

计算机网络实验 2

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1. The Basic HTTP GET/response interaction

GET 报文如下

/tmp/wireshark_wlp0s20f34P9HS1.pcapng 156 total packets, 2 shown

No.	Time	Source	Destination	Protocol	Length	Info
37	2.971029639	114.214.172.45	128.119.245.12	HTTP	456	GET /wireshark-labs/HTTP-wireshark-file1.html HTTP/1.1

Frame 37: 456 bytes on wire (3648 bits), 456 bytes captured (3648 bits) on interface wlp0s20f3, id 0
Ethernet II, Src: IntelCor_9a:07:45 (34:2e:b7:9a:07:45), Dst: Hangzhou_91:72:e2 (5c:dd:70:91:72:e2)
Internet Protocol Version 4, Src: 114.214.172.45, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 54156, Dst Port: 80, Seq: 1, Ack: 1, Len: 390
Hypertext Transfer Protocol
GET /wireshark-labs/HTTP-wireshark-file1.html HTTP/1.1\r\n
Host: gaia.cs.umass.edu\r\n
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8\r\n
Upgrade-Insecure-Requests: 1\r\n
User-Agent: Mozilla/5.0 (X11; Linux x86_64) AppleWebKit/605.1.15 (KHTML, like Gecko) Version/15.0 Safari/605.1.15 Surf/2.1\r\n
Accept-Encoding: gzip, deflate\r\n
Accept-Language: zh-CN\r\n
Connection: Keep-Alive\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: 40]

响应报文如下

/tmp/wireshark_wlp0s20f34P9HS1.pcapng 156 total packets, 2 shown

No.	Time	Source	Destination	Protocol	Length	Info
40	3.277826792	128.119.245.12	114.214.172.45	HTTP	552	HTTP/1.1 200 OK (text/html)

Frame 40: 552 bytes on wire (4416 bits), 552 bytes captured (4416 bits) on interface wlp0s20f3, id 0
Ethernet II, Src: Hangzhou_91:72:e2 (5c:dd:70:91:72:e2), Dst: IntelCor_9a:07:45 (34:2e:b7:9a:07:45)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 114.214.172.45
Transmission Control Protocol, Src Port: 80, Dst Port: 54156, Seq: 1, Ack: 391, Len: 486
Hypertext Transfer Protocol
HTTP/1.1 200 OK\r\n
Date: Sun, 18 Sep 2022 16:43:59 GMT\r\n
Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.30 mod_perl/2.0.11 Perl/v5.16.3\r\n
Last-Modified: Sun, 18 Sep 2022 05:59:02 GMT\r\n
ETag: "80-5e8ed4abaeae1"\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: 0.306797153 seconds]
[Request in frame: 37]
[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. 我的浏览器运行 HTTP 1.1 版本, 可以从 GET 报文的 `GET /wireshark-labs/HTTP-wireshark-file1.html HTTP/1.1` 得到; 服务器运行 HTTP 1.1 版本, 可以从响应报文的 `HTTP/1.1 200 OK (text/html)` 得到.
2. 从 GET 报文的 `Accept-Language: zh-CN\r\n` 可以看出浏览器指示可以接受简体中文.
3. 我的电脑的 IP 地址为 `114.214.172.45` (即 GET 报文的 `Source` 和响应报文的 `Destination`); 服务器的 IP 地址为 `128.119.245.12` (即 GET 报文的 `Destination` 和响应报文的 `Source`).
4. 返回的状态码为 `200`, 可以从响应报文的 `HTTP/1.1 200 OK (text/html)` 得到.
5. 从响应报文的 `Last-Modified: Sun, 18 Sep 2022 05:59:02 GMT\r\n` 可知上次修改时间为 2022 年九月 18 日星期日的 05:59:02 GMT 时间.
6. 从响应报文的 `Content-Length: 128\r\n` 可知共 128 字节.
7. 我没有看到没被显示的首部.

