# 实验内容和实验步骤描述

## 实验任务

**深入理解典型的应用层协议——HTTP和SMTP的要点。**

## 实验内容

**1. 使用Wireshark软件捕获HTTP消息，分析其消息头，理解HTTP的通信原理；**

**2. 使用Wireshark软件捕获一次从客户端发送Email的过程，分析SMTP消息，理解Email系统中发送邮件的通信原理；**

**3. 使用Telnet软件访问Email服务器，输入SMTP命令与Email服务器交互，理解SMTP的通信过程和Base64编码的概念。**

## 实验环境

**一台装有MS Windows系列操作系统、Linux或Mac操作系统的计算机，能够连接到因特网，并安装Wireshark软件。**

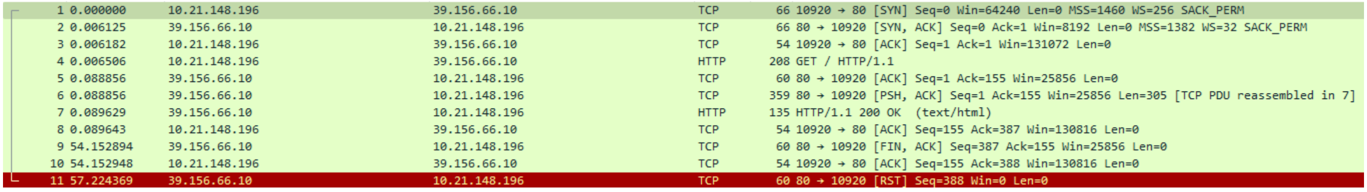
## 实验步骤

**安装Wireshark并运行**

**设置过滤器为`tcp port 80`，开始捕捉，在浏览器中输入`www.xinhuanet.com`**

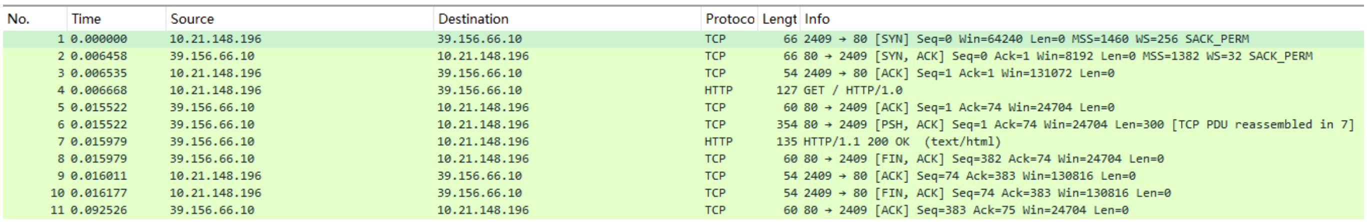
**发现有两台服务器响应，一台有完整tcp三次握手，另一台直接进行http传输，可能是使用了cdn，故尝试使用curl访问其他网站以获得更加易于分析的响应**

**在powershell中输入`curl baidu.com`，查看捕捉结果，设置过滤器为`ip.addr == 39.156.66.10`，获得了完整的tcp三次握手与http协议响应，但未得到完整的四次挥手**



| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 0.000000 | 10.21.148.196 | 39.156.66.10 | TCP | 66 | 10920 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM |
| 2 | 0.006125 | 39.156.66.10 | 10.21.148.196 | TCP | 66 | 80 → 10920 [SYN, ACK] Seq=0 Ack=1 Win=8192 Len=0 MSS=1382 WS=32 SACK_PERM |
| 3 | 0.006182 | 10.21.148.196 | 39.156.66.10 | TCP | 54 | 10920 → 80 [ACK] Seq=1 Ack=1 Win=131072 Len=0 |
| 4 | 0.006506 | 10.21.148.196 | 39.156.66.10 | HTTP | 208 | GET / HTTP/1.1 |
| 5 | 0.088856 | 39.156.66.10 | 10.21.148.196 | TCP | 60 | 80 → 10920 [ACK] Seq=1 Ack=155 Win=25856 Len=0 |
| 6 | 0.088856 | 39.156.66.10 | 10.21.148.196 | TCP | 359 | 80 → 10920 [PSH, ACK] Seq=1 Ack=155 Win=25856 Len=305 [TCP PDU reassembled in 7] |
| 7 | 0.089629 | 39.156.66.10 | 10.21.148.196 | HTTP | 135 | HTTP/1.1 200 OK  (text/html) |
| 8 | 0.089643 | 10.21.148.196 | 39.156.66.10 | TCP | 54 | 10920 → 80 [ACK] Seq=155 Ack=387 Win=130816 Len=0 |
| 9 | 54.152894 | 39.156.66.10 | 10.21.148.196 | TCP | 60 | 80 → 10920 [FIN, ACK] Seq=387 Ack=155 Win=25856 Len=0 |
| 10 | 54.152948 | 10.21.148.196 | 39.156.66.10 | TCP | 54 | 10920 → 80 [ACK] Seq=155 Ack=388 Win=130816 Len=0 |
| 11 | 57.224369 | 39.156.66.10 | 10.21.148.196 | TCP | 60 | 80 → 10920 [RST] Seq=388 Win=0 Len=0 |

