Computer Networks Lab

ASSIGNMENT – 3

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PART – 1

```
No.     Time                           Source                Destination           Protocol Length Info
    246 2024-01-16 15:48:42.965734     10.196.12.136         128.119.245.12        HTTP     445    GET /wireshark-labs/HTTP-wireshark-
file1.html HTTP/1.1
Frame 246: 445 bytes on wire (3560 bits), 445 bytes captured (3560 bits) on interface \Device\NPF_{B181DFC0-E836-4B91-8518-352EF97DDDE3}, id 0
Ethernet II, Src: AzureWaveTec_0d:70:4d (48:e7:da:0d:70:4d), Dst: ExtremeNetworks_9a:82:e8 (02:04:96:9a:82:e8)
Internet Protocol Version 4, Src: 10.196.12.136, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 9576, Dst Port: 80, Seq: 1, Ack: 1, Len: 391
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 NT 10.0; Win64; x64; rv:121.0) Gecko/20100101 Firefox/121.0\r\n
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;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-file1.html]
    [HTTP request 1/1]
    [Response in frame: 258]
No.     Time                           Source                Destination           Protocol Length Info
    258 2024-01-16 15:48:43.253187     128.119.245.12        10.196.12.136         HTTP     540    HTTP/1.1 200 OK  (text/html)
Frame 258: 540 bytes on wire (4320 bits), 540 bytes captured (4320 bits) on interface \Device\NPF_{B181DFC0-E836-4B91-8518-352EF97DDDE3}, id 0
Ethernet II, Src: MojoNetworks_a7:12:01 (30:b6:2d:a7:12:01), Dst: AzureWaveTec_0d:70:4d (48:e7:da:0d:70:4d)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.196.12.136
Transmission Control Protocol, Src Port: 80, Dst Port: 9576, Seq: 1, Ack: 392, Len: 486
Hypertext Transfer Protocol
    HTTP/1.1 200 OK\r\n
    Date: Tue, 16 Jan 2024 10:18:43 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.33 mod_perl/2.0.11 Perl/v5.16.3\r\n
    Last-Modified: Tue, 16 Jan 2024 06:59:02 GMT\r\n
    ETag: "80-60f0aaa58bd41"\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: 0.287453000 seconds]
    [Request in frame: 246]
    [Request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file1.html]
    File Data: 128 bytes
Line-based text data: text/html (4 lines)
```

1. HTTP Versions:

- The browser is running **HTTP version 1.1**. This is indicated by the presence of "HTTP/1.1" in the HTTP GET request (frame 246).
- The server is also running **HTTP version 1.1**. This is evident from the "HTTP/1.1" status line in the server's response (frame 258).

2. Languages Accepted by Browser:

- The languages that the browser indicates it can accept are specified in the "Accept-Language" header of the HTTP GET request (frame 246).
- In this case, it is "en-US,en;q=0.5", indicating that the browser can accept English (United States) with a preference and a fallback option for any English.

3. IP Addresses:

- The IP address of my computer (the source) is **10.196.12.136**, as seen in the source field of the IP header in the HTTP GET request (frame 246).
- The IP address of the gaia.cs.umass.edu server (the destination) is **128.119.245.12**, as seen in the destination field of the IP header in the HTTP GET request (frame 246).

4. Server Response Status Code:

- The status code returned from the server to the browser is **200**. This is indicated in the "HTTP/1.1 200 OK" status line of the server's response (frame 258). A status code of 200 means that the request was successful.

5. Last Modification Time of the HTML File:

- The HTML file's last modification time at the server is specified in the "Last-Modified" header of the server's response (frame 258). In this case, it is **Tue, 16 Jan 2024 06:59:02 GMT.**

