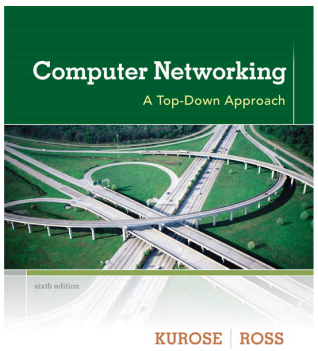
Wireshark Lab: HTTP
SOLUTION



Supplement to *Computer Networking: A Top-Down Approach, 6th ed.,* J.F. Kurose and K.W. Ross

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The following screen shots showing the HTTP GET and HTTP reply answer these questions:

1. Is your browser running HTTP version 1.0 or 1.1? What version of HTTP is the server running?
2. What languages (if any) does your browser indicate that it can accept to the server?
3. What is the IP address of your computer? Of the gaia.cs.umass.edu server?
4. What is the status code returned from the server to your browser?
5. When was the HTML file that you are retrieving last modified at the server?
6. How many bytes of content are being returned to your browser?
7. By inspecting the raw data in the packet content window, do you see any headers within the data that are not displayed in the packet-listing window? If so, name one. *Answer: no, I don't see any in the HTTP Message below*

```
No.     Time        Source                Destination           Protocol Info
    133 4.098946    192.168.1.101         128.119.245.12        HTTP     GET /wireshark-labs/HTTP-wire

Frame 133 (488 bytes on wire, 488 bytes captured)
Ethernet II, Src: IntelCor dc:36:d0 (00:22:fa:dc:36:d0), Dst: Cisco-Li 45:1f:1b (00:22:6b:45:1f:1b)
Internet Protocol, Src: 192.168.1.101 (192.168.1.101), Dst: 128.119.245.12 (128.119.245.12)
    Version: 4
    Header length: 20 bytes
    Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
    Total Length: 474
    Identification: 0x036e (878)
    Flags: 0x02 (Don't Fragment)
    Fragment offset: 0
    Time to live: 128
    Protocol: TCP (0x06)
    Header checksum: 0xbe1e [correct]
    Source: 192.168.1.101 (192.168.1.101)
    Destination: 128.119.245.12 (128.119.245.12)
Transmission Control Protocol, Src Port: 55428 (55428), Dst Port: http (80), Seq: 1, Ack: 1, Len: 434
    Source port: 55428 (55428)
    Destination port: http (80)
    [Stream index: 27]
    Sequence number: 1    (relative sequence number)
    [Next sequence number: 435    (relative sequence number)]
    Acknowledgement number: 1    (relative ack number)
    Header length: 20 bytes
    Flags: 0x18 (PSH, ACK)
    Window size: 64240
    Checksum: 0xe737 [validation disabled]
    [SEQ/ACK analysis]
Hypertext Transfer Protocol
    GET /wireshark-labs/HTTP-wireshark-file1.html HTTP/1.1\r\n
    Host: gaia.cs.umass.edu\r\n
    User-Agent: Mozilla/5.0 (Windows; U; Windows NT 6.1; en-US; rv:1.9.2.11) Gecko/20101012 Firefox/3.
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8\r\n
    Accept-Language: en-us,en;q=0.5\r\n
    Accept-Encoding: gzip,deflate\r\n
    Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7\r\n
    Keep-Alive: 115\r\n
    Connection: keep-alive\r\n
    \r\n
```

Client IP address

Gaia server IP address

Client running http 1.1

languages accepted

```
No.     Time        Source                Destination           Protocol Info
    135 4.126437    128.119.245.12        192.168.1.101         HTTP     HTTP/1.1 200 OK  (text/html)

Frame 135 (488 bytes on wire, 488 bytes captured)
Ethernet II, Src: Cisco-Li 45:1f:1b (00:22:6b:45:1f:1b), Dst: IntelCor dc:36:d0 (00:22:fa:dc:36:d0)
Internet Protocol, Src: 128.                12), Dst: 192.168.1.101 (192.168.1.101)
Transmission Control Protocc                Dst Port: 55428 (55428), Seq: 1, Ack: 435, Len: 43
Hypertext Transfer Protocol
    HTTP/1.1 200 OK\r\n
        [Expert Info (Chat/Sequence): HTTP/1.1 200 OK\r\n]
        Request Version: HTTP/1.1
        Response Code: 200
    Date: Wed, 27 Oct 2010 11:26:58 GMT\r\n
    Server: Apache/2.0.52 (CentOS)\r\n
    Last-Modified: Wed, 27 Oct 2010 11:26:01 GMT\r\n
    ETag: "8734d-80-7d74e440"\r\n
    Accept-Ranges: bytes\r\n
    Content-Length: 128\r\n
        [Content length: 128]
    Keep-Alive: timeout=10, max=100\r\n
    Connection: Keep-Alive\r\n
    Content-Type: text/html; charset=ISO-8859-1\r\n
    \r\n
Line-based text data: text/html
    <html>\n
    Congratulations.  You've downloaded the file \n
    http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file1.html!\n
    </html>\n
```