2. The HTTP CONDITIONAL GET/response interaction

第一次 GET 报文如下

/tmp/wireshark_wlp0s20f3DJUMS1.pcapng 1572 total packets, 4 shown

No.	Time	Source	Destination	Protocol	Length	Info
1366	140.239657674	114.214.172.45	128.119.245.12	HTTP	549	GET /wireshark-labs/HTTP-wireshark-file2.html HTTP/1.1

Frame 1366: 549 bytes on wire (4392 bits), 549 bytes captured (4392 bits) on interface wlp0s20f3, id 0
Ethernet II, Src: IntelCor_9a:07:45 (34:2e:b7:9a:07:45), Dst: Hangzhou_91:72:e2 (5c:dd:70:91:72:e2)
Internet Protocol Version 4, Src: 114.214.172.45, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 40244, Dst Port: 80, Seq: 1, Ack: 1, Len: 483
Hypertext Transfer Protocol
GET /wireshark-labs/HTTP-wireshark-file2.html HTTP/1.1\r\n
Host: gaia.cs.umass.edu\r\n
Connection: keep-alive\r\n
Upgrade-Insecure-Requests: 1\r\n
User-Agent: Mozilla/5.0 (X11; Linux x86_64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/105.0.0.0 Safari/537.36\r\n
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.9\r\n
Accept-Encoding: gzip, deflate\r\n
Accept-Language: zh,zh-CN;q=0.9,en-US;q=0.8,en;q=0.7\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: 1371]

第一次响应报文如下

/tmp/wireshark_wlp0s20f3DJUMS1.pcapng 1572 total packets, 4 shown

No.	Time	Source	Destination	Protocol	Length	Info
1371	140.446971162	128.119.245.12	114.214.172.45	HTTP	796	HTTP/1.1 200 OK (text/html)

Frame 1371: 796 bytes on wire (6368 bits), 796 bytes captured (6368 bits) on interface wlp0s20f3, id 0
Ethernet II, Src: Hangzhou_91:72:e2 (5c:dd:70:91:72:e2), Dst: IntelCor_9a:07:45 (34:2e:b7:9a:07:45)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 114.214.172.45
Transmission Control Protocol, Src Port: 80, Dst Port: 40244, Seq: 1, Ack: 484, Len: 730
Hypertext Transfer Protocol
HTTP/1.1 200 OK\r\n
Date: Sun, 18 Sep 2022 17:32:28 GMT\r\n
Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.30 mod_perl/2.0.11 Perl/v5.16.3\r\n
Last-Modified: Sun, 18 Sep 2022 05:59:02 GMT\r\n
ETag: "173-5e8ed4abadf29"\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: 0.207313488 seconds]
[Request in frame: 1366]
[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)

第二次 GET 报文如下

/tmp/wireshark_wlp0s20f3DJUMS1.pcapng 1572 total packets, 4 shown

No.	Time	Source	Destination	Protocol	Length	Info
1429	145.554930770	114.214.172.45	128.119.245.12	HTTP	661	GET /wireshark-labs/HTTP-wireshark-file2.html HTTP/1.1

Frame 1429: 661 bytes on wire (5288 bits), 661 bytes captured (5288 bits) on interface wlp0s20f3, id 0
Ethernet II, Src: IntelCor_9a:07:45 (34:2e:b7:9a:07:45), Dst: Hangzhou_91:72:e2 (5c:dd:70:91:72:e2)
Internet Protocol Version 4, Src: 114.214.172.45, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 40234, Dst Port: 80, Seq: 1, Ack: 1, Len: 595
Hypertext Transfer Protocol
GET /wireshark-labs/HTTP-wireshark-file2.html HTTP/1.1\r\n
Host: gaia.cs.umass.edu\r\n
Connection: keep-alive\r\n
Cache-Control: max-age=0\r\n
Upgrade-Insecure-Requests: 1\r\n
User-Agent: Mozilla/5.0 (X11; Linux x86_64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/105.0.0.0 Safari/537.36\r\n
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.9\r\n
Accept-Encoding: gzip, deflate\r\n
Accept-Language: zh,zh-CN;q=0.9,en-US;q=0.8,en;q=0.7\r\n
If-None-Match: "173-5e8ed4abadf29"\r\n
If-Modified-Since: Sun, 18 Sep 2022 05:59:02 GMT\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: 1432]