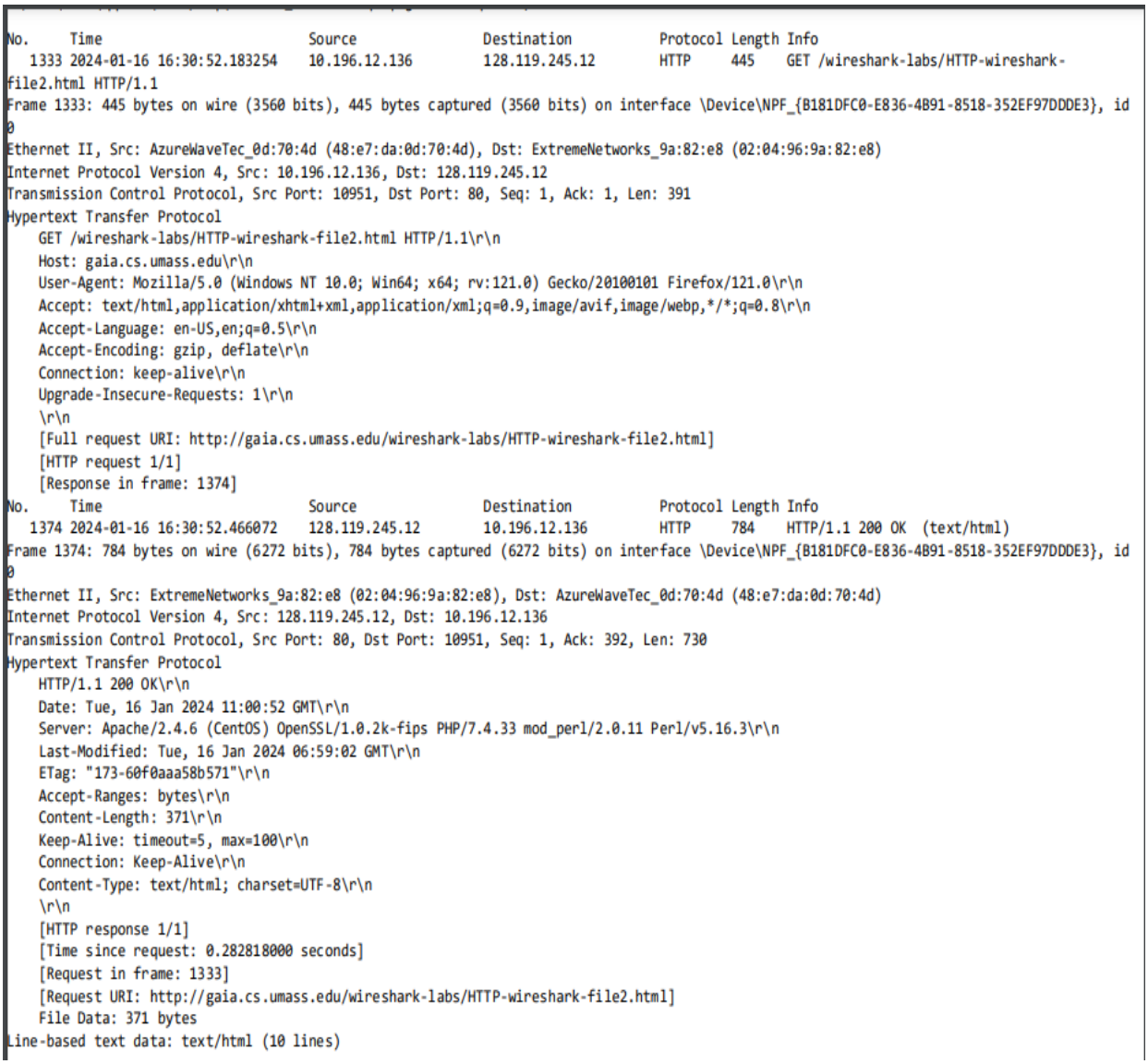
6. Content Length Returned to Browser:

- The number of bytes of content being returned to the browser is indicated by the "Content-Length" header in the server's response (frame 258). In this case, it is **128 bytes.**

7. Inspecting Raw Data for Additional Headers:

- By inspecting the raw data in the packet content window, you might find additional headers that are not displayed in the packet-listing window. One common header not explicitly listed in the packet-listing window is the "Date" header, which provides the current date and time according to the server's clock.