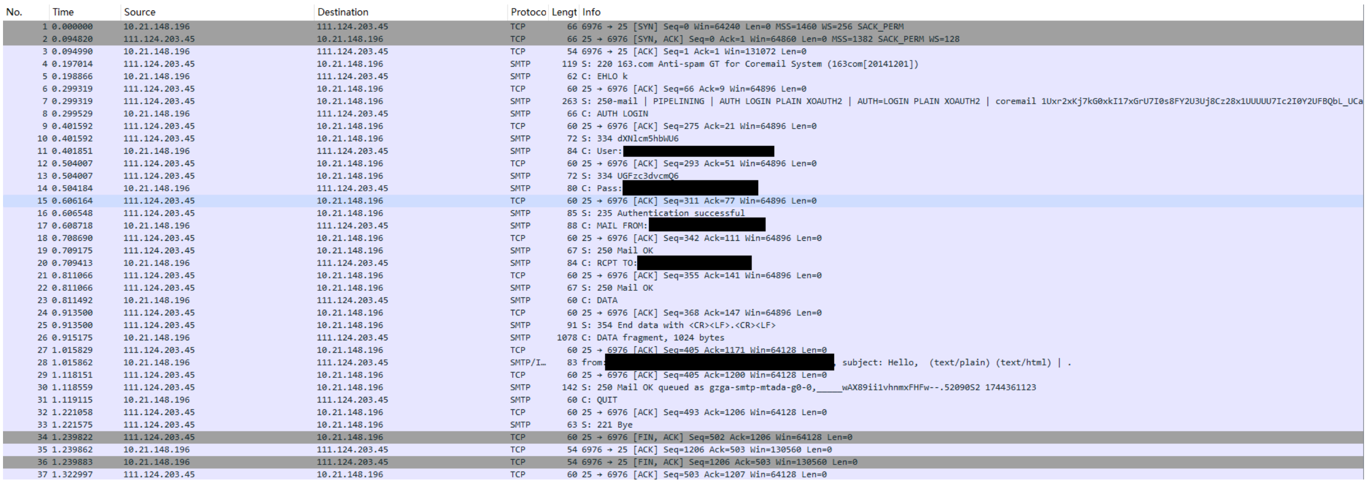
**由于http1.1协议默认使用Keep-Alive，故使用`curl --http1.0 baidu.com`再次捕获，成功得到完整的tcp与http协议响应**



| No. | Time | Source | Destination | Protoco | Lengt | Info |
|---|---|---|---|---|---|---|
| 1 | 0.000000 | 10.21.148.196 | 39.156.66.10 | TCP | 66 | 2409 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM |
| 2 | 0.006458 | 39.156.66.10 | 10.21.148.196 | TCP | 66 | 80 → 2409 [SYN, ACK] Seq=0 Ack=1 Win=8192 Len=0 MSS=1382 WS=32 SACK_PERM |
| 3 | 0.006535 | 10.21.148.196 | 39.156.66.10 | TCP | 54 | 2409 → 80 [ACK] Seq=1 Ack=1 Win=131072 Len=0 |
| 4 | 0.006668 | 10.21.148.196 | 39.156.66.10 | HTTP | 127 | GET / HTTP/1.0 |
| 5 | 0.015522 | 39.156.66.10 | 10.21.148.196 | TCP | 60 | 80 → 2409 [ACK] Seq=1 Ack=74 Win=24704 Len=0 |
| 6 | 0.015522 | 39.156.66.10 | 10.21.148.196 | TCP | 354 | 80 → 2409 [PSH, ACK] Seq=1 Ack=74 Win=24704 Len=300 [TCP PDU reassembled in 7] |
| 7 | 0.015979 | 39.156.66.10 | 10.21.148.196 | HTTP | 135 | HTTP/1.1 200 OK  (text/html) |
| 8 | 0.015979 | 39.156.66.10 | 10.21.148.196 | TCP | 60 | 80 → 2409 [FIN, ACK] Seq=382 Ack=74 Win=24704 Len=0 |
| 9 | 0.016011 | 10.21.148.196 | 39.156.66.10 | TCP | 54 | 2409 → 80 [ACK] Seq=74 Ack=383 Win=130816 Len=0 |
| 10 | 0.016177 | 10.21.148.196 | 39.156.66.10 | TCP | 54 | 2409 → 80 [FIN, ACK] Seq=74 Ack=383 Win=130816 Len=0 |
| 11 | 0.092526 | 39.156.66.10 | 10.21.148.196 | TCP | 60 | 80 → 2409 [ACK] Seq=383 Ack=75 Win=24704 Len=0 |

