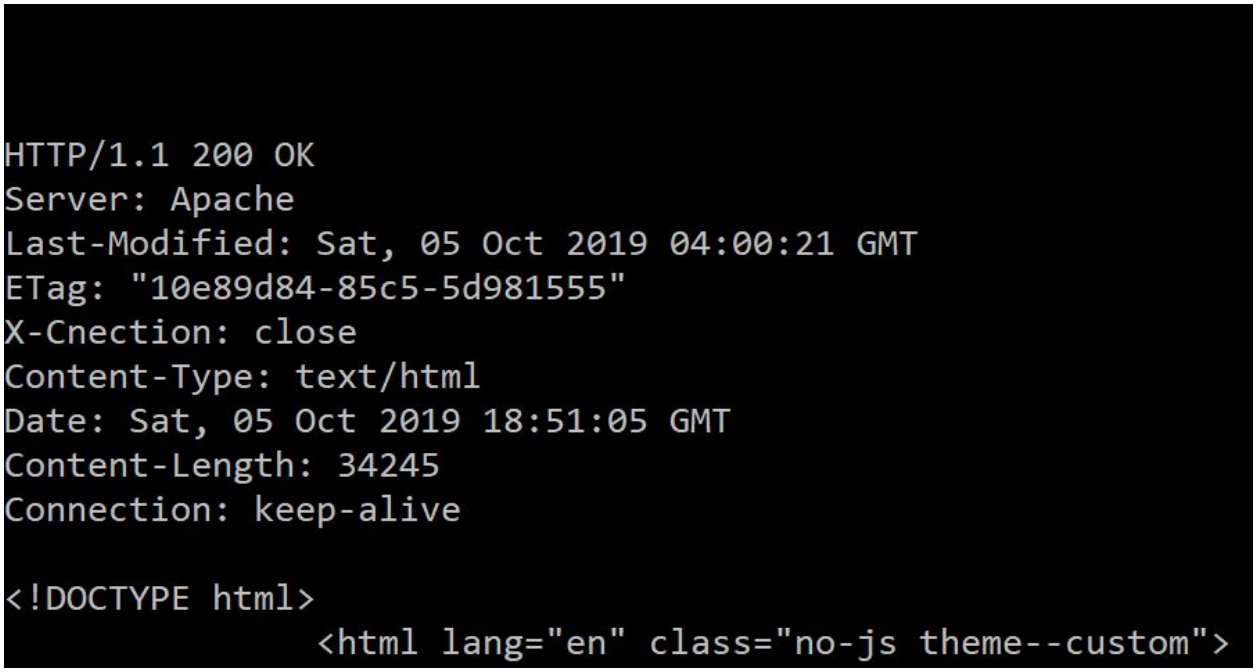
Telnet

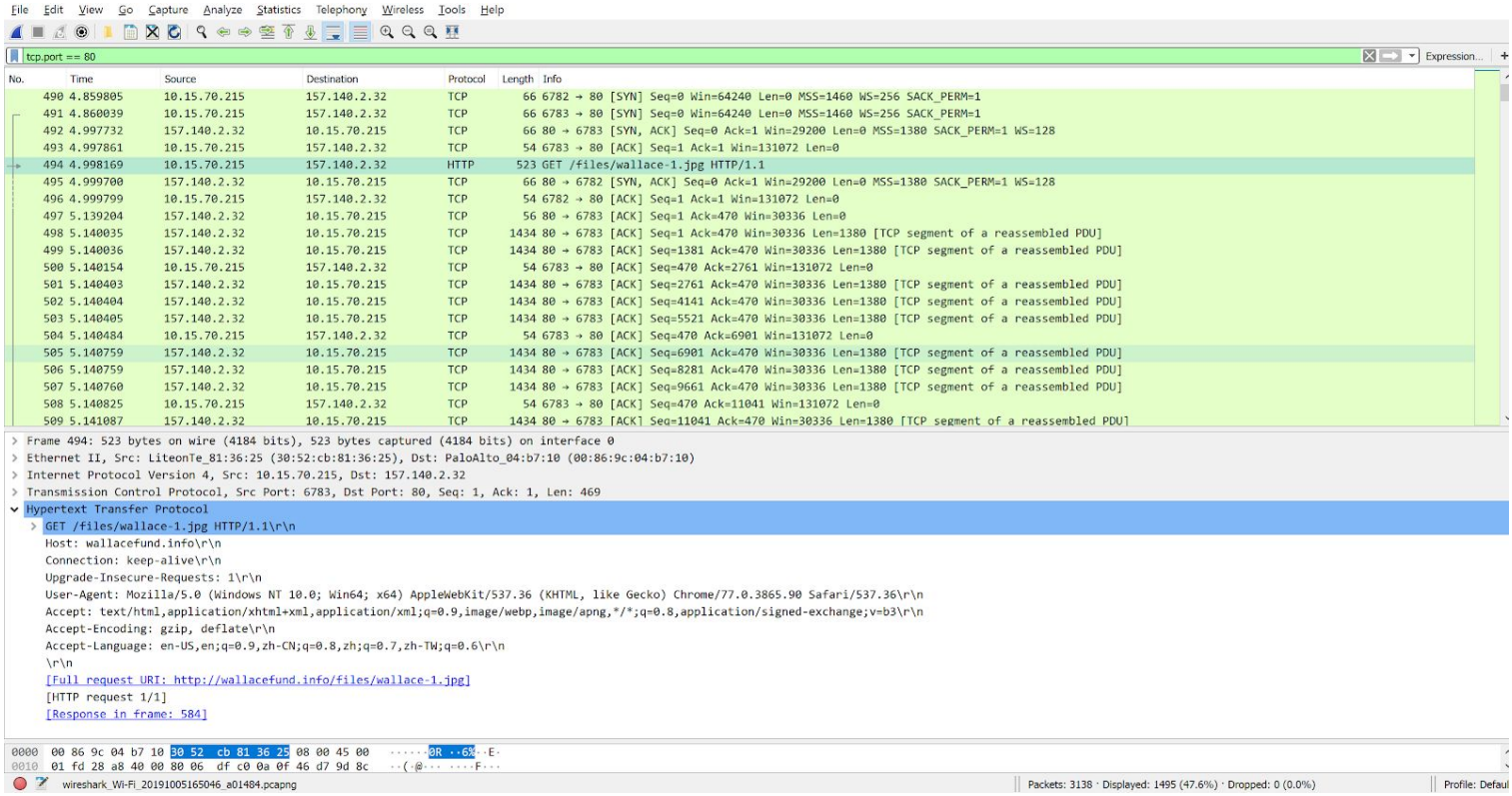
1. **What version of HTTP is the server running?**
   The server uses HTTP/1.1
2. **How is the beginning of the content sent by the server recognized by the client?**
   The first line of the response is “Status Line” which contains the following information:
   - The protocol version, usually HTTP/1.1.
   - A status code, indicating success or failure of the request. Common status codes are 200, 404, or 302
   - A status text. A brief, purely informational, textual description of the status code to help a human understand the HTTP message.