PART – 2



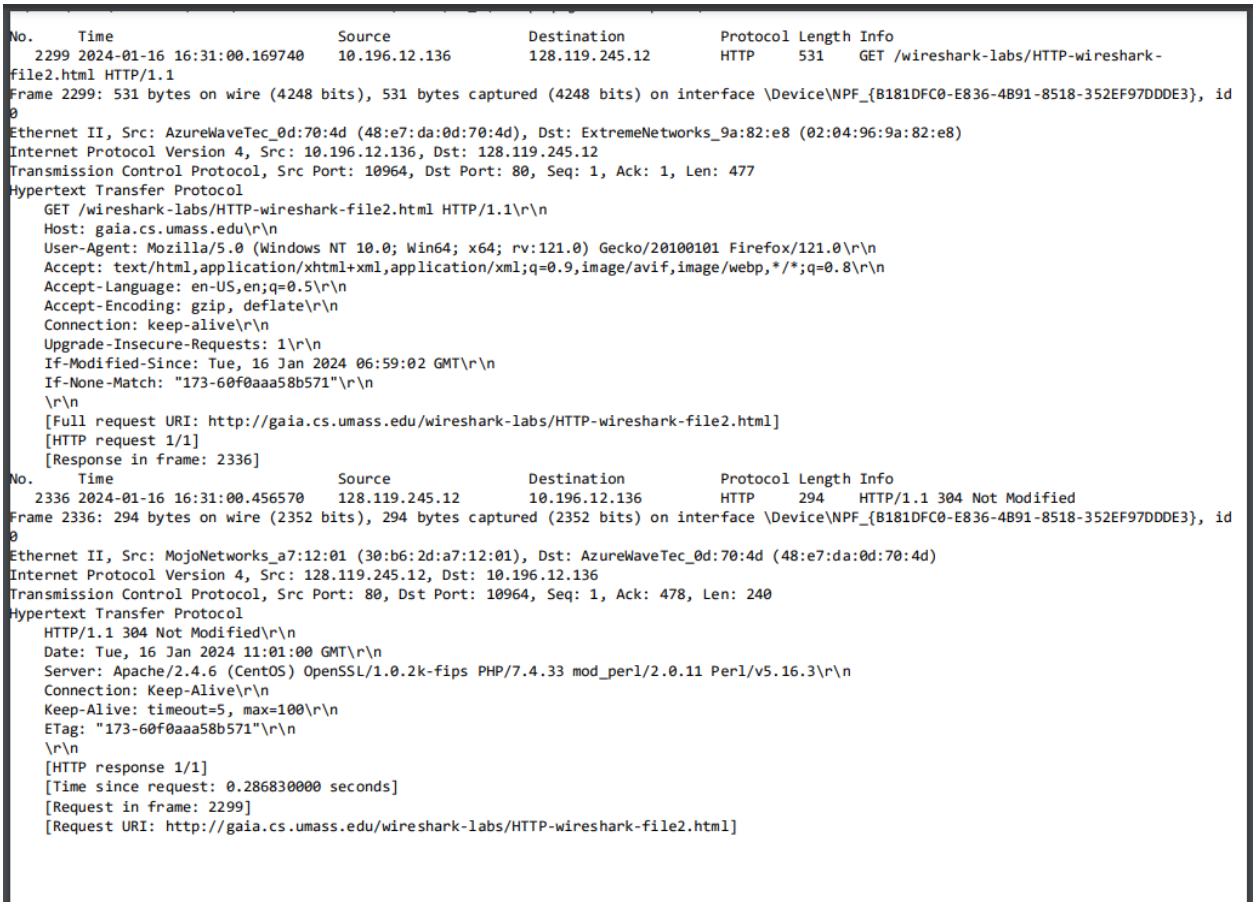
```
No.     Time                           Source                Destination           Protocol Length Info
   1333 2024-01-16 16:30:52.183254     10.196.12.136         128.119.245.12        HTTP     445    GET /wireshark-labs/HTTP-wireshark-
file2.html HTTP/1.1
Frame 1333: 445 bytes on wire (3560 bits), 445 bytes captured (3560 bits) on interface \Device\NPF_{B181DFC0-E836-4B91-8518-352EF97DDDE3}, id
0
Ethernet II, Src: AzureWaveTec_0d:70:4d (48:e7:da:0d:70:4d), Dst: ExtremeNetworks_9a:82:e8 (02:04:96:9a:82:e8)
Internet Protocol Version 4, Src: 10.196.12.136, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 10951, Dst Port: 80, Seq: 1, Ack: 1, Len: 391
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 (Windows NT 10.0; Win64; x64; rv:121.0) Gecko/20100101 Firefox/121.0\r\n
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;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-file2.html]
    [HTTP request 1/1]
    [Response in frame: 1374]
No.     Time                           Source                Destination           Protocol Length Info
   1374 2024-01-16 16:30:52.466072     128.119.245.12        10.196.12.136         HTTP     784    HTTP/1.1 200 OK  (text/html)
Frame 1374: 784 bytes on wire (6272 bits), 784 bytes captured (6272 bits) on interface \Device\NPF_{B181DFC0-E836-4B91-8518-352EF97DDDE3}, id
0
Ethernet II, Src: ExtremeNetworks_9a:82:e8 (02:04:96:9a:82:e8), Dst: AzureWaveTec_0d:70:4d (48:e7:da:0d:70:4d)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.196.12.136
Transmission Control Protocol, Src Port: 80, Dst Port: 10951, Seq: 1, Ack: 392, Len: 730
Hypertext Transfer Protocol
    HTTP/1.1 200 OK\r\n
    Date: Tue, 16 Jan 2024 11:00:52 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.33 mod_perl/2.0.11 Perl/v5.16.3\r\n
    Last-Modified: Tue, 16 Jan 2024 06:59:02 GMT\r\n
    ETag: "173-60f0aaa58b571"\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 1/1]
    [Time since request: 0.282818000 seconds]
    [Request in frame: 1333]
    [Request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file2.html]
    File Data: 371 bytes
Line-based text data: text/html (10 lines)
```

1. IF-MODIFIED-SINCE Header in the HTTP GET:

- ***No***, there is no "IF-MODIFIED-SINCE" line in the HTTP GET request from the browser. The HTTP GET request (frame 1333) includes standard headers like "Host," "User-Agent," "Accept," "Accept-Language," "Accept-Encoding," "Connection," and "Upgrade-Insecure-Requests," but there is no "IF-MODIFIED-SINCE" header present.