Return status:

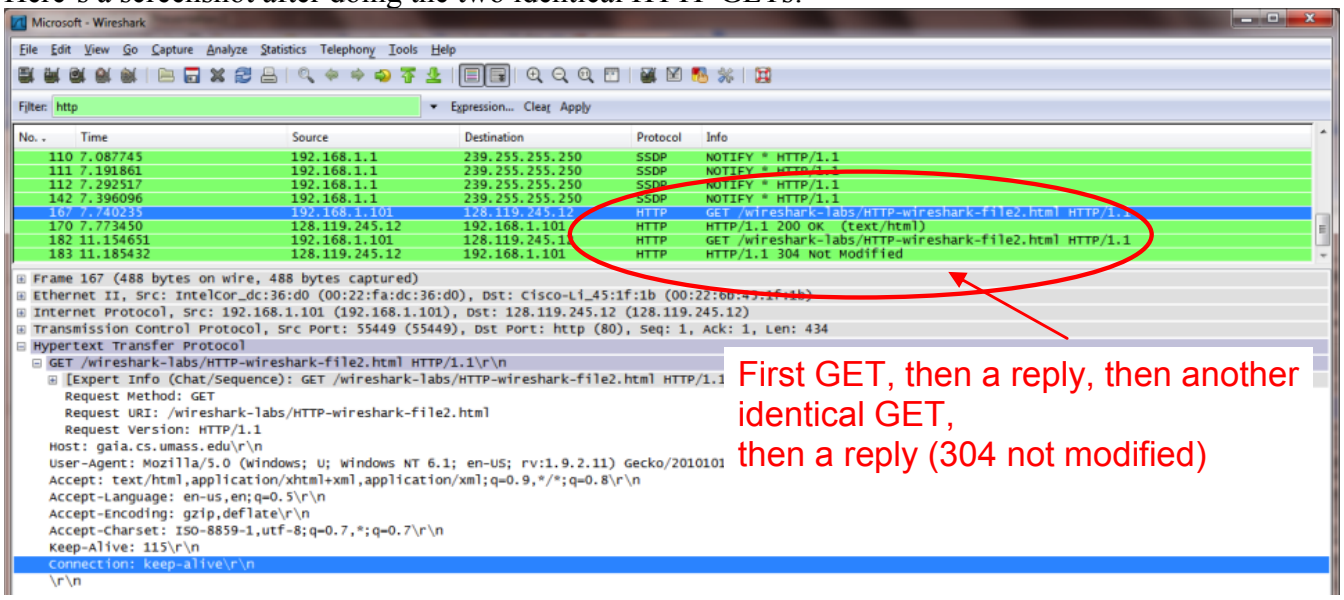
server running http

document last modified

content: 128

2. The HTTP CONDITIONAL GET/response interaction

Here's a screenshot after doing the two identical HTTP GETs:



Answer the following questions:

8. Inspect the contents of the first HTTP GET request from your browser to the server. Do you see an "IF-MODIFIED-SINCE" line in the HTTP GET?
9. Inspect the contents of the server response. Did the server explicitly return the contents of the file? How can you tell?
10. Now inspect the contents of the second HTTP GET request from your browser to the server. Do you see an "IF-MODIFIED-SINCE:" line in the HTTP GET? If so, what information follows the "IF-MODIFIED-SINCE:" header?
11. What is the HTTP status code and phrase returned from the server in response to this second HTTP GET? Did the server explicitly return the contents of the file? Explain.

