郭隆翔 2292019220395l

P1 a. I find that host "www.nasa.gov" has 28 hops.

The strategy is, select those servers that are located inland, and far from the source

b, I meet a problem that when I traceroute, ISPs response ~~response~~ nothing, so I can't a destination host that traverses the largest number of ISPs.

But I presume the strategy is same as first question, and as much as possible select servers located in country which has the most ISPs.

P2 60000 ~~six~~ people make a phonecall per day, average of $\frac{60000}{86400}$ per second

$$\lambda = \frac{25}{36}, \quad \cdots\cdots ①$$

each call takes on average 180 seconds

$$\frac{1}{\mu} = 180 \quad \cdots\cdots ②$$

$$p_k \lambda = p_{k+1}(k+1)\mu \quad \cdots\cdots ③$$

$$\sum_{k=0}^{N} p_k = 1 \quad \cdots\cdots ④$$

$$p_N = 0.01 \quad \cdots\cdots ⑤$$

~~combin~~ combining ①②③④⑤

$$p_N = \frac{1}{(N)!}\left(\frac{\lambda}{\mu}\right)^N \frac{1}{1+\frac{1}{1!}\frac{\lambda}{\mu}+\frac{1}{2!}\left(\frac{\lambda}{\mu}\right)^2+\ldots+\frac{1}{N!}\left(\frac{\lambda}{\mu}\right)^N} = 0.01$$

$$\cancel{\frac{1}{(N)!}\left(\frac{\lambda}{\mu}\right)^N \frac{1}{e^{\frac{\lambda}{\mu}}} = 0.01}$$

when $N = 143$, $p_N \approx 0.010193$

P3 $\cancel{\lambda = \frac{15}{4}, \frac{1}{\mu} =}$

quad-core: for every single core, $\lambda = \frac{15}{4}$, $\frac{1}{\mu} = \frac{1}{5}$, $\rho = \frac{\lambda}{\mu} = \frac{15}{20}$, $s = \frac{1}{\mu} = 5$

$$Delay = s\frac{1}{1-\rho} = 5\frac{1}{1-\frac{3}{4}} = 20s$$

dual-core: $\lambda = \frac{15}{2}$, $s = \frac{1}{\mu} = \frac{1}{5}$, $\rho = \frac{\lambda}{\mu} = 1.5 > 1$, average delay infinite

P4 a, $d_{prop} = \frac{m}{s}$

b: $d_{trans} = \frac{L}{R}$

c: $d = \frac{m}{s} + \frac{L}{R}$

d: ~~if dtrans > dprop~~

about to be sent to Host B

e: on the way

f, has been ~~sent to Host B~~ received by Host B

g: $m \approx 5.36 \times 10^8 m$

P5 a, $R \cdot d_{prop} = 2Mbps \cdot \frac{20000 \times 10^3 m}{2.5 \times 10^8 m/s} = 0.16 Mb$

b, $800{,}000\ b =$ ~~0.7629395 Mb~~ $0.8 Mb > R \cdot d_{prop}$

the max number of bits in the link is 0.16Mb

c the max number of bits can be accommodated in the link

~~d $\frac{0.16Mb}{20000 \times 10^3 m} = \frac{0.16 \times 10^6 b}{2 \times 10^7 m} = 0.008$ b/m~~

~~e $W_{bit} = \frac{R \cdot \frac{m}{s}}{}$~~

d: $\frac{20000 \times 10^3 m}{0.16 \times 10^6 b} = 125 m/b$

e: $W_{bit} = \frac{m}{R \cdot \frac{m}{s}} = \frac{s}{R}$

P6 packets time $t_{pack} = \dfrac{56 \times 8\,b}{64\,kbps} = 7 \times 10^{-3}\,s$

$t_{trans} = \dfrac{56 \times 8\,b}{2\,Mbps} = 0.224 \times 10^{-3}\,s$

$t_{prop} = 10 \times 10^{-3}\,s$

~~t decode = tpack~~

$t = t_{pack} + t_{trans} + t_{prop} = 1.7224 \times 10^{-2}\,m$

P7 $40\,TB = \cancel{40 \times 8\,Tb}\ 3.5184 \times 10^{8}\,Mb$

$t_{trans} = \dfrac{3.5184 \times 10^{8}\,Mb}{100\,Mbps} = 3.5184 \times 10^{6}\,s \approx 41$ Days

It takes almost 41 Days to transmit the data, so I choose FedEx

P8 a. packet-switched network

Reason: 1. Only a portion of the bandwidth is used (low resource usage)

2. Charge by packet, low cost (Data is ~~alway~~ being transmitted all the time, charging by time is not cost effective.

b. congestion control is needed. Because it takes time for host to process the packet, and processing capacity is limited.

P9 a: only one

b: $p = 0.1$

c: $p = C_{120}^{n} 0.1^{n} 0.9^{120-n}$

d: $p = 1 - \sum_{i=0}^{20} C_{120}^{i} 0.1^{i} 0.9^{120-i}$

P10 a: $t = \frac{8 \times 10^6 b}{2Mbps} = 4s$

$t_{total} = 4 \times 3 = 12s$

b: $t_1 = \frac{10000b}{2Mbps} = 0.005s$

$t_2 = 2t_1 = 0.01s$

c: $t_{800} = 800t_1 = 8s$

$t = t_{800} + 2t_1 = \cancel{8.02s}$ $8.01s$

less then result in a

use message segmentation improve ~~transmiss~~ transmission efficiency

d: If packet is lost, user only needs to retransmit missing packet

e: take more time to handing header information

P11 $t_1 = \frac{80+S}{R}$

$t_n = \frac{F}{S} \cdot \frac{80+S}{R}$

$t = t_n + 2t_1 = (\frac{F}{S}+2)\frac{80+S}{R}$

$f(S) = (\frac{F}{S}+2)\frac{80+S}{R}$ $(S>0)$

$f'(S) = (-\frac{1}{S^2})\frac{80+S}{R} + \frac{1}{R}(\frac{F}{S}+2) = \frac{FS+2S^2-80-S}{RS^2}$

$\therefore S = \frac{1-F+\sqrt{(F-1)^2+640}}{4}$

P12 Constructing an interface between internet and telephone network.