计算机网络HTTP实验报告

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一.实验目的

- 通过wireshark查看网络协议
- 探索HTTP协议的几个方面
    - 基本的GET/response交互
    - HTTP报文格式
    - 检索大的HTML文件
    - 检索具有内嵌对象的HTML文件
    - HTTP鉴别和安全性

二.实验环境与工具

- windows操作系统
- wireshark分组嗅探器
- Microsoft Edge浏览器

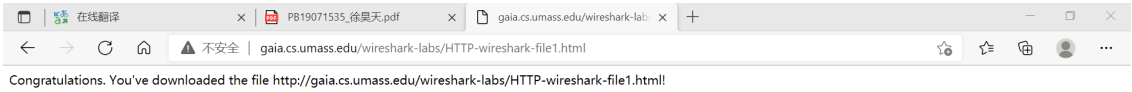
三.实验步骤

1.基本的HTTP GET/response交互

通过下载一个HTML文件探索HTTP

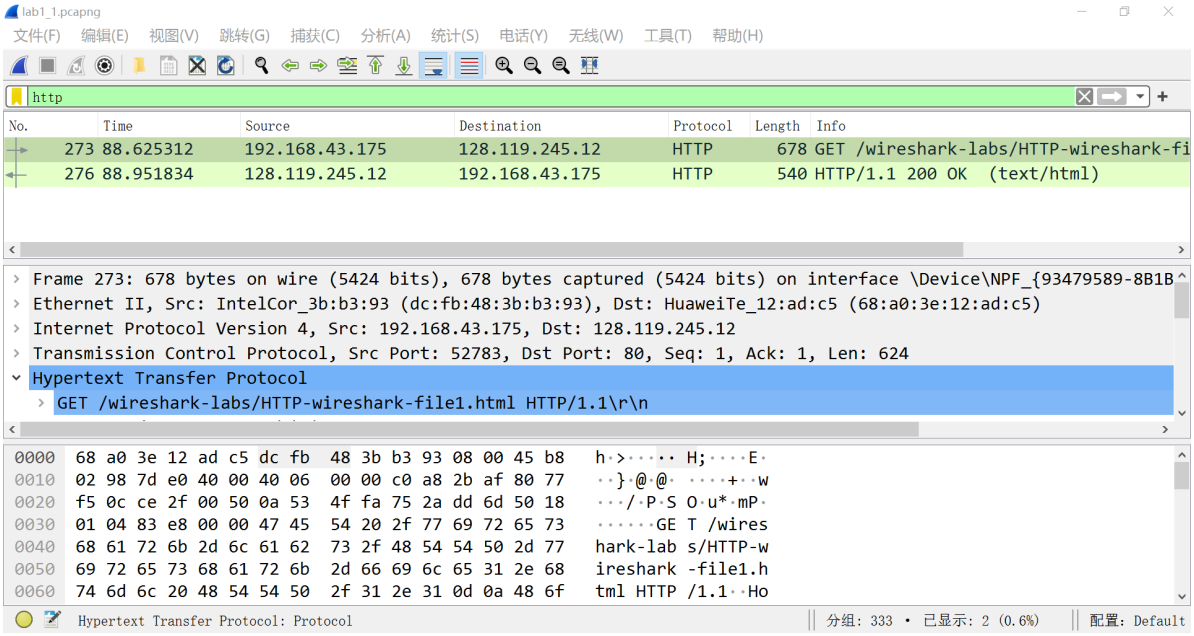
1. 启动Web浏览器
2. 启动 Wireshark 数据包嗅探器,筛选出http消息
3. 等待一分钟后开始抓包
4. 将http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file1.html输入浏览器。

   结果如下图所示:



5. 停止抓包

抓包结束后wireshark界面如下图所示：



打印http的GET消息如下图所示：

```
No.     Time           Source                Destination           Protocol Length Info
    273 88.625312      192.168.43.175        128.119.245.12        HTTP     678    GET /wireshark-labs/HTTP-wireshark-
file1.html HTTP/1.1
Frame 273: 678 bytes on wire (5424 bits), 678 bytes captured (5424 bits) on interface \Device\NPF_{93479589-8B1B-4881-
A81B-0CFD9315526F}, id 0
Ethernet II, Src: IntelCor_3b:b3:93 (dc:fb:48:3b:b3:93), Dst: HuaweiTe_12:ad:c5 (68:a0:3e:12:ad:c5)
Internet Protocol Version 4, Src: 192.168.43.175, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 52783, Dst Port: 80, Seq: 1, Ack: 1, Len: 624
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) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/93.0.4577.82
Safari/537.36 Edg/93.0.961.52\r\n
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,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-CN,zh;q=0.9,en;q=0.8,en-GB;q=0.7,en-US;q=0.6\r\n
    Cache-Control: max-age=0\r\n
    Connection: keep-alive\r\n
    If-Modified-Since: Mon, 20 Sep 2021 05:30:01 GMT\r\n
    If-None-Match: "80-5cc6692999a7f"\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: 276]
```