Here are the four captures packets (two GETs and two REPLIES, in chronological order):

```
No.     Time        Source                Destination           Protocol Info
    167 7.740235    192.168.1.101         128.119.245.12        HTTP     GET /wireshark-labs/HTTP-wire

Frame 167 (488 bytes on wire, 488 bytes captured)
Ethernet II, Src: IntelCor dc:36:d0 (00:22:fa:dc:36:d0), Dst: Cisco-Li 45:1f:1b (00:22:6b:45:1f:1b)
Internet Protocol, Src: 192.168.1.101 (192.168.1.101), Dst: 128.119.245.12 (128.119.245.12)
Transmission Control Protocol, Src Port: 55449 (55449), Dst Port: http (80), Seq: 1, Ack: 1, Len: 434
Hypertext Transfer Protocol
    GET /wireshark-labs/HTTP-wireshark-file2.html HTTP/1.1\r\n
        [Expert Info (Chat/Sequence): GET /wireshark-labs/HTTP-wireshark-file2.html HTTP/1.1\r\n]
            [Message: GET /wireshark-labs/HTTP-wireshark-file2.html HTTP/1.1\r\n]
            [Severity level: Chat]
            [Group: Sequence]
        Request Method: GET
        Request URI: /wireshark-labs/HTTP-wireshark-file2.html
        Request Version: HTTP/1.1
    Host: gaia.cs.umass.edu\r\n
    User-Agent: Mozilla/5.0 (Windows; U; Windows NT 6.1; en-US; rv:1.9.2.11) Gecko/20101012 Firefox/3.
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8\r\n
    Accept-Language: en-us,en;q=0.5\r\n
    Accept-Encoding: gzip,deflate\r\n
    Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7\r\n
    Keep-Alive: 115\r\n
    Connection: keep-alive\r\n
    \r\n
```

There is no IF-MODIFIED-SINCE in the first GET

```
No.     Time        Source                Destination           Protocol Info
    170 7.773450    128.119.245.12        192.168.1.101         HTTP     HTTP/1.1 200 OK  (text/html)

Frame 170 (425 bytes on wire, 425 bytes captured)
Ethernet II, Src: Cisco-Li 45:1f:1b (00:22:6b:45:1f:1b), Dst: IntelCor dc:36:d0 (00:22:fa:dc:36:d0)
Internet Protocol, Src: 128.119.245.12 (128.119.245.12), Dst: 192.168.1.101 (192.168.1.101)
Transmission Control Protocol, Src Port: http (80), Dst Port: 55449 (55449), Seq: 308, Ack: 435, Len:
[Reassembled TCP Segments (678 bytes): #169(307), #170(371)]
Hypertext Transfer Protocol
    HTTP/1.1 200 OK\r\n
        [Expert Info (Chat/Sequence): HTTP/1.1 200 OK\r\n]
        Request Version: HTTP/1.1
        Response Code: 200
    Date: Wed, 27 Oct 2010 11:54:25 GMT\r\n
    Server: Apache/2.0.52 (CentOS)\r\n
    Last-Modified: Wed, 27 Oct 2010 11:54:02 GMT\r\n
    ETag: "d6c96-173-e1a6ea80"\r\n
    Accept-Ranges: bytes\r\n
    Content-Length: 371\r\n
        [Content length: 371]
    Keep-Alive: timeout=10, max=100\r\n
    Connection: Keep-Alive\r\n
    Content-Type: text/html; charset=ISO-8859-1\r\n
    \r\n
Line-based text data: text/html
    \n
    <html>\n
    \n
    Congratulations again!  Now you've downloaded the file lab2-2.html. <br>\n
    This file's last modification date will not change.  <p>\n
    Thus  if you download this multiple times on your browser, a complete copy <br>\n
    will only be sent once by the server due to the inclusion of the IN-MODIFIED-SINCE<br>\n
    field in your browser's HTTP GET request to the server.\n
    \n
    </html>\n
```

text returned in response to first GET

```
No.     Time        Source                Destination           Protocol Info
    182 11.154651   192.168.1.101         128.119.245.12        HTTP     GET /wireshark-labs/HTTP-wire

Frame 182 (575 bytes on wire, 575 bytes captured)
Ethernet II, Src: IntelCor dc:36:d0 (00:22:fa:dc:36:d0), Dst: Cisco-Li 45:1f:1b (00:22:6b:45:1f:1b)
Internet Protocol, Src: 192.168.1.101 (192.168.1.101), Dst: 128.119.245.12 (128.119.245.12)
Transmission Control Protocol, Src Port: 55449 (55449), Dst Port: http (80), Seq: 435, Ack: 679, Len:
Hypertext Transfer Protocol
    GET /wireshark-labs/HTTP-wireshark-file2.html HTTP/1.1\r\n
        [Expert Info (Chat/Sequence): GET /wireshark-labs/HTTP-wireshark-file2.html HTTP/1.1\r\n]
        Request Method: GET
        Request URI: /wireshark-labs/HTTP-wireshark-file2.html
        Request Version: HTTP/1.1
    Host: gaia.cs.umass.edu\r\n
    User-Agent: Mozilla/5.0 (Windows; U; Windows NT 6.1; en-US; rv:1.9.2.11) Gecko/20101012 Firefox/3.
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8\r\n
    Accept-Language: en-us,en;q=0.5\r\n
    Accept-Encoding: gzip,deflate\r\n
    Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7\r\n
    Keep-Alive: 115\r\n
    Connection: keep-alive\r\n
    If-Modified-Since: Wed, 27 Oct 2010 11:54:02 GMT\r\n
    If-None-Match: "d6c96-173-e1a6ea80"\r\n
    \r\n
```

2nd GET has IF-MODIFED-SINCE

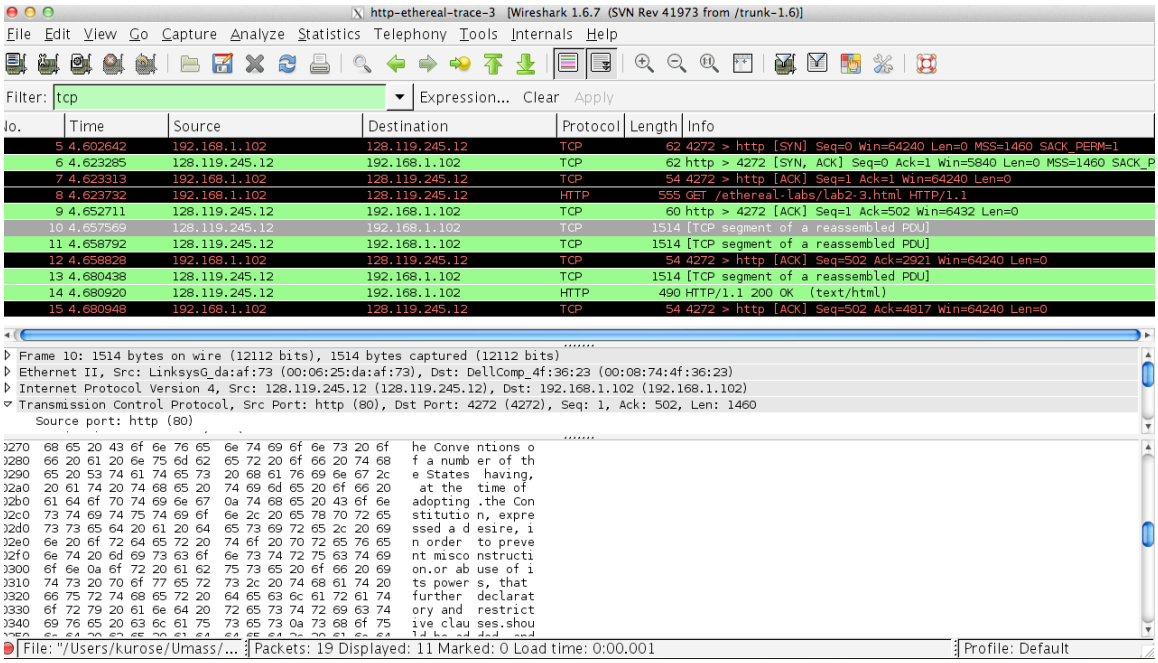
```
No.     Time        Source                Destination           Protocol Info
    183 11.185432   128.119.245.12        192.168.1.101         HTTP     HTTP/1.1 304 Not Modified

Frame 183 (236 bytes on wire, 236 bytes captured)
Ethernet II, Src: Cisco-Li 45:1f:1b (00:22:6b:45:1f:1b), Dst: IntelCor dc:36:d0 (00:22:fa:dc:36:d0)
Internet Protocol, Src: 128.119.245.12 (128.119.245.12), Dst: 192.168.1.101 (192.168.1.101)
Transmission Control Protocol, Src Port: http (80), Dst Port: 55449 (55449), Seq: 679, Ack: 956, Len:
Hypertext Transfer Protocol
    HTTP/1.1 304 Not Modified\r\n
        [Expert Info (Chat/Sequence): HTTP/1.1 304 Not Modified\r\n]
        Request Version: HTTP/1.1
        Response Code: 304
    Date: Wed, 27 Oct 2010 11:54:28 GMT\r\n
    Server: Apache/2.0.52 (CentOS)\r\n
    Connection: Keep-Alive\r\n
    Keep-Alive: timeout=10, max=99\r\n
    ETag: "d6c96-173-e1a6ea80"\r\n
    \r\n
```

The file has not been modified!
So the text of the file is NOT
returned in the HTTP message

3. Retrieving Long Documents

In our answer below, we use the http-ethereal-trace-3 packet trace file. The HTTP GET for the long document is packet 8 in the trace (at t=4.623732); the HTTP OK reply is packet 14 (at t=6.680432).



The HTTP repl7 carrying the text of the Bill of Rights are packets 10, 11, and 13. If you look into the ASCII content of packet 10, you can see the beginning of the text of the Bill or Rights. Note that packet 12 is a client-to-server TCP ACK.

Answer the following questions:

12. How many HTTP GET request messages did your browser send? *Answer: 1.* Which packet number in the trace contains the GET message for the Bill or Rights? *Answer: 8.*
13. Which packet number in the trace contains the status code and phrase associated with the response to the HTTP GET request? *Answer: packet 10.*
14. What is the status code and Phrase in the response? A*nswer: 200 (OK)*
15. How many data-containing TCP segments were needed to carry the single HTTP response and the text of the Bill of Rights? Answer: three packets (10, 11, 13 in the trace)

4. HTML Documents with Embedded Objects

In our answers below, we use the http-ethereal-trace-4 packet trace file.

Answer the following questions:

16. How many HTTP GET request messages did your browser send? *Answer: there were three HTTP GET messages sent: packet 10 in the trace (to get the base file), packet 17 (to get the Pearson logo) and packet 20 (to get the 5th edition textbook cover).* To which Internet addresses were these GET requests sent? Each of these three GET messages were sent to different IP addresses! Packet 10 was sent to 128.119.245.12, packet 17 to 165.193.123.218, and packet 20 to 134.241.6.82.

17. Can you tell whether your browser downloaded the two images serially, or whether they were downloaded from the two web sites in parallel? Explain. *Answer: The downloads occurred in parallel. Note that the two GET messages for the images are in packets 17 and 20. The 200OK reply containing the images sow up as packets 25, and 54. Thus the request for the second image file (packet 20) was made BEFORE packet 25, the first image file was received.*

5 HTTP Authentication

Finally, let's try visiting a web site that is password-protected and examine the sequence of HTTP message exchanged for such a site. The URL http://gaia.cs.umass.edu/wireshark-labs/protected_pages/HTTP-wireshark-file5.html is password protected. The username is "wireshark-students" (without the quotes), and the password is "network" (again, without the quotes). So let's access this "secure" password-protected site. Do the following:

- Make sure your browser's cache is cleared, as discussed above, and close down your browser. Then, start up your browser
- Start up the Wireshark packet sniffer
- Enter the following URL into your browser
  http://gaia.cs.umass.edu/wireshark-labs/protected_pages/HTTP-wireshark-file5.html
  Type the requested user name and password into the pop up box.
- Stop Wireshark packet capture, and enter "http" in the display-filter-specification window, so that only captured HTTP messages will be displayed later in the packet-listing window.
- (*Note:* If you are unable to run Wireshark on a live network connection, you can use the http-ethereal-trace-5 packet trace to answer the questions below; see footnote 2. This trace file was gathered while performing the steps above on one of the author's computers.)

Now let's examine the Wireshark output. You might want to first read up on HTTP authentication by reviewing the easy-to-read material on "HTTP Access Authentication Framework" at http://frontier.userland.com/stories/storyReader$2159

Answer the following questions:

18. What is the server's response (status code and phrase) in response to the initial HTTP GET message from your browser? *Answer: Packet 6 in the trace contains the first GET and packet 9 contains the REPLY. The server's in packet 9 is: 401 Authorization Required*

19. When your browser's sends the HTTP GET message for the second time, what new field is included in the HTTP GET message? *Answer: The HTTP GET includes the Authorization: Basic: field*