   Then after the response header there is an empty line to indicate the beginning of the message body.
3. **How does the client know what type of content is returned?**
   The “Content-type” entity header is used to indicate the media type of the resource. In addition, the ”<!DOCTYPE html>” informs the visitor’s browser that the document being rendered is an HTML document.



WireShark

Screenshot of the captured packets following the lab1 instructions as below:



Screenshot of the one example of response header:

```
Hypertext Transfer Protocol
  HTTP/1.1 304 Not Modified\r\n
  Date: Sat, 05 Oct 2019 23:28:43 GMT\r\n
  Server: Apache\r\n
  ETag: "16cc0-4f8f5c3f2fc40"\r\n
  Expires: Tue, 05 Nov 2019 09:28:43 GMT\r\n
  Cache-Control: max-age=2628000\r\n
  X-Content-Type-Options: nosniff\r\n
  Last-Modified: Fri, 09 May 2014 11:19:05 GMT\r\n
  Content-Type: image/jpeg\r\n
  X-Varnish: 463962250 458883126\r\n
  Age: 1342\r\n
  Via: 1.1 varnish-v4\r\n
  grace: none\r\n
  Connection: keep-alive\r\n
  \r\n
  [HTTP response 1/1]
  [Time since request: 0.140970000 seconds]
```

1. **What is the format of a header line? Give a simple description that fits the headers you see.**
   As in the response header above, header fields include:
   - Status line: indicating the protocol version (HTTP/1.1), followed by a numeric status code and its textual phrase (200, OK).
   - Date: indicating the response message was generated at such date and time
   - Server: indicating that this server is using Apache as the hosting software
   - Etag: this is an identifier for a specific version of a resource. It lets caches be more efficient and save bandwidth, as a web server does not need to resend a full response if the content has not changed.
   - Expires: indicating the resource is considered stale after such date and time
   - Cache-Control: indicating the maximum amount of time a resource will be considered fresh is 97308 seconds
   - X-Content-Type-Options: is a marker used by the server to indicate that the MIME types advertised in the Content-Type headers should not be changed and be followed.
   - Last-Modified: indicating the date and time that server considers when the resource was last modified
   - Content-Type: indicating that response content is of the “image/jpeg” type.
   - X-Varnish: indicating the entries to find the log for this transaction.
   - Age: the value for “Age” header is usually calculated as a difference between the proxy's current date and the Date general header included in the HTTP response.
   - Via: is added by proxy and used to track message forwards
   - grace: indicating there is no maintained Proxy operation
   - Connection: indicating that network stays persistent and not closed, allowing for subsequent requests to the same server to be done

2. **What headers are used to indicate the kind and length of content that is returned in a response?**
   - “Content-Type” header indicates that the response content is of the “application/ocsp-response” type.
   - “Content-Length” header indicates the response length is 471 bytes

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Re-fetch header:

```
Hypertext Transfer Protocol
  GET /files/wallace-1.jpg HTTP/1.1\r\n
  Host: wallacefund.info\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 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/77.0.3865.90 Safari/537.36\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\r\n
  Accept-Encoding: gzip, deflate\r\n
  Accept-Language: en-US,en;q=0.9,zh-CN;q=0.8,zh;q=0.7,zh-TW;q=0.6\r\n
  If-None-Match: "16cc0-4f8f5c3f2fc40"\r\n
  If-Modified-Since: Fri, 09 May 2014 11:19:05 GMT\r\n
  \r\n
  [Full request URI: http://wallacefund.info/files/wallace-1.jpg]
  [HTTP request 1/1]
  [Response in frame: 666]
```

1. **What is the name of the header the browser sends to let the server work out whether to send fresh content?**

Based on the screenshot above, the unique header being referenced by server is "**If-None-Match**". Server can use the value from this field to find any matching entity in the cache, if found the server can directly return the cached content.

The header "If-Modified-Since" is ignored here as "If-None-Match" is taking presence here.

2. **Where exactly does the timestamp value carried by the header come from?**

The timestamp value in the "If-Modified-Since" header is taken from the 1st response header as shown below: