CSC 361 Ass1
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1. a) According to the book, we know that $bps = (bits/symbols) \times (symbols/seconds)$, and in the best-case (which we can't really achive) $bps = 2H \log_2 V$. From these two formular we can easily see that we can change the speed by changing the number of symbols and the bandwith. That is how we improved our speed from 2.4 to 9.6 and 28.8 kbps.

b) Because of the shannon limit, we can achive the max speed. In this case, we have bandwidth = 3000 Hz, $S/N = 10^3$ by using the formular $bps = H \log_2(1 + S/N)$ we can get $bps = 3000 \log_2(1 + 10^3) \approx 30$ kbps. That's where the improvement stops.

c) Since we are using telephone lines and given that the bandwidth is 3000 Hz. Now look at the formular $bps = H \log_2(1 + S/N)$ the only way to increase the speed to 56 kbps is to increase S/N.

d) We can achive even higher speed by seperate the cable between telephone and modle in order to free up more H.

2. a) By wifi b) by optical fiber

c)

Tracing route to google.com [2607:f8b0:400a:809::200e]over a maximum of 30 hops:

1 3 ms 2 ms 2 ms node-1w7jr9sruwa2phpx9rqo4xtls.ipv6.telus.net [2001:569:bd7c:fd00:72f1:96ff:fe93:5820]

2 20 ms 16 ms 21 ms node-1w7jr9qxg4tsj6k2h7ki7qs5u.ipv6.telus.net [2001:569:8002:f::12]

3 22 ms 23 ms 200 ms sttlwawbgr80.bb.telus.com [2001:568:1::50a]

4 22 ms 22 ms 22 ms 2001:4860:1:1:0:354:0:4

5 23 ms 22 ms 23 ms 2001:4860:0:1040::1

6 23 ms 22 ms 23 ms 2001:4860:0:1::491

7 22 ms 22 ms 22 ms sea15s12-in-x0e.1e100.net [2607:f8b0:400a:809::200e]

Trace complete.

d) Ping: 25 ms, Download speed: 93.80 Mbps, upload speed: 28.95 Mbps

e) As d show the down stream speed is 93.80 Mbps which has 6.20 Mbps difference than it advertised. The two most effectivly reason are ① The provider limit a residential rate when tiered service are offered (according to the book). ② The distance between my place and the center office (co), if the distance is >5-10 miles it will slow down since it needs to be "resorted to an alternative form of Internet access." (book)