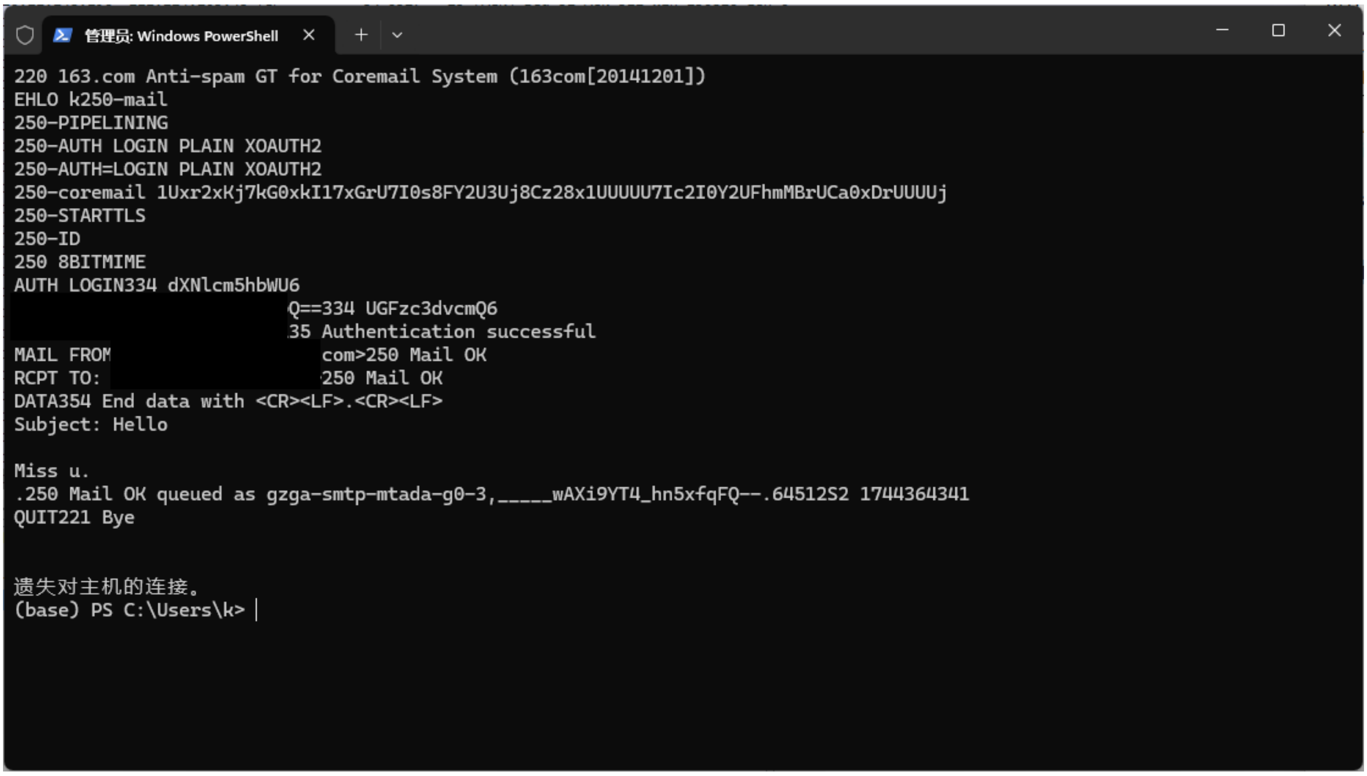
**安装Foxmail，生成邮箱授权码，使用qq邮箱进行发送邮件，出现错误**`S: 530 Login fail. A secure connection is requiered(such as ssl). More information at https://help.mail.qq.com/detail/0/1010`