第二次响应报文如下

/tmp/wireshark_wlp0s20f3DJUMS1.pcapng 1572 total packets, 4 shown

```
No.      Time                Source                Destination            Protocol Length Info
1432 145.817697999 128.119.245.12        114.214.172.45         HTTP      306      HTTP/1.1 304 Not Modified
Frame 1432: 306 bytes on wire (2448 bits), 306 bytes captured (2448 bits) on interface wlp0s20f3, id 0
Ethernet II, Src: Hangzhou_91:72:e2 (5c:dd:70:91:72:e2), Dst: IntelCor_9a:07:45 (34:2e:b7:9a:07:45)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 114.214.172.45
Transmission Control Protocol, Src Port: 80, Dst Port: 40234, Seq: 1, Ack: 596, Len: 240
Hypertext Transfer Protocol
  HTTP/1.1 304 Not Modified\r\n
  Date: Sun, 18 Sep 2022 17:32:33 GMT\r\n
  Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.30 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: "173-5e8ed4abadf29"\r\n
  \r\n
[HTTP response 1/1]
[Time since request: 0.262767229 seconds]
[Request in frame: 1429]
[Request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file2.html]
```

- 在第一次 GET 请求中没有看到 "IF-MODIFIED-SINCE".
- 在第一次响应中返回了文件内容, 因为在报文中有 `Content-Length: 371\r\n`, 且 Wireshark 抓取到了如下图所示的 10 行 HTML 文件;

```
File Data: 371 bytes
Line-based text data: text/html (10 lines)
\r\n
<html>\r\n
\r\n
Congratulations again! Now you've downloaded the file lab2-2.html. <br>\r\n
This file's last modification date will not change. <p>\r\n
Thus if you download this multiple times on your browser, a complete copy <br>\r\n
will only be sent once by the server due to the inclusion of the IN-MODIFIED-SINCE<br>\r\n
field in your browser's HTTP GET request to the server.\r\n
\r\n
</html>\r\n
```

在第二次响应中没有返回文件内容, 因为在报文中没有 `Content-Length` 首部, Wireshark 也没有抓取到文件内容.

- 第二次 GET 请求中有 "IF-MODIFIED-SINCE" 首部行, 内容如下. 其中在 `If-Modified-Since:` 后面的时间就是第一次响应报文中的 `Last-Modified` 首部行的时间.

```
If-Modified-Since: Sun, 18 Sep 2022 05:59:02 GMT\r\n
```

- 第二次响应返回的状态码和短语为 `304 Not Modified`. 服务器并没有返回文件内容, 因为自上一次获取文件内容起, 服务器中的文件并没有被修改, 不满足 GET 报文中 `If-Modified-Since` 的条件. 所以不需要服务器返回文件, 只需要使用缓存器中的文件副本即可.

