everybody in the podcast service. He only wants to transmit to those who have subscribed to his podcast so he would need to use multicast.
4. Exercise 10
    a. Each of the mediums is used differently so they require different multiplexing techniques. FDM and STDM are not cost-effective for computer networks because they aren't able to adapt to an unknown number of flows. They operate with a fixed number. Time shared links would be impractical for computer

networks because link idleness can be significant which would hinder the flow of other traffic.

5. Exercise 13
    a. Latency = propagation + transmit = 2 * (385,000*10^3 m)/(3*10^8 m/s) + 0 = 2.57 s = 2570 ms
    b. delay * bandwidth = 2.57 s * 10^9 bits per second = 2.57 * 10^9 bits = 2.57 Gb/ 8 = .32 GB
    c. The delay * bandwidth product is the amount of data that can be sent before receiving a response.
    d. Transfer time = RTT + Size/ Bandwidth = 2.57 s + 25 MB/1 Gbps = 2.57 s + (25 * 8 * 2^20) b/ 10^9 bps = .21 s + 2.57 s = 2.78 s
6. Exercise 18
    a. The bandwidth is 100-Mbps.
    b. Packet Latency = 4 * 10 microseconds (propagation delay) + 4*(12000 bits or .012 Mb) / 100 Mbps = 4*10 microseconds + 480 microseconds = 520 microseconds
        i. ACK Latency = 4*10 microseconds + .0004 M bit/ 100 Mbps = 40 microseconds + 4 microseconds = 44 microseconds
        ii. Total RTT = Packet Delay + Acknowledgement Packet Delay = 520 microseconds + 44 microseconds = 564 microseconds
        iii. Bandwidth = Size/ Transmit = 12000 bits/ .000564 s = 21276595 bits per second = 21.27 Mbps
    c. 100 * (4.7 * 8 Gb) / (12 *3600 seconds) = .087 Gbps = 87 Mbps
7. Exercise 21

a. Transmit = Size/ Bandwidth

   i. W/o compression transmit = 1 MB/ Bandwidth

   ii. W/ compression transmit = compression time + compressed size/ Bandwidth

   iii. bandwidth = compressed size / time to compress

   iv. = .5 MB / 1 sec

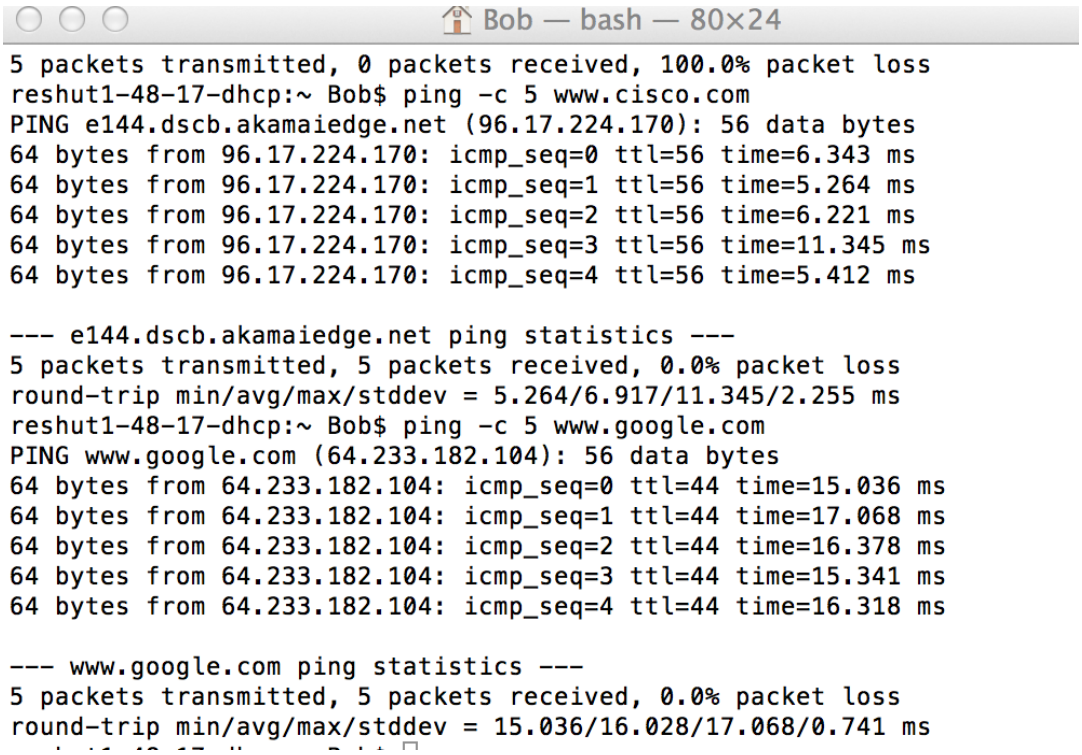
   v. = .6 MB / 2 sec = .3 MB / 1 sec

b. Latency doesn't affect the answer because it is the same for both compressed and uncompressed files.