**故更换使用163邮箱，成功发送并捕获**



| No. | Time | Source | Destination | Protoco | Lengt | Info |
|---|---|---|---|---|---|---|
| 1 | 0.000000 | 10.21.148.196 | 111.124.203.45 | TCP | 66 | 6976 → 25 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM |
| 2 | 0.094820 | 111.124.203.45 | 10.21.148.196 | TCP | 66 | 25 → 6976 [SYN, ACK] Seq=0 Ack=1 Win=64860 Len=0 MSS=1382 SACK_PERM WS=128 |
| 3 | 0.094990 | 10.21.148.196 | 111.124.203.45 | TCP | 54 | 6976 → 25 [ACK] Seq=1 Ack=1 Win=131072 Len=0 |
| 4 | 0.197014 | 111.124.203.45 | 10.21.148.196 | SMTP | 119 | S: 220 163.com Anti-spam GT for Coremail System (163com[20141201]) |
| 5 | 0.198866 | 10.21.148.196 | 111.124.203.45 | SMTP | 62 | C: EHLO k |
| 6 | 0.299319 | 111.124.203.45 | 10.21.148.196 | TCP | 60 | 25 → 6976 [ACK] Seq=66 Ack=9 Win=64896 Len=0 |
| 7 | 0.299319 | 111.124.203.45 | 10.21.148.196 | SMTP | 263 | S: 250-mail \| PIPELINING \| AUTH LOGIN PLAIN XOAUTH2 \| AUTH=LOGIN PLAIN XOAUTH2 \| coremail 1Uxr2xKj7kG0xkI17xGrU7I0s8FY2U3Uj8Cz28x1UUUUU7Ic2I0Y2UFBQbL_UCa |
| 8 | 0.299529 | 10.21.148.196 | 111.124.203.45 | SMTP | 66 | C: AUTH LOGIN |
| 9 | 0.401592 | 111.124.203.45 | 10.21.148.196 | TCP | 60 | 25 → 6976 [ACK] Seq=275 Ack=21 Win=64896 Len=0 |
| 10 | 0.401592 | 111.124.203.45 | 10.21.148.196 | SMTP | 72 | S: 334 dXNlcm5hbWU6 |
| 11 | 0.401851 | 10.21.148.196 | 111.124.203.45 | SMTP | 84 | C: User: [redacted] |
| 12 | 0.504007 | 111.124.203.45 | 10.21.148.196 | TCP | 60 | 25 → 6976 [ACK] Seq=293 Ack=51 Win=64896 Len=0 |
| 13 | 0.504007 | 111.124.203.45 | 10.21.148.196 | SMTP | 72 | S: 334 UGFzc3dvcmQ6 |
| 14 | 0.504184 | 10.21.148.196 | 111.124.203.45 | SMTP | 80 | C: Pass: [redacted] |
| 15 | 0.606164 | 111.124.203.45 | 10.21.148.196 | TCP | 60 | 25 → 6976 [ACK] Seq=311 Ack=77 Win=64896 Len=0 |
| 16 | 0.606548 | 111.124.203.45 | 10.21.148.196 | SMTP | 85 | S: 235 Authentication successful |
| 17 | 0.608718 | 10.21.148.196 | 111.124.203.45 | SMTP | 88 | C: MAIL FROM: [redacted] |
| 18 | 0.708690 | 111.124.203.45 | 10.21.148.196 | TCP | 60 | 25 → 6976 [ACK] Seq=342 Ack=111 Win=64896 Len=0 |
| 19 | 0.709175 | 111.124.203.45 | 10.21.148.196 | SMTP | 67 | S: 250 Mail OK |
| 20 | 0.709413 | 10.21.148.196 | 111.124.203.45 | SMTP | 84 | C: RCPT TO: [redacted] |
| 21 | 0.811066 | 111.124.203.45 | 10.21.148.196 | TCP | 60 | 25 → 6976 [ACK] Seq=355 Ack=141 Win=64896 Len=0 |
| 22 | 0.811066 | 111.124.203.45 | 10.21.148.196 | SMTP | 67 | S: 250 Mail OK |
| 23 | 0.811492 | 10.21.148.196 | 111.124.203.45 | SMTP | 60 | C: DATA |
| 24 | 0.913500 | 111.124.203.45 | 10.21.148.196 | TCP | 60 | 25 → 6976 [ACK] Seq=368 Ack=147 Win=64896 Len=0 |
| 25 | 0.913500 | 111.124.203.45 | 10.21.148.196 | SMTP | 91 | S: 354 End data with <CR><LF>.<CR><LF> |
| 26 | 0.915175 | 10.21.148.196 | 111.124.203.45 | SMTP | 1078 | C: DATA fragment, 1024 bytes |
| 27 | 1.015829 | 111.124.203.45 | 10.21.148.196 | TCP | 60 | 25 → 6976 [ACK] Seq=405 Ack=1171 Win=64128 Len=0 |
| 28 | 1.015862 | 10.21.148.196 | 111.124.203.45 | SMTP/I… | 83 | from: [redacted] subject: Hello,  (text/plain) (text/html) \| . |
| 29 | 1.118151 | 111.124.203.45 | 10.21.148.196 | TCP | 60 | 25 → 6976 [ACK] Seq=405 Ack=1200 Win=64128 Len=0 |
| 30 | 1.118559 | 111.124.203.45 | 10.21.148.196 | SMTP | 142 | S: 250 Mail OK queued as gzga-smtp-mtada-g0-0,_____wAX89ii1vhnmxFHFw--.52090S2 1744361123 |
| 31 | 1.119115 | 10.21.148.196 | 111.124.203.45 | SMTP | 60 | C: QUIT |
| 32 | 1.221058 | 111.124.203.45 | 10.21.148.196 | TCP | 60 | 25 → 6976 [ACK] Seq=493 Ack=1206 Win=64128 Len=0 |
| 33 | 1.221575 | 111.124.203.45 | 10.21.148.196 | SMTP | 63 | S: 221 Bye |
| 34 | 1.239822 | 111.124.203.45 | 10.21.148.196 | TCP | 60 | 25 → 6976 [FIN, ACK] Seq=502 Ack=1206 Win=64128 Len=0 |
| 35 | 1.239862 | 10.21.148.196 | 111.124.203.45 | TCP | 54 | 6976 → 25 [ACK] Seq=1206 Ack=503 Win=130560 Len=0 |
| 36 | 1.239883 | 10.21.148.196 | 111.124.203.45 | TCP | 54 | 6976 → 25 [FIN, ACK] Seq=1206 Ack=503 Win=130560 Len=0 |
| 37 | 1.322997 | 111.124.203.45 | 10.21.148.196 | TCP | 60 | 25 → 6976 [ACK] Seq=503 Ack=1207 Win=64128 Len=0 |