2. Contents of the Server Response:

- ***Yes***, the server explicitly returned the contents of the file in its response. This can be determined from the "HTTP/1.1 200 OK" status line and the subsequent headers in the server's response (frame 1374).
- The presence of the "Content-Length" header in the server's response indicates the size of the content being returned to the browser, which is **371 bytes** in this case.
- Additionally, the actual content of the file is present in the "File Data" section, and it is a text/html file with 10 lines of line-based text data. This confirms that the server provided the contents of the file in response to the HTTP GET request.



```
No.     Time                           Source                Destination           Protocol Length Info
   2299 2024-01-16 16:31:00.169740    10.196.12.136         128.119.245.12        HTTP     531    GET /wireshark-labs/HTTP-wireshark-
file2.html HTTP/1.1
Frame 2299: 531 bytes on wire (4248 bits), 531 bytes captured (4248 bits) on interface \Device\NPF_{B181DFC0-E836-4B91-8518-352EF97DDDE3}, id
0
Ethernet II, Src: AzureWaveTec_0d:70:4d (48:e7:da:0d:70:4d), Dst: ExtremeNetworks_9a:82:e8 (02:04:96:9a:82:e8)
Internet Protocol Version 4, Src: 10.196.12.136, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 10964, Dst Port: 80, Seq: 1, Ack: 1, Len: 477
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 (Windows NT 10.0; Win64; x64; rv:121.0) Gecko/20100101 Firefox/121.0\r\n
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;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: Tue, 16 Jan 2024 06:59:02 GMT\r\n
    If-None-Match: "173-60f0aaa58b571"\r\n
    \r\n
    [Full request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file2.html]
    [HTTP request 1/1]
    [Response in frame: 2336]
No.     Time                           Source                Destination           Protocol Length Info
   2336 2024-01-16 16:31:00.456570    128.119.245.12        10.196.12.136         HTTP     294    HTTP/1.1 304 Not Modified
Frame 2336: 294 bytes on wire (2352 bits), 294 bytes captured (2352 bits) on interface \Device\NPF_{B181DFC0-E836-4B91-8518-352EF97DDDE3}, id
0
Ethernet II, Src: MojoNetworks_a7:12:01 (30:b6:2d:a7:12:01), Dst: AzureWaveTec_0d:70:4d (48:e7:da:0d:70:4d)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.196.12.136
Transmission Control Protocol, Src Port: 80, Dst Port: 10964, Seq: 1, Ack: 478, Len: 240
Hypertext Transfer Protocol
    HTTP/1.1 304 Not Modified\r\n
    Date: Tue, 16 Jan 2024 11:01:00 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.33 mod_perl/2.0.11 Perl/v5.16.3\r\n
    Connection: Keep-Alive\r\n
    Keep-Alive: timeout=5, max=100\r\n
    ETag: "173-60f0aaa58b571"\r\n
    \r\n
    [HTTP response 1/1]
    [Time since request: 0.286830000 seconds]
    [Request in frame: 2299]
    [Request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file2.html]
```

3. IF-MODIFIED-SINCE Header in the Second HTTP GET:

- ***Yes***, there is an "IF-MODIFIED-SINCE" line in the second HTTP GET request from the browser (frame 2299). The header is as follows:

  If-Modified-Since: Tue, 16 Jan 2024 06:59:02 GMT
- The information that follows the "IF-MODIFIED-SINCE" header is the date and time indicating the last modification timestamp of the requested resource. In this case, it is set to "Tue, 16 Jan 2024 06:59:02 GMT."

4. HTTP Status Code and Server Response:

- The HTTP status code returned from the server in response to the second HTTP GET request (frame 2336) is **304 Not Modified.**
- The server did not explicitly return the contents of the file. Instead, it indicates that the requested resource has not been modified since the specified date and time (as provided in the "IF-MODIFIED-SINCE" header). The response is a standard HTTP 304 response, indicating that the client's cached version of the resource is still valid, and there is no need to transfer the actual content again.

