SACRAMENTO STATE

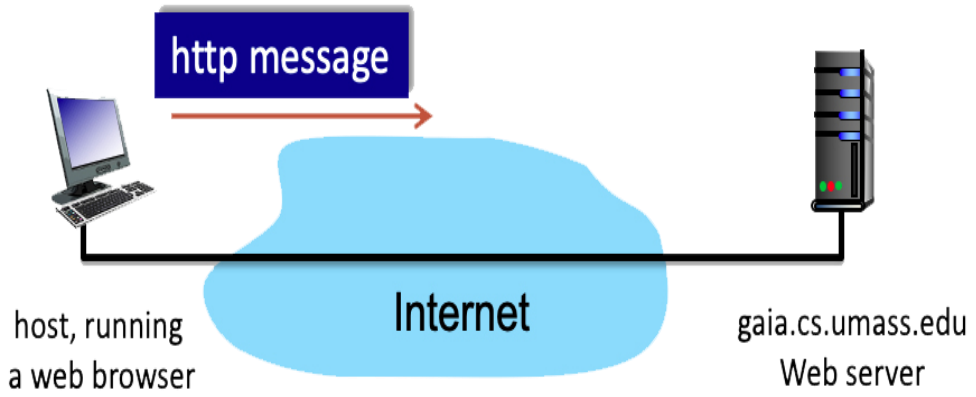
In Class Exercises

Application Layer

Redefine the Possible℠

Problem 1

Consider the figure below, where a client is sending an HTTP GET message to a web server, gaia.cs.umass.edu



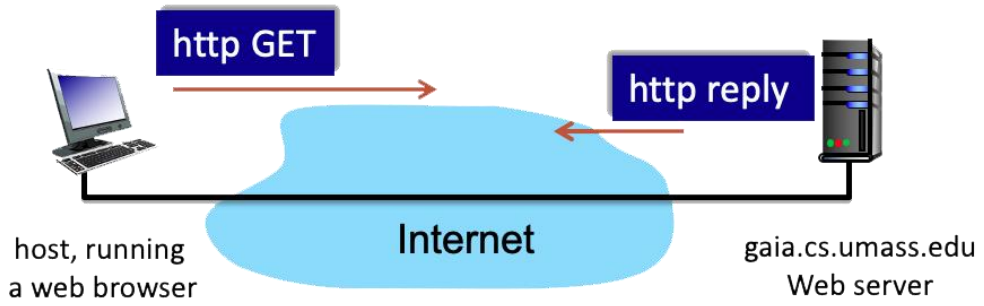
Suppose the client-to-server HTTP GET message is the following:

GET /kurose_ross_sandbox/interactive/quotation8.htm HTTP/1.1
Host: gaia.cs.umass.edu
Accept: text/plain, text/html, text/xml, image/jpeg, image/gif, audio/vnf.wave, audio/mpeg, video/mp4, video/wmv,
Accept-Language: en-us, en-gb;q=0.8, en;q=0.4, fr, fr-ch, zh, ar, cs
If-Modified-Since: Wed, 20 Sep 2023 22:08:58 -0700
User Agent: Mozilla/5.0 (compatible; MSIE 9.0; Windows NT 6.1; WOW64; Trident/5.0)

1. What is the name of the file that is being retrieved in this GET message? *quotation8.htm*
2. What version of HTTP is the client running? *HTTP/1.1*
3. What is the client's preferred version of English? American English
4. What is the client's least preferred version of English? British English

Question 2

Consider the figure below, where the server is sending a HTTP RESPONSE message back the client.



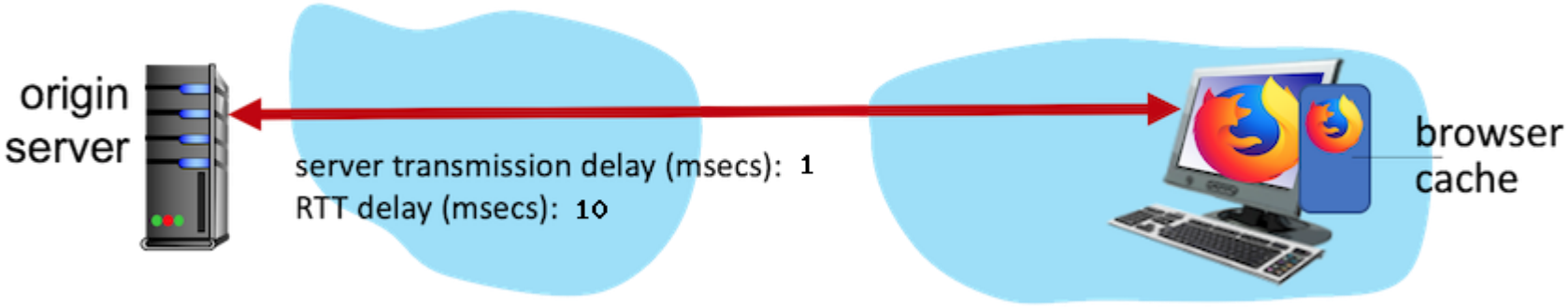
Suppose the server-to-client HTTP RESPONSE message is the following:

HTTP/1.0 200 OK
Date: Thu, 21 Sep 2023 05:46:27 +0000
Server: Apache/2.2.3 (CentOS)
Last-Modified: Thu, 21 Sep 2023 05:57:27 +0000
ETag:17dc6-a5c-bf716880.
Content-Length: 381
Connection: Close
Content-type: image/html

1. What is HTTP the version? *HTTP/1.0*
2. Was the server able to send the document successfully? *Yes (status code)*
3. How big is the document in bytes? *381 bytes*
4. Is the connection persistent or nonpersistent? *Nonpersistent (HTTP/1.0)*

Question 3

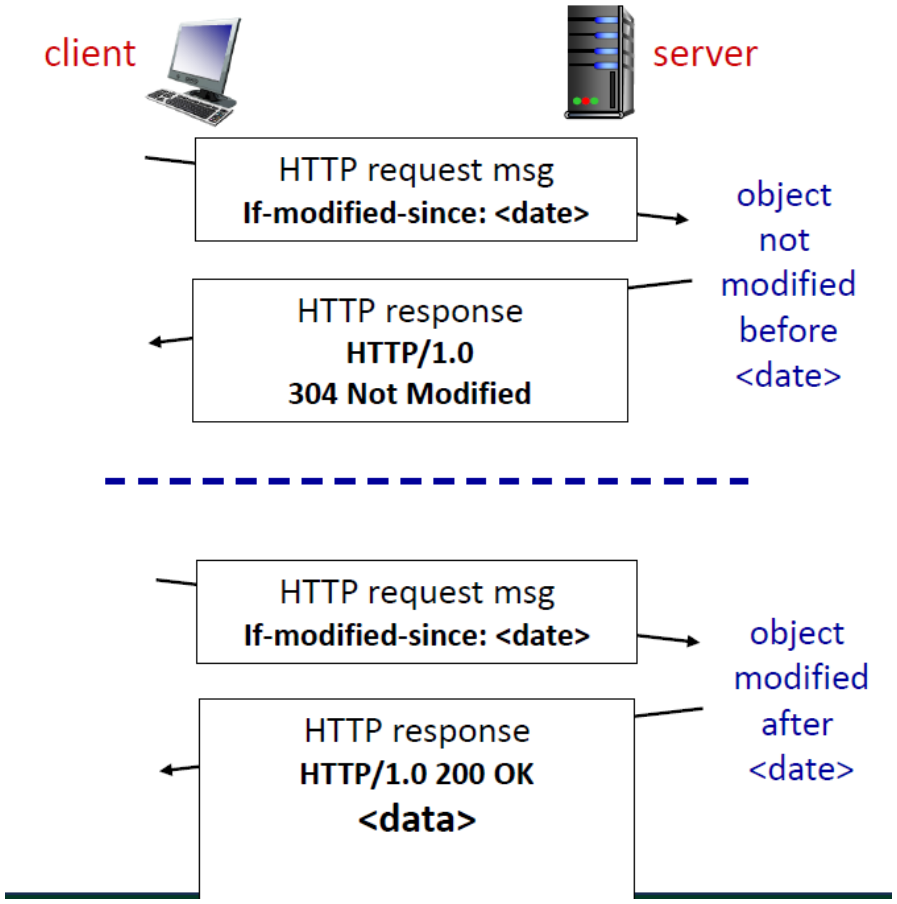
Consider an HTTP server and client as shown in the figure below. Suppose that the RTT delay between the client and server is 10 msecs; the time a server needs to transmit an object into its outgoing link is 1 msecs; and any other HTTP message not containing an object has a negligible (zero) transmission time. Suppose the client again makes 100 requests, one after the other, waiting for a reply to a request before sending the next request.



