计算机网络 作业 2 参考答案

2024 年 11 月 2 日

P4.

a) The document request was http://gaia.cs.umass.edu/cs453/index.html. The Host : field indicates the server's name and /cs453/index.html indicates the file name.

b) The browser is running HTTP version 1.1, as indicated just before the first <cr><lf> pair.

c) The browser is requesting a persistent connection, as indicated by the Connection: keepalive.

d) This is a trick question. This information is not contained in an HTTP message anywhere. So there is no way to tell this from looking at the exchange of HTTP messages alone. One would need information from the IP datagrams (that carried the TCP segment that carried the HTTP GET request) to answer this question.

e) Mozilla/5.0. The browser type information is needed by the server to send different versions of the same object to different types of browsers.

P7.

The total amount of time to get the IP address is
$RTT_1 + RTT_2 + \cdots + RTT_n$

Once the IP address is known, RTT_o elapses to set up the TCP connection and another RTT_o elapses to request and receive the small object. The total response time is
$2RTT_o + RTT_1 + RTT_2 + \cdots + RTT_n$

P8.

a) $RTT_1 + \cdots + RTT_n + 2RTT_o + 8 \cdot 2RTT_o$
$= 18RTT_o + RTT_1 + \cdots + RTT_n$.

b) $RTT_1 + \cdots + RTT_n + 2RTT_o + 2 \cdot 2RTT_o$
$= 6RTT_o + RTT_1 + \cdots + RTT_n$.

c) Persistent connection with pipelining. This is the default mode of HTTP.
$RTT_1 + \cdots + RTT_n + 2RTT_o + RTT_o$
$= 3RTT_o + RTT_1 + \cdots + RTT_n$

Persistent connection without pipelining, without parallel connections.
$RTT_1 + \cdots + RTT_n + 2RTT_o + 8RTT_o$
$= 10RTT_o + RTT_1 + \cdots + RTT_n$

P13.

The MAIL FROM: in SMTP is a message from the SMTP client that identi fies the sender of the mail message to the SMTP server. The From: on the mail message itself is NOT an SMTP message, but rather is just a line in the body of the mail message.

P18.

a) For a given input of domain name (such as ccn.com), IP address or net work administrator name, the whois database can be used to locate the corre sponding registrar, whois server, DNS server, and so on.

b) NS4.YAHOO.COM from www.register.com; NS1.MSFT.NET from ww.reg ister.com

c)

Local Domain: www.mindspring.com

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Web servers : www.mindspring.com
              207.69.189.21, 207.69.189.22,
              207.69.189.23, 207.69.189.24,
              207.69.189.25, 207.69.189.26, 207.69.189.27,
              207.69.189.28
Mail Servers : mx1.mindspring.com (207.69.189.217)
              mx2.mindspring.com (207.69.189.218)
              mx3.mindspring.com (207.69.189.219)
              mx4.mindspring.com (207.69.189.220)
Name Servers: itchy.earthlink.net (207.69.188.196)
              scratchy.earthlink.net (207.69.188.197)
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www.yahoo.com

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Web Servers: www.yahoo.com (216.109.112.135, 66.94.234.13)
Mail Servers: a.mx.mail.yahoo.com (209.191.118.103)
              b.mx.mail.yahoo.com (66.196.97.250)
              c.mx.mail.yahoo.com (68.142.237.182, 216.39.53.3)
              d.mx.mail.yahoo.com (216.39.53.2)
              e.mx.mail.yahoo.com (216.39.53.1)
              f.mx.mail.yahoo.com (209.191.88.247, 68.142.202.247)
              g.mx.mail.yahoo.com (209.191.88.239, 206.190.53.191)
Name Servers: ns1.yahoo.com (66.218.71.63)
              ns2.yahoo.com (68.142.255.16)
              ns3.yahoo.com (217.12.4.104)
              ns4.yahoo.com (68.142.196.63)
              ns5.yahoo.com (216.109.116.17)
              ns8.yahoo.com (202.165.104.22)
              ns9.yahoo.com (202.160.176.146)
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www.hotmail.com

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Web Servers: www.hotmail.com (64.4.33.7, 64.4.32.7)
Mail Servers: mx1.hotmail.com (65.54.245.8, 65.54.244.8,
   65.54.244.136)
              mx2.hotmail.com (65.54.244.40, 65.54.244.168,
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                 65.54.245.40)
             mx3.hotmail.com (65.54.244.72, 65.54.244.200,
                 65.54.245.72)
             mx4.hotmail.com (65.54.244.232, 65.54.245.104,
                 65.54.244.104)
Name Servers: ns1.msft.net (207.68.160.190)
             ns2.msft.net (65.54.240.126)
             ns3.msft.net (213.199.161.77)
             ns4.msft.net (207.46.66.126)
             ns5.msft.net (65.55.238.126)
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d) The yahoo web server has multiple IP addresses www.yahoo.com (216.109.112.135, 66.94.234.13)

e) The address range for Polytechnic University: 128.238.0.0 – 128.238.255.255

f) An attacker can use the whois database and nslookup tool to determine the IP address ranges, DNS server addresses, etc., for the target institution.

g) By analyzing the source address of attack packets, the victim can use whois to obtain information about domain from which the attack is coming and possibly inform the administrators of the origin domain.