PART – 3

```
No.     Time                           Source                Destination           Protocol Length Info
    386 2024-01-16 16:43:53.910676     10.196.12.136         128.119.245.12        HTTP     445    GET /wireshark-labs/HTTP-wireshark-
file3.html HTTP/1.1
Frame 386: 445 bytes on wire (3560 bits), 445 bytes captured (3560 bits) on interface \Device\NPF_{B181DFC0-E836-4B91-8518-352EF97DDDE3}, id 0
Ethernet II, Src: AzureWaveTec_0d:70:4d (48:e7:da:0d:70:4d), Dst: ExtremeNetworks_9a:82:e8 (02:04:96:9a:82:e8)
Internet Protocol Version 4, Src: 10.196.12.136, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 11618, Dst Port: 80, Seq: 1, Ack: 1, Len: 391
Hypertext Transfer Protocol
    GET /wireshark-labs/HTTP-wireshark-file3.html HTTP/1.1\r\n
        [Expert Info (Chat/Sequence): GET /wireshark-labs/HTTP-wireshark-file3.html HTTP/1.1\r\n]
        Request Method: GET
        Request URI: /wireshark-labs/HTTP-wireshark-file3.html
        Request Version: HTTP/1.1
    Host: gaia.cs.umass.edu\r\n
    User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:121.0) Gecko/20100101 Firefox/121.0\r\n
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;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 1/1]
    [Response in frame: 410]
No.     Time                           Source                Destination           Protocol Length Info
    410 2024-01-16 16:43:54.194557     128.119.245.12        10.196.12.136         HTTP     535    HTTP/1.1 200 OK  (text/html)
Frame 410: 535 bytes on wire (4280 bits), 535 bytes captured (4280 bits) on interface \Device\NPF_{B181DFC0-E836-4B91-8518-352EF97DDDE3}, id 0
Ethernet II, Src: MojoNetworks_a7:12:01 (30:b6:2d:a7:12:01), Dst: AzureWaveTec_0d:70:4d (48:e7:da:0d:70:4d)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.196.12.136
Transmission Control Protocol, Src Port: 80, Dst Port: 11618, Seq: 4381, Ack: 392, Len: 481
[2 Reassembled TCP Segments (4861 bytes): #409(4380), #410(481)]
    [Frame: 409, payload: 0-4379 (4380 bytes)]
    [Frame: 410, payload: 4380-4860 (481 bytes)]
    [Segment count: 2]
    [Reassembled TCP length: 4861]
    [Reassembled TCP Data [truncated]:
485454502f312e3120323030204f4b0d0a446174653a205475652c203136204a616e203230323432031313a31333a353420474d540d0a5365727665723a204170616368652f322e3
Hypertext Transfer Protocol
    HTTP/1.1 200 OK\r\n
        [Expert Info (Chat/Sequence): HTTP/1.1 200 OK\r\n]
        Response Version: HTTP/1.1
        Status Code: 200
        [Status Code Description: OK]
        Response Phrase: OK
    Date: Tue, 16 Jan 2024 11:13:54 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.33 mod_perl/2.0.11 Perl/v5.16.3\r\n
    Last-Modified: Tue, 16 Jan 2024 06:59:02 GMT\r\n
    ETag: "1194-60f0aaa587ad9"\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 1/1]
    [Time since request: 0.283881000 seconds]
    [Request in frame: 386]
    [Request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file3.html]
    File Data: 4500 bytes
Line-based text data: text/html (98 lines)
```

1.

- **How Many HTTP GET Request Messages:**
    - The web browser initiated a single HTTP GET request message, as evident from the Wireshark capture. The specific GET message for the Bill of Rights can be identified in frame number 386.
- **Packet Number for GET Message for the Bill of Rights:**
    - The HTTP GET request for the Bill of Rights is encapsulated in **frame number 386**. This packet captures the moment when the browser sought the specific content related to the Bill of Rights.

2. Packet Number with Status Code and Phrase in the Response:

- The pertinent status code and corresponding phrase in response to the HTTP GET request are encapsulated in frame number 410. This frame provides insight into the server's acknowledgment of the client's request.

3. Status Code and Phrase in the Response:

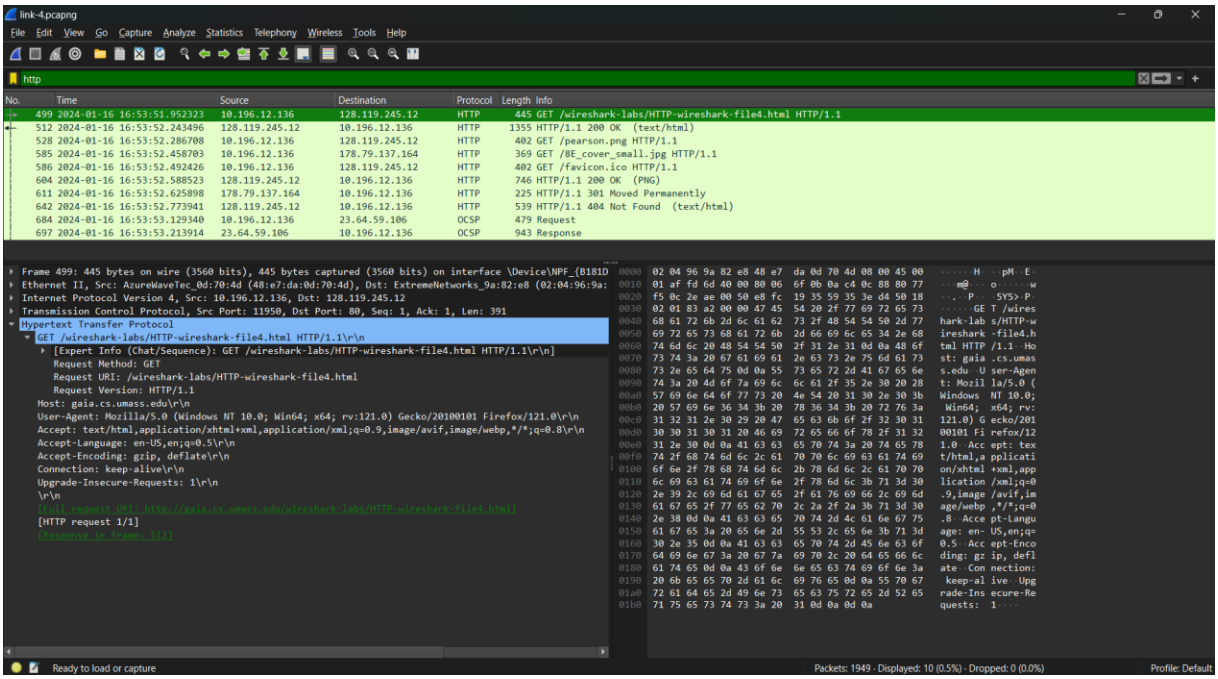
- In response to the HTTP GET request, the server communicated a status code of "200," signifying a successful request, and the accompanying phrase "OK." This standard HTTP response code indicates that the requested operation was carried out successfully by the server.