打印http的OK消息如下图所示：

```
No.     Time           Source                Destination           Protocol Length Info
    276 88.951834      128.119.245.12        192.168.43.175        HTTP     540    HTTP/1.1 200 OK  (text/html)
Frame 276: 540 bytes on wire (4320 bits), 540 bytes captured (4320 bits) on interface \Device\NPF_{93479589-8B1B-4881-
A81B-0CFD9315526F}, id 0
Ethernet II, Src: HuaweiTe_12:ad:c5 (68:a0:3e:12:ad:c5), Dst: IntelCor_3b:b3:93 (dc:fb:48:3b:b3:93)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.43.175
Transmission Control Protocol, Src Port: 80, Dst Port: 52783, Seq: 1, Ack: 625, Len: 486
Hypertext Transfer Protocol
    HTTP/1.1 200 OK\r\n
    Date: Mon, 20 Sep 2021 05:33:24 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.23 mod_perl/2.0.11 Perl/v5.16.3\r\n
    Last-Modified: Mon, 20 Sep 2021 05:33:01 GMT\r\n
    ETag: "80-5cc669d533549"\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: 0.326522000 seconds]
    [Request in frame: 273]
    [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)
```

通过查看GET与OK消息，回答如下问题：

1. 您的浏览器是否运行HTTP版本1.0或1.1？服务器运行什么版本的HTTP？

   答：如图一红色横线部分所示，浏览器运行HTTP版本为1.1；

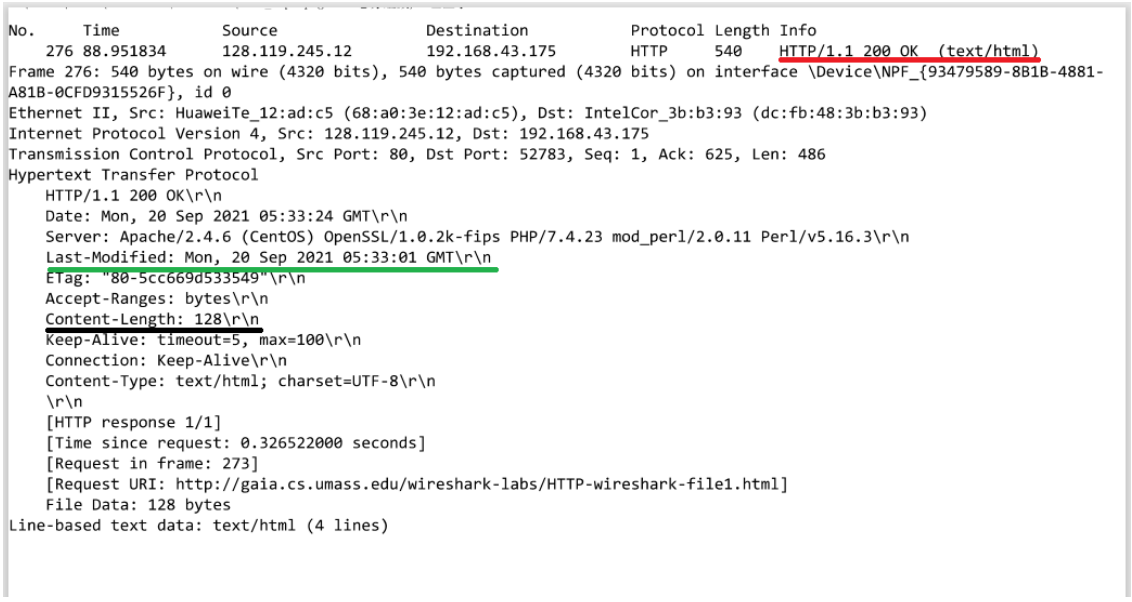
   如图二红色横线部分所示，服务器运行HTTP版本为1.1。

```
No.     Time           Source                Destination           Protocol Length Info
    273 88.625312      192.168.43.175        128.119.245.12        HTTP     678    GET /wireshark-labs/HTTP-wireshark-
file1.html HTTP/1.1
Frame 273: 678 bytes on wire (5424 bits), 678 bytes captured (5424 bits) on interface \Device\NPF_{93479589-8B1B-4881-
A81B-0CFD9315526F}, id 0
Ethernet II, Src: IntelCor_3b:b3:93 (dc:fb:48:3b:b3:93), Dst: HuaweiTe_12:ad:c5 (68:a0:3e:12:ad:c5)
Internet Protocol Version 4, Src: 192.168.43.175, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 52783, Dst Port: 80, Seq: 1, Ack: 1, Len: 624
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) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/93.0.4577.82
Safari/537.36 Edg/93.0.961.52\r\n
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,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-CN,zh;q=0.9,en;q=0.8,en-GB;q=0.7,en-US;q=0.6\r\n
    Cache-Control: max-age=0\r\n
    Connection: keep-alive\r\n
    If-Modified-Since: Mon, 20 Sep 2021 05:30:01 GMT\r\n
    If-None-Match: "80-5cc6692999a7f"\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: 276]
```

图一

2. 您的浏览器向服务器指示了它能接受哪种语言（如果有的话）？

   答：如图一蓝色横线部分所示，服务器可接受简体中文（zh-CN）,中文（zh）,美式英语（en-US）,英式英语（en-GB）,英语（en）。



```
No.     Time           Source                Destination           Protocol Length Info
    276 88.951834      128.119.245.12        192.168.43.175        HTTP     540    HTTP/1.1 200 OK  (text/html)
Frame 276: 540 bytes on wire (4320 bits), 540 bytes captured (4320 bits) on interface \Device\NPF_{93479589-8B1B-4881-
A81B-0CFD9315526F}, id 0
Ethernet II, Src: HuaweiTe_12:ad:c5 (68:a0:3e:12:ad:c5), Dst: IntelCor_3b:b3:93 (dc:fb:48:3b:b3:93)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.43.175
Transmission Control Protocol, Src Port: 80, Dst Port: 52783, Seq: 1, Ack: 625, Len: 486
Hypertext Transfer Protocol
    HTTP/1.1 200 OK\r\n
    Date: Mon, 20 Sep 2021 05:33:24 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.23 mod_perl/2.0.11 Perl/v5.16.3\r\n
    Last-Modified: Mon, 20 Sep 2021 05:33:01 GMT\r\n
    ETag: "80-5cc669d533549"\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: 0.326522000 seconds]
    [Request in frame: 273]
    [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)
```

图二

3. 您的计算机的IP地址是什么？ http://gaia.cs.umass.edu服务器地址呢?

   答：如图一绿色横线部分所示，计算机IP地址为192.168.43.175；如图一黑色横线部分所示，http://gaia.cs.umass.edu服务器地址为128.119.245.12。

4. 服务器返回到浏览器的状态代码是什么?

   答：如图二红色横线部分所示，状态代码为200。

5. 服务器上HTML文件的最近一次修改是什么时候?

   答：如图二绿色横线部分所示，上一次修改GMT时间为2021年9月20日5：33：01、周一，换算为北京时间为2021年9月20日13：33：01、周日。

6. 服务器返回多少字节的内容到您的浏览器?

   答：如图二黑色横线部分所示，服务器返回128个字节到浏览器。

7. 通过检查分组内容窗口中的原始数据，你是否看到有协议头在分组列表窗口中未显示？ 如果是，请举一个例子。

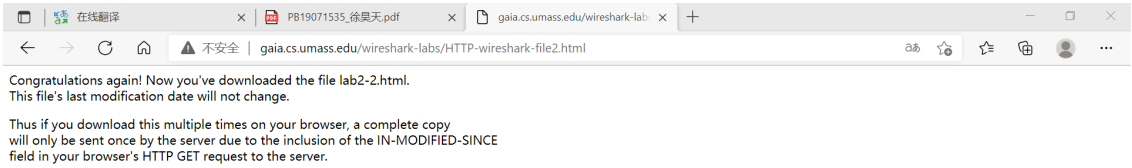
答：否。

2.HTTP的条件Get/response交互

大多数Web浏览器使用对象缓存，从而在检索HTTP对象时执行条件GET。执行以下步骤之前，应确保浏览器的缓存为空。

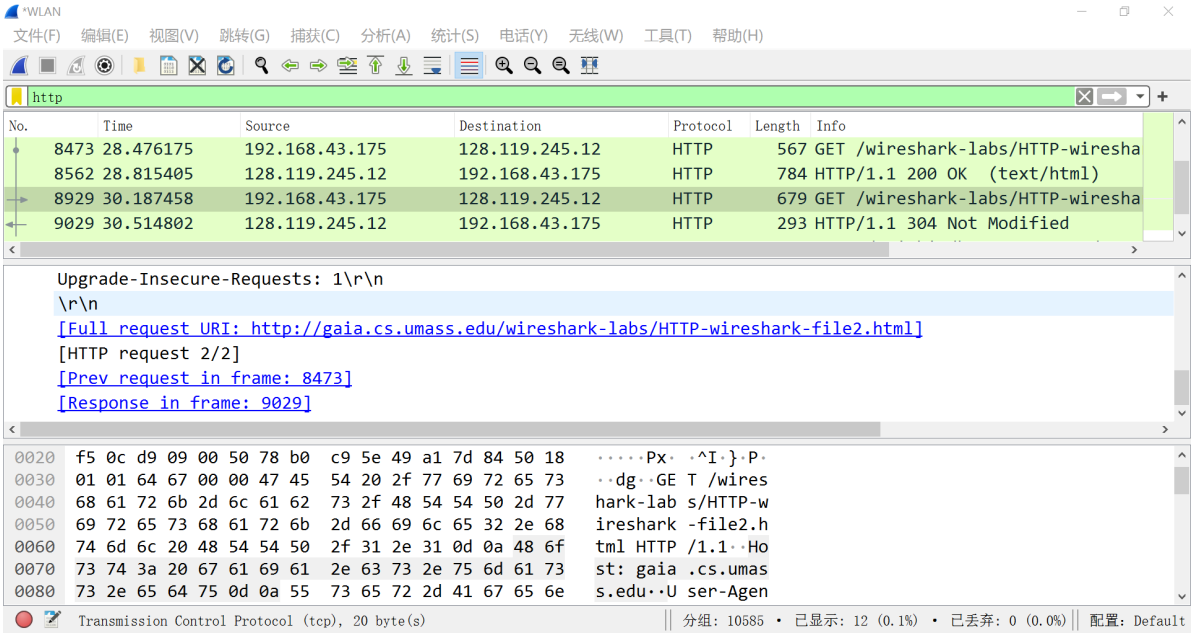
1. 启动浏览器，并将浏览器的缓存清除。
2. 启动Wireshark分组嗅探器。
3. 在浏览器中输入以下 URL http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file2.html。
4. 再次快速地将相同的URL输入到浏览器中。

   得到界面如下图所示：



5. 停止Wireshark分组捕获，并在display-filter-specification窗口中输入“http”，以便只捕获HTTP消息，并在分组列表窗口中显示。

抓包结束后Wireshark界面如下图所示:



回答下列问题：

8. 检查第一个从您浏览器到服务器的HTTP GET请求的内容。您在HTTP GET中看到了“IF-MODIFIED-SINCE”首部字段吗？

   答：根据图三所示，未看见该首部字段。

```
No.     Time           Source                Destination           Protocol Length Info
   8473 28.476175      192.168.43.175        128.119.245.12        HTTP     567    GET /wireshark-labs/HTTP-wireshark-
file2.html HTTP/1.1
Frame 8473: 567 bytes on wire (4536 bits), 567 bytes captured (4536 bits) on interface \Device\NPF_{93479589-8B1B-4881-
A81B-0CFD9315526F}, id 0
Ethernet II, Src: IntelCor_3b:b3:93 (dc:fb:48:3b:b3:93), Dst: HuaweiTe_12:ad:c5 (68:a0:3e:12:ad:c5)
Internet Protocol Version 4, Src: 192.168.43.175, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 55561, Dst Port: 80, Seq: 1, Ack: 1, Len: 513
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) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/93.0.4577.82
Safari/537.36 Edg/93.0.961.52\r\n
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,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-CN,zh;q=0.9,en;q=0.8,en-GB;q=0.7,en-US;q=0.6\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 1/2]
    [Response in frame: 8562]
    [Next request in frame: 8929]
```

图三：第一个GET消息

9. 检查服务器响应的内容。服务器是否显式返回文件的内容？ 你是怎么知道的？

   答：是显式返回文件的内容。如图四绿色框所示，File Data部分即包含了返回文件的内容。

```
No.     Time           Source                Destination           Protocol Length Info
   8562 28.815405      128.119.245.12        192.168.43.175        HTTP     784    HTTP/1.1 200 OK  (text/html)
Frame 8562: 784 bytes on wire (6272 bits), 784 bytes captured (6272 bits) on interface \Device\NPF_{93479589-8B1B-4881-
A81B-0CFD9315526F}, id 0
Ethernet II, Src: HuaweiTe_12:ad:c5 (68:a0:3e:12:ad:c5), Dst: IntelCor_3b:b3:93 (dc:fb:48:3b:b3:93)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.43.175
Transmission Control Protocol, Src Port: 80, Dst Port: 55561, Seq: 1, Ack: 514, Len: 730
Hypertext Transfer Protocol
    HTTP/1.1 200 OK\r\n
    Date: Mon, 20 Sep 2021 06:47:04 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.23 mod_perl/2.0.11 Perl/v5.16.3\r\n
    Last-Modified: Mon, 20 Sep 2021 05:59:01 GMT\r\n
    ETag: "173-5cc66fa498f89"\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: 0.339230000 seconds]
    [Request in frame: 8473]
    [Next request in frame: 8929]
    [Next response in frame: 9029]
    [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)
```

图四：第一个OK消息

10. 现在，检查第二个HTTP GET请求的内容。 您在HTTP GET中看到了“IF-MODIFIED-SINCE”首部字段吗？ 如果是，“IF-MODIFIED-SINCE”首部字段包含哪些信息？

    答：是。如图五蓝色框所示，“IF-MODIFIED-SINCE”首部字段包含信息为：

    Mon,20 Sep 2021 05:59:01 GMT\r\n

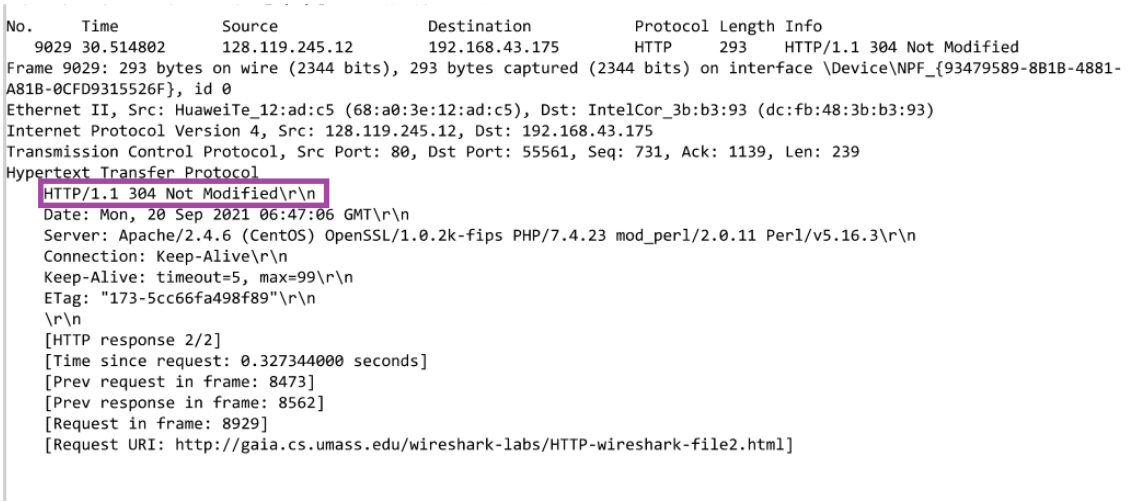
图五：第二个GET消息

11. 针对第二个HTTP GET，从服务器响应的HTTP状态码和短语是什么？服务器是否明确地返回文件的内容？请解释。

    答：如图六紫色框内所示，HTTP的状态码和短语为：

    HTTP/1.1 304 Not Modified\r\n

    服务器未明确地返回文件的内容。因为请求的服务器中的对象并没有被修改，为缩短响应时间，故未明确返回文件内容。

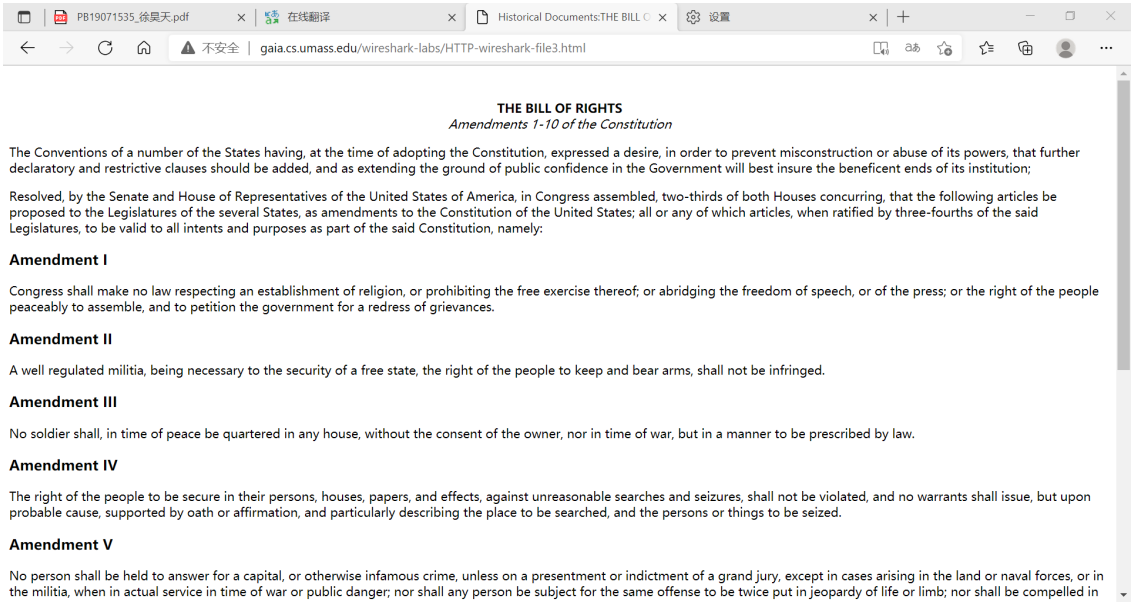


图六：第二个OK消息

3.检索长文件

1. 启动您的浏览器，并清楚浏览器缓存。
2. 启动Wireshark分组嗅探器。
3. 在浏览器中输入以下 URL http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file3.html
   。

   得到界面如下图所示：



THE BILL OF RIGHTS

Amendments 1-10 of the Constitution

The Conventions of a number of the States having, at the time of adopting the Constitution, expressed a desire, in order to prevent misconstruction or abuse of its powers, that further declaratory and restrictive clauses should be added, and as extending the ground of public confidence in the Government will best insure the beneficent ends of its institution;

Resolved, by the Senate and House of Representatives of the United States of America, in Congress assembled, two-thirds of both Houses concurring, that the following articles be proposed to the Legislatures of the several States, as amendments to the Constitution of the United States; all or any of which articles, when ratified by three-fourths of the said Legislatures, to be valid to all intents and purposes as part of the said Constitution, namely:

Amendment I

Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the government for a redress of grievances.

Amendment II

A well regulated militia, being necessary to the security of a free state, the right of the people to keep and bear arms, shall not be infringed.

Amendment III

No soldier shall, in time of peace be quartered in any house, without the consent of the owner, nor in time of war, but in a manner to be prescribed by law.

