# Lab: 3 Understanding Working of HTTP Headers

Question: Understand working of HTTP headers Conditional Get: If-Modified-Since

HTTP Cookies: Cookie and Set-Cookie

Authentication: Auth-Basic

Design a web page that has one embedded page (e.g. image) and sets a cookie and enables authentication. You are required to configure the web server (e.g. apache) with authentication mechanism. Show the behavior of conditional get when embedded objects are modified and when it is not (you can just change the create date of the embedded object). Decode the BasicAuth header using Base64 mechanism as per the password setup.

**Observation**: Show the behavior of browser when cookie is set and when cookie is removed. **Solution:** Analyzing Basic Authentication and Cookies

The three parts of experiment are: 1. Password Authentication 2. Cookie Setting 3. Conditional get

**Steps of Execution (for Password Authentication)** 1. Executing the below commands on the terminal.

--> Provide username and password to set authentication

sudo htpasswd -c /etc/apache2/.htpasswd netwo

--> View the authentication

sudo cat /etc/apache2/.htpasswd

Here "netwo" is the username. Also, password is entered twice.

- 2. To setup the authentication phase, execute the following commands. Configuring Access control within the Virtual Host Definition.
- --> Opening the file for setting authentication

### sudo nano /etc/apache2/sites-available/000-default.conf

<VirtualHost\*:80>
ServerAdmin webmaster@localhost
DocumentRoot /var/www/html
ErrorLog \${APACHE\_LOG\_DIR}/error.log
CustomLog \${APACHE\_LOG\_DIR}/access.log combined <Directory "/var/www/html">

### AuthType Basic

AuthName "RESTRICTED" AuthUserFile /etc/apache2/.htpasswd Require valid-user >

</Directory> </VirtualHost>

```
*VirtualHost *:80>

# The ServerName directive sets the request scheme, hostname and port that
# the server uses to identify itself. This is used when creating
# redirection URLS. In the context of virtual hosts, the ServerName
# specifies what hostname must appear in the request's Host: header to
# match this virtual host. For the default virtual host (this file) this
# value is not decisive as it is used as a last resort host regardless.
# However, you must set it for any further virtual host explicitly.
#ServerName www.example.com

ServerAdmin webmaster@localhost
DocumentRoot /var/www/html

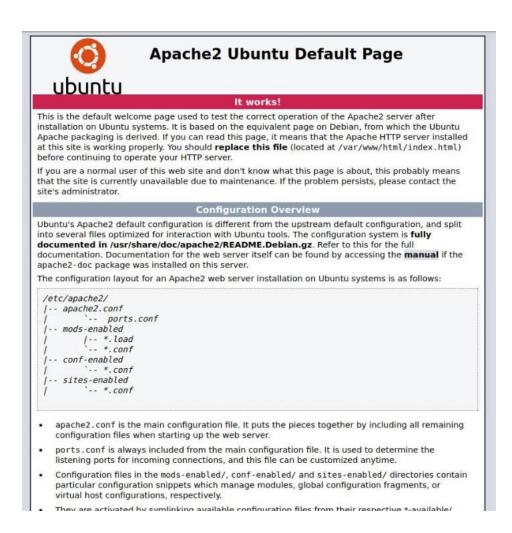
# Available loglevels: trace8, ..., trace1, debug, info, notice, warn,
# error, crit, alert, emerg.
# It is also possible to configure the loglevel for particular
# modules, e.g.
#LogLevel info ssl:warn

ErrorLog ${APACHE_LOG_DIR}/error.log
CustomLog ${APACHE_LOG_DIR}/error.log
CustomLog ${APACHE_LOG_DIR}/ercor.log
CustomLog ${APACHE_LO
```

3. Password policy implementation is done by restarting the server as:

### sudo service apache2 restart

4. The localhost is then accessed using the Firefox browser requiring a username and a password set during the authentication phase.



5. Wireshark is used to capture the packets sent upon the network.

```
2124 / 2224 6. 127 / 8-5 1
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```

6. Using the "follow TCP stream" on the HTTP message segment the password was retrieved which was encrypted by the base64 algorithm and decryption could be done with same algorithm.

# **Steps of Execution (Cookie Setting)**

1. A PHP file to set the cookie is created which also contains an image in it (placed under the HTML directory) to be accessed once the cookie is set. The following code helped to set the cookie:

```
<html> <?php
setcookie("namecookie","netqwerty",time()+123); setcookie("nickname","work"); ?>
<img src= "highres.png" width= "300" height= "300" title= "password" /> </html>
```



Note: The Image added is called **1.jpeg** 

2. The combined file saved with a .php extension is placed under /var/www/html for accessing.





3. The packets are captured using Wireshark and using the "follow TCP stream" which checks for the set-cookie field whether the cookie is set or not set.