3. Retrieving Long Documents

GET 报文如下

/tmp/wireshark_wlp0s20f3T51PS1.pcapng 194 total packets, 2 shown

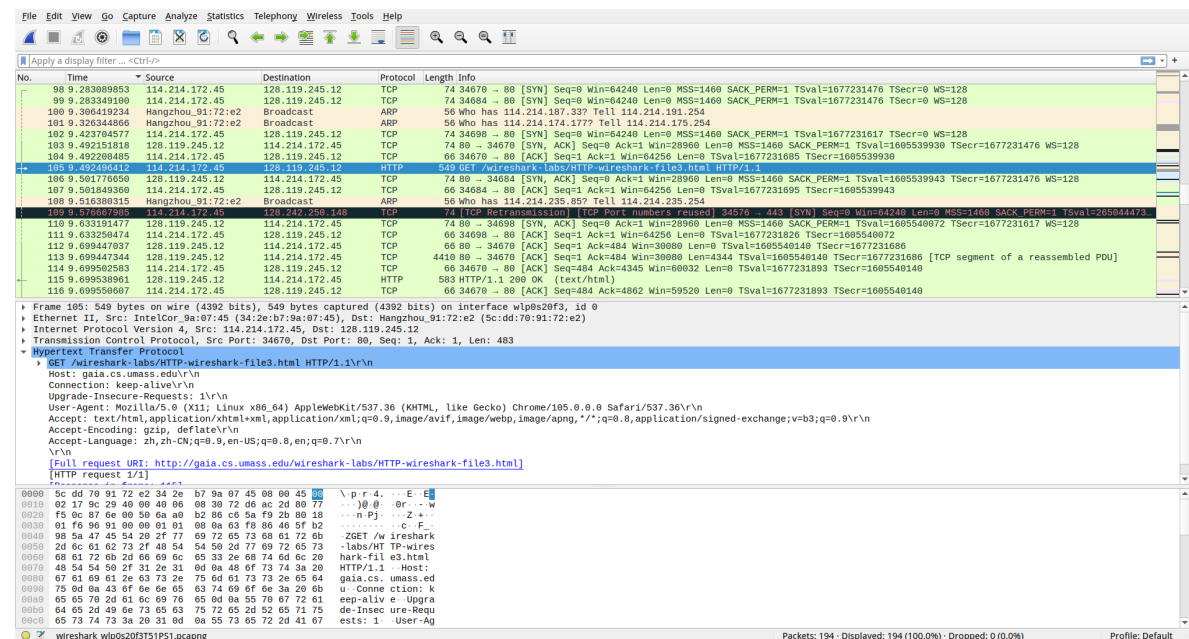
```
No.      Time                Source                Destination            Protocol Length Info
105 9.492496412 114.214.172.45        128.119.245.12         HTTP      549      GET /wireshark-labs/HTTP-wireshark-file3.html
HTTP/1.1
Frame 105: 549 bytes on wire (4392 bits), 549 bytes captured (4392 bits) on interface wlp0s20f3, id 0
Ethernet II, Src: IntelCor_9a:07:45 (34:2e:b7:9a:07:45), Dst: Hangzhou_91:72:e2 (5c:dd:70:91:72:e2)
Internet Protocol Version 4, Src: 114.214.172.45, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 34670, Dst Port: 80, Seq: 1, Ack: 1, Len: 483
Hypertext Transfer Protocol
  GET /wireshark-labs/HTTP-wireshark-file3.html HTTP/1.1\r\n
  Host: gaia.cs.umass.edu\r\n
  Connection: keep-alive\r\n
  Upgrade-Insecure-Requests: 1\r\n
  User-Agent: Mozilla/5.0 (X11; Linux x86_64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/105.0.0.0 Safari/537.36\r\n
  Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;q=0.9\r\n
  Accept-Encoding: gzip, deflate\r\n
  Accept-Language: zh,zh-CN;q=0.9,en-US;q=0.8,en;q=0.7\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: 115]
```

响应报文如下

/tmp/wireshark_wlp0s20f3T51PS1.pcapng 194 total packets, 2 shown

```
No.      Time            Source                Destination            Protocol Length Info
115 9.699538961 128.119.245.12        114.214.172.45        HTTP 583      HTTP/1.1 200 OK (text/html)
Frame 115: 583 bytes on wire (4664 bits), 583 bytes captured (4664 bits) on interface wlp0s20f3, id 0
Ethernet II, Src: Hangzhou_91:72:e2 (5c:dd:70:91:72:e2), Dst: IntelCor_9a:07:45 (34:2e:b7:9a:07:45)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 114.214.172.45
Transmission Control Protocol, Src Port: 80, Dst Port: 34670, Seq: 4345, Ack: 484, Len: 517
[2 Reassembled TCP Segments (4861 bytes): #113(4344), #115(517)]
Hypertext Transfer Protocol
  HTTP/1.1 200 OK\r\n
  Date: Sun, 18 Sep 2022 18:04:02 GMT\r\n
  Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.30 mod_perl/2.0.11 Perl/v5.16.3\r\n
  Last-Modified: Sun, 18 Sep 2022 05:59:02 GMT\r\n
  ETag: "1194-5e8ed4aba8d20"\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: 0.207042549 seconds]
[Request in frame: 105]
[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)
```