**将捕获的请求保存在临时的文件中，在powershell中输入`telnet smtp.163.com 25`，将对应请求依次输入**



```
220 163.com Anti-spam GT for Coremail System (163com[20141201])
EHLO k250-mail
250-PIPELINING
250-AUTH LOGIN PLAIN XOAUTH2
250-AUTH=LOGIN PLAIN XOAUTH2
250-coremail 1Uxr2xKj7kG0xkI17xGrU7I0s8FY2U3Uj8Cz28x1UUUUU7Ic2I0Y2UFhmMBrUCa0xDrUUUUj
250-STARTTLS
250-ID
250 8BITMIME
AUTH LOGIN334 dXNlcm5hbWU6
[redacted]Q==334 UGFzc3dvcmQ6
          35 Authentication successful
MAIL FROM[redacted]com>250 Mail OK
RCPT TO:           250 Mail OK
DATA354 End data with <CR><LF>.<CR><LF>
Subject: Hello

Miss u.
.250 Mail OK queued as gzga-smtp-mtada-g0-3,_____wAXi9YT4_hn5xfqFQ--.64512S2 1744364341
QUIT221 Bye


遗失对主机的连接。
(base) PS C:\Users\k>
```

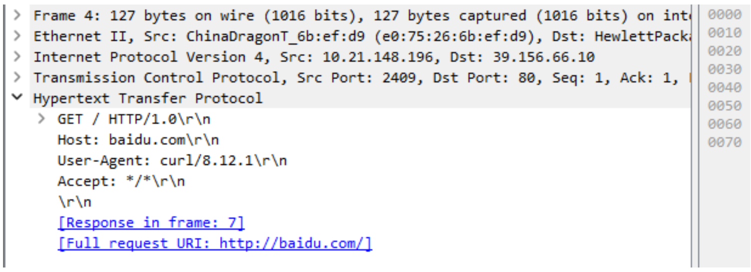
# HTTP协议分析

## 根据捕获到的消息，对照讲义和教材，理解HTTP的功能和通信过程。

## 观察HTTP请求/应答消息的各字段及消息头的内容，自己查找资料理解各消息头的功能，列表总结请求消息和应答消息中各字段及各消息头的功能及现有值的含义。

### 请求

**可知GET请求访问`baidu.com/`使用http1.0协议，用户客户端为curl，接受所有语言的回复，未使用Keep-Alive**



```
> Frame 4: 127 bytes on wire (1016 bits), 127 bytes captured (1016 bits) on int
> Ethernet II, Src: ChinaDragonT_6b:ef:d9 (e0:75:26:6b:ef:d9), Dst: HewlettPack
> Internet Protocol Version 4, Src: 10.21.148.196, Dst: 39.156.66.10
> Transmission Control Protocol, Src Port: 2409, Dst Port: 80, Seq: 1, Ack: 1,
v Hypertext Transfer Protocol
  > GET / HTTP/1.0\r\n
    Host: baidu.com\r\n
    User-Agent: curl/8.12.1\r\n
    Accept: */*\r\n
    \r\n
    [Response in frame: 7]
    [Full request URI: http://baidu.com/]
```

```
0000  10 4f 58 6c 24 00 e0 75  26 6b ef d9 08 00 45 00   ·OXl$··u &k····E·
0010  00 71 b2 7d 40 00 80 06  3f 8a 0a 15 94 c4 27 9c   ·q·}@··· ?·····'·
0020  42 0a 09 69 00 50 d6 3c  91 77 55 ac 46 85 50 18   B··i·P·< ·wU·F·P·
0030  02 00 55 1b 00 00 47 45  54 20 2f 20 48 54 54 50   ··U···GE T / HTTP
