

Essay Questions :

- ① if you just want to send fast and don't care about reliability use UDP but if reliability is important then use TCP
- ② All the clients act as clients & servers of a communication session
- ③ Caching decreases the time taken to get the file from the origin server by placing it nearer to the ISP that requested the object. And it would only decrease the delay if the object requested is in the cache else it doesn't decrease the delay.
- ④ Yes, because each has a different type of DNS resolving.

Mail type = MX

- ⑤ ~~In-band~~ <sup>out-of-band</sup> Transmits control data on a separate connection from the main one

In-band ~~sends~~ control data & main data on the same connection

In-band

HTTP

SMTP

DNS

out-of-Band

FTP

DNS

TCP

Problems:-

$$\textcircled{1} \quad F = 15 \text{ Gbits} = 15 \times 10^9 \text{ bits}$$

$N$  peers

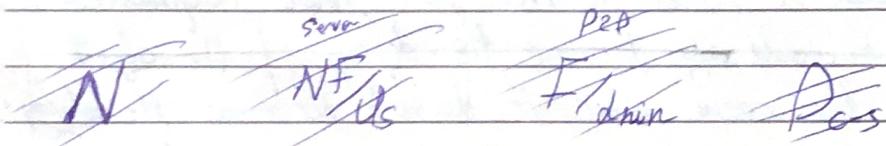
$$U_s = 30 \text{ Mbps} = 30 \times 10^6 \text{ bits/s}$$

$$d_i = 2 \text{ Mbps} = 2 \times 10^6 \quad , \quad U_i = U \Rightarrow N = 10, 100, 1000$$

$$U = 300 \times 10^3, 700 \times 10^3, 2 \times 10^6$$

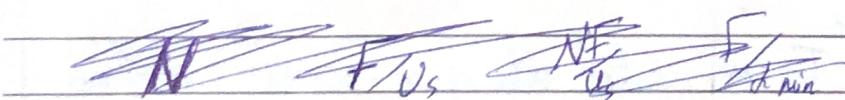
chat-server

$$\text{Direct: } D_{cs} \geq \max \left\{ \frac{NF}{U_s}, \frac{F}{d_{min}} \right\}$$



P2P

$$D_{P2P} \geq \max \left\{ \frac{F}{U_s}, \frac{F}{d_{min}}, \frac{NF}{(U_s + \epsilon U_i)} \right\}$$



$N$	$F/U_s$	$NF/U_s$	$F/d_{min}$	$\epsilon U_i$	$NF/(U_s + \epsilon U_i)$	$D_{C-S}$	$D_{P2P}$
10	500	<del>5000x10^3</del>	$7.5 \times 10^3$	$3 \times 10^6$	45, 45, 45	$7.5 \times 10^3$	$7.5 \times 10^3$
100	500	$50 \times 10^3$	$7.5 \times 10^3$	$70 \times 10^6$	15,000	$50 \times 10^3$	$15 \times 10^3$
1000	500	$500 \times 10^3$	$7.5 \times 10^3$	$2 \times 10^9$	7,389	$500 \times 10^3$	$7.5 \times 10^3$

2)

$$\textcircled{2} \quad \text{Size of object} = 850 \times 10^3 \text{ bits}$$

$$\text{request rate} = 16/\text{second}$$

$$\Delta/(1-\Delta\beta)$$

$$\text{HTTP request} = 3 \text{ seconds}$$

$$\text{access link} = 15 \times 10^{-6}$$

$$\text{a) } \Delta = \frac{850 \times 10^3}{15 \times 10^{-6}} = 0.0567 \text{ seconds}$$

$$\beta = 16$$

$$\beta\Delta = 0.9067$$

$$\frac{\Delta}{(1-\Delta\beta)} = \frac{0.0567}{(1-0.9067)}$$

$$= 0.61$$

$$\text{Average} = 3 + 0.61 = 3.61 \text{ seconds}$$

$$\text{b) } 40\% = \text{miss rate}$$

$$\beta\Delta = 0.4 \times 0.9067 = 0.3627$$

$$\frac{\Delta}{(1-\Delta\beta)} = 0.0889$$

$$\text{Average delay of access link} = 3.0889$$

$$\text{Average access with cache} = 1.23556 \text{ seconds}$$

③  $\text{WWW.b.com/bigfile} = 1 \times 10^9 \text{ bits}$

~~1. local DNS → local DNS~~

~~2. local DNS → root DNS~~

~~3. Root DNS → TLD DNS (.com)~~

1. ml.a.com  $\xrightarrow{\text{DNS}}$  local DNS

2. local DNS  $\xrightarrow{\text{DNS}}$  Root DNS

3. Root DNS  $\xrightarrow{\text{DNS}}$  TLD .com

4. TLD .com  $\xrightarrow{\text{DNS}}$  Autocorrective name b.com

5. b.com  $\xrightarrow{\text{DNS}}$  local DNS

6. local DNS  $\xrightarrow{\text{DNS}}$  b1.com

7. b1.com  $\xrightarrow{\text{DNS}}$  IP of b1.com to local DNS

8. HTTP request to b1.com (GET request)

9. 1 Gbps  $\xrightarrow{\text{HTTP}}$  Cache

10. Cache  $\xrightarrow{\text{HTTP}}$  ml.a.com