Amendment IV

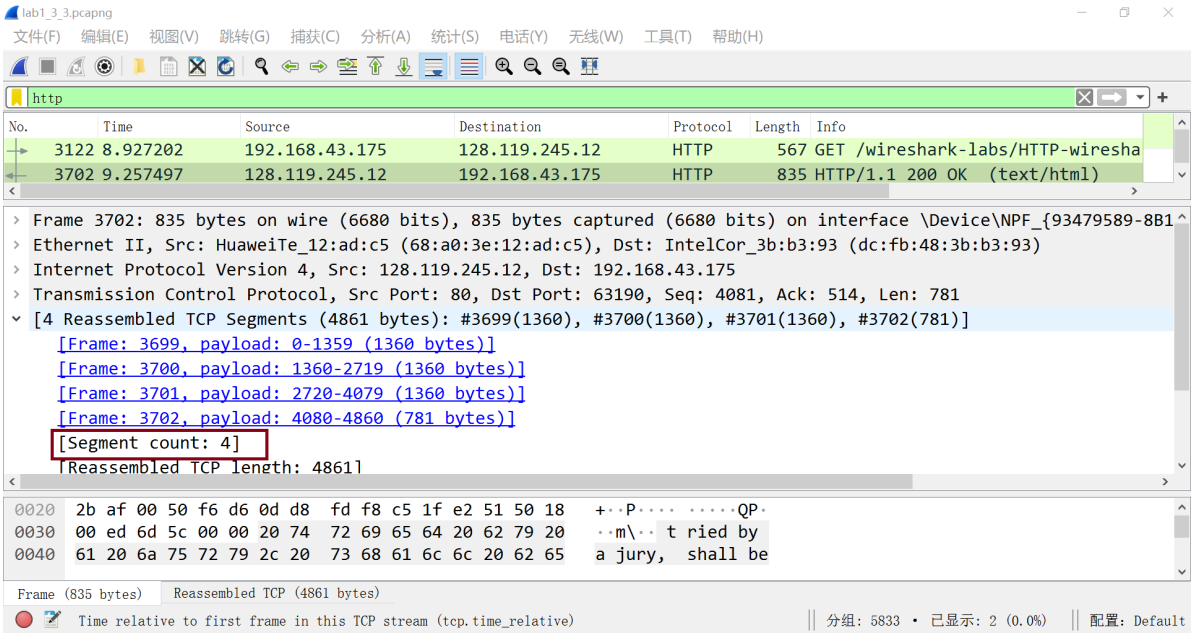
The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no warrants shall issue, but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

Amendment V

No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a grand jury, except in cases arising in the land or naval forces, or in the militia, when in actual service in time of war or public danger; nor shall any person be subject for the same offense to be twice put in jeopardy of life or limb; nor shall be compelled in

4. 停止Wireshark分组捕获，并在display-filter-specification窗口中输入“http”，以便只显示捕获的HTTP报文。

抓包结束后wireshark界面如下图所示：



回答下列问题：

12. 您的浏览器发送多少HTTP GET请求报文？哪个分组包含了美国权利法案的消息？

    答：发送了一个HTTP GET报文；四个分组都包含了美国权利法案的消息：3699,3700,3701,3702。

13. 哪个分组包含响应HTTP GET请求的状态码和短语？

    答：第一个分组。

14. 响应中的状态码和短语是什么？

    答：状态码和短语分别为：200，OK。

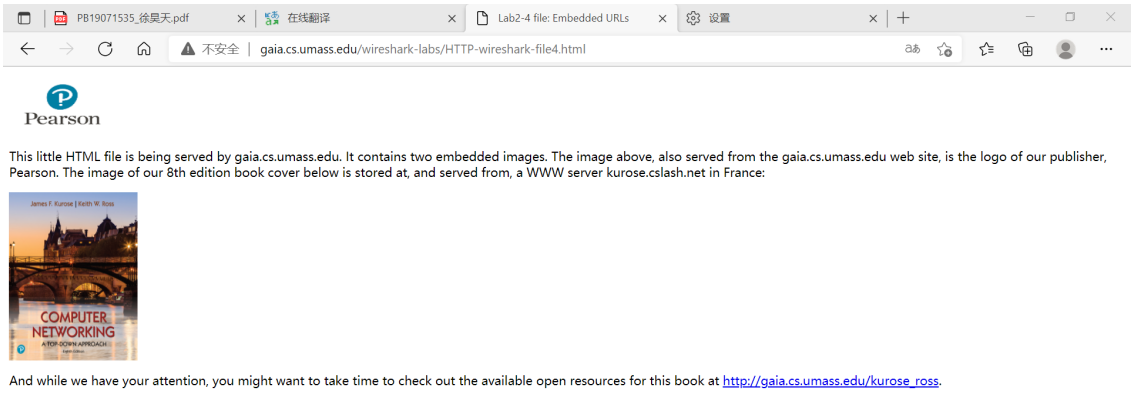
15. 需要多少包含数据的TCP报文段来执行单个HTTP响应和权利法案文本？

    答：如上图红色框所示，需要四个数据包。

4.具有嵌入对象的HTML文档

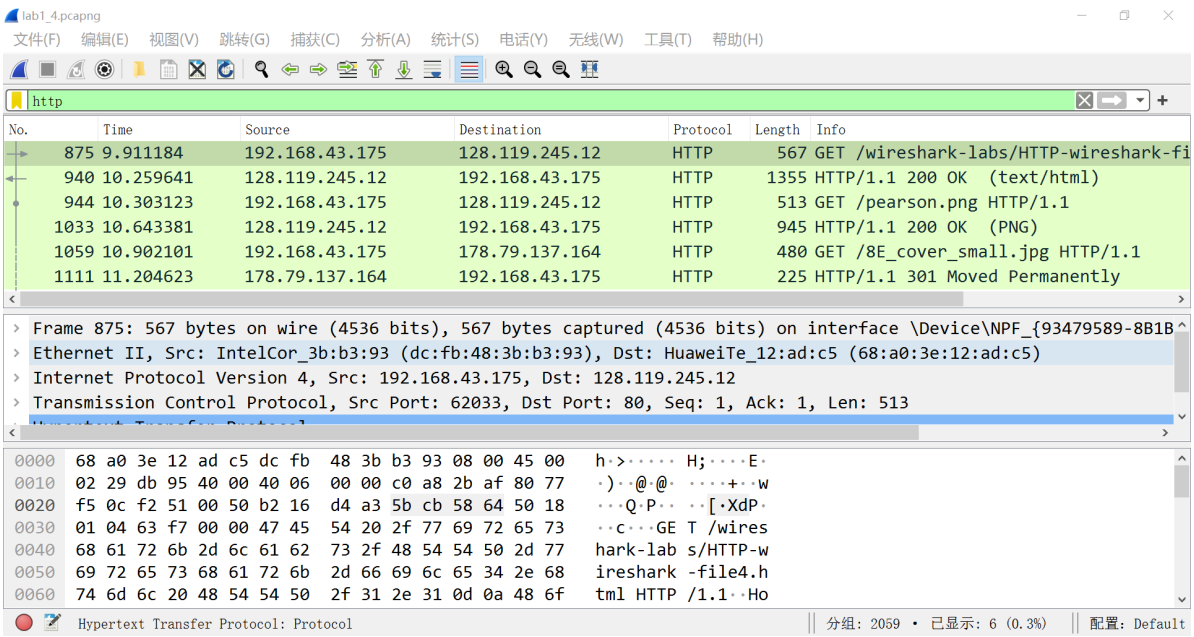
1. 启动浏览器。
2. 启动Wireshark数据包嗅探器。
3. 在浏览器中输入以下 URL http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file4.html。

   得到界面如下图所示：



4. 停止Wireshark数据包捕获，并在display-filter-specification窗口中输入“http”，以便只显示捕获的HTTP消息。

抓包结束后得到wireshark界面如下图所示：



回答下列问题：

16. 您的浏览器发送了几个HTTP GET请求报文？ 这些GET请求发送到哪个IP地址？

    答：三个请求报文。前两个GET请求发送到IP地址128.119.245.12，最后一个GET请求发送到IP地址178.79.137.164。

17. 浏览器从两个网站串行还是并行下载了两张图片？请说明。

答：串行下载。

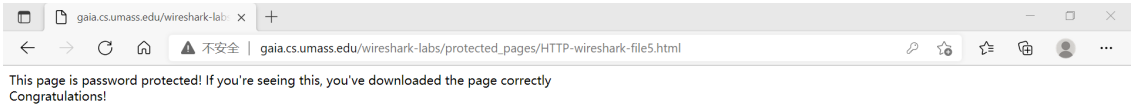
原因：第一张图于10.64秒左右响应，第二张图于10.90秒左右发送请求，两者请求时间并无重叠，故该两张图片为串行下载。

5.HTTP认证

尝试访问受密码保护的网站，并检查网站的HTTP消息交换的序列。

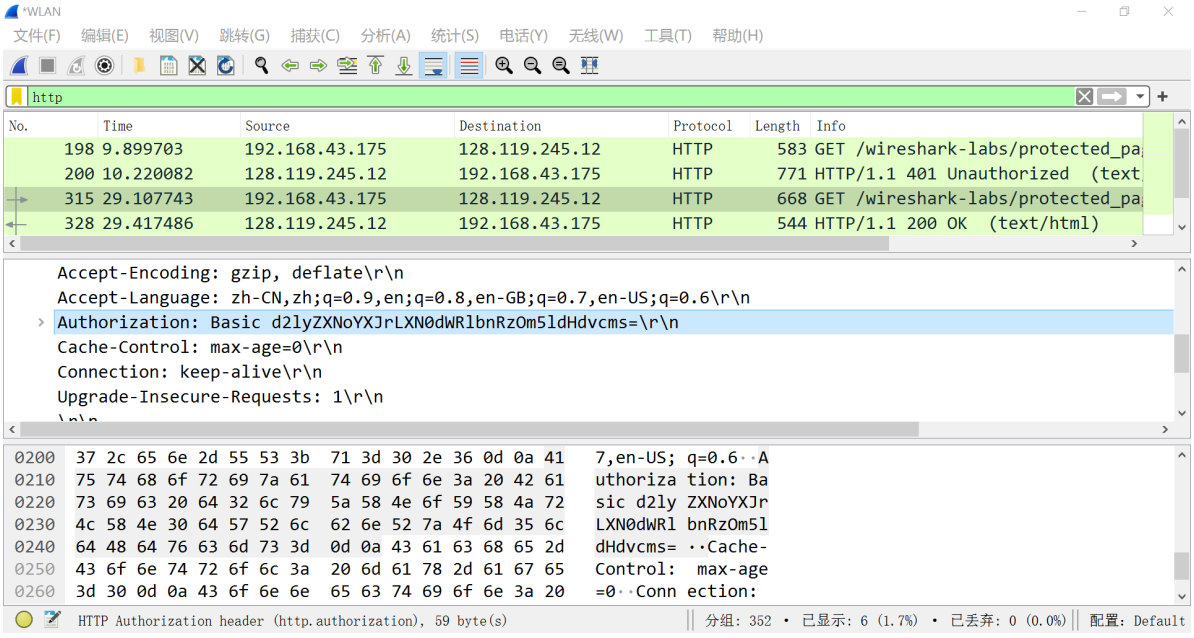
1. 将浏览器的缓存清除，关闭浏览器后再启动浏览器。
2. 启动Wireshark分组嗅探器。
3. 将以下 URL 输入浏览器 http://gaia.cs.umass.edu/wireshark-labs/protected_pages/HTTP-wiresharkfile5.html。

   得到界面如下图所示：



4. 停止Wireshark分组捕获，并在display-filter-specification窗口中输入“http”，以便只显示捕获的HTTP消息。

抓包结束后wireshark界面如下图所示：



回答下列问题：

18. 对于您的浏览器的初始HTTP GET消息，服务器响应（状态码和短语）是什么响应?

    答：如上图所示，服务器响应为：HTTP/1.1 401 Unauthorized\r\n

19. 当您的浏览器第二次发送HTTP GET消息时，HTTP GET消息中包含哪些新字段?

    答：通过对比以下两次GET消息，可得第二次GET消息包含如下新字段：

    Authorization:Basic d2lyZXNoYXJrLXN0dWRlbnRzOm5ldHdvcms=\r\n

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

```
No.     Time           Source                Destination           Protocol Length Info
    198 9.899703       192.168.43.175        128.119.245.12        HTTP     583    GET /wireshark-labs/protected_pages/
HTTP-wireshark-file5.html HTTP/1.1
Frame 198: 583 bytes on wire (4664 bits), 583 bytes captured (4664 bits) on interface \Device\NPF_{93479589-8B1B-4881-
A81B-0CFD9315526F}, id 0
Ethernet II, Src: IntelCor_3b:b3:93 (dc:fb:48:3b:b3:93), Dst: HuaweiTe_12:ad:c5 (68:a0:3e:12:ad:c5)
Internet Protocol Version 4, Src: 192.168.43.175, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 55306, Dst Port: 80, Seq: 1, Ack: 1, Len: 529
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 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/93.0.4577.82
Safari/537.36 Edg/93.0.961.52\r\n
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,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-CN,zh;q=0.9,en;q=0.8,en-GB;q=0.7,en-US;q=0.6\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/protected_pages/HTTP-wireshark-file5.html]
    [HTTP request 1/1]
    [Response in frame: 200]
```

图七：第一次GET消息

```
No.     Time           Source                Destination           Protocol Length Info
    315 29.107743      192.168.43.175        128.119.245.12        HTTP     668    GET /wireshark-labs/protected_pages/
HTTP-wireshark-file5.html HTTP/1.1
Frame 315: 668 bytes on wire (5344 bits), 668 bytes captured (5344 bits) on interface \Device\NPF_{93479589-8B1B-4881-
A81B-0CFD9315526F}, id 0
Ethernet II, Src: IntelCor_3b:b3:93 (dc:fb:48:3b:b3:93), Dst: HuaweiTe_12:ad:c5 (68:a0:3e:12:ad:c5)
Internet Protocol Version 4, Src: 192.168.43.175, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 53857, Dst Port: 80, Seq: 1, Ack: 1, Len: 614
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 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/93.0.4577.82
Safari/537.36 Edg/93.0.961.52\r\n
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,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-CN,zh;q=0.9,en;q=0.8,en-GB;q=0.7,en-US;q=0.6\r\n
    Authorization: Basic d2lyZXNoYXJrLXN0dWRlbnRzOm5ldHdvcms=\r\n
    Cache-Control: max-age=0\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/protected_pages/HTTP-wireshark-file5.html]
    [HTTP request 1/2]
    [Response in frame: 328]
    [Next request in frame: 330]
```

图八：第二次GET消息

四.实验感想与收获

- 深入探索和理解了HTTP协议，了解了其许多方面的工作原理。
- 加深了对wireshark使用的了解，通过读取HTTP报文，查看请求报文和响应报文的信息，了解了HTTP协议多方面的性质。