Assume the client is using HTTP 1.1 and the IF-MODIFIED-SINCE header line. Assume 30% of the objects requested have NOT changed since the client downloaded them (before these 100 downloads are performed)

1. **How much time elapses (in milliseconds) between the client transmitting the first request, and the completion of the last request?**

Question 3 - Continue



Delay consists of RTT delay + Transmission delay (packet not in cache)

RTT Delay = RTT * NUM_PACKETS

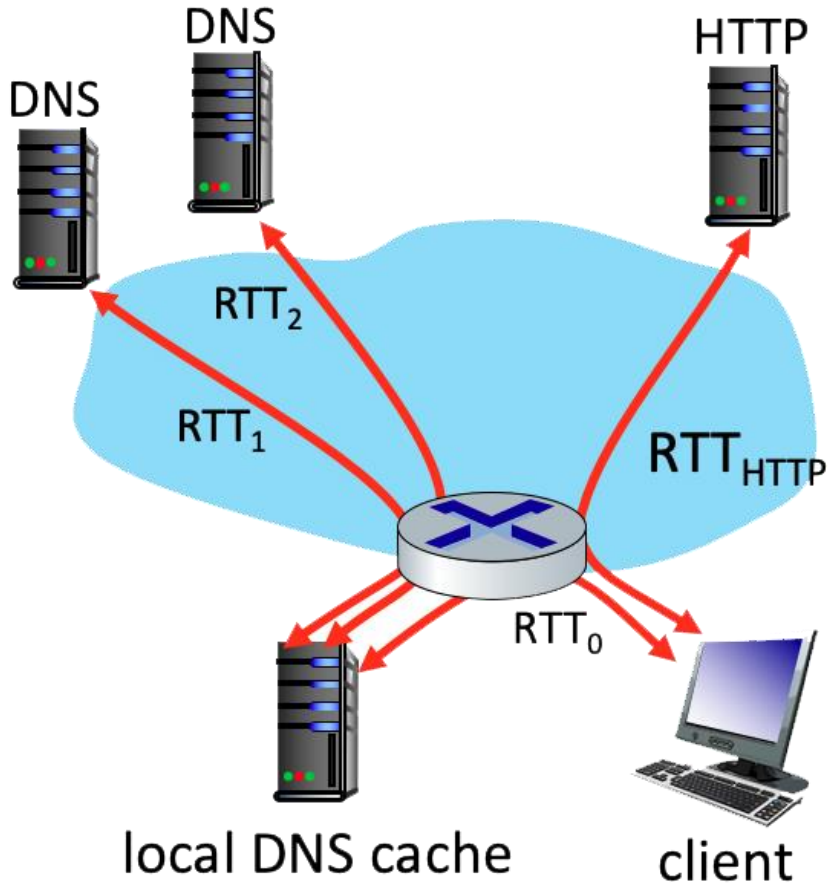
Transmission Delay = (PERCENT__NOT_CACHED / 100) * TRANS_DELAY)

ANSWER: 1070 ms

Question 4

Suppose within your Web browser you click on a link to obtain a Web page. The IP address for the associated URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose that three DNS servers are visited before your host receives the IP address from DNS. The first DNS server visited is the local DNS cache, with an RTT delay of RTT_0 = 3 msecs. The second and third DNS servers contacted have RTTs of 1 and 30 msecs, respectively. Initially, let's suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text (0 transmission delay). Suppose the RTT between the local host and the Web server containing the object is RTT_{HTTP} = 28 msecs.

1. Assuming zero transmission time for the HTML object, how much time (in msec) elapses from when the client clicks on the link until the client receives the object?



Question 4

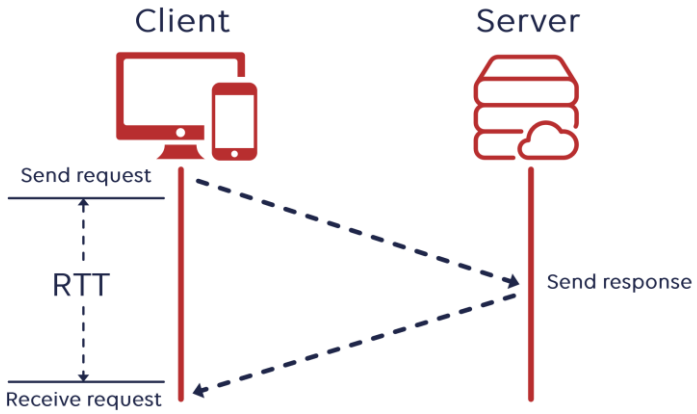
1. Assuming zero transmission time for the HTML object, how much time (in msec) elapses from when the client clicks on the link until the client receives the object?

