

CSc 361: Computer Networks (Spring 2017)

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Written Assignment 1 (W1) Due date: January 23, 2017

1. Internet access over telephone lines has been driven by your desire for higher speed. Given the following fact: voice bandwidth: 3,000 Hz; signal-to-noise ratio between two phone sets: 30 dB; modem sampling rate: 2,400 baud, please explain concisely:

(a) how your old modem was improved from 2.4 to 9.6 and 28.8 Kbps (i.e., kilobit-per-second) in speed; [1]

(bits/symbol)*(symbols/second)=bps.
Minimum euclidean distance will pack more info in one symbol
Because baud rate is 2400.
If 1 bit per symbol, it is $1*2400=2.4$ Kbps.
If 4 bit per symbol, it is $4*2400=9.6$ Kbps.
If 12 bit per symbol, it is $12*2400=28.8$ Kbps.

(b) why such improvement stopped around 33.6 Kbps; [1]

The channel capacity is $C=3000*\log_2(1+1000)=29.9$ Kbps, which is between 28.8 and 33.6. So 33.6 Kbps is the upper bound.

(c) how 56 Kbps is achieved otherwise; [1]

Increased S/N, asymmetric H

$C=H\log_2(1+S/N)$ If increased S/N and/or asymmetric H, the capacity will increase.

(d) how your DSL modem now can achieve even higher speed. [1]

The noise decreases and frequency increases. $C=H\log_2(1+S/N)$. So C increases.

2. For your actual Internet access at home:

(a) how do you connect your computer at home to your home router (or access point)? [0.25]

1. Plug one end of an Ethernet cable into your modem.
2. Plug the other end of that Ethernet cable into the Internet, Uplink, WAN, or WLAN port on your router.
3. Plug in your router. After 2 to 3 minutes, the Internet, WAN, or WLAN lights

up. That is the indication that your router is successfully connected to your modem.

4. On your computer, click Start, and click Shut Down.
5. From the drop-down list, select Shut Down, and click OK.
6. Connect an Ethernet cable to your computer's network adapter.
7. Connect the other end of the Ethernet cable to one of the Ethernet ports your router.
8. Start your computer, and log on (if you require a login after you restart). Your computer automatically detects that you are connected to the Internet. You should be able to open your browser and log in to your router to configure it to work with your computer.

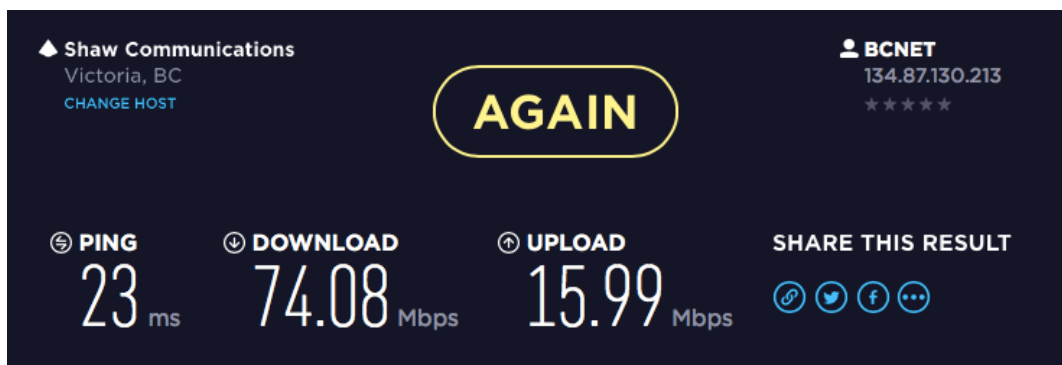
(b) can you figure out and state your access technology from your home to your Internet service provider? [0.25]

phone line, cable line, powerline

(c) can you traceroute and give the output from your computer at home to google.com? [0.25]

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traceroute to google.com (216.58.193.110), 64 hops max, 52 byte packets
 1  hitronhub.home (192.168.0.1)  3.088 ms  1.937 ms  2.289 ms
 2  * * *
 3  rd2cv-be108-1.gv.shawcable.net (64.59.161.193)  16.309 ms  16.874 ms  11.763 ms
 4  rclwt-be40.wa.shawcable.net (66.163.68.18)  17.732 ms  19.120 ms  13.780 ms
 5  72.14.198.104 (72.14.198.104)  26.336 ms  22.282 ms  12.290 ms
 6  108.170.245.113 (108.170.245.113)  23.195 ms  30.786 ms
    108.170.245.97 (108.170.245.97)  30.675 ms
 7  209.85.243.233 (209.85.243.233)  21.600 ms  25.435 ms
    209.85.243.153 (209.85.243.153)  14.236 ms
 8  sea15s08-in-f110.1e100.net (216.58.193.110)  13.882 ms  19.574 ms  12.306 ms
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(d) can you use www.speedtest.net and give the output from your computer at home to the Shaw's speedtest server in Victoria? [0.25]



(e) can you explain the difference of your speed test results from those advertised by your Internet service provider? [extra 1]

My speed results are lower than those advertised by my Internet service provider. I think there are following reasons:

1. Congestion: I am sharing an Internet connection line with my roommates, so congestion can result as all these people compete for the Internet connection.
2. Time of Day: Because more people are probably using the shared connection line during peak hours — around 6pm to midnight for residential connections — I may experience slower speeds at these times.