0040  2f 31 2e 30 0d 0a 48 6f  73 74 3a 20 62 61 69 64   /1.0··Ho st: baid
0050  75 2e 63 6f 6d 0d 0a 55  73 65 72 2d 41 67 65 6e   u.com··U ser-Agen
0060  74 3a 20 63 75 72 6c 2f  38 2e 31 32 2e 31 0d 0a   t: curl/ 8.12.1··
0070  41 63 63 65 70 74 3a 20  2a 2f 2a 0d 0a 0d 0a      Accept:  */*····
```

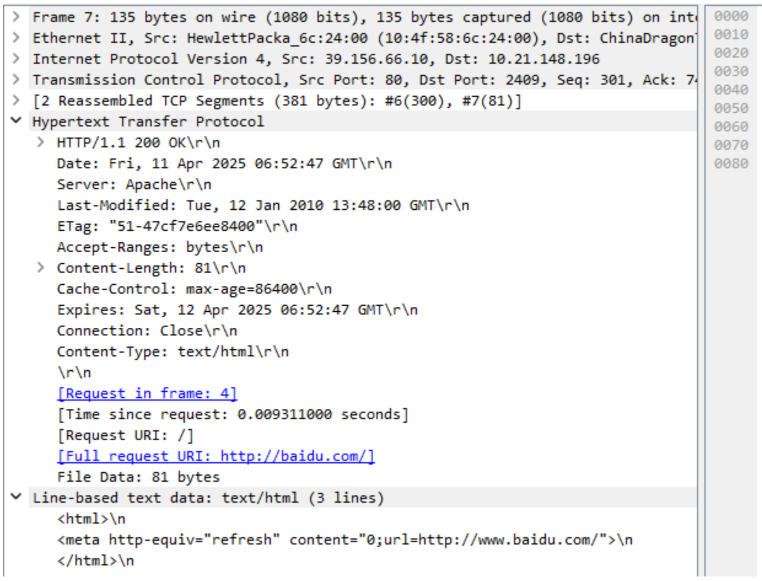
响应

**可知响应使用http1.1协议，状态码200 OK，日期Date，服务器应用程序软件的名称和版本Server为Apache，该页上次修改时间Last-Modified，缓存标识符ETag，对文件下载请求的支持范围Accept-Ranges，消息体的大小Content-Length为81字节，缓存控制指令Cache-Control缓存存储的最大周期为86400s，响应过期时间Expires，连接类型Connection为close即非持久连接，响应资源类型Cootent-Type为text/html**

**响应的html字段为**

```
<html>\n
<meta http-equiv="refresh" content="0;url=http://www.baidu.com/">\n
</html>\n
```

**功能为让浏览器刷新页面，将该网页重新导向至**`www.baidu.com`



```
> Frame 7: 135 bytes on wire (1080 bits), 135 bytes captured (1080 bits) on int
> Ethernet II, Src: HewlettPacka_6c:24:00 (10:4f:58:6c:24:00), Dst: ChinaDragon
> Internet Protocol Version 4, Src: 39.156.66.10, Dst: 10.21.148.196
> Transmission Control Protocol, Src Port: 80, Dst Port: 2409, Seq: 301, Ack: 7
> [2 Reassembled TCP Segments (381 bytes): #6(300), #7(81)]
v Hypertext Transfer Protocol
  > HTTP/1.1 200 OK\r\n
    Date: Fri, 11 Apr 2025 06:52:47 GMT\r\n
    Server: Apache\r\n
    Last-Modified: Tue, 12 Jan 2010 13:48:00 GMT\r\n
    ETag: "51-47cf7e6ee8400"\r\n
    Accept-Ranges: bytes\r\n
  > Content-Length: 81\r\n
    Cache-Control: max-age=86400\r\n
    Expires: Sat, 12 Apr 2025 06:52:47 GMT\r\n
    Connection: Close\r\n
    Content-Type: text/html\r\n
    \r\n
    [Request in frame: 4]
    [Time since request: 0.009311000 seconds]
    [Request URI: /]
    [Full request URI: http://baidu.com/]
    File Data: 81 bytes
v Line-based text data: text/html (3 lines)
    <html>\n
    <meta http-equiv="refresh" content="0;url=http://www.baidu.com/">\n
    </html>\n
```

