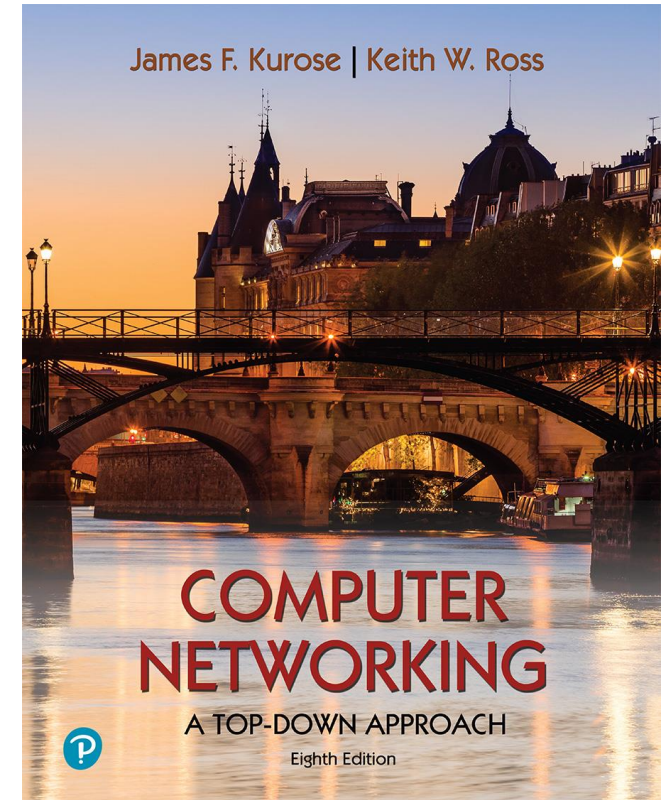


Chapter 2

Application Layer

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Computer Networking: A Top-Down Approach

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■ Web and HTTP

Question 1: Stateless HTTP

What do we mean when we say “HTTP is stateless”? In answering this question, assume that cookies are not used. Check all answers that apply.

- A. An HTTP client does not remember the identities of the servers with which it has interacted
- B. We say this when an HTTP server is not operational
- C. An HTTP *client* does not remember anything about what happened during earlier steps in interacting with any HTTP server
- D. The HTTP protocol is not licensed in any country.
- E. An HTTP *server* does not remember anything about what happened during earlier steps in interacting with this HTTP client

Answer: E

Question 2: HTTP Cookies

What is an HTTP cookie used for?

- A. A cookie is a code used by a server, carried on a client's HTTP request, to access information the server had earlier stored about an earlier interaction with this *Web browser*
- B. A cookie is s a code used by a client to authenticate a person's identity to an HTTP server
- C. cookies is a code used by a server, carried on a client's HTTP request, to access information the server had earlier stored about an earlier interaction with this *person*.
- D. ike dessert, cookies are used at the end of a transaction, to indicate the end of the transaction.
- E. A cookie is used to spoof client identity to an HTTP server

Answer: A

Question 3: HTTP GET

What is the purpose of the conditional HTTP GET request message?

- A. The HTTP GET request message is sent by a web server to a web client to get the identity of the web client.
- B. The HTTP GET request message is sent by a web server to a web client to get the next request from the web client
- C. The HTTP GET request message is used by a web client to post an object on a web server.
- D. The HTTP GET request message is used by a web client to request a web server to send the requested object from the server to the client.

Answer: D

Question 4: Conditional HTTP GET

What is the purpose of the conditional HTTP GET request message?

- A. To allow a server to only send the requested object to the client if the server is not overloaded
- B. To allow a server to only send the requested object to the client if this object has changed since the server last sent this object to the client
- C. To allow a server to only send the requested object to the client if the client is authorized to receive that object.
- D. To allow a server to only send the requested object to the client if the client has never requested that object before.

Answer: B

Question 5: HTTP GET

Suppose a client is sending an HTTP GET request 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/quotation2.htm HTTP/1.1

Host: gaia.cs.umass.edu

Accept: text/plain, text/html, text/xml, image/jpeg, image/gif, audio/mpeg, audio/mp4, video/wmv, video/mp4,

Accept-Language: en-us, en-gb;q=0.1, en;q=0.7, fr, fr-ch, da, de, fi

If-Modified-Since: Wed, 09 Sep 2020 16:06:01 -0700

User Agent: Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/535.11 (KHTML, like Gecko) Chrome/17.0.963.56 Safari/535.11

What version of HTTP is the client using?