Answer

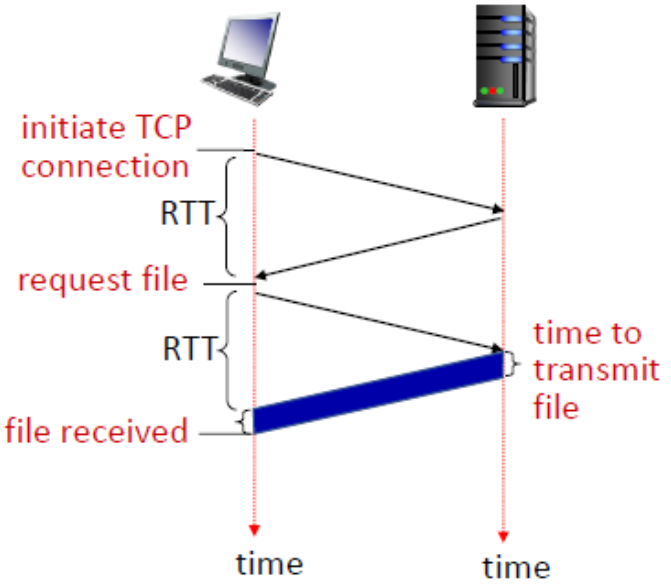
The time from when the Web request is made in the browser until the page is displayed in the browser is: RTT_0 + RTT_1 + RTT_2 + 2*RTT_{HTTP} = 3 + 1 + 30 + 2*28 = 90 msecs.

Note that 2 RTT_{HTTP} are needed to fetch the HTML object - one RTT_{HTTP} to establish the TCP connection, and then one RTT_{HTTP} to perform the HTTP GET/response over that TCP connection.

DNS: response time



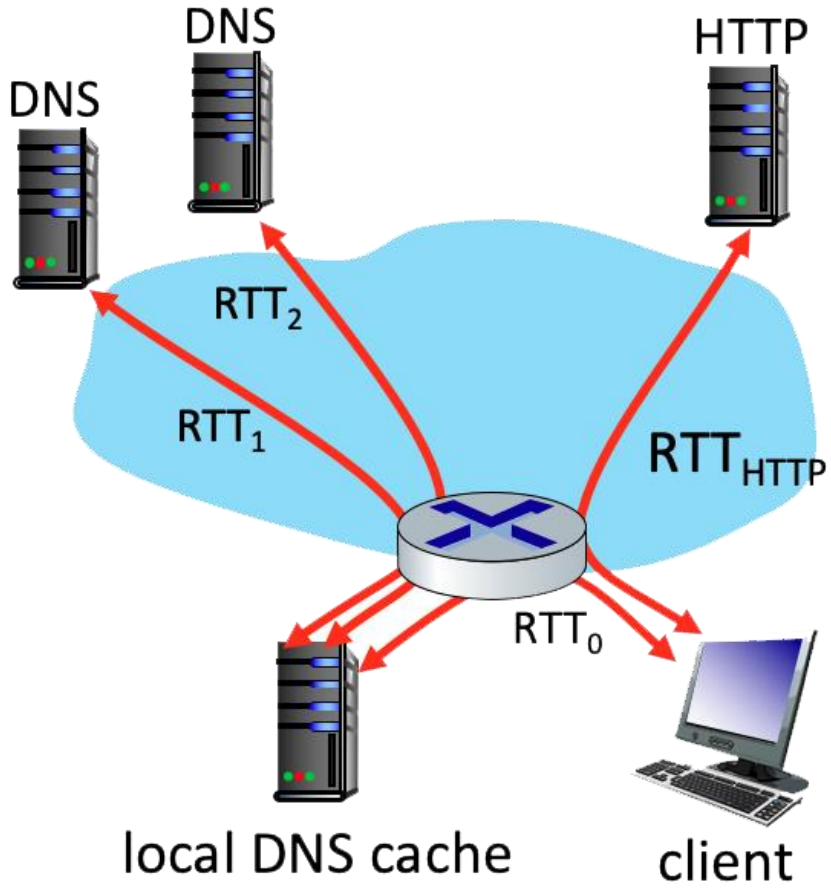
HTTP: response time



https://www.stormit.cloud/

Question 4

Suppose within your Web browser you click on a link to obtain a Web page. The IP address for the associated URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose that three DNS servers are visited before your host receives the IP address from DNS. The first DNS server visited is the local DNS cache, with an RTT delay of RTT_0 = 3 msecs. The second and third DNS servers contacted have RTTs of 1 and 30 msecs, respectively. Initially, let's suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text (0 transmission delay). Suppose the RTT between the local host and the Web server containing the object is RTT_{HTTP} = 28 msecs.



2. Now suppose the HTML object references 10 very small objects on the same server. Neglecting transmission times, how much time (in msec) elapses from when the client clicks on the link until the base object and all 10 additional objects are received from web server at the client, assuming non-persistent HTTP and no parallel TCP connections?

Question 4

2. Now suppose the HTML object references 10 very small objects on the same server. Neglecting transmission times, how much time (in msec) elapses from when the client clicks on the link until the base object and all 10 additional objects are received from web server at the client, assuming non-persistent HTTP and no parallel TCP connections?

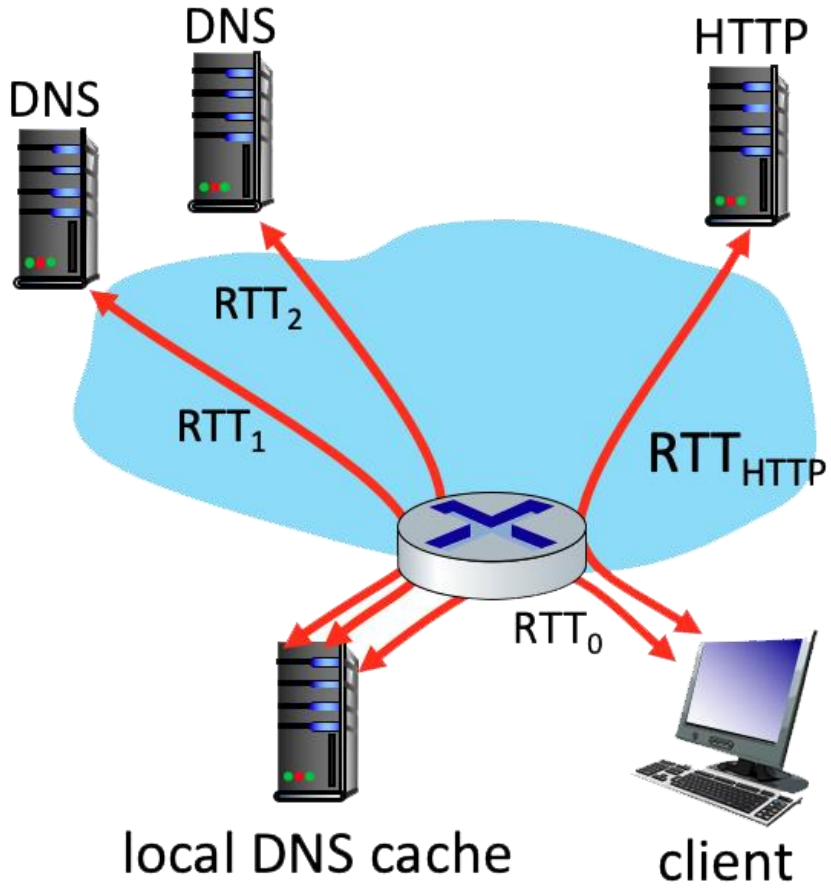
Answer

The time from when the Web request is made in the browser until the page is displayed in the browser is:
$RTT_0 + RTT_1 + RTT_2 + 2*RTT_{HTTP} + 2*10*RTT_{HTTP} = 3 + 1 + 30 + 2*28 + 2*10*28 = 650$ msecs.

Question 4

Suppose within your Web browser you click on a link to obtain a Web page. The IP address for the associated URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose that three DNS servers are visited before your host receives the IP address from DNS. The first DNS server visited is the local DNS cache, with an RTT delay of RTT_0 = 3 msecs. The second and third DNS servers contacted have RTTs of 1 and 30 msecs, respectively. Initially, let's suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text (0 transmission delay). Suppose the RTT between the local host and the Web server containing the object is RTT_{HTTP} = 28 msecs.

3. Suppose the HTML object references 10 very small objects on the same server, but assume that the client is configured to support a maximum of 5 parallel TCP connections, with non-persistent HTTP.



Question 4

3. Suppose the HTML object references 10 very small objects on the same server, but assume that the client is configured to support a maximum of 5 parallel TCP connections, with non-persistent HTTP.

Answer

Since there are 10 objects, there's a delay of 34 msec for the DNS query, two RTT_{HTTP} for the base page, and $4*RTT_{HTTP}$ for the objects since the requests for 5 of these objects can be run in parallel (2 RTT_{HTTP}) and the rest can be done after (2 RTT_{HTTP}). The total is 34 + 56 + 56 + 56 = 202 msec

How about persistent HTTP?