```
| Public | Children |
```

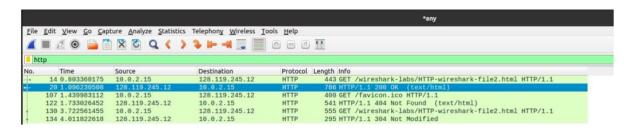
```
### TOTAL DISCUSSIONS

### TOTAL DISCUSSIONS
```

The cookie is set as shown in the above screenshot.

**Observation:** Understand and work out base 64 algorithm and write in your observation. Observe various parameters associated with Cookie in the wireshark capture. **Conditional Get: If-Modified-Since Observations:** 

- 1. Inspect the contents of the first HTTP GET request from your browser to the server. Do you see an "IF-MODIFIED-SINCE" line in the HTTP GET?
- 2. Inspect the contents of the server response. Did the server explicitly return the contents of the file? How can you tell?
- 3. Now inspect the contents of the second HTTP GET request from your browser to the server. Do you see an "IF-MODIFIED-SINCE:" line in the HTTP GET? If so, what information follows the "IF-MODIFIED-SINCE:" header?
- 4. What is the HTTP status code and phrase returned from the server in response to this second HTTP GET? Did the server explicitly return the contents of the file? Explain. Wireshark containing the HTTP REQUESTS AND RESPONSES



### 1. IF-MODIFIED-SINCE is not present in the first HTTP GET

```
Wireshark · Packet 14 · any
Frame 14: 443 bytes on wire (3544 bits), 443 bytes captured (3544 bits) on interface any, id 0
Linux cooked capture
 Internet Protocol Version 4, Src: 10.0.2.15, Dst: 128.119.245.12
> Transmission Control Protocol, Src Port: 42346, Dst Port: 80, Seq: 1, Ack: 1, Len: 387
- 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 (X11; Ubuntu; Linux x86_64; rv:96.0) Gecko/20100101 Firefox/96.0\r\n
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.8\r\n
    Accept-Language: en-US, en; q=0.5\r\n
    Accept-Encoding: gzip, deflate\r\n
    Connection: keep-alive\r\n
    Upgrade-Insecure-Requests: 1\r\n
    [Full request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file2.html]
    [HTTP request 1/2]
    Response in frame: 20]
    [Next request in frame: 130]
```

2. The server explicitly returned the contents on the first HTTP RESPONSE **Line-Based text data** is the content returned by the **server** on **first HTTP RESPONSE** 

```
Wireshark · Packet 20 · any
 Frame 20: 786 bytes on wire (6288 bits), 786 bytes captured (6288 bits) on interface any, id 0
  Linux cooked capture
 Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.0.2.15
Transmission Control Protocol, Src Port: 80, Dst Port: 42346, Seq: 1, Ack: 388, Len: 730
 Hypertext Transfer Protocol

HTTP/1.1 200 OK\r\n
Date: Sun, 13 Feb 2022 09:03:56 GMT\r\n
      Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.27 mod_perl/2.0.11 Perl/v5.16.3\r\n Last-Modified: Sun, 13 Feb 2022 06:59:02 GMT\r\n
     ETag: "173-5d7e0d5c000cb"\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
      [HTTP response 1/2]
[Time since request: 0.292870333 seconds]
       [Request in frame: 14]
[Next request in frame: 130]
      [Next response in frame: 134]
[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)
      <html>\n
     Congratulations again! Now you've downloaded the file lab2-2.html. <br/>
This file's last modification date will not change. \n
Thus if you download this multiple times on your browser, a complete copy <br/>
will only be sent once by the server due to the inclusion of the IN-MODIFIED-SINCE<br/>
br\n
      field in your browser's HTTP GET request to the server. 