Answer: 1.1

Question 6: HTTP GET

Suppose a client is sending an HTTP GET request 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/quotation2.htm HTTP/1.1
```

```
Host: gaia.cs.umass.edu
```

```
Accept: text/plain, text/html, text/xml, image/jpeg, image/gif, audio/mpeg,  
audio/mp4, video/wmv, video/mp4,
```

```
Accept-Language: en-us, en-gb;q=0.1, en;q=0.7, fr, fr-ch, da, de, fi
```

```
If-Modified-Since: Wed, 09 Sep 2020 16:06:01 -0700
```

```
User Agent: Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/535.11  
(KHTML, like Gecko) Chrome/17.0.963.56 Safari/535.11
```

What is the language in which the client would least prefer to get a response?

Answer: United Kingdom English

Question 6: HTTP GET

Suppose a client is sending an HTTP GET request 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/quotation2.htm HTTP/1.1

Host: gaia.cs.umass.edu

Accept: text/plain, text/html, text/xml, image/jpeg, image/gif, audio/mpeg, audio/mp4, video/wmv, video/mp4,

Accept-Language: en-us, en-gb;q=0.1, en;q=0.7, fr, fr-ch, da, de, fi

If-Modified-Since: Wed, 09 Sep 2020 16:06:01 -0700

User Agent: Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/535.11 (KHTML, like Gecko) Chrome/17.0.963.56 Safari/535.11

Does the client have a cached copy of the object being requested?

Answer: Yes, because this is a conditional GET, as evidenced by the If-Modified-Since field.

Question 6: HTTP GET

Suppose a client is sending an HTTP GET request 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/quotation2.htm HTTP/1.1

Host: gaia.cs.umass.edu

Accept: text/plain, text/html, text/xml, image/jpeg, image/gif, audio/mpeg, audio/mp4, video/wmv, video/mp4,

Accept-Language: en-us, en-gb;q=0.1, en;q=0.7, fr, fr-ch, da, de, fi

If-Modified-Since: Wed, 09 Sep 2020 16:06:01 -0700

User Agent: Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/535.11 (KHTML, like Gecko) Chrome/17.0.963.56 Safari/535.11

Does the client have a cached copy of the object being requested?

Answer: Yes, because this is a conditional GET, as evidenced by the If-Modified-Since field.

Question 7: HTTP REPLY

Suppose the server sends the following HTTP response message to the client:

```
HTTP/1.0 200 OK
Date: Wed, 09 Sep 2020 23:46:21 +0000
Server: Apache/2.2.3 (CentOS)
Last-Modified: Wed, 09 Sep 2020 23:51:41 +0000
ETag:17dc6-a5c-bf716880.
Content-Length: 418
Connection: Close
Content-type: image/html
```

Will the web server close the TCP connection after sending this message?

Answer: Yes, the server will close this connection because version 1.0 of HTTP is being used, and TCP connections do not stay open persistently.

Question 8: WEB CACHING

What is the purpose of the conditional HTTP GET request message?

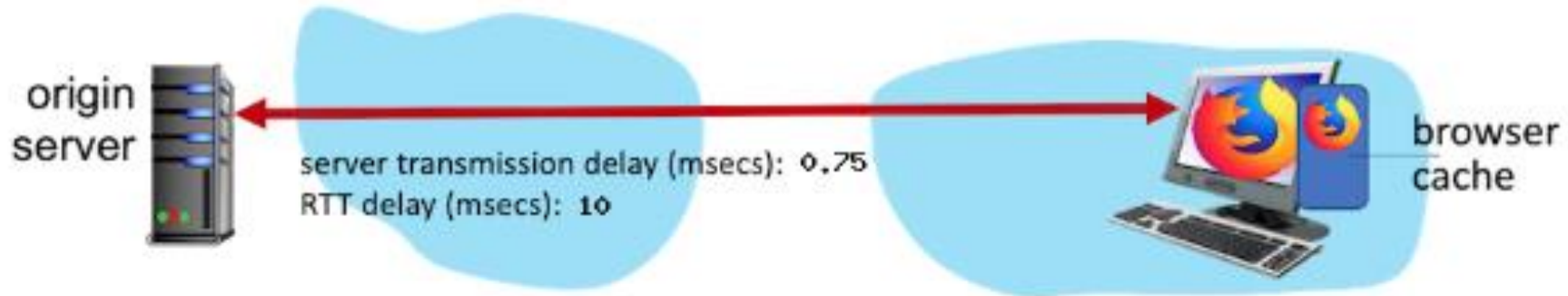
- A. To allow a server to only send the requested object to the client if the server is not overloaded
- B. To allow a server to only send the requested object to the client if this object has changed since the server last sent this object to the client
- C. To allow a server to only send the requested object to the client if the client is authorized to receive that object.
- D. To allow a server to only send the requested object to the client if the client has never requested that object before.

Answer: B

Problem 1: WEB CACHING

Consider an HTTP server and client as shown in the figure below. Suppose that the RTT delay between the client and server is 10 msec; the time a server needs to transmit an object into its outgoing link is 0.75 msec; 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 60% of the objects requested have NOT changed since the client downloaded them (before these 100 downloads are performed). How much time elapses (in milliseconds) between the client transmitting the first request, and the completion of the last request?



$$(RTT * NUM_PACKETS) + (NUM_PACKETS * (PERCENT_NOT_CACHED / 100) * TRANS_DELAY) = (10 * 100) + (100 * ((100-60) / 100) * 0.75) = 1030 \text{ ms}$$

Problem 2: THE HTTP GET MESSAGE

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/quotation9.htm HTTP/1.0

Host: gaia.cs.umass.edu

If-Modified-Since: Sun, 17 Sep 2023 20:32:06 -0700

What is the name of the file that is being retrieved in this GET message?

What version of HTTP is the client running?

True or False: The client already has a cached copy of the file



quotation9.htm

HTTP/1.0

True

Problem 3: THE HTTP RESPONSE MESSAGE

Consider the figure below, where a server is sending an HTTP RESPONSE message back to the client. Suppose the server-to-client HTTP RESPONSE message is the following:

HTTP/1.0 200 OK

Date: Mon, 18 Sep 2023 03:40:06 +0000

Server: Apache/2.2.3 (CentOS)

Last-Modified: Mon, 18 Sep 2023 04:17:46 +0000

ETag:17dc6-a5c-bf716880.

Content-Length: 984

Connection: Close

Content-type: image/html

Is the response message using HTTP 1.0 or HTTP 1.1?

Was the server able to send the document successfully? Yes or No

How big is the document in bytes?

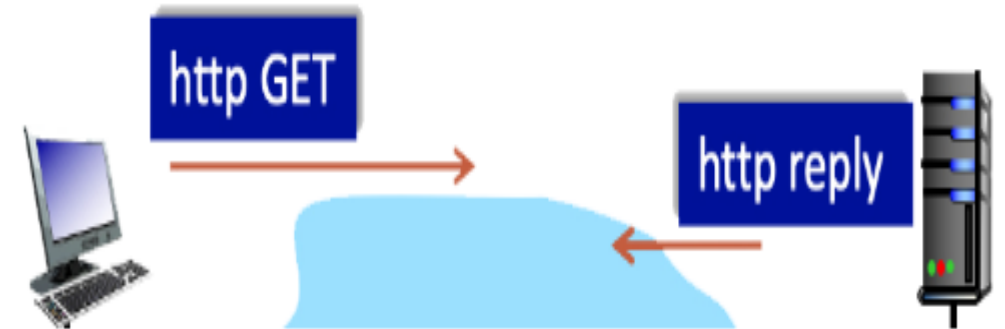
Is the connection persistent or nonpersistent?

HTTP/1.0

Yes

984

Nonpersistent



Problem 3: THE HTTP RESPONSE MESSAGE

Consider the figure below, where a server is sending an HTTP RESPONSE message back to the client. Suppose the server-to-client HTTP RESPONSE message is the following:

HTTP/1.0 200 OK

Date: Mon, 18 Sep 2023 03:40:06 +0000

Server: Apache/2.2.3 (CentOS)

Last-Modified: Mon, 18 Sep 2023 04:17:46 +0000

ETag:17dc6-a5c-bf716880.

Content-Length: 984

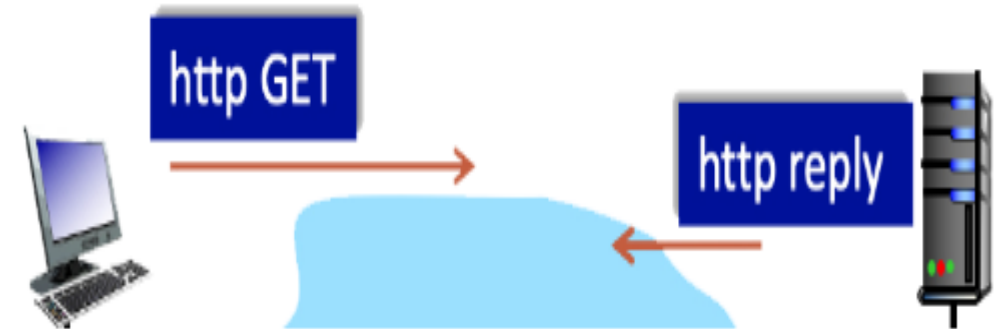
Connection: Close

Content-type: image/html

What is the type of file being sent by the server in response?