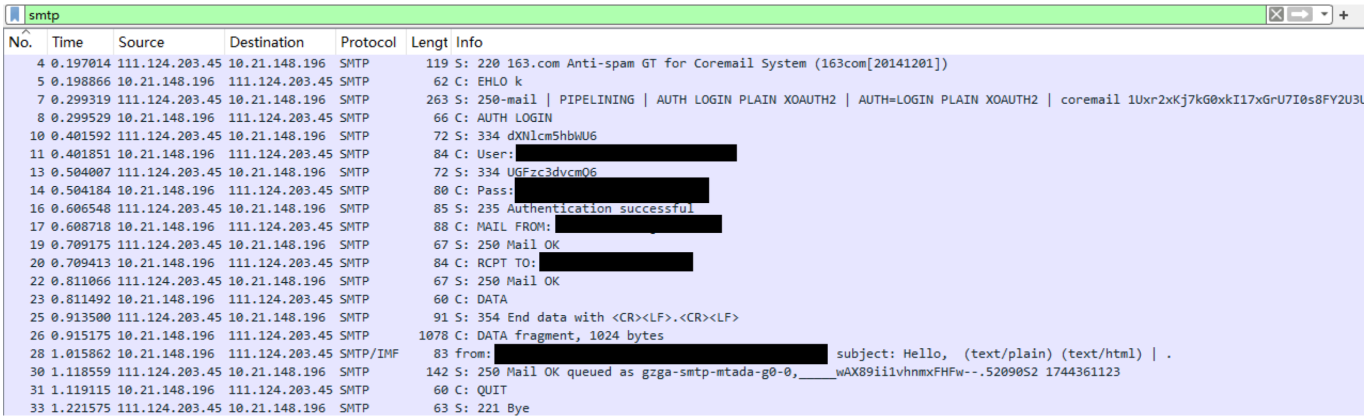
```
0000  e0 75 26 6b ef d9 10 4f  58 6c 24 00 08 00 45 04   ·u&k···O Xl$···E·
0010  00 79 be d6 40 00 28 06  8b 25 27 9c 42 0a 0a 15   ·y··@·(· ·%'·B···
0020  94 c4 00 50 09 69 55 ac  47 b1 d6 3c 91 c0 50 18   ···P·iU· G··<··P·
0030  03 04 92 35 00 00 3c 68  74 6d 6c 3e 0a 3c 6d 65   ···5··<h tml>·<me
0040  74 61 20 68 74 74 70 2d  65 71 75 69 76 3d 22 72   ta http- equiv="r
0050  65 66 72 65 73 68 22 20  63 6f 6e 74 65 6e 74 3d   efresh"  content=
0060  22 30 3b 75 72 6c 3d 68  74 74 70 3a 2f 2f 77 77   "0;url=h ttp://ww
0070  77 2e 62 61 69 64 75 2e  63 6f 6d 2f 22 3e 0a 3c   w.baidu. com/">·<
0080  2f 68 74 6d 6c 3e 0a                               /html>·
```

