

### Exercise 3

1. The status code is 200 and the phrase returned from the server to the client browser is "OK"
2. Last-modified: Tuesday 23 September 2003 05:29:00 GMT  
The response also does contain a DATE header: Tuesday 23 September 2003 05:29:50 GMT.  
Date is the time when the request is made, whereas last-modified is when the requested object was last modified.
3. The connection established between the browser and the server is persistent as shown by the Keep-Alive connection field status in both the HTTP request and response headers.
4. 73 bytes of content have been returned to the client.
5. The data contained inside the HTTP response packet is text/html.

### Exercise 4

1. There is no "IF-MODIFIED-SINCE" line in the first HTTP GET request.
2. The response does indicate the last time that the requested file was modified, which was on Tuesday, 23 September 2003 5:35:00 GMT.
3. There is an "IF-MODIFIED-SINCE" line in the second HTTP get request, which was on Tuesday, 23 September 2003 5:35:00 GMT. There is also an "IF-NONE-MATCH" line.

```
▼ Hypertext Transfer Protocol
▶ GET /ethereal-labs/lab2-2.html HTTP/1.1\r\n
Host: gaia.cs.umass.edu\r\n
User-Agent: Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.0.2) Gecko/20021120 Netscape/7.01\r\n
Accept: text/xml,application/xml,application/xhtml+xml,text/html;q=0.9,text/plain;q=0.8,video/x-mng,image/png,image,
Accept-Language: en-us, en;q=0.50\r\n
Accept-Encoding: gzip, deflate, compress;q=0.9\r\n
Accept-Charset: ISO-8859-1, utf-8;q=0.66, *;q=0.66\r\n
Keep-Alive: 300\r\n
Connection: keep-alive\r\n
If-Modified-Since: Tue, 23 Sep 2003 05:35:00 GMT\r\n
If-None-Match: "1bfef-173-8f4ae900"\r\n
Cache-Control: max-age=0\r\n
\r\n
[Full request URI: http://gaia.cs.umass.edu/ethereal-labs/lab2-2.html]
[HTTP request 2/2]
[Prev request in frame: 8]
[Response in frame: 15]
```

4. The status code is 304 and the phrase is "Not Modified". The server did not explicitly return the contents of the file because it will only do so if the file has been last modified after a given date. Since the file has not been modified, the server only returns a 304 status to reduce traffic intensity and increase efficiency.
5. The value of the Etag field in the second response message is highlighted in the screenshot below.

No.	Time	Source	Destination	Protocol	Length	Info
8	2.331268	192.168.1.102	128.119.245.12	HTTP	555	GET /etherreal-labs/lab2-2.html HTTP/1.1
10	2.357902	128.119.245.12	192.168.1.102	HTTP	739	HTTP/1.1 200 OK (text/html)
14	5.517390	192.168.1.102	128.119.245.12	HTTP	668	GET /etherreal-labs/lab2-2.html HTTP/1.1
15	5.540216	128.119.245.12	192.168.1.102	HTTP	243	HTTP/1.1 304 Not Modified

```

▶ Frame 15: 243 bytes on wire (1944 bits), 243 bytes captured (1944 bits)
▶ Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: Dell_4f:36:23 (00:08:74:4f:36:23)
▶ Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.1.102
▶ Transmission Control Protocol, Src Port: 80, Dst Port: 4247, Seq: 686, Ack: 1116, Len: 189
▼ Hypertext Transfer Protocol
  ▶ HTTP/1.1 304 Not Modified\r\n
    Date: Tue, 23 Sep 2003 05:35:53 GMT\r\n
    Server: Apache/2.0.40 (Red Hat Linux)\r\n
    Connection: Keep-Alive\r\n
    Keep-Alive: timeout=10, max=99\r\n
    ETag: "1bfef-173-8f4ae900"\r\n

```

The value of the Etag field in the first response message is highlighted in the screenshot below.

