University of Dhaka

Department of Information Technology

Assignment on,

Chapter 2 - Problem Solving Assignments

MITM 303 (Advanced Computer Networks and Internet Working)

Submitted to,

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MITM-303

Advance Computer Networks and Internetworking

Chapter 2: Problem Solving Assignments

Problem: 1 → True or false?

(a) A user requests a web page that consists of some text and three images. For this page, the client will send one request message and receive four response messages.

Answer (a): False.

(b). Two distinct web pages (for example www.mit.edu/resear .html and www.mit.edu/students.html) can be sent over the same persistent connection.

Answer (b): True.

(c). With nonpersistent connections bet^n browser and origin server, it is possible for a single TCP segment to carry two distinct HTTP request messages.

Answer (c): False.

(e) HTTP response messages never have an empty message body.

Answer (e): False.

(d). The Date: header in the HTTP response message indècates when the object in the response was last modified.

Answer (d): False.

Problem: 3 → Consider an HTTP client that wants to retrieve a web document at a given URL. The IP address of the HTTP server is initially unknown. What transport and application-layer protocols besides HTTP are needed in this scenario?

Answer: An HTTP client aims to retrieve a web documents form a server, several protoclols are involved in the process. especially when the server's IP address is Initially unknown The transport and application layer protocols necessary in such a scenario.

Application-Layer Protocols:

① Domain Name System (DNS): Necessity to inittating an HTTP request, the client must determine the server's IP address, which is achieved through a DNS query.

Transport-Layer Protocols:

① User Datagram Protocol (UDP): Provides connectionless communication without guaranted delivery.

② Transmission Control Protocol: (TCP): Reliable and connection-oriented communication bet^n devices. HTTP operates over TCP to ensure that requests and response are delivered accurately.

Problem: 4 →

@. What is the URL of the document requested by the browser?

Answer (a): The documents request URL:

http://gaia.cs.umass.edu/cs453/index.html.

The request line of the HTTP GET message:

GET /cs453/index.htm HTTP/1.1

this indicates the file name and Host indicates the server's name.

(b). What version of HTTP is the browser running?

Answer (b): The browser is running HTTP/1.1 (version 1.1).

(c). Does the browser request a non-persistent or a persistent connection?

Answer (c): The browser request a persistent connection.

This is specified in the Connection Header:

Connection: keep-alive

(d). What is the IP address of the host on which the browser is running?

Answer (d): The IP address of the host on which the browser is running is not specified in the HTTP Get message.

The HTTP request message does not include the client's IP address. This info is typically found in lower layers of the network stack.

(e) What type of browser initiates this message? Why is the browser type needed in an HTTP request message?

Answer (e): The browser initiating this message is 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.

Problem: 5 →

(a). Was the server able to successfully find the document or not? What time was the document reply provided?

Answer (a): Yes, the server successfully found the document.

The status code: HTTP/1.1 200 OK.

That is the server was able to locate the document.

(a). The server's response time is provided:

Date: Tue, 07 Mar 2008 12:39:45 GMT

(b). When was the document last modifed?

Answer (b): The document last modifed:

Last-Modified: Sat, 10 Dec 2005 18:27:46 GMT

(c) How many bytes are there in the document being returned?

Answer (c): The document size is 3874 bytes. being returned.

(d). What are the first 5 bytes of the document being returned? Did the server agree to a presistent connection?

Answer (d): The first 5 bytes of the documet are: <!doc

The server aggreed to a persistent connection. Header:

Connection: keep-Alive

Problem: 7 →

Answer: The total amount of time to resolve the URL to an IP address by visiting n DNS server.

In the sum of their respective round-trips times. (RTTs);

$$RTT_1 + RTT_2 + RTT_3 + \cdots + RTT_n$$

After obtaining IP Address,

$$\text{HTTP Response-Request Time} = 2 \times RTT_0$$

Here, RTT_0 denotes the round trip time bet^n local host and web server.

The total time elapsed is the sum of the DNS lookup,

Total Response Time:

$$(RTT_1 + RTT_2 + \cdots + RTT_n) + 2 \times RTT_0$$

Example:

$RTT_1 = 10$ ms

$RTT_2 = 15$ ms

$RTT_3 = 20$ ms

$RTT_0 = 50$ ms

$\therefore$ Total time $= (10 + 15 + 20) + 2 \times 50$ ms

$= 145$ ms

Problem-8 →

Referring to Problem P7, suppose the HTML file references eight very small objects on the same server. Neglecting transmission times, how much time elapses with,

(a). Non-persistent HTTP with no parallel TCP connections?

Answer(a): In non-persistent HTTP, each object requires a separate TCP connection,

TCP Connection Establishment: 1 RTT

HTTP Request and Response: 1 RTT

9 objects (1 base HTML + 8 referenced objects); Now

Total time: $9 \times (1 RTT + 1 RTT) + RTT_1 + RTT_2 + \dots + RTT_n$

$= 18 RTT + RTT_1 + \dots + RTT_n$

(b). Non-persisten HTTP with the browser configured for 5 parallal connections?

Answer(b): 5 parallal connections, the client can fetch 5 object simultaneously.

TCP Connection Establishment: 1RTT (for each connection)

HTTP Request and Response: 1RTT (for each object)

For 9 objects, 2 phase:

1st Phase: 2 RTT

2nd Phase: 2 RTT

Total time: $2RTT + 2 \times 2RTT + RTT_1 + RTT_2 + \cdots + RTT_n$

$= 6RTT + RTT_1 + \cdots + RTT_n$.

(c). Persistent HTTP?

Answer(C): Persistent connection with pipelining,

$2RTT + RTT + RTT_1 + \cdots + RTT_n$

$= 3RTT + RTT_1 + \cdots + RTT_n$

Persistent connection without pipelining,

$2RTT + 8RTT + RTT_1 + RTT_2 + \cdots + RTT_n$

$= 10RTT + RTT_1 + \cdots + RTT_n$,

Problem: 9 →

Answer (a):

Calculate the Avarage time to send an object (Δ),

$$\Delta = \frac{L}{B}$$

Substitude the given values;

$$\Delta = \frac{850000 \text{ bits}}{15,000\,000 \text{ bit/sec}}$$

$$= 0'0567 \text{ sec}$$

Calculate the trafic intensity ($\Delta \times R$),

$$\Delta \times R = 0'0567 \text{ sec} \times 16 \text{ req/sec}$$

$$= 0'907 \text{ sec}^{-1}$$

Calculate the avarage Access Delay (D_a),

$$D_a = \frac{\Delta}{1-(\Delta \times R)} = \frac{0'0567 \text{ sec}}{1-0'907 \text{ sec}^{-1}}$$

$$= 0'608 \text{ sec}$$

∴ Total response time,

$$D_a + I = (0'608 + 3) \text{ sec}$$

$$= 3'608 \text{ sec}$$

Answer (6):

with 60% chaching

Reduce traffic Intensity = 40% of original

$= 0.4 \times 0.907$

$= 0.363$

Average Access delay, $\dfrac{0.0567}{1-0.363}$

$= 0.089$ sec

Cashe miss,

Response time $= (0.089 + 3)$

$= 3.089$ sec

Average total Response Time,

$(0.6 \times 0) + (0.4 \times 3.089)$

$= 1.24$ sec.