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Wireshark Lab - HTTP

Section 1: The Basic HTTP GET/response Interaction

NOTE: This section of the lab was run on a different virtual machine. I accidentally destroyed my VirtualBox machine while running some updates (using Kali Linux). When I rebuilt the machine I switched over to using a `Bridged Network Adapater` as opposed to the default `Host-Only Adapter` so that I could copy the `pcapng` files from my VM to my Windows host for screenshots and further analysis using SSH. For later sections of the lab my IP address is `192.168.1.49` as opposed to `10.0.2.15`.

1. Is your browser running HTTP version 1.0 or 1.1? What version of HTTP is the server running? Browser: `HTTP v1.1`

```
> Frame 8: 454 bytes on wire (3632 bits), 454 bytes captured (3632 bits) on interface 0
> Ethernet II, Src: PcsCompu_0a:94:54 (08:00:27:0a:94:54), Dst: RealtekU_12:35:02 (52:54:00:12:35:02)
> Internet Protocol Version 4, Src: 10.0.2.15, Dst: 128.119.245.12
> Transmission Control Protocol, Src Port: 46278, Dst Port: 80, Seq: 1, Ack: 1, Len: 400
v 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 (X11; Linux x86_64; rv:52.0) Gecko/20100101 Firefox/52.0\r\n
    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
    Connection: keep-alive\r\n
    Upgrade-Insecure-Requests: 1\r\n
    Pragma: no-cache\r\n
    Cache-Control: no-cache\r\n
    \r\n
    [Full request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file1.html]
    [HTTP request 1/1]
    [Response in frame: 10]
```

Server: `HTTP v1.1`

```
> Frame 10: 540 bytes on wire (4320 bits), 540 bytes captured (4320 bits) on interface 0
> Ethernet II, Src: RealtekU_12:35:02 (52:54:00:12:35:02), Dst: PcsCompu_0a:94:54 (08:00:27:0a:94:54)
> Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.0.2.15
> Transmission Control Protocol, Src Port: 80, Dst Port: 46278, Seq: 1, Ack: 401, Len: 486
v Hypertext Transfer Protocol
  > HTTP/1.1 200 OK\r\n
    Date: Thu, 27 Sep 2018 23:54:33 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/5.4.16 mod_perl/2.0.10 Perl/v5.16.3\r\n
    Last-Modified: Thu, 27 Sep 2018 05:59:01 GMT\r\n
    ETag: "80-576d4091ba60c"\r\n
    Accept-Ranges: bytes\r\n
  > Content-Length: 128\r\n
    Keep-Alive: timeout=5, max=100\r\n
    Connection: Keep-Alive\r\n
    Content-Type: text/html; charset=UTF-8\r\n
    \r\n
    [HTTP response 1/1]
    [Time since request: 0.010581309 seconds]
    [Request in frame: 8]
```

2. What languages (if any) does your browser indicate that it can accept to the server? Languages: `en-US, en` (In that order)

```
> Frame 8: 454 bytes on wire (3632 bits), 454 bytes captured (3632 bits) on interface 0
> Ethernet II, Src: PcsCompu_0a:94:54 (08:00:27:0a:94:54), Dst: RealtekU_12:35:02 (52:54:00:12:35:02)
> Internet Protocol Version 4, Src: 10.0.2.15, Dst: 128.119.245.12
> Transmission Control Protocol, Src Port: 46278, Dst Port: 80, Seq: 1, Ack: 1, Len: 400
v 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 (X11; Linux x86_64; rv:52.0) Gecko/20100101 Firefox/52.0\r\n
    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
    Connection: keep-alive\r\n
    Upgrade-Insecure-Requests: 1\r\n
    Pragma: no-cache\r\n
    Cache-Control: no-cache\r\n
    \r\n
    [Full request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file1.html]
    [HTTP request 1/1]
    [Response in frame: 10]
```

3. What is the IP address of your computer? Of the gaia.cs.umass.edu server? My Computer: `10.0.2.15` `gaia.cs.umass.edu`: `128.119.245.12`

```
No.  Time          Source          Destination     Protocol  Length  Info
   8  0.012433279   10.0.2.15       128.119.245.12  HTTP      454     GET /wireshark-labs/HTTP-wireshark-file1.html HTTP/1.1
  10  0.023014588   128.119.245.12  10.0.2.15       HTTP      540     HTTP/1.1 200 OK  (text/html)
```

```
> Frame 8: 454 bytes on wire (3632 bits), 454 bytes captured (3632 bits) on interface 0
> Ethernet II, Src: PcsCompu_0a:94:54 (08:00:27:0a:94:54), Dst: RealtekU_12:35:02 (52:54:00:12:35:02)
> Internet Protocol Version 4, Src: 10.0.2.15, Dst: 128.119.245.12
> Transmission Control Protocol, Src Port: 46278, Dst Port: 80, Seq: 1, Ack: 1, Len: 400
v 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 (X11; Linux x86_64; rv:52.0) Gecko/20100101 Firefox/52.0\r\n
    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
    Connection: keep-alive\r\n
    Upgrade-Insecure-Requests: 1\r\n
    Pragma: no-cache\r\n
    Cache-Control: no-cache\r\n
    \r\n
    [Full request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file1.html]
    [HTTP request 1/1]
    [Response in frame: 10]
```

4. What is the status code returned from the server to your browser? `200 OK`

```
> Frame 10: 540 bytes on wire (4320 bits), 540 bytes captured (4320 bits) on interface 0
> Ethernet II, Src: RealtekU_12:35:02 (52:54:00:12:35:02), Dst: PcsCompu_0a:94:54 (08:00:27:0a:94:54)
> Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.0.2.15
> Transmission Control Protocol, Src Port: 80, Dst Port: 46278, Seq: 1, Ack: 401, Len: 486
v Hypertext Transfer Protocol
  > HTTP/1.1 200 OK\r\n
    Date: Thu, 27 Sep 2018 23:54:33 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/5.4.16 mod_perl/2.0.10 Perl/v5.16.3\r\n
    Last-Modified: Thu, 27 Sep 2018 05:59:01 GMT\r\n
    ETag: "80-576d4091ba60c"\r\n
    Accept-Ranges: bytes\r\n
  > Content-Length: 128\r\n
    Keep-Alive: timeout=5, max=100\r\n
    Connection: Keep-Alive\r\n
    Content-Type: text/html; charset=UTF-8\r\n
    \r\n
    [HTTP response 1/1]
    [Time since request: 0.010581309 seconds]
    [Request in frame: 8]
```