No.	Time	Source	Destination	Protocol	Length	Info
8	2.331268	192.168.1.102	128.119.245.12	HTTP	555	GET /etherreal-labs/lab2-2.html HTTP/1.1
10	2.357902	128.119.245.12	192.168.1.102	HTTP	739	HTTP/1.1 200 OK (text/html)
14	5.517390	192.168.1.102	128.119.245.12	HTTP	668	GET /etherreal-labs/lab2-2.html HTTP/1.1
15	5.540216	128.119.245.12	192.168.1.102	HTTP	243	HTTP/1.1 304 Not Modified

```

▶ Frame 10: 739 bytes on wire (5912 bits), 739 bytes captured (5912 bits)
▶ Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: Dell_4f:36:23 (00:08:74:4f:36:23)
▶ Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.1.102
▶ Transmission Control Protocol, Src Port: 80, Dst Port: 4247, Seq: 1, Ack: 502, Len: 685
▼ Hypertext Transfer Protocol
  ▶ HTTP/1.1 200 OK\r\n
    Date: Tue, 23 Sep 2003 05:35:50 GMT\r\n
    Server: Apache/2.0.40 (Red Hat Linux)\r\n
    Last-Modified: Tue, 23 Sep 2003 05:35:00 GMT\r\n
    ETag: "1bfef-173-8f4ae900"\r\n

```

Both ETag values are the same, which means that there have been no changes made to the first file.

## Exercise 5

Sample output:

```
^Cz5205864@vx6:/tmp_amd/reed/export/reed/3/z5205864/3331/labs/lab2$ java PingSer
3r 5000
3Received from 127.0.0.1: 3331 PING0 2021-03-05 11:46:30.262
3  Reply not sent.
3Received from 127.0.0.1: 3332 PING1 2021-03-05 11:46:30.863
3  Reply sent.
MReceived from 127.0.0.1: 3333 PING2 2021-03-05 11:46:31.026
M  Reply not sent.
AReceived from 127.0.0.1: 3334 PING3 2021-03-05 11:46:31.627
4  Reply sent.
zReceived from 127.0.0.1: 3335 PING4 2021-03-05 11:46:31.815
3  Reply sent.
3Received from 127.0.0.1: 3336 PING5 2021-03-05 11:46:31.946
3  Reply sent.
3Received from 127.0.0.1: 3337 PING6 2021-03-05 11:46:32.092
3  Reply sent.
3Received from 127.0.0.1: 3338 PING7 2021-03-05 11:46:32.209
3  Reply sent.
3Received from 127.0.0.1: 3339 PING8 2021-03-05 11:46:32.323
3  Reply sent.
3Received from 127.0.0.1: 3340 PING9 2021-03-05 11:46:32.390
3  Reply sent.
3Received from 127.0.0.1: 3341 PING10 2021-03-05 11:46:32.587
3  Reply sent.
3Received from 127.0.0.1: 3342 PING11 2021-03-05 11:46:32.587
3  Reply sent.
3Received from 127.0.0.1: 3343 PING12 2021-03-05 11:46:32.636
3  Reply not sent.
MReceived from 127.0.0.1: 3344 PING13 2021-03-05 11:46:33.237
M  Reply not sent.
AReceived from 127.0.0.1: 3345 PING14 2021-03-05 11:46:33.838
5  Reply not sent.
z
```

```
z5205864@vx6:/tmp_amd/reed/export/reed/3/z5205864/3331/labs/lab2$ python3 PingClient.py 127.0.0.1 5000
3331 ping to 127.0.0.1, seq = 0, rtt = time out
3332 ping to 127.0.0.1, seq = 1, rtt = 163 ms
3333 ping to 127.0.0.1, seq = 2, rtt = time out
3334 ping to 127.0.0.1, seq = 3, rtt = 188 ms
3335 ping to 127.0.0.1, seq = 4, rtt = 132 ms
3336 ping to 127.0.0.1, seq = 5, rtt = 146 ms
3337 ping to 127.0.0.1, seq = 6, rtt = 117 ms
3338 ping to 127.0.0.1, seq = 7, rtt = 114 ms
3339 ping to 127.0.0.1, seq = 8, rtt = 67 ms
3340 ping to 127.0.0.1, seq = 9, rtt = 197 ms
3341 ping to 127.0.0.1, seq = 10, rtt = 1 ms
3342 ping to 127.0.0.1, seq = 11, rtt = 49 ms
3343 ping to 127.0.0.1, seq = 12, rtt = time out
3344 ping to 127.0.0.1, seq = 13, rtt = time out
3345 ping to 127.0.0.1, seq = 14, rtt = time out
```

Minimum RTT = 1 ms  
Maximum RTT = 197 ms  
Average RTT = 117 ms  
50.0 % of packets have been lost