 \n
      \n
</html>\n
```

3. Yes. IF-MODIFIED-SINCE is present in the second HTTP GET

```
Wireshark · Packet 130
 Frame 130: 555 bytes on wire (4440 bits), 555 bytes captured (4440 bits) on interface any, id 0
Linux cooked capture
 Internet Protocol Version 4, Src: 10.0.2.15, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 42346, Dst Port: 80, Seq: 388, Ack: 731, Len: 499
- 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 (X11; Ubuntu; Linux x86_64; rv:96.0) Gecko/20100101 Firefox/96.0\r\n
    Accept-Language: en-US,en;q=0.5\r\n
Accept-Encoding: gzip, deflate\r\n
    Connection: keep-alive\r\n
    Upgrade-Insecure-Requests: 1\r\n
    If-None-Match: "173-5d7e0d5c000cb"\r\n
    Cache-Control: max-age=0\r\n
    \r\n
    [Full request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file2.html]
[HTTP request 2/2]
    [Prev request in frame: 14]
[Response in frame: 134]
```

### 4. The HTTP status code for the second HTTP GET is **304.**

The Server does not return the file as they are already present from the time the first http get request was made. This time the contents are not modified.

```
Wireshark Packet 134 any

> Frame 134: 295 bytes on wire (2360 bits), 295 bytes captured (2360 bits) on interface any, id 0

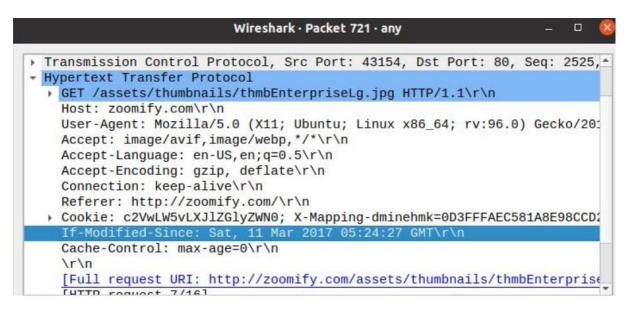
> Linux cooked capture
> Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.0.2.15
> Transmission Control Protocol, Src Port: 80, Dst Port: 42346, Seq: 731, Ack: 887, Len: 239

+ Hypertext Transfer Protocol
> HTTP/1.1 304 Not Modified\r\n
Date: Sun, 13 Feb 2022 09:03:59 GMT\r\n
Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.27 mod_perl/2.0.11 Perl/v5.16.3\r\n
Connection: Keep-Alive\r\n
Keep-Alive: timeout=5, max=99\r\n
ETag: "173-5d7e0d5c000cb"\r\n
\r\n
[HTTP response 2/2]
[Time since request: 0.289261163 seconds]
[Prev request in frame: 14]
[Prev response in frame: 20]
[Request in frame: 130]
[Request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file2.html]
```

# For a server with images (used the website www.zoomify.com)

Inttp					
0.	Time	* Source	Destination	Protocol	Length Info
		10.0.2.15		HTTP	434 GET /ZV5/ZoomifyImageViewerExpress-min.js HTTP/1.1
	177 4.721701850	98.129.229.158	10.0.2.15	HTTP	1039 HTTP/1.1 200 OK (application/x-javascript)
	180 4.721702139	98.129.229.158	10.0.2.15	HTTP	945 HTTP/1.1 200 OK (application/x-javascript)
	185 4.722773218	10.0.2.15	98.129.229.158	HTTP	458 GET /assets/logos/zoomify/v5Gold-isHere.jpg HTTP/1.1
	187 4.725211301	10.0.2.15	98.129.229.158	HTTP	444 GET /assets/icons/circle3.gif HTTP/1.1
	193 4.743240904	10.0.2.15	98.129.229.158	HTTP	458 GET /assets/thumbnails/thmbEnterpriseLg.jpg HTTP/1.1
	194 4.743340732	10.0.2.15	98.129.229.158	HTTP	452 GET /assets/thumbnails/thmbFreeLg.jpg HTTP/1.1
	205 4.948596554	98.129.229.158	10.0.2.15	HTTP	2085 HTTP/1.1 200 OK (JPEG JFIF image)
	207 4.948783606	10.0.2.15	98.129.229.158	HTTP	486 GET /assets/dynamic/scripts.js?cb=1644745436431&fingerprint=c
	209 4.954276801	98.129.229.158	10.0.2.15	HTTP	1643 HTTP/1.1 200 OK (GIF89a)
	211 4.954569568	10.0.2.15	98.129.229.158	HTTP	455 GET /assets/icons/checkmarkSmallBlue.gif HTTP/1.1
	215 4.969083117	10.0.2.15	98.129.229.158	HTTP	455 GET /assets/thumbnails/thmbExpressLg.jpg HTTP/1.1