5. When was the HTML file that you are retrieving last modified at the server? `Thu, 27 Sep 2018 05:59:01 GMT`

```
> Frame 10: 540 bytes on wire (4320 bits), 540 bytes captured (4320 bits) on interface 0
> Ethernet II, Src: RealtekU_12:35:02 (52:54:00:12:35:02), Dst: PcsCompu_0a:94:54 (08:00:27:0a:94:54)
> Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.0.2.15
> Transmission Control Protocol, Src Port: 80, Dst Port: 46278, Seq: 1, Ack: 401, Len: 486
v Hypertext Transfer Protocol
  > HTTP/1.1 200 OK\r\n
    Date: Thu, 27 Sep 2018 23:54:33 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/5.4.16 mod_perl/2.0.10 Perl/v5.16.3\r\n
    Last-Modified: Thu, 27 Sep 2018 05:59:01 GMT\r\n
    ETag: "80-576d4091ba60c"\r\n
    Accept-Ranges: bytes\r\n
  > Content-Length: 128\r\n
    Keep-Alive: timeout=5, max=100\r\n
    Connection: Keep-Alive\r\n
    Content-Type: text/html; charset=UTF-8\r\n
    \r\n
    [HTTP response 1/1]
    [Time since request: 0.010581309 seconds]
    [Request in frame: 8]
```

6. How many bytes of content are being returned to your browser? `128 bytes`

```
> Frame 10: 540 bytes on wire (4320 bits), 540 bytes captured (4320 bits) on interface 0
> Ethernet II, Src: RealtekU_12:35:02 (52:54:00:12:35:02), Dst: PcsCompu_0a:94:54 (08:00:27:0a:94:54)
> Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.0.2.15
> Transmission Control Protocol, Src Port: 80, Dst Port: 46278, Seq: 1, Ack: 401, Len: 486
v Hypertext Transfer Protocol
  > HTTP/1.1 200 OK\r\n
    Date: Thu, 27 Sep 2018 23:54:33 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/5.4.16 mod_perl/2.0.10 Perl/v5.16.3\r\n
    Last-Modified: Thu, 27 Sep 2018 05:59:01 GMT\r\n
    ETag: "80-576d4091ba60c"\r\n
    Accept-Ranges: bytes\r\n
  > Content-Length: 128\r\n
    Keep-Alive: timeout=5, max=100\r\n
    Connection: Keep-Alive\r\n
    Content-Type: text/html; charset=UTF-8\r\n
    \r\n
    [HTTP response 1/1]
    [Time since request: 0.010581309 seconds]
    [Request in frame: 8]
```

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. There are no additional headers shown

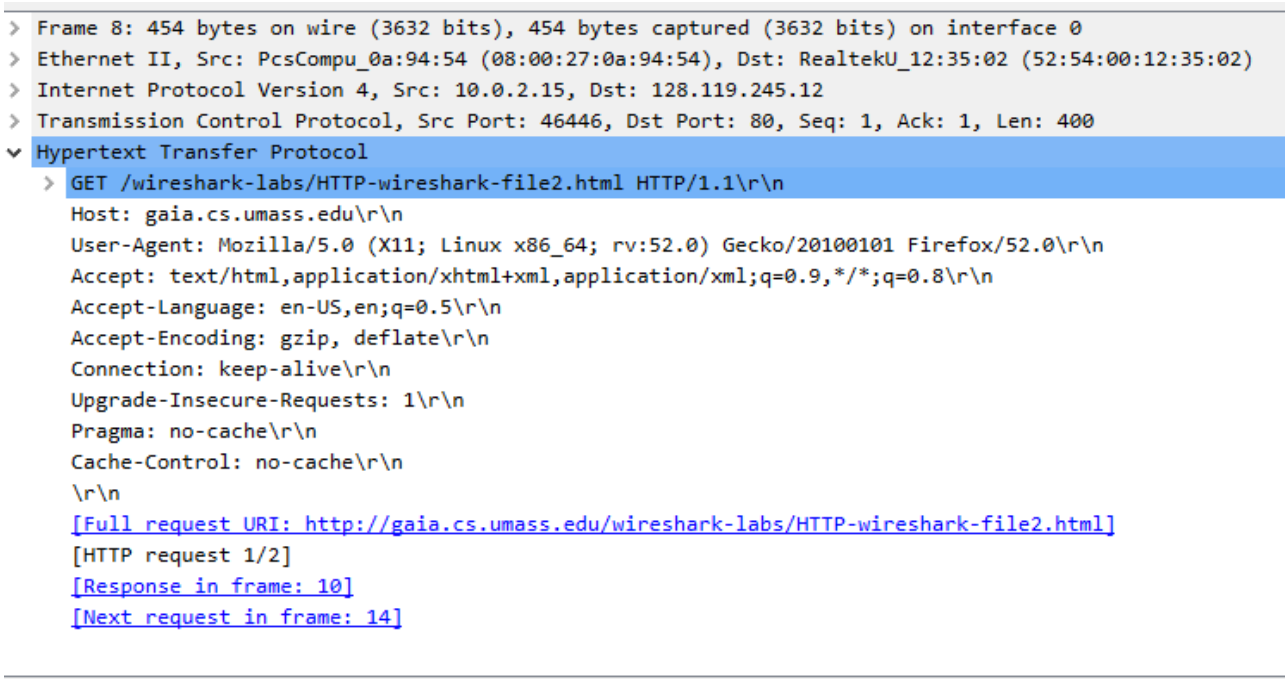
in the packet content window.

```
> Frame 10: 540 bytes on wire (4320 bits), 540 bytes captured (4320 bits) on interface 0
> Ethernet II, Src: RealtekU_12:35:02 (52:54:00:12:35:02), Dst: PcsCompu_0a:94:54 (08:00:27:0a:94:54)
> Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.0.2.15
> Transmission Control Protocol, Src Port: 80, Dst Port: 46278, Seq: 1, Ack: 401, Len: 486
v Hypertext Transfer Protocol
  > HTTP/1.1 200 OK\r\n
    Date: Thu, 27 Sep 2018 23:54:33 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/5.4.16 mod_perl/2.0.10 Perl/v5.16.3\r\n
    Last-Modified: Thu, 27 Sep 2018 05:59:01 GMT\r\n
    ETag: "80-576d4091ba60c"\r\n
    Accept-Ranges: bytes\r\n
  > Content-Length: 128\r\n
    Keep-Alive: timeout=5, max=100\r\n
    Connection: Keep-Alive\r\n
    Content-Type: text/html; charset=UTF-8\r\n
    \r\n
    [HTTP response 1/1]
    [Time since request: 0.010581309 seconds]
    [Request in frame: 8]
    File Data: 128 bytes
> Line-based text data: text/html (4 lines)
```

```
0000  08 00 27 0a 94 54 52 54  00 12 35 02 08 00 45 00   ··'··TRT ··5···E·
0010  02 0e 63 41 00 00 40 06  94 16 80 77 f5 0c 0a 00   ··cA··@· ···w····
0020  02 0f 00 50 b4 c6 08 fa  d4 02 98 3d 61 cd 50 18   ···P···· ···=a·P·
0030  ff ff 04 42 00 00 48 54  54 50 2f 31 2e 31 20 32   ···B··HT TP/1.1 2
0040  30 30 20 4f 4b 0d 0a 44  61 74 65 3a 20 54 68 75   00 OK··D ate: Thu
0050  2c 20 32 37 20 53 65 70  20 32 30 31 38 20 32 33   , 27 Sep  2018 23
0060  3a 35 34 3a 33 33 20 47  4d 54 0d 0a 53 65 72 76   :54:33 G MT··Serv
0070  65 72 3a 20 41 70 61 63  68 65 2f 32 2e 34 2e 36   er: Apac he/2.4.6
0080  20 28 43 65 6e 74 4f 53  29 20 4f 70 65 6e 53 53    (CentOS ) OpenSS
0090  4c 2f 31 2e 30 2e 32 6b  2d 66 69 70 73 20 50 48   L/1.0.2k -fips PH
00a0  50 2f 35 2e 34 2e 31 36  20 6d 6f 64 5f 70 65 72   P/5.4.16  mod_per
00b0  6c 2f 32 2e 30 2e 31 30  20 50 65 72 6c 2f 76 35   l/2.0.10  Perl/v5
00c0  2e 31 36 2e 33 0d 0a 4c  61 73 74 2d 4d 6f 64 69   .16.3··L ast-Modi
00d0  66 69 65 64 3a 20 54 68  75 2c 20 32 37 20 53 65   fied: Th u, 27 Se
00e0  70 20 32 30 31 38 20 30  35 3a 35 39 3a 30 31 20   p 2018 0 5:59:01
00f0  47 4d 54 0d 0a 45 54 61  67 3a 20 22 38 30 2d 35   GMT··ETa g: "80-5
0100  37 36 64 34 30 39 31 62  61 36 30 63 22 0d 0a 41   76d4091b a60c"··A
0110  63 63 65 70 74 2d 52 61  6e 67 65 73 3a 20 62 79   ccept-Ra nges: by
0120  74 65 73 0d 0a 43 6f 6e  74 65 6e 74 2d 4c 65 6e   tes··Con tent-Len
0130  67 74 68 3a 20 31 32 38  0d 0a 4b 65 65 70 2d 41   gth: 128 ··Keep-A
0140  6c 69 76 65 3a 20 74 69  6d 65 6f 75 74 3d 35 2c   live: ti meout=5,
0150  20 6d 61 78 3d 31 30 30  0d 0a 43 6f 6e 6e 65 63    max=100 ··Connec
0160  74 69 6f 6e 3a 20 4b 65  65 70 2d 41 6c 69 76 65   tion: Ke ep-Alive
0170  0d 0a 43 6f 6e 74 65 6e  74 2d 54 79 70 65 3a 20   ··Conten t-Type:
0180  74 65 78 74 2f 68 74 6d  6c 3b 20 63 68 61 72 73   text/htm l; chars
0190  65 74 3d 55 54 46 2d 38  0d 0a 0d 0a 3c 68 74 6d   et=UTF-8 ····<htm
01a0  6c 3e 0a 43 6f 6e 67 72  61 74 75 6c 61 74 69 6f   l>·Congr atulatio
01b0  6e 73 2e 20 20 59 6f 75  27 76 65 20 64 6f 77 6e   ns.  You 've down
01c0  6c 6f 61 64 65 64 20 74  68 65 20 66 69 6c 65 20   loaded t he file
01d0  0a 68 74 74 70 3a 2f 2f  67 61 69 61 2e 63 73 2e   ·http:// gaia.cs.
01e0  75 6d 61 73 73 2e 65 64  75 2f 77 69 72 65 73 68   umass.ed u/wiresh
01f0  61 72 6b 2d 6c 61 62 73  2f 48 54 54 50 2d 77 69   ark-labs /HTTP-wi
0200  72 65 73 68 61 72 6b 2d  66 69 6c 65 31 2e 68 74   reshark- file1.ht
0210  6d 6c 21 0a 3c 2f 68 74  6d 6c 3e 0a              ml!·</ht ml>·
```

Section 2: The HTTP Conditional GET/response Interaction

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? No



9. Inspect the contents of the server response. Did the server explicitly return the contents of the file? How can you tell? Yes - The content is available in the packet contents window. The total size returned by the

server is 371 bytes, in 3 frames (highlighted below.)

```
> Frame 10: 784 bytes on wire (6272 bits), 784 bytes captured (6272 bits) on interface 0
> Ethernet II, Src: RealtekU_12:35:02 (52:54:00:12:35:02), Dst: PcsCompu_0a:94:54 (08:00:27:0a:94:54)
> Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.0.2.15
> Transmission Control Protocol, Src Port: 80, Dst Port: 46446, Seq: 1, Ack: 401, Len: 730
v Hypertext Transfer Protocol
  > HTTP/1.1 200 OK\r\n
    Date: Sat, 29 Sep 2018 02:24:18 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/5.4.16 mod_perl/2.0.10 Perl/v5.16.3\r\n
    Last-Modified: Fri, 28 Sep 2018 05:59:02 GMT\r\n
    ETag: "173-576e826fdabcc"\r\n
    Accept-Ranges: bytes\r\n
  > Content-Length: 371\r\n
    Keep-Alive: timeout=5, max=100\r\n
    Connection: Keep-Alive\r\n
    Content-Type: text/html; charset=UTF-8\r\n
    \r\n
    [HTTP response 1/2]
    [Time since request: 0.022995985 seconds]
    [Request in frame: 8]
    [Next request in frame: 14]
    [Next response in frame: 16]
```

```
00b0  6c 2f 32 2e 30 2e 31 30  20 50 65 72 6c 2f 76 35   l/2.0.10  Perl/v5
00c0  2e 31 36 2e 33 0d 0a 4c  61 73 74 2d 4d 6f 64 69   .16.3··L ast-Modi
00d0  66 69 65 64 3a 20 46 72  69 2c 20 32 38 20 53 65   fied: Fr i, 28 Se
00e0  70 20 32 30 31 38 20 30  35 3a 35 39 3a 30 32 20   p 2018 0 5:59:02
00f0  47 4d 54 0d 0a 45 54 61  67 3a 20 22 31 37 33 2d   GMT··ETa g: "173-
0100  35 37 36 65 38 32 36 66  64 61 62 63 63 22 0d 0a   576e826f dabcc"··
0110  41 63 63 65 70 74 2d 52  61 6e 67 65 73 3a 20 62   Accept-R anges: b
0120  79 74 65 73 0d 0a 43 6f  6e 74 65 6e 74 2d 4c 65   ytes··Co ntent-Le
0130  6e 67 74 68 3a 20 33 37  31 0d 0a 4b 65 65 70 2d   ngth: 37 1··Keep-
0140  41 6c 69 76 65 3a 20 74  69 6d 65 6f 75 74 3d 35   Alive: t imeout=5
0150  2c 20 6d 61 78 3d 31 30  30 0d 0a 43 6f 6e 6e 65   , max=10 0··Conne
0160  63 74 69 6f 6e 3a 20 4b  65 65 70 2d 41 6c 69 76   ction: K eep-Aliv
0170  65 0d 0a 43 6f 6e 74 65  6e 74 2d 54 79 70 65 3a   e··Conte nt-Type:
0180  20 74 65 78 74 2f 68 74  6d 6c 3b 20 63 68 61 72    text/ht ml; char
0190  73 65 74 3d 55 54 46 2d  38 0d 0a 0d 0a 0a 3c 68   set=UTF- 8·····<h
01a0  74 6d 6c 3e 0a 0a 43 6f  6e 67 72 61 74 75 6c 61   tml>··Co ngratula
01b0  74 69 6f 6e 73 20 61 67  61 69 6e 21 20 20 4e 6f   tions ag ain!  No
01c0  77 20 79 6f 75 27 76 65  20 64 6f 77 6e 6c 6f 61   w you've  downloa
01d0  64 65 64 20 74 68 65 20  66 69 6c 65 20 6c 61 62   ded the  file lab
01e0  32 2d 32 2e 68 74 6d 6c  2e 20 3c 62 72 3e 0a 54   2-2.html . <br>·T
01f0  68 69 73 20 66 69 6c 65  27 73 20 6c 61 73 74 20   his file 's last
0200  6d 6f 64 69 66 69 63 61  74 69 6f 6e 20 64 61 74   modifica tion dat
0210  65 20 77 69 6c 6c 20 6e  6f 74 20 63 68 61 6e 67   e will n ot chang
0220  65 2e 20 20 3c 70 3e 0a  54 68 75 73 20 20 69 66   e.  <p>· Thus  if
0230  20 79 6f 75 20 64 6f 77  6e 6c 6f 61 64 20 74 68    you dow nload th
0240  69 73 20 6d 75 6c 74 69  70 6c 65 20 74 69 6d 65   is multi ple time
0250  73 20 6f 6e 20 79 6f 75  72 20 62 72 6f 77 73 65   s on you r browse
0260  72 2c 20 61 20 63 6f 6d  70 6c 65 74 65 20 63 6f   r, a com plete co
0270  70 79 20 3c 62 72 3e 0a  77 69 6c 6c 20 6f 6e 6c   py <br>· will onl
0280  79 20 62 65 20 73 65 6e  74 20 6f 6e 63 65 20 62   y be sen t once b
0290  79 20 74 68 65 20 73 65  72 76 65 72 20 64 75 65   y the se rver due
02a0  20 74 6f 20 74 68 65 20  69 6e 63 6c 75 73 69 6f    to the  inclusio
02b0  6e 20 6f 66 20 74 68 65  20 49 4e 2d 4d 4f 44 49   n of the  IN-MODI
02c0  46 49 45 44 2d 53 49 4e  43 45 3c 62 72 3e 0a 66   FIED-SIN CE<br>·f
02d0  69 65 6c 64 20 69 6e 20  79 6f 75 72 20 62 72 6f   ield in  your bro
02e0  77 73 65 72 27 73 20 48  54 54 50 20 47 45 54 20   wser's H TTP GET
02f0  72 65 71 75 65 73 74 20  74 6f 20 74 68 65 20 73   request  to the s
0300  65 72 76 65 72 2e 0a 0a  3c 2f 68 74 6d 6c 3e 0a   erver.·· </html>·
```

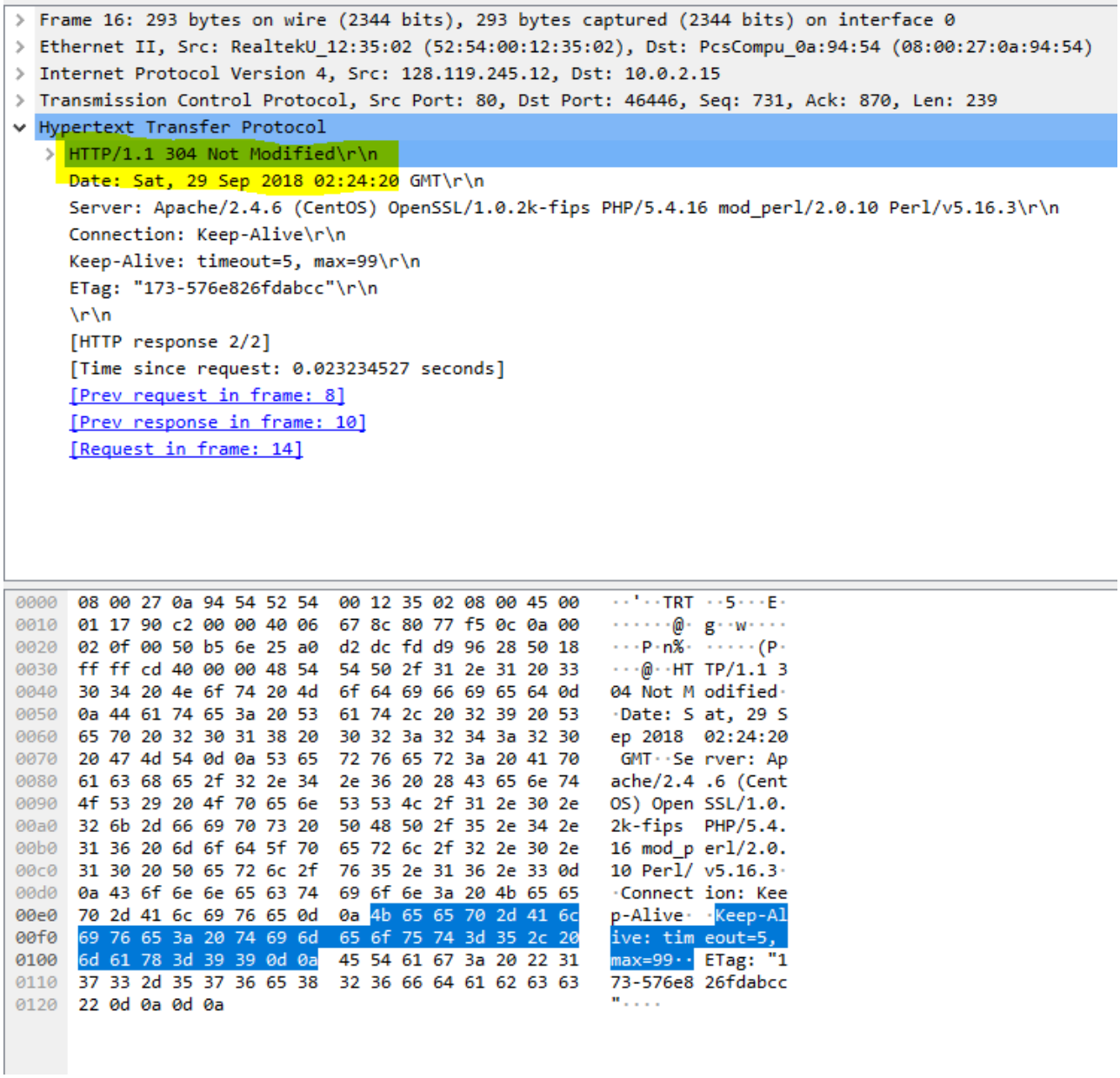
10. Now inspect the contents of the second HTTP GET request from your browser to the server. Do you see an "IF-MODIFIED-SINCE:" line in the HTTP GET? If so, what information follows the "IF-MODIFIED-

SINCE:" header? Yes `IF-MODIFIED-SINCE: Fri, 28 Sep 2018 05:59:02 GMT`

```
> Frame 14: 523 bytes on wire (4184 bits), 523 bytes captured (4184 bits) on interface 0
> Ethernet II, Src: PcsCompu_0a:94:54 (08:00:27:0a:94:54), Dst: RealtekU_12:35:02 (52:54:00:12:35:02)
> Internet Protocol Version 4, Src: 10.0.2.15, Dst: 128.119.245.12
> Transmission Control Protocol, Src Port: 46446, Dst Port: 80, Seq: 401, Ack: 731, Len: 469
v Hypertext Transfer Protocol
  > GET /wireshark-labs/HTTP-wireshark-file2.html HTTP/1.1\r\n
    Host: gaia.cs.umass.edu\r\n
    User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:52.0) Gecko/20100101 Firefox/52.0\r\n
    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
    Connection: keep-alive\r\n
    Upgrade-Insecure-Requests: 1\r\n
    If-Modified-Since: Fri, 28 Sep 2018 05:59:02 GMT\r\n
    If-None-Match: "173-576e826fdabcc"\r\n
    Cache-Control: max-age=0\r\n
    \r\n
    [Full request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file2.html]
    [HTTP request 2/2]
    [Prev request in frame: 8]
    [Response in frame: 16]
```

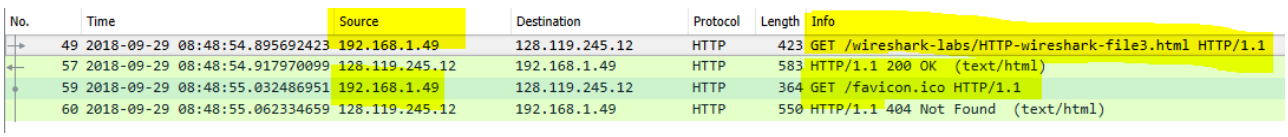
11. What is the HTTP status code and phrase returned from the server in response to this second HTTP GET? Did the server explicitly return the contents of the file? Explain. The status code is `304 Not Modified` No - The contents of the file were not returned (they are not shown in the packet contents window). Since the file was not modified since the last HTTP request, the contents of the file are just

loaded from the browser cache.



Section 3: Retrieving Long Documents

12. How many HTTP GET request messages did your browser send? Which packet number in the trace contains the GET message for the Bill or Rights? There were two `HTTP GET` requests sent by my browser. No. 49 and No. 59



The request for the Bill of Rights (`HTTP-wireshark-file3.html`) was No. 49

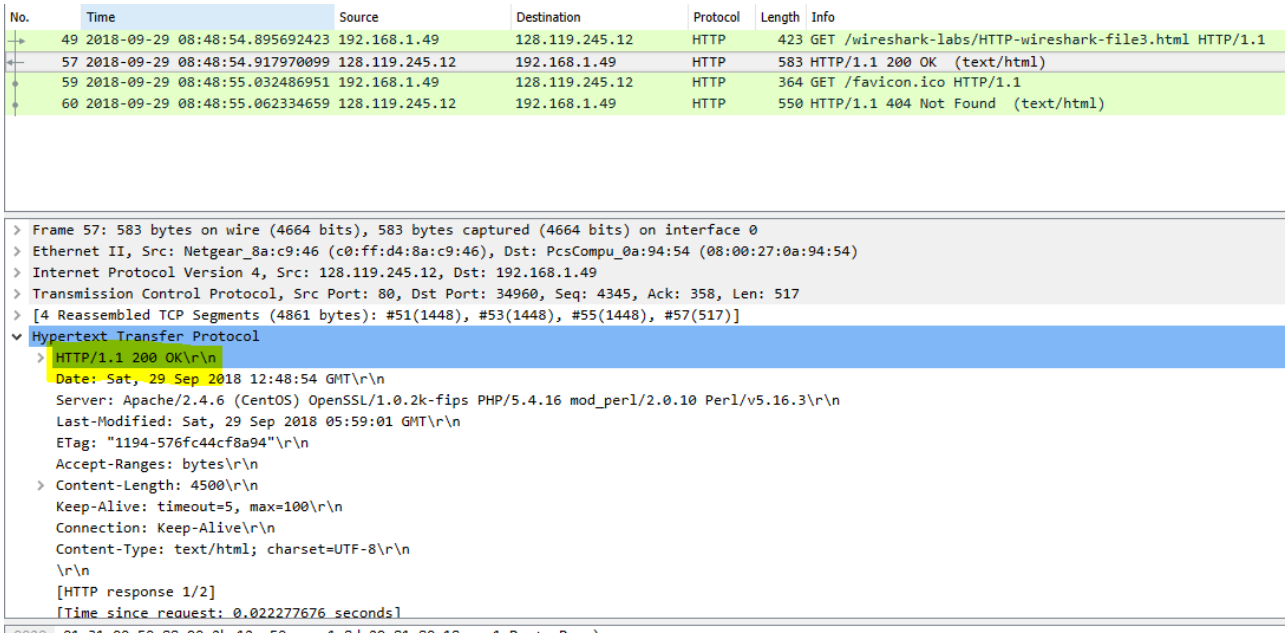
```
> Frame 49: 423 bytes on wire (3384 bits), 423 bytes captured (3384 bits) on interface 0
> Ethernet II, Src: PcsCompu_0a:94:54 (08:00:27:0a:94:54), Dst: Netgear_8a:c9:46 (c0:ff:d4:8a:c9:46)
> Internet Protocol Version 4, Src: 192.168.1.49, Dst: 128.119.245.12
> Transmission Control Protocol, Src Port: 34960, Dst Port: 80, Seq: 1, Ack: 1, Len: 357
v Hypertext Transfer Protocol
  > GET /wireshark-labs/HTTP-wireshark-file3.html HTTP/1.1\r\n
    Host: gaia.cs.umass.edu\r\n
    User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:52.0) Gecko/20100101 Firefox/52.0\r\n
    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
    Connection: keep-alive\r\n
    Upgrade-Insecure-Requests: 1\r\n
    \r\n
    [Full request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file3.html]
    [HTTP request 1/2]
    [Response in frame: 57]
    [Next request in frame: 59]
```

13. Which packet number in the trace contains the status code and phrase associated with the response to the HTTP GET request? No. 57 contains the Response

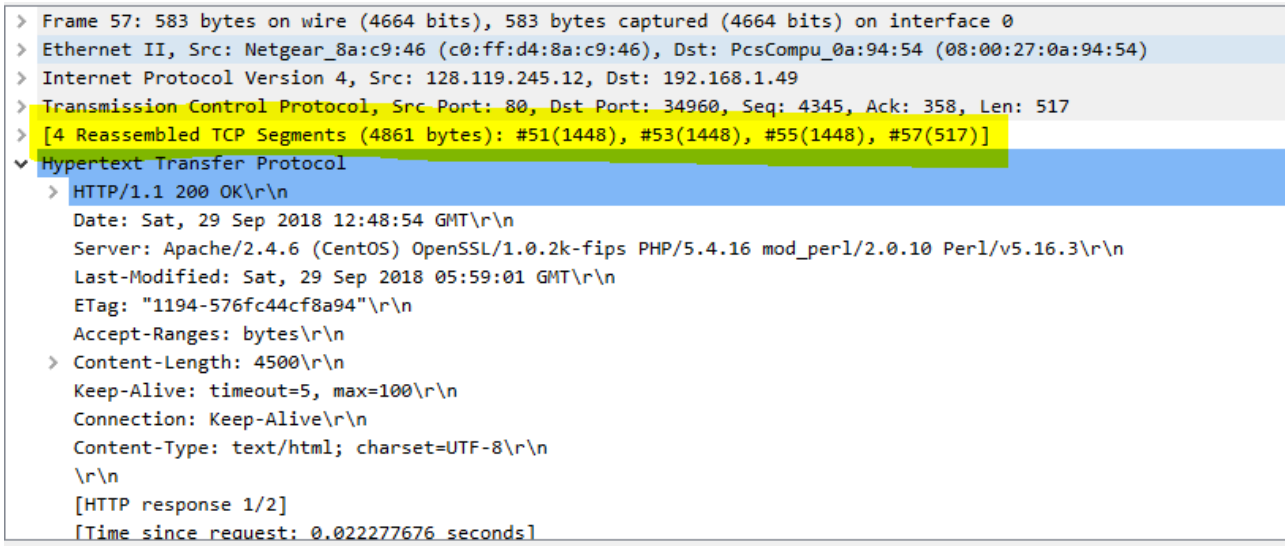
```
No.  Time                        Source          Destination     Protocol Length Info
 49  2018-09-29 08:48:54.895692423 192.168.1.49    128.119.245.12  HTTP     423 GET /wireshark-labs/HTTP-wireshark-file3.html HTTP/1.1
 57  2018-09-29 08:48:54.917970099 128.119.245.12  192.168.1.49    HTTP     583 HTTP/1.1 200 OK  (text/html)
 59  2018-09-29 08:48:55.032486951 192.168.1.49    128.119.245.12  HTTP     364 GET /favicon.ico HTTP/1.1
 60  2018-09-29 08:48:55.062334659 128.119.245.12  192.168.1.49    HTTP     550 HTTP/1.1 404 Not Found  (text/html)
```

```
> Frame 57: 583 bytes on wire (4664 bits), 583 bytes captured (4664 bits) on interface 0
> Ethernet II, Src: Netgear_8a:c9:46 (c0:ff:d4:8a:c9:46), Dst: PcsCompu_0a:94:54 (08:00:27:0a:94:54)
> Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.1.49
> Transmission Control Protocol, Src Port: 80, Dst Port: 34960, Seq: 4345, Ack: 358, Len: 517
> [4 Reassembled TCP Segments (4861 bytes): #51(1448), #53(1448), #55(1448), #57(517)]
v Hypertext Transfer Protocol
  > HTTP/1.1 200 OK\r\n
    Date: Sat, 29 Sep 2018 12:48:54 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/5.4.16 mod_perl/2.0.10 Perl/v5.16.3\r\n
    Last-Modified: Sat, 29 Sep 2018 05:59:01 GMT\r\n
    ETag: "1194-576fc44cf8a94"\r\n
    Accept-Ranges: bytes\r\n
  > Content-Length: 4500\r\n
    Keep-Alive: timeout=5, max=100\r\n
    Connection: Keep-Alive\r\n
    Content-Type: text/html; charset=UTF-8\r\n
    \r\n
    [HTTP response 1/2]
    [Time since request: 0.022277676 seconds]
```

14. What is the status code and phrase in the response? The phrase is `200 OK`



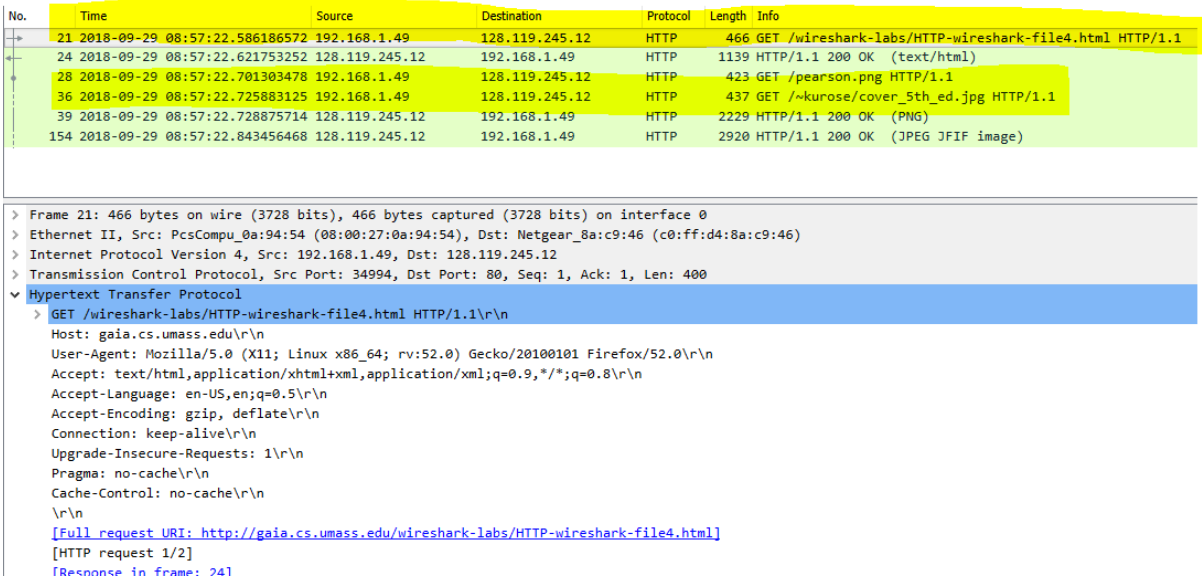
15. How many data-containing TCP segments were needed to carry the single HTTP response and the text of the Bill of Rights? 4 TCP Segments



Section 4: HTML Documents with Embedded Objects

16. How many HTTP GET request messages did your browser send? To which Internet addresses were these GET requests sent? 3 `HTTP GET` requests were sent
    - No. 21 was to `128.119.245.12` - `/wireshark-labs/HTTP-wireshark-file4.html`
    - No. 28 was to `128.119.245.12` - `pearson.png`

- No. 36 was to `128.119.245.12` - `/~kurose/cover_5th_ed.jpg`



```
No.  Time                        Source          Destination     Protocol Length Info
 21  2018-09-29 08:57:22.586186572 192.168.1.49   128.119.245.12  HTTP      466 GET /wireshark-labs/HTTP-wireshark-file4.html HTTP/1.1
 24  2018-09-29 08:57:22.621753252 128.119.245.12 192.168.1.49    HTTP     1139 HTTP/1.1 200 OK  (text/html)
 28  2018-09-29 08:57:22.701303478 192.168.1.49   128.119.245.12  HTTP      423 GET /pearson.png HTTP/1.1
 36  2018-09-29 08:57:22.725883125 192.168.1.49   128.119.245.12  HTTP      437 GET /~kurose/cover_5th_ed.jpg HTTP/1.1
 39  2018-09-29 08:57:22.728875714 128.119.245.12 192.168.1.49    HTTP     2229 HTTP/1.1 200 OK  (PNG)
154  2018-09-29 08:57:22.843456468 128.119.245.12 192.168.1.49    HTTP     2920 HTTP/1.1 200 OK  (JPEG JFIF image)

> Frame 21: 466 bytes on wire (3728 bits), 466 bytes captured (3728 bits) on interface 0
> Ethernet II, Src: PcsCompu_0a:94:54 (08:00:27:0a:94:54), Dst: Netgear_8a:c9:46 (c0:ff:d4:8a:c9:46)
> Internet Protocol Version 4, Src: 192.168.1.49, Dst: 128.119.245.12
> Transmission Control Protocol, Src Port: 34994, Dst Port: 80, Seq: 1, Ack: 1, Len: 400
v Hypertext Transfer Protocol
  > GET /wireshark-labs/HTTP-wireshark-file4.html HTTP/1.1\r\n
    Host: gaia.cs.umass.edu\r\n
    User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:52.0) Gecko/20100101 Firefox/52.0\r\n
    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
    Connection: keep-alive\r\n
    Upgrade-Insecure-Requests: 1\r\n
    Pragma: no-cache\r\n
    Cache-Control: no-cache\r\n
    \r\n
    [Full request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file4.html]
    [HTTP request 1/2]
    [Response in frame: 24]
```

