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HOMEWORK 2

P7

The total amount of time to get the IP address is the sum of all the round-trip times (RTT) it takes on its way to finding the destination IP.

$RTT_1 + RTT_2 + ... + RTT_n$

Once the IP is known, $2RTT_0$ elapses to establish the server-client TCP connection and to GET the requested object. The total time elapsed (assuming $d_{trans} = 0$) is:

$RTT_1 + RTT_2 + ... + RTT_n + 2RTT_0$

P8,

a. Non-persistent HTTP with no parallel TCP connections:

$RTT_1 + ... + RTT_n + 2RTT_0 + 8 \cdot 2RTT_0 = 18RTT_0 + RTT_1 + ... RTT_n$

This includes the time it takes to locate the destination IP address, the time to establish the TCP connection and time for the client and server to GET and SEND each of the 8 objects, respectively.

b. Non-persistent HTTP with the browser configured for 5 parallel connections:

$RTT_1 + ... + RTT_n + 2RTT_0 + 2 \cdot 2RTT_0 = 6RTT_0 + RTT_1 + ... + RTT_n$

The 8*2 is reduced to 2*2 since a 5-parallel connection only requires 2 GETs to get 8 objects if each connection sends only 1 GET request.

c. Persistent HTTP:

$RTT_1 + ... + RTT_n + 2RTT_0 + RTT_0 = 3RTT_0 + RTT_1 + ... + RTT_n$

No new TCP connections must be established after each GET request. Since $d_{trans} = 0$, a single GET request should get you the 8 objects virtually instantaneously (i.e. RTT_0 time).

P11

a. Yes, parallel connections help because he can reserve more instances of non-persistent HTTP than the other 4 users.

b. No, because every user including Bob would have the same # of parallel connections, meaning that Bob would get 1/5 of the non-persistent HTTP instances, same as the other 4 users.

P15

MTA stands for “Mail Transfer Agents”. The originator of this spam email is: `tennis5@pp33head.com`

P18

a. A whois database is a collection of information made publicly available on registered domain names and contact information for the registrant of that domain name.

b. **$whois fordham.edu**

```
      IT-DNS02.FORDHAM.EDU    150.108.28.20
      IT-DNS01.FORDHAM.EDU    150.108.27.20
$whois nytimes.com
      DNS.EWR1.NYTIMES.COM
      DNS.SEA1.NYTIMES.COM
```

c. **$nslookup**

```
> set type=A
> fordham.edu
Name: fordham.edu
Address: 150.108.28.79
> nytimes.com
Name: nytimes.com
Address: 170.149.168.130
Name: nytimes.com
Address: 170.149.172.130
```

```
> data.gov
Name: data.gov
Address: 216.128.241.41
Name: data.gov
Address: 173.252.148.98
```

```
> set type=NS
> fordham.edu
ds-dc04.ds.fordham.edu.
ds-dc01.ds.fordham.edu.
ds-dc02.ds.fordham.edu.
ds-dc03.ds.fordham.edu.
gordy.fordham.edu.
ds-dce1.ds.fordham.edu.
eldin.fordham.edu.
```

```
> nytimes.com
Non-authoritative:
dns.sea1.nytimes.com
dns.ewr1.nytimes.com
Authoritative:
dns.sea1.nytimes.com 170.149.173.133
```

```
> data.gov
Non-authoritative:
dns.gsa.gov.
dns2.gsa.gov.
dns3.gsa.gov.
dns4.gsa.gov.
dns5.gsa.gov.
dns6.gsa.gov.
```

```
Authoritative:
159.142.148.200
2620:0:150:300c::11
159.142.148.210
209.225.2.109
159.142.152.60
2620:0:150:140d::11
159.142.119.252
159.142.90.245
```

```
> set type=MX
> fordham.edu
200 fordham.edu.s8a2.psmtp.com.
100 fordham.edu.s8a1.psmtp.com.
400 fordham.edu.s8b2.psmtp.com.
300 fordham.edu.s8b1.psmtp.com.
```

```
> nytimes.com
5 ALT2.ASPMX.L.GOOGLE.com.
10 ASPMX2.GOOGLEMAIL.com.
10 ASPMX3.GOOGLEMAIL.com.
1 ASPMX.L.GOOGLE.com.
5 ALT1.ASPMX.L.GOOGLE.com.
```

```
> data.gov
10 phx-smt-03.data.gov
30 phl-smt-04.data.gov
```

d. All 3 of the Web servers I performed `nslookup` on returned multiple IP addresses. Yes.

e. `Search WhoisRWS: "fordham"`

`NetRange: 150.108.0.0 – 150.108.255.255`

f. `whois` databases can provide the owner of a domain name and the `nslookup` can give you the IP address of the domain name, thereby enabling you to target a specific company/person for a DDoS attack.

g. This provides accountability for the content posted on sites. Otherwise, it would be much easier for a domain owner to evade responsibility for illicit or generally bad content.

P19,

a. **$dig www.fordham.edu**

```
;; QUESTION SECTION:
;www.fordham.edu.            IN              A

;; ANSWER SECTION:
www.fordham.edu.  600        IN         CNAME www.fordham.edu.edgesuite.net.
www.fordham.edu.edgesuite.net. 17120 IN  CNAME a1166.g.akamai.net.
a1166.g.akamai.net.     18   IN         A     168.143.242.242
a1166.g.akamai.net.     18   IN         A     168.143.242.209
```

b. **$dig google.com**

```
;; QUESTION SECTION:
;google.com.                    IN    A

;; ANSWER SECTION:
google.com.       285   IN    A     74.125.226.232
google.com.       285   IN    A     74.125.226.225
google.com.       285   IN    A     74.125.226.229
google.com.       285   IN    A     74.125.226.228
google.com.       285   IN    A     74.125.226.226
google.com.       285   IN    A     74.125.226.224
google.com.       285   IN    A     74.125.226.227
google.com.       285   IN    A     74.125.226.238
google.com.       285   IN    A     74.125.226.231
google.com.       285   IN    A     74.125.226.230
google.com.       285   IN    A     74.125.226.233
```

$dig yahoo.com

```
;; QUESTION SECTION:
;yahoo.com.                 IN    A

;; ANSWER SECTION:
yahoo.com.        1343  IN    A     206.190.36.45
yahoo.com.        1343  IN    A     98.138.253.109
yahoo.com.        1343  IN    A     98.139.183.24
```

$dig amazon.com

```
;; QUESTION SECTION:
;amazon.com.                    IN    A

;; ANSWER SECTION:
amazon.com.       26    IN    A     72.21.194.212
amazon.com.       26    IN    A     176.32.98.166
amazon.com.       26    IN    A     72.21.215.232
amazon.com.       26    IN    A     205.251.242.54
```

P32

No. The client-side port is 5432 and the serverside port is 12000. Before adding this line, the client-side port number was unspecified (i.e. left up to the OS to decide). The server-side port was always 12000.

P33

Yes. The disadvantage of more simultaneous TCP connections is that for each additional user, HTTP response time increases and congestion is exacerbated. The only time multiple simultaneous TCP connections can be advantageous is on a shared network connection, where each connection is assigned a time-share.