Wireshark 界面如下



12. 浏览器只发送了一条 HTTP GET 请求报文, 其编号为 105.

13. 编号为 113 的包.

14. 返回的状态码和短语为 **200 OK**.

15. 总共 2 个, 如下图所示.

```
ICP segment data (517 bytes)
[2 Reassembled TCP Segments (4861 bytes): #113(4344), #115(517)]
[Frame: 113, payload: 0-4343 (4344 bytes)]
[Frame: 115, payload: 4344-4860 (517 bytes)]
[Segment count: 2]
[Reassembled TCP length: 4861]
[Reassembled TCP Data: 485454502f312e3120323030204f4b0d0a446174653a2053756e2c203138205365702032...
```

4. HTML Documents with Embedded Objects

Wireshark 界面如下

File Edit View Go Capture Analyze Statistics Telephony Tools Help
Wireshark 3.10.0

http
[X] [Y] [Z]

No.	Time	Source	Destination	Protocol	Length	Info
35	1.644400190	114.214.182.70	128.119.245.12	HTTP	575	GET /wireshark-labs/HTTP-wireshark-file4.html HTTP/1.1
43	1.096711310	128.119.245.12	114.214.182.70	HTTP	1307	HTTP/1.1 200 OK (text/html)
46	1.958790701	114.214.182.70	128.119.245.12	HTTP	495	GET /pearson.png HTTP/1.1
48	1.975478120	114.214.182.70	178.79.137.164	HTTP	462	GET /BE_cover_small.jpg HTTP/1.1
52	2.21147585	128.119.245.12	114.214.182.70	HTTP	781	HTTP/1.1 200 OK (PNG)
50-272123530	110-979137-104		114-214.182.70	HTTP	237	HTTP/1.1 301 Moved Permanently

Frame 56: 237 bytes on wire (1896 bits), 237 bytes captured (1896 bits) on interface wlp0s20f3, id 0
 Ethernet II, Src: Hongzhou, 72:e2:5c:dd:70:91:72:e2, Dst: IntelCor_9a:0a:07:45 (34:2e:b7:9a:07:45)
 Internet Protocol Version 4, Src: 178.79.137.164, Dst: 114.214.182.70
 Transmission Control Protocol, Src Port: 80, Dst Port: 52848, Seq: 1, Ack: 397, Len: 171
 Hypertext Transfer Protocol
 HTTP/1.1 301 Moved Permanently\r\n
 Location: https://kurose.cslash.net/BE_cover_small.jpg\r\n
 Content-Length: 0\r\n
 Date: Mon, 19 Sep 2022 03:36:47 GMT\r\n
 Server: lighttpd/1.4.47\r\n
 \r\n
 [HTTP response 1/1]
 [Time since request: 0.295777193 seconds]
 [Request in frame: 48]
 [Request URI: http://kurose.cslash.net/BE_cover_small.jpg]

```

0000 34 2e b7 9a 07 45 5c dd 70 91 72 e2 00 00 45 80 4..E\pr...E
0010 00 df 05 3a 40 00 29 08 47 ce b2 4f 89 a4 72 d6 ..0( G O r
0020 b6 46 00 50 cb 5f 03 e6 91 41 96 bc c7 a3 80 18 .F.P.P...A...
0030 61 fa e6 99 00 00 01 01 00 8a 00 11 96 05 c0 c9 .1...U...
0040 2b 6e 4b 54 54 50 2f 31 2e 31 29 33 30 31 20 4d +HTTP/1.1 301 M
0050 6f 76 65 64 20 50 65 72 6d 61 6e 65 6e 74 c6 79 oved Per manently
0060 6d 0a 4c 6f 63 61 74 69 6f 6e 3a 20 68 74 74 70 .Locati on: http
0070 73 3a 2f 2f 0b 75 72 6f 73 65 2e 63 73 6c 61 73 s://kuro se.cslas
0080 68 2e 6e 65 74 2f 38 45 5f 63 6f 76 65 72 5f 73 h.net/BE_ cover_s
0090 6d 61 6c 6e 6e 6a 70 6f 6d 8a 43 6f 6e 74 65 6e mall.jpg Conten
0100 74 2d 0c 05 6e 67 74 68 3a 20 30 6d 6a 44 61 74 t-length: 0 Dat
0110 65 3a 20 4d 6f 6e 2a 20 31 39 29 53 65 70 20 32 e: Mon, 19 Sep 2
0120 30 32 32 29 30 33 3a 33 36 3a 34 37 20 47 4d 54 022 03:3 6:47 GMT
0130 6d 0a 53 65 72 76 65 72 3a 20 6c 69 67 68 74 4 Server: lightt
0140 70 64 2f 31 2e 34 3a 24 37 6d 0a 0d 0a pd/1.4.4 7...

