CS438 Communication Networks Problem Set 1

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1

2TB = 2* 1024GB= 2*1024*1024MB = 2*1024*1024*1024KB = 2*1024^3*1024B = 2*2^{40}*2^3 bits = 2^{44}bits
15TB = 15*2^{43}bits
200Mbps = 200 * 10^6 = 2*10^8bits per second.
700Mbps = 7*10^8bits per second
(a) The time it takes using high speed internet will be the time uploading the 15TB data with the network speed 200Mbps, which is 15TB / 200 Mbps = 6.94days plus the transmission delay 10ms, which in total is 6.94days.
(b) The time takes to copy all the data to the hard disk is 15TB/700Mbps = 1.98days. It takes the same amount of time to copy it from the hard disk to the new site.Plus the transition delay, 2 hours, which is in total 4 days.
So the option b is a lot faster than option a.

2

(a) The total transfer time is 512B/200Mbps + 4*5*10^{-6}s = 20.48micro seconds + 20microseconds = 40.48microseconds.
(b) Since only 512B - 100B = 412B are effective, so the the effective bandwidth is 412B/40.48microseconds = 81.42Mbps
(c)The time it takes for transmitting the 100B acknowledgement from B to A is 100B/200Mbps + 20microseconds = 24microseconds. So the new effective bandwidth will be 412B/64.48microseconds = 51.12Mbps.

3

(a)There are only 1 person is allowed each time when circuit switching is used.
(b)Since each user transmits for 8 percent of the time. So for n users to transmit at the same time, the probability is (1500 choose n)*0.08^n*0.92^{1500-n}.
(c)The link will get overloaded when the number of active users is over floor(1000/7) = 142. So the problem becomes to find the probability that there are more than 142 users transmitting simultaneously. Which is $1-\sum_{n=0}^{142}(1500 choose n)*0.08^n*0.92^{1500-n}$

4

(a)15Gbps*60μs = 15 * 10^9 * 60* 10^{-6} = 9000 bits
(b)450Mbps * 0.15μs = 450 * 10^6 * 0.15 * 10^{-6} = 67.5 bits
(c)2*500Mbps * 35786km/lightSpeed = 2*500 * 10^6 * 35786/ (3*10^5) = 12042272 bits

5

(a)0.65^7 years
(b) The number of chips win in average will be 0 * 0.35 + 50 * 1*0.65*0.35 + 2 * 50 * 0.65^2 * 0.35 + 3 * 50* 0.65^3*0.35 + 4 * 50 * 0.65^4*0.35 + 5 * 50 *0.65^5 * 0.35 + 6* 50 *0.65^6 * 0.35 + 7*50*0.65^7 = 88.31
(c)the number of rounds played per tournament will be 1 * 0.35 + 2 * 0.65*0.35 + 3 * 0.65^2 * 0.35 + 4 * 0.65^3*0.35 + 5 *0.65^4*0.35 + 6* 0.65^5 * 0.35 + 7 *0.65^6 * 0.35 + 8*0.65^7 = 2.77 rounds
(d)m/n = 31.88

6

6.1 microsoft.com:

Registrar: MarkMonitor Inc.
Creation Date: 1991-05-02T04:00:00Z
Registry Expiry Date: 2021-05-03T04:00:00Z

6.2 microsoot.com

Registrar: MarkMonitor Inc.
Creation Date: 1999-05-22T10:29:58Z
Registry Expiry Date: 2018-05-22T10:29:26Z

6.3 illinois.edu

Registrar: EDUCAUSE Whois
Domain record activated: 13-Jan-1997
Domain expires: 31-Jul-2018

6.4 npr.org

Registrar: Network Solutions, LLC
Creation Date: 1993-12-13T05:00:00Z

Registry Expiry Date: 2018-12-12T05:00:00Z

6.5 chelseafc.com

Registrar: GoDaddy.com, LLC
Creation Date: 1998-09-12T04:00:00Z
Registry Expiry Date: 2021-09-11T04:00:00Z