What is the name of the server and its version? Write your answer as server/x.y.z

Will the ETag change if the resource content at this particular resource location changes? Yes or No



image/html

Apache/2.2.3

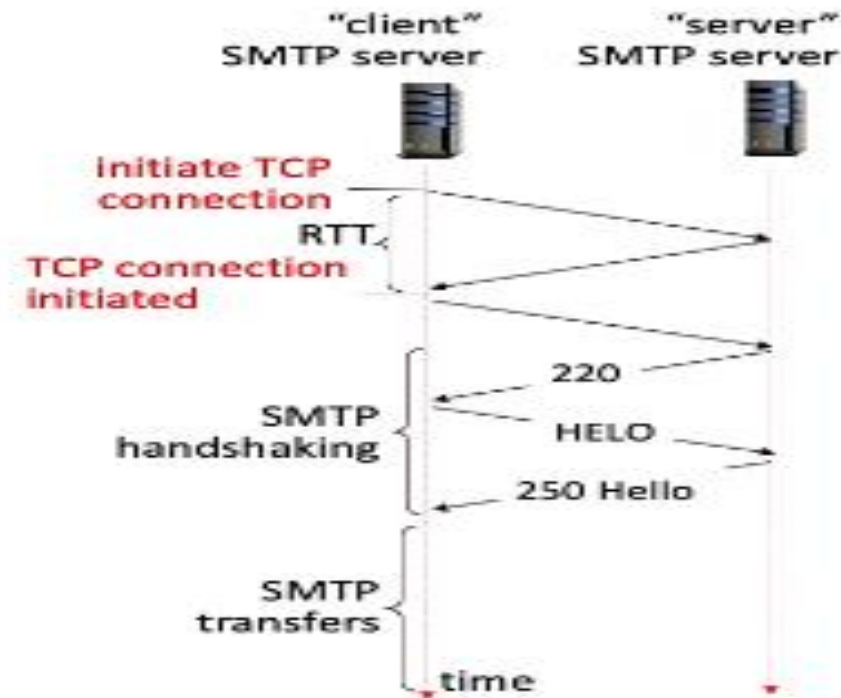
Yes

- Email/SMTP

Question 8: Email Delays

How many RTTs are there from when a client first contacts an email server (by initiating a TCP session) to when the client can begin sending the email message itself – that is following all initial TCP or SMTP handshaking required?

- A. 2.5
- B. 3
- C. 0
- D. 1
- E. 2



Answer: B

Question 8: HTTP VS SMTP

Which of the following characteristics apply to HTTP only (and do *not* apply to SMTP)? Note: check one or more of the characteristics below.

- A. Operates mostly as a “client pull” protocol.
- B. Operates mostly as a “client push” protocol.
- C. Uses server port 80.
- D. Uses a blank line (CRLF) to indicate end of request header.
- E. Is able to use a persistent TCP connection to transfer multiple objects.
- F. Uses CRLF.CRLF to indicate end of message.
- G. Uses server port 25.
- H. Has ASCII command/response interaction, status codes.
- I. **Answer: A , D, C**

Question 8: HTTP VS SMTP

Which of the following characteristics apply to SMTP only (and do *not* apply to HTTP)? Note: check one or more of the characteristics below.

- A. Operates mostly as a “client pull” protocol.
- B. Operates mostly as a “client push” protocol.
- C. Uses server port 80.
- D. Uses a blank line (CRLF) to indicate end of request header.
- E. Is able to use a persistent TCP connection to transfer multiple objects.
- F. Uses CRLF.CRLF to indicate end of message.
- G. Uses server port 25.
- H. Has ASCII command/response interaction, status codes.
- I. **Answer: B, F, G**

Question 8: HTTP VS SMTP

Which of the following characteristics apply to both HTTP and SMTP? Note: check one or more of the characteristics below.

- A. Operates mostly as a “client pull” protocol.
- B. Operates mostly as a “client push” protocol.
- C. Uses a blank line (CRLF) to indicate end of request header.
- D. Is able to use a persistent TCP connection to transfer multiple objects.
- E. Uses CRLF.CRLF to indicate end of message.
- F. Has ASCII command/response interaction, status codes.
- G. Answer: D, F**

Question 8: Email Protocol

Pulls mail from one mail server to another mail server.

Neither SMTP nor IMAP does this

Pulls email to a mail client from a mail server

IMAP

Pushes email from a mail client to a mail server.

SMTP

■ DNS

Question 9: DND Functions

For a given function of a server, write the name of type of DNS server in the DNS server hierarchy:

Provides authoritative hostname to IP mappings for organization's named hosts.

Authoritative DNS server

Replies to DNS query by local host, by contacting other DNS servers to answer the query.

Local DNS server

Responsible for a domain (e.g., *.com, *.edu); knows how to contact authoritative name servers.

Top Level Domain (TLD) servers

Highest level of the DNS hierarchy, knows how to reach servers responsible for a given domain (e.g., *.com, *.edu).

DNS root servers

Question 9: DND RRs

What information does the type “A” resource record hold in the DNS database?

A hostname and an IP address

Question 10: DNS

What information does the type “A” resource record hold in the DNS database?

A hostname and an IP address