```

Wireshark wlp0s20f3\VOIS1.cpaang
Packets: 475 · Displayed: 6 (1.3%) · Drooped: 0 (0.0%)
Profile: Default

16. 浏览器总共发送了三个 GET 请求报文, 其中前两个发送到了 128.119.245.12 (gaia.cs.umass.edu), 第三个发送到了 178.79.137.164 (kurose.cslash.net).
17. 浏览器并行下载这两张图片, 因为从 Wireshark 中可以看出, 浏览器在发送了获取两张图片的 GET 请求后, 第一个 GET 请求才收到响应, 说明两个请求是并行的.

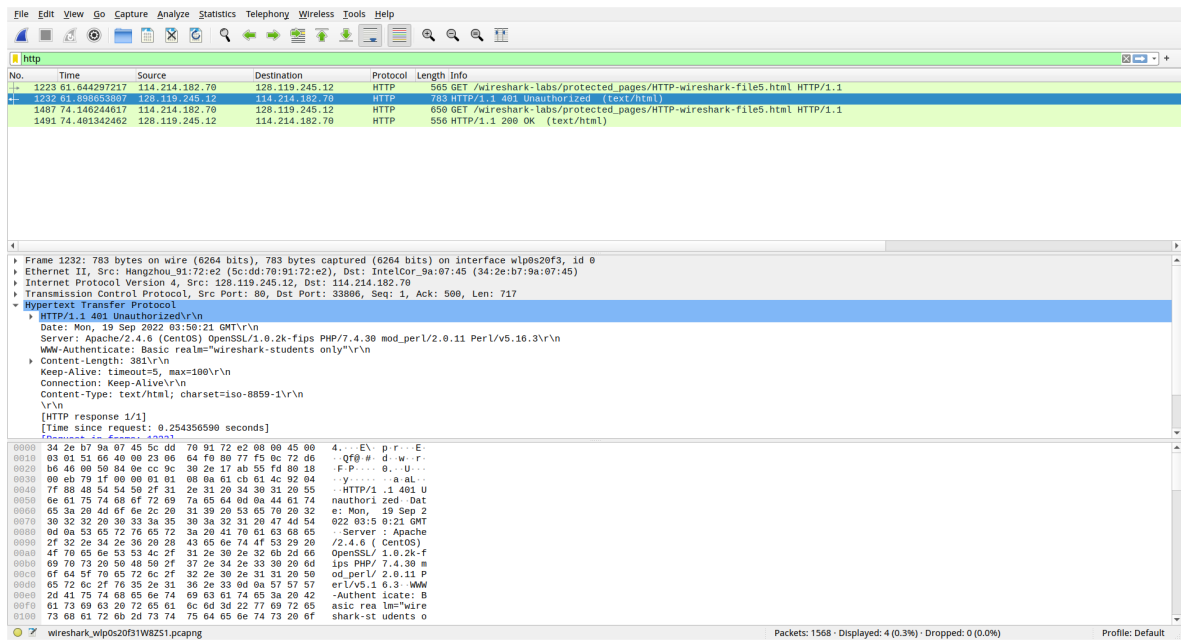
第一次 GET 报文如下

```
No.      Time      Source      Destination      Protocol Length Info
1223 61.644297217 114.214.182.70 128.119.245.12   HTTP      565      GET /wireshark-labs/protected_pages/HTTP-wireshark-
file5.html HTTP/1.1
Frame 1223: 565 bytes on wire (4520 bits), 565 bytes captured (4520 bits) on interface wlp0s20f3, id 0
Ethernet II, Src: IntelCor_9a:07:45 (34:2e:b7:9a:07:45), Dst: Hangzhou_91:72:e2 (5c:dd:70:91:72:e2)
Internet Protocol Version 4, Src: 114.214.182.70, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 33806, Dst Port: 80, Seq: 1, Ack: 1, Len: 499
Hypertext Transfer Protocol
    GET /wireshark-labs/protected_pages/HTTP-wireshark-file5.html HTTP/1.1\r\n
Host: gaia.cs.umass.edu\r\n
Connection: keep-alive\r\n
Upgrade-Insecure-Requests: 1\r\n
User-Agent: Mozilla/5.0 (X11; Linux x86_64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/105.0.0.0 Safari/537.36\r\n
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-
exchange;v=b3;q=0.9\r\n
Accept-Encoding: gzip, deflate\r\n
Accept-Language: zh,zh-CN;q=0.9,en-US;q=0.8,en;q=0.7\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: 1232]
```