P23.

a) Consider a distribution scheme in which the server sends the file to each client, in parallel, at a rate of a rate of u_s/N. Note that this rate is less than each of the client's download rate, since by assumption $u_s/N \le d_{min}$. Thus each client can also receive at rate u_s/N. Since each client receives at rate u_s/N, the time for each client to receive the entire file is $F/(u_s/N) = NF/u_s$. Since all the clients receive the file in NF/u_s, the overall distribution time is also NF/u_s.

b) Consider a distribution scheme in which the server sends the file to each client, in parallel, at a rate of d_{min}. Note that the aggregate rate, Nd_{min}, is less than the server's link rate u_s, since by assumption $u_s/N \ge d_{min}$. Since each client receives at rate dmin, the time for each client to receive the entire file is F/d_{min}. Since all the clients receive the file in this time, the overall distribution time is also F/d_{min}.

c) From Section 2.6 we know that

$D_{CS} \geq max\{NF/u_s, F/d_{min}\}$ (Equation 1)

Suppose that $u_s/N \leq d_{min}$. Then from Equation 1 we have $D_{CS} \geq NF/u_s$. But from (a) we have $D_{CS} \leq NF/u_s$. Combining these two gives:

$D_{CS} = NF/u_s$ when $u_s/N \leq d_{min}$. (Equation 2)

We can similarly show that:

$D_{CS} = F/d_{min}$ when $u_s/N \geq d_{min}$ (Equation 3).

Combining Equation 2 and Equation 3 gives the desired result.

P24.

a) Define $u = u_1 + u_2 + ... + u_N$. By assumption

$u_s <= (u_s + u)/N$ Equation 1

Divide the file into N parts, with the i^{th} part having size $(u_i/u)F$. The server transmits the i^{th} part to peer i at rate $r_i = (u_i/u)u_s$. Note that $r_1 + r_2 + ... + r_N = u_s$, so that the aggregate server rate does not exceed the link rate of the server. Also have each peer i forward the bits it receives to each of the $N-1$ peers at rate r_i. The aggregate forwarding rate by peer i is $(N-1)r_i$. We have

$(N-1)r_i = (N-1)(u_s u_i)/u <= u_i$,

where the last inequality follows from Equation 1. Thus the aggregate forward ing rate of peer i is less than its link rate u_i.

In this distribution scheme, peer i receives bits at an aggregate rate of

$$r_i + \sum_{j<>i} r_j = u_s$$

Thus each peer receives the file in F/u_s.

b) Again define $u = u_1 + u_2 + ... + u_N$. By assumption

$u_s >= (u_s + u)/N$ Equation 2

Let $r_i = u_i/(N-1)$ and
$r_{N+1} = (u_s - u/(N-1))/N$

In this distribution scheme, the file is broken into N+1 parts. The server sends bits from the ith part to the ith peer $(i = 1, ..., N)$ at rate r_i. Each peer i forwards the bits arriving at rate r_i to each of the other N1 peers. Additionally, the server sends bits from the $(N+1)^{st}$ part at rate r_{N+1} to each of the N peers. The peers do not forward the bits from the $(N+1)^{st}$ part.

The aggregate send rate of the server is

$r_1 + ... + r_N + Nr_{N+1} = u/(N-1) + u_s - u/(N-1) = u_s$

Thus, the server's send rate does not exceed its link rate. The aggregate send rate of peer i is

$(N-1)r_i = u_i$

Thus, each peer's send rate does not exceed its link rate. In this distribu tion scheme, peer i receives bits at an aggregate rate of

$$r_i + r_{N+1} + \sum_{j<>i} r_j = u/(N-1) + (u_s - u/(N-1))/N = (u_s + u)/N$$

Thus each peer receives the file in $NF/(u_s + u)$. (For simplicity, we neglected to specify the size of the file part for $i = 1, ..., N + 1$. We now provide that here. Let $\Delta = (u_s + u)/N$ be the distribution time. For $i = 1, ..., N$, the i^{th} file part is $F_i = r_i\Delta$ bits. The $(N + 1)^{st}$ file part is $F_{N+1} = r_{N+1}\Delta$ bits. It is straightforward to show that $F_1 + ... + F_{N+1} = F$.)

c) The solution to this part is similar to that of 17 (c). We know from section 2.6 that

$$D_{P2P} >= max\{F/u_s, NF/(u_s + u)\}$$

Combining this with a) and b) gives the desired result.

P26.

a) Yes. His first claim is possible, as long as there are enough peers staying in the swarm for a long enough time. Bob can always receive data through optimistic unchoking by other peers.

b) His second claim is also true. He can run a client on each host, let each client "freeride," and combine the collected chunks from the different hosts into a single file. He can even write a small scheduling program to make the different hosts ask for different chunks of the file. This is actually a kind of Sybil attack in P2P networks.