# SMTP协议分析

## 根据捕获到的消息，对照讲义和教材，理解SMTP的功能和通信过程。

## 观察SMTP命令消息和响应状态码，自己查资料理解命令和状态码的功能，并画出一次完整通信过程所对应的消息序列图。

**设置过滤器为**`smtp`



smtp

| No. | Time | Source | Destination | Protocol | Lengt | Info |
|---|---|---|---|---|---|---|
| 4 | 0.197014 | 111.124.203.45 | 10.21.148.196 | SMTP | 119 | S: 220 163.com Anti-spam GT for Coremail System (163com[20141201]) |
| 5 | 0.198866 | 10.21.148.196 | 111.124.203.45 | SMTP | 62 | C: EHLO k |
| 7 | 0.299319 | 111.124.203.45 | 10.21.148.196 | SMTP | 263 | S: 250-mail \| PIPELINING \| AUTH LOGIN PLAIN XOAUTH2 \| AUTH=LOGIN PLAIN XOAUTH2 \| coremail 1Uxr2xKj7kG0xkI17xGrU7I0s8FY2U3U |
| 8 | 0.299529 | 10.21.148.196 | 111.124.203.45 | SMTP | 66 | C: AUTH LOGIN |
| 10 | 0.401592 | 111.124.203.45 | 10.21.148.196 | SMTP | 72 | S: 334 dXNlcm5hbWU6 |
| 11 | 0.401851 | 10.21.148.196 | 111.124.203.45 | SMTP | 84 | C: User: [redacted] |
| 13 | 0.504007 | 111.124.203.45 | 10.21.148.196 | SMTP | 72 | S: 334 UGFzc3dvcmQ6 |
| 14 | 0.504184 | 10.21.148.196 | 111.124.203.45 | SMTP | 80 | C: Pass: [redacted] |
| 16 | 0.606548 | 111.124.203.45 | 10.21.148.196 | SMTP | 85 | S: 235 Authentication successful |
| 17 | 0.608718 | 10.21.148.196 | 111.124.203.45 | SMTP | 88 | C: MAIL FROM: [redacted] |
| 19 | 0.709175 | 111.124.203.45 | 10.21.148.196 | SMTP | 67 | S: 250 Mail OK |
| 20 | 0.709413 | 10.21.148.196 | 111.124.203.45 | SMTP | 84 | C: RCPT TO: [redacted] |
| 22 | 0.811066 | 111.124.203.45 | 10.21.148.196 | SMTP | 67 | S: 250 Mail OK |
| 23 | 0.811492 | 10.21.148.196 | 111.124.203.45 | SMTP | 60 | C: DATA |
| 25 | 0.913500 | 111.124.203.45 | 10.21.148.196 | SMTP | 91 | S: 354 End data with <CR><LF>.<CR><LF> |
| 26 | 0.915175 | 10.21.148.196 | 111.124.203.45 | SMTP | 1078 | C: DATA fragment, 1024 bytes |
| 28 | 1.015862 | 10.21.148.196 | 111.124.203.45 | SMTP/IMF | 83 | from: [redacted] subject: Hello,  (text/plain) (text/html) \| . |
| 30 | 1.118559 | 111.124.203.45 | 10.21.148.196 | SMTP | 142 | S: 250 Mail OK queued as gzga-smtp-mtada-g0-0,_____wAX89ii1vhnmxFHFw--.52090S2 1744361123 |
| 31 | 1.119115 | 10.21.148.196 | 111.124.203.45 | SMTP | 60 | C: QUIT |
| 33 | 1.221575 | 111.124.203.45 | 10.21.148.196 | SMTP | 63 | S: 221 Bye |

**220为服务就绪，EHLO为成功建立连接后的固定回复，250为采取并完成了请求的操作**

**AUTH LOGIN为申请进行身份认证，334为等待用户输入验证信息**

**User与Pass后均为base64编码后的账号名称与密码（此处为授权码），235为身份验证成功**

**MAIL FROM与RCPT TO为发送者与接收者的邮箱地址**

**DATA为开始发送邮件内容，354为服务器已开始等待邮件内容输入**

**QUIT为关闭会话，221为服务关闭**

## 消息序列图

```
客户端 (Client)                         服务器 (Server)
        |                                      |
        |---------- 1. 建立TCP连接 ------------>|
        |                                      |
        |<------- 2. 返回欢迎消息 (220) --------|
        |                                      |
        |---------- 3. 发送 HELO/EHLO --------->|
        |                                      |
        |<------- 4. 确认 HELO/EHLO (250) ------|
        |                                      |
        |---------- 5. 发送 MAIL FROM --------->|
        |                                      |
        |<------- 6. 确认 MAIL FROM (250) ------|
        |                                      |
        |---------- 7. 发送 RCPT TO ----------->|
        |                                      |
        |<------- 8. 确认 RCPT TO (250) --------|
        |                                      |
        |---------- 9. 发送 DATA -------------->|
        |                                      |
        |<------- 10. 准备接收数据 (354) -------|
        |                                      |
        |---------- 11. 发送邮件内容 ---------->|
        |                                      |
        |---------- 12. 发送结束标志 (.) ----->|
        |                                       |
        |<------- 13. 确认邮件发送 （250） -------|
        |                                       |
        |---------- 14. 发送 QUIT ------------->|
        |                                       |
        |<------- 15. 确认断开连接 （221） -------|
        |                                       |
        |---------- 16. 关闭TCP连接 ----------->|
```

# 实验结论和实验心得

**要善用搜索引擎**