8. Exercise 36

   a. ping -c 5 www.google.com, ping -c 5 www.cisco.com

      i.



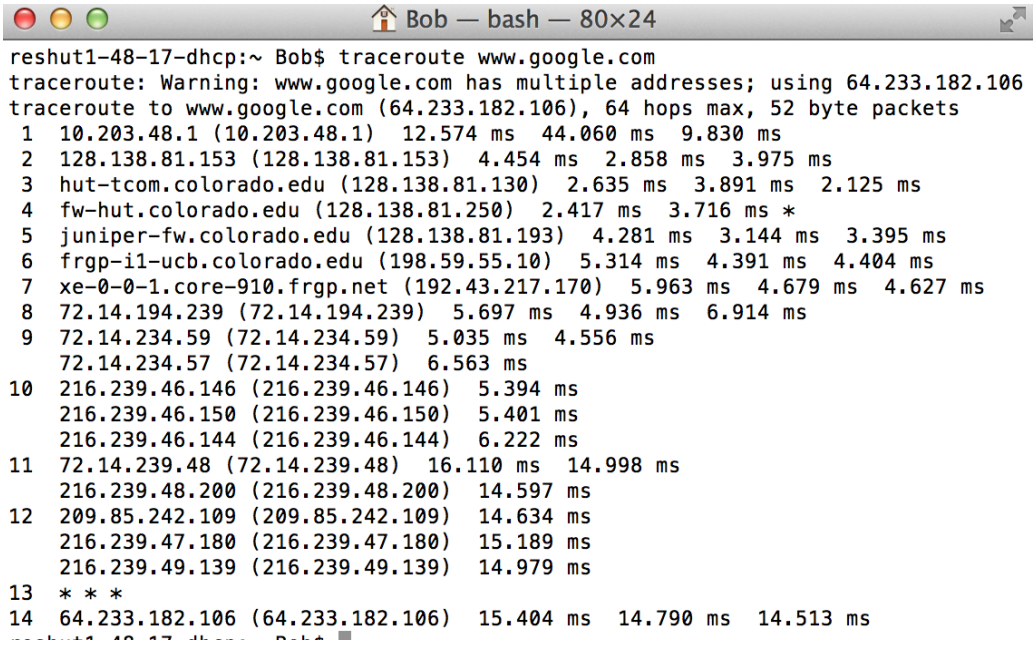
      ii. RTT Icmp packets take longer for google.com than they do for cisco.com. This might be due to physical distance of the servers of each domain

name, the number of requests being handled by those servers, or the number of requests being handled by the WAN that I'm on.

9. Exercises 37

   a. traceroute www.google.com

      i.



   b. traceroute -q 1 www.cisco.com

      i.

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reshut1-48-17-dhcp:~ Bob$ traceroute -q 1 www.cisco.com
traceroute to e144.dscb.akamaiedge.net (23.4.128.211), 64 hops max, 52 byte packets
 1  10.203.48.1 (10.203.48.1)  2.362 ms
 2  128.138.81.153 (128.138.81.153)  3.552 ms
 3  hut-tcom.colorado.edu (128.138.81.130)  2.103 ms
 4  fw-hut.colorado.edu (128.138.81.250)  3.267 ms
 5  juniper-fw.colorado.edu (128.138.81.193)  3.583 ms
 6  tcommx-compmx.colorado.edu (128.138.81.254)  3.841 ms
 7  dvr-edge-13.inet.qwest.net (205.171.45.117)  4.956 ms
 8  72.164.247.150 (72.164.247.150)  5.225 ms
 9  *
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   c. Hops don't correlate with RTT times. Cisco had a smaller RTT yet it had more hops than google.com.

   d. As geographical distance increases, the number of hops increases.