/tmp/wireshark_wlp0s20f31W8ZS1.pcapng 1568 total packets, 4 shown

```
No.      Time      Source      Destination      Protocol Length Info
 1487 74.146244617 114.214.182.70 128.119.245.12  HTTP      650      GET /wireshark-labs/protected_pages/HTTP-wireshark-
files.html HTTP/1.1
Frame 1487: 650 bytes on wire (5200 bits), 650 bytes captured (5200 bits) on interface wlp0s20f3, id 0
Ethernet II, Src: IntelCor_9a:07:45 (34:2e:b7:9a:07:45), Dst: Hangzhou_91:72:e2 (5c:dd:70:91:72:e2)
Internet Protocol Version 4, Src: 114.214.182.70, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 33820, Dst Port: 80, Seq: 1, Ack: 1, Len: 584
Hypertext Transfer Protocol
    GET /wireshark-labs/protected_pages/HTTP-wireshark-file5.html HTTP/1.1\r\n
    Host: gaia.cs.umass.edu\r\n
    Connection: keep-alive\r\n
    Cache-Control: max-age=0\r\n
    Authorization: Basic d2lyZXN0YXJrLXN0dWRlbnRzM05ldHdvcmcs\r\n
    Upgrade-Insecure-Requests: 1\r\n
    User-Agent: Mozilla/5.0 (X11; Linux x86_64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/105.0.0.0 Safari/537.36\r\n
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-
exchange;v=b3;q=0.9\r\n
    Accept-Encoding: gzip, deflate\r\n
    Accept-Language: zh,zh-CN;q=0.9,en-US;q=0.8,en;q=0.7\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: 1491]
```

Wireshark 界面如下



18. 第一次响应返回的状态码和短语为 **401 Unauthorized** .

19. 第二次 GET 报文有新的两个首部行 **Cache-Control** 和 **Authorization** , 内容如下.

```
Cache-Control: max-age=0\r\n
```

```
Authorization: Basic d2lyZXNoYXJrLXN0dWR1bnRzOm5ldHdvcm5=\r\n
```