	218 4.969853702	10.0.2.15	98.129.229.158	HTTP	451 GET /assets/thumbnails/thmbProLg.jpg HTTP/1.1
	231 4.974536324	98.129.229.158	10.0.2.15	HTTP	3249 HTTP/1.1 200 OK (JPEG JFIF image)
	233 4.974783718	10.0.2.15	98.129.229.158	HTTP	448 GET /assets/icons/flags/china.png HTTP/1.1
	235 5.184532174	98.129.229.158	10.0.2.15	HTTP	2651 HTTP/1.1 200 OK (application/javascript)
	237 5.184532632	98.129.229.158	10.0.2.15	HTTP	410 HTTP/1.1 200 OK (GIF89a)
	239 5.185119668	10.0.2.15	98.129.229.158	HTTP	456 GET /assets/icons/flags/europeanUnion.png HTTP/1.1
	240 5.185193592	10.0.2.15	98.129.229.158	HTTP	449 GET /assets/icons/flags/france.png HTTP/1.1
	271 5.206431829	98.129.229.158	10.0.2.15	HTTP	1087 HTTP/1.1 200 OK (PNG)
	273 5.206726069	10.0.2.15	98.129.229.158	HTTP	435 GET /assets/shim.gif HTTP/1.1
	279 5.277259930	10.0.2.15	117.254.84.212	HTTP	467 GET /getjs?nadipdata=%7B%7D&screenheight=100&screenwidth=100&
	297 5.353219064	117.254.84.212	10.0.2.15	HTTP	5054 HTTP/1.1 200 OK (application/x-javascript)
	299 5.411781172	98.129.229.158	10.0.2.15	HTTP	3905 HTTP/1.1 200 OK (PNG)

- 1. IF-MODIFIED-SINCE is not present in the first HTTP GET
- 2. Theserverreturnsthefile explicitly.
- 3. Yes. IF-MODIFIED-SINCE is present in the second HTTP GET



4. The HTTP status code for the second HTTP GET is 304.

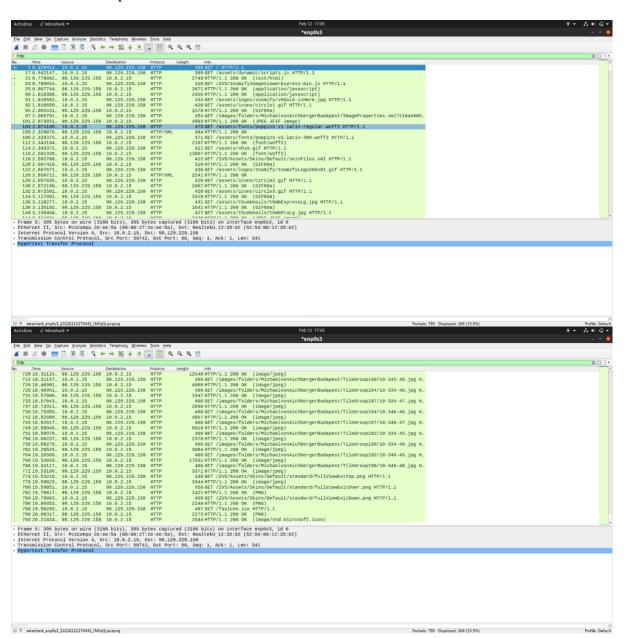
The Server does not return the file as they are already present from the time the first http get request was made.

# **Persistent Non-persistent Connections**

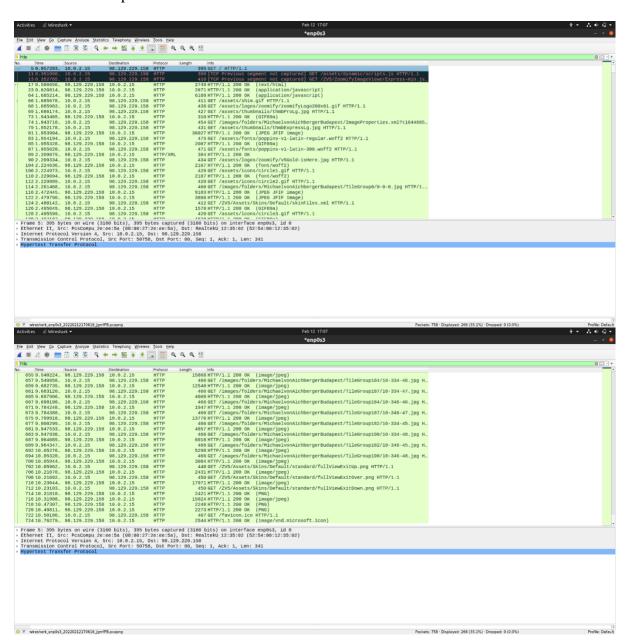
### Non-Persistent



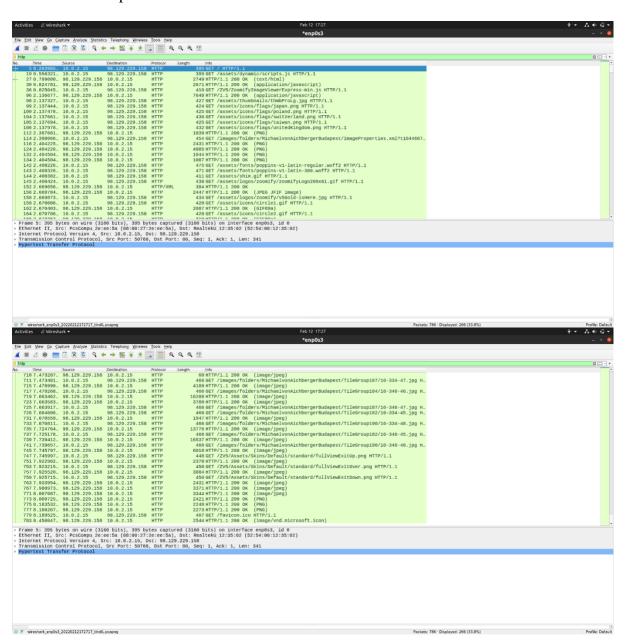
38.2236-0.2669=37.9567



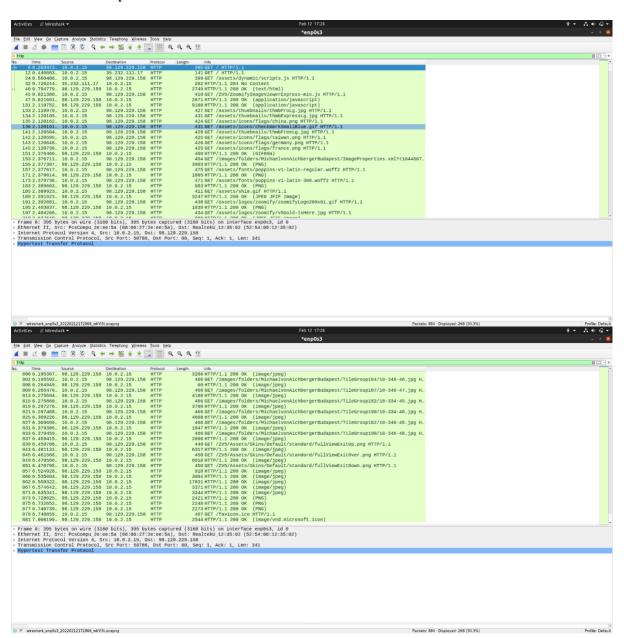
20.238-0.2594=19.9786



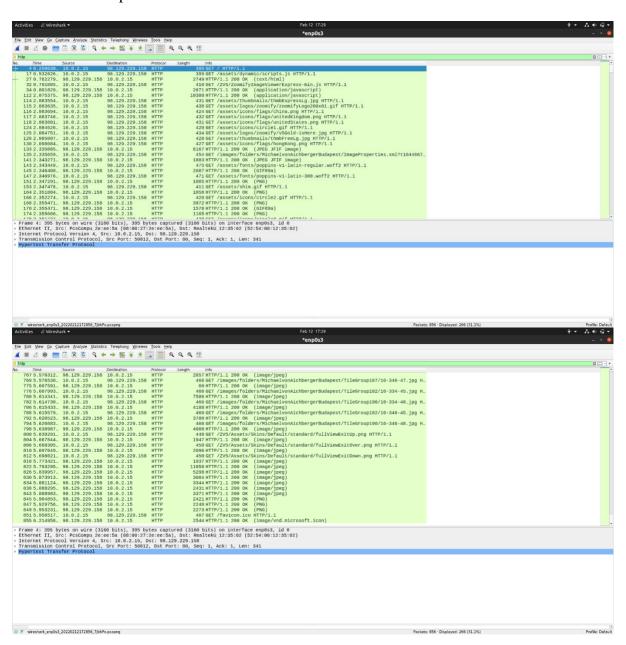
10.762-0.057=10.705



8.45-0.263=8.187



7.006-0.263=6.743



6.214-0.250=5.964