4. Number of Data-Containing TCP Segments for the HTTP Response and Text of the Bill of Rights:

- The HTTP response, including the content of the Bill of Rights, is distributed across two reassembled TCP segments: frame number 409 (4380 bytes) and frame number 410 (481 bytes). This segmentation highlights the structured nature of the data transfer, requiring two segments for the complete HTTP response and the inclusion of the Bill of Rights text.

PART – 4

```
No.     Time                           Source                Destination           Protocol Length Info
    499 2024-01-16 16:53:51.952323     10.196.12.136         128.119.245.12        HTTP     445    GET /wireshark-labs/HTTP-wireshark-
file4.html HTTP/1.1
Frame 499: 445 bytes on wire (3560 bits), 445 bytes captured (3560 bits) on interface \Device\NPF_{B181DFC0-E836-4B91-8518-352EF97DDDE3}, id 0
Ethernet II, Src: AzureWaveTec_0d:70:4d (48:e7:da:0d:70:4d), Dst: ExtremeNetworks_9a:82:e8 (02:04:96:9a:82:e8)
Internet Protocol Version 4, Src: 10.196.12.136, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 11950, Dst Port: 80, Seq: 1, Ack: 1, Len: 391
Hypertext Transfer Protocol
    GET /wireshark-labs/HTTP-wireshark-file4.html HTTP/1.1\r\n
        [Expert Info (Chat/Sequence): GET /wireshark-labs/HTTP-wireshark-file4.html HTTP/1.1\r\n]
        Request Method: GET
        Request URI: /wireshark-labs/HTTP-wireshark-file4.html
        Request Version: HTTP/1.1
    Host: gaia.cs.umass.edu\r\n
    User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:121.0) Gecko/20100101 Firefox/121.0\r\n
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;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-file4.html]
    [HTTP request 1/1]
    [Response in frame: 512]
No.     Time                           Source                Destination           Protocol Length Info
    512 2024-01-16 16:53:52.243496     128.119.245.12        10.196.12.136         HTTP     1355   HTTP/1.1 200 OK  (text/html)
Frame 512: 1355 bytes on wire (10840 bits), 1355 bytes captured (10840 bits) on interface \Device\NPF_{B181DFC0-E836-4B91-8518-352EF97DDDE3},
id 0
Ethernet II, Src: ExtremeNetworks_9a:82:e8 (02:04:96:9a:82:e8), Dst: AzureWaveTec_0d:70:4d (48:e7:da:0d:70:4d)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.196.12.136
Transmission Control Protocol, Src Port: 80, Dst Port: 11950, Seq: 1, Ack: 392, Len: 1301
Hypertext Transfer Protocol
    HTTP/1.1 200 OK\r\n
        [Expert Info (Chat/Sequence): HTTP/1.1 200 OK\r\n]
        Response Version: HTTP/1.1
        Status Code: 200
        [Status Code Description: OK]
        Response Phrase: OK
    Date: Tue, 16 Jan 2024 11:23:52 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.33 mod_perl/2.0.11 Perl/v5.16.3\r\n
    Last-Modified: Tue, 16 Jan 2024 06:59:02 GMT\r\n
    ETag: "3ae-60f0aaa58a9b9"\r\n
    Accept-Ranges: bytes\r\n
    Content-Length: 942\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: 0.291173000 seconds]
    [Request in frame: 499]
    [Request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file4.html]
    File Data: 942 bytes
Line-based text data: text/html (23 lines)
```



1. HTTP GET Requests and Destination Addresses:

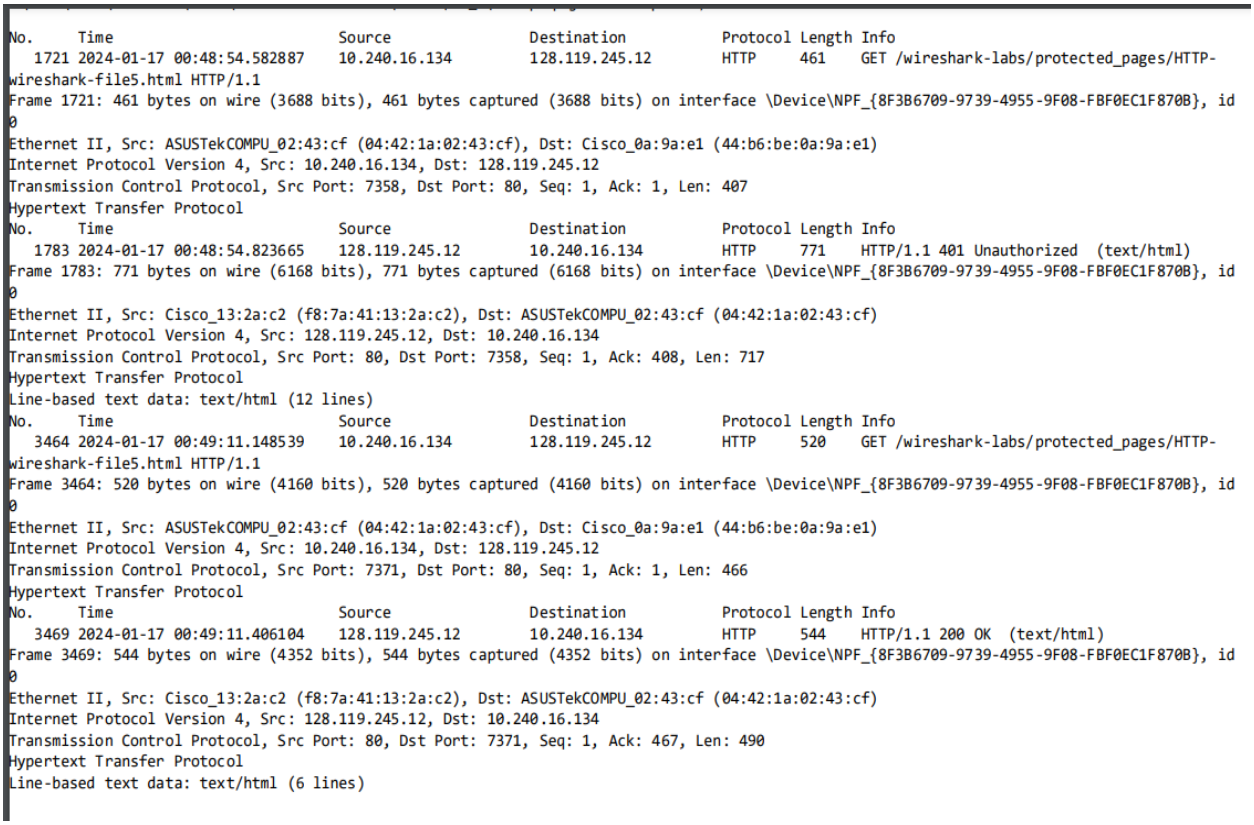
- The browser sent a total of **three** HTTP GET request messages.
- The GET requests were sent to the following Internet addresses:
- For the first GET request (frame 499):
    - Destination Address: 128.119.245.12 (gaia.cs.umass.edu)
- For the second GET request (frame 528):
    - Destination Address: 128.119.245.12 (gaia.cs.umass.edu)
- For the third GET request (frame 585):
    - Destination Address: 178.79.137.164 (kurose.cslash.net)

2. Downloading Images Serially or in Parallel:

- Analyzing the HTTP GET requests for the two images:
- The second GET request (frame 528) is for the image at http://gaia.cs.umass.edu/pearson.png.
- The third GET request (frame 585) is for the image at http://kurose.cslash.net/8E_cover_small.jpg.
- The browser initiated the requests to different Internet addresses (gaia.cs.umass.edu and kurose.cslash.net), indicating that these requests were meant for distinct resources.

- The requests for the images were performed in ***parallel***, as they were directed to different servers. This parallelization enables the browser to download resources concurrently, enhancing overall efficiency and reducing the time needed to load all the required content.

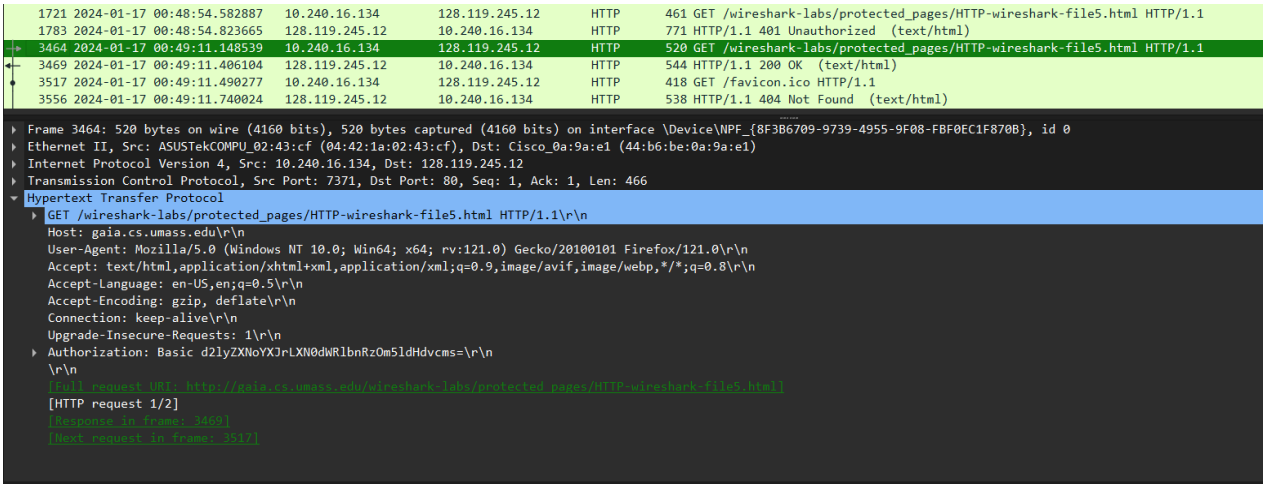
PART – 5



```
No.     Time                           Source                Destination           Protocol Length Info
   1721 2024-01-17 00:48:54.582887    10.240.16.134         128.119.245.12        HTTP     461    GET /wireshark-labs/protected_pages/HTTP-
wireshark-file5.html HTTP/1.1
Frame 1721: 461 bytes on wire (3688 bits), 461 bytes captured (3688 bits) on interface \Device\NPF_{8F3B6709-9739-4955-9F08-FBF0EC1F870B}, id
0
Ethernet II, Src: ASUSTekCOMPU_02:43:cf (04:42:1a:02:43:cf), Dst: Cisco_0a:9a:e1 (44:b6:be:0a:9a:e1)
Internet Protocol Version 4, Src: 10.240.16.134, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 7358, Dst Port: 80, Seq: 1, Ack: 1, Len: 407
Hypertext Transfer Protocol
No.     Time                           Source                Destination           Protocol Length Info
   1783 2024-01-17 00:48:54.823665    128.119.245.12        10.240.16.134         HTTP     771    HTTP/1.1 401 Unauthorized  (text/html)
Frame 1783: 771 bytes on wire (6168 bits), 771 bytes captured (6168 bits) on interface \Device\NPF_{8F3B6709-9739-4955-9F08-FBF0EC1F870B}, id
0
Ethernet II, Src: Cisco_13:2a:c2 (f8:7a:41:13:2a:c2), Dst: ASUSTekCOMPU_02:43:cf (04:42:1a:02:43:cf)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.240.16.134
Transmission Control Protocol, Src Port: 80, Dst Port: 7358, Seq: 1, Ack: 408, Len: 717
Hypertext Transfer Protocol
Line-based text data: text/html (12 lines)
No.     Time                           Source                Destination           Protocol Length Info
   3464 2024-01-17 00:49:11.148539    10.240.16.134         128.119.245.12        HTTP     520    GET /wireshark-labs/protected_pages/HTTP-
wireshark-file5.html HTTP/1.1
Frame 3464: 520 bytes on wire (4160 bits), 520 bytes captured (4160 bits) on interface \Device\NPF_{8F3B6709-9739-4955-9F08-FBF0EC1F870B}, id
0
Ethernet II, Src: ASUSTekCOMPU_02:43:cf (04:42:1a:02:43:cf), Dst: Cisco_0a:9a:e1 (44:b6:be:0a:9a:e1)
Internet Protocol Version 4, Src: 10.240.16.134, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 7371, Dst Port: 80, Seq: 1, Ack: 1, Len: 466
Hypertext Transfer Protocol
No.     Time                           Source                Destination           Protocol Length Info
   3469 2024-01-17 00:49:11.406104    128.119.245.12        10.240.16.134         HTTP     544    HTTP/1.1 200 OK  (text/html)
Frame 3469: 544 bytes on wire (4352 bits), 544 bytes captured (4352 bits) on interface \Device\NPF_{8F3B6709-9739-4955-9F08-FBF0EC1F870B}, id
0
Ethernet II, Src: Cisco_13:2a:c2 (f8:7a:41:13:2a:c2), Dst: ASUSTekCOMPU_02:43:cf (04:42:1a:02:43:cf)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.240.16.134
Transmission Control Protocol, Src Port: 80, Dst Port: 7371, Seq: 1, Ack: 467, Len: 490
Hypertext Transfer Protocol
Line-based text data: text/html (6 lines)
```

1. Server's Response to the Initial HTTP GET:

- The initial HTTP GET request (frame 1721) from the browser is met with a response from the server (frame 1783).
- The server's response includes the following information:
    - Status Code: 401 (Unauthorized)
    - Status Phrase: Unauthorized
- This indicates that the server requires authentication, and the browser needs to provide valid credentials to access the requested resource.



2. New Field in the HTTP GET Message for the Second Time:

- In the second HTTP GET request (frame 3464) sent by the browser, there is a new field included in the HTTP GET message:
  - **Authorization**: This field is added to carry the credentials required for authentication. It contains information such as a username and password or other authentication tokens.
- The inclusion of the Authorization field is a way for the browser to provide the necessary credentials to the server, addressing the authentication challenge presented in the initial response with the 401-status code.