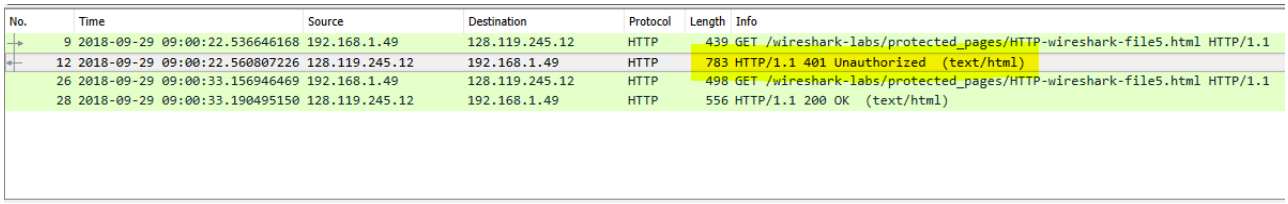
17. Can you tell whether your browser downloaded the two images serially, or whether they were downloaded from the two web sites in parallel? Explain. The images were downloaded serially because there were multiple TCP requests sent out for the images.

```
> Frame 36: 437 bytes on wire (3496 bits), 437 bytes captured (3496 bits) on interface 0
> Ethernet II, Src: PcsCompu_0a:94:54 (08:00:27:0a:94:54), Dst: Netgear_8a:c9:46 (c0:ff:d4:8a:c9:46)
> Internet Protocol Version 4, Src: 192.168.1.49, Dst: 128.119.245.12
v Transmission Control Protocol, Src Port: 34996, Dst Port: 80, Seq: 1, Ack: 1, Len: 371
    Source Port: 34996
    Destination Port: 80
    [Stream index: 2]
    [TCP Segment Len: 371]
    Sequence number: 1    (relative sequence number)
    [Next sequence number: 372    (relative sequence number)]
    Acknowledgment number: 1    (relative ack number)
    1000 .... = Header Length: 32 bytes (8)
  > Flags: 0x018 (PSH, ACK)
    Window size value: 229
    [Calculated window size: 29312]
    [Window size scaling factor: 128]
    Checksum: 0x38f7 [unverified]
    [Checksum Status: Unverified]
    Urgent pointer: 0
```


```
> Frame 36: 437 bytes on wire (3496 bits), 437 bytes captured (3496 bits) on interface 0
> Ethernet II, Src: PcsCompu_0a:94:54 (08:00:27:0a:94:54), Dst: Netgear_8a:c9:46 (c0:ff:d4:8a:c9:46)
> Internet Protocol Version 4, Src: 192.168.1.49, Dst: 128.119.245.12
v Transmission Control Protocol, Src Port: 34996, Dst Port: 80, Seq: 1, Ack: 1, Len: 371
    Source Port: 34996
    Destination Port: 80
    [Stream index: 2]
    [TCP Segment Len: 371]
    Sequence number: 1    (relative sequence number)
    [Next sequence number: 372    (relative sequence number)]
    Acknowledgment number: 1    (relative ack number)
    1000 .... = Header Length: 32 bytes (8)
  > Flags: 0x018 (PSH, ACK)
    Window size value: 229
    [Calculated window size: 29312]
    [Window size scaling factor: 128]
    Checksum: 0x38f7 [unverified]
    [Checksum Status: Unverified]
    Urgent pointer: 0
```

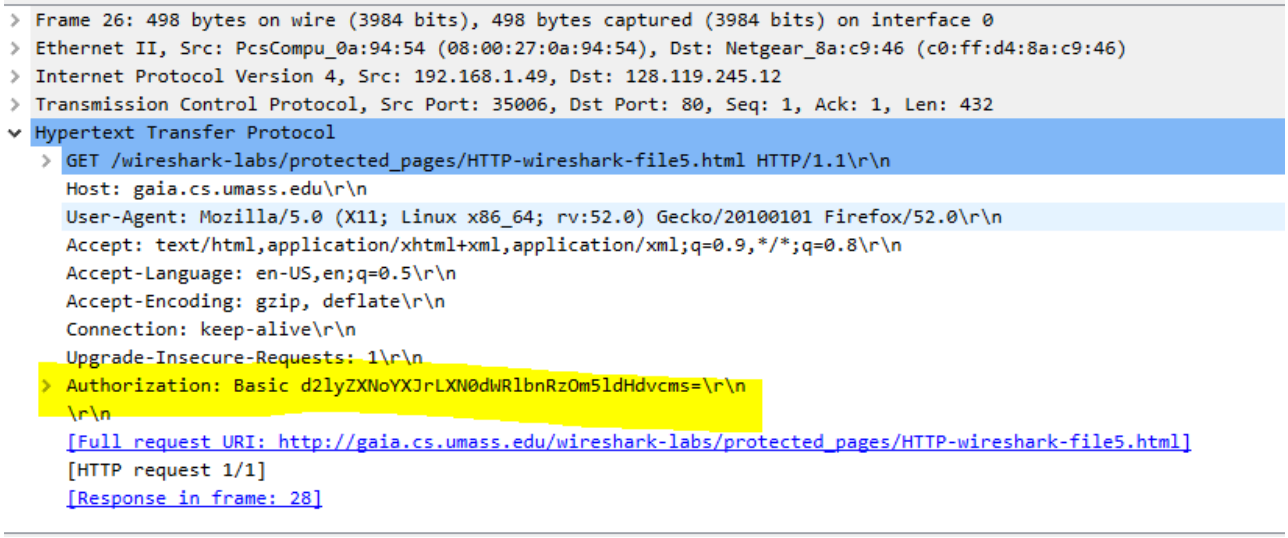
Section 5: HTTP Authentication

18. What is the server's response (status code and phrase) in response to the initial HTTP GET message from your browser? `401 Unauthorized`



No.	Time	Source	Destination	Protocol	Length	Info
9	2018-09-29 09:00:22.536646168	192.168.1.49	128.119.245.12	HTTP	439	GET /wireshark-labs/protected_pages/HTTP-wireshark-file5.html HTTP/1.1
12	2018-09-29 09:00:22.560807226	128.119.245.12	192.168.1.49	HTTP	783	HTTP/1.1 401 Unauthorized (text/html)
26	2018-09-29 09:00:33.156946469	192.168.1.49	128.119.245.12	HTTP	498	GET /wireshark-labs/protected_pages/HTTP-wireshark-file5.html HTTP/1.1
28	2018-09-29 09:00:33.190495150	128.119.245.12	192.168.1.49	HTTP	556	HTTP/1.1 200 OK (text/html)

19. When your browser's sends the HTTP GET message for the second time, what new field is included in the HTTP GET message? `AUthorization: Basic d2lyZXNoYXJrLXN0dWRlbnRzOm5ldHdvcms=`



```
> Frame 26: 498 bytes on wire (3984 bits), 498 bytes captured (3984 bits) on interface 0
> Ethernet II, Src: PcsCompu_0a:94:54 (08:00:27:0a:94:54), Dst: Netgear_8a:c9:46 (c0:ff:d4:8a:c9:46)
> Internet Protocol Version 4, Src: 192.168.1.49, Dst: 128.119.245.12
> Transmission Control Protocol, Src Port: 35006, Dst Port: 80, Seq: 1, Ack: 1, Len: 432
v Hypertext Transfer Protocol
  > GET /wireshark-labs/protected_pages/HTTP-wireshark-file5.html HTTP/1.1\r\n
    Host: gaia.cs.umass.edu\r\n
    User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:52.0) Gecko/20100101 Firefox/52.0\r\n
    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
    Connection: keep-alive\r\n
    Upgrade-Insecure-Requests: 1\r\n
  > Authorization: Basic d2lyZXNoYXJrLXN0dWRlbnRzOm5ldHdvcms=\r\n
    \r\n
    [Full request URI: http://gaia.cs.umass.edu/wireshark-labs/protected_pages/HTTP-wireshark-file5.html]
    [HTTP request 1/1]
    [Response in frame: 28]
```