Machine Problem 4: Simple HTTP Proxy
ECEN 602
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Below is the information pertaining to the contributions made by each team member and the test cases ran on the client and server.

Overview:

For this project, both team members decided to work on their own versions of the HTTP server and client code implementation with the plan to identify the better of the two codes to use for the submission. Both team members were successful in developing and implementing their code with successful compilation of their codes. As a team, we decided to use Neha's HTTP Proxy server and client code for the submission. Attached you will find the HTTP server/client code, ChatGPT associated codes, and this README file. For the rest of the project, James completed the README file associated with the attached programs – to include running the test cases.

Precursor:

Prior to running any test cases, the team needed to verify that all code was working correctly and would compile. The *makefile* successfully creates the associated executable files with respect to the HTTP Proxy Server and HTTP Proxy Client. Command for running the makefile is "*make*".

Beginning Stages:

Overall syntax for running the executables:

Server: *./<executable> <IP address> <Port Number>*

Client: *./<executable> <IP address> <Port Number> <URL>*

Verification Test case from Recitation Slides:

```
┌──(gnome㉿SparklingGnome06)-[~/ECEN_MP/MP4]
└─$ ./client3 127.0.0.1 8000 web.mit.edu/dimitrib/www/datanets.html
Request: web.mit.edu/dimitrib/www/datanets.html
File name:      datanets.html
```

```
┌──(gnome㉿SparklingGnome06)-[~/ECEN_MP/MP4]
└─$ ./server3 127.0.0.1 8000
Proxy is up and running.....!
Socket new connection has been established! : 4

Client 4: requested web.mit.edu/dimitrib/www/datanets.html
Client 4: Cache Missed/ Cache Entry is not present. Cache Block Allocated 9

Access Time: Mon, 30 Oct 2023 02:31:53 GMT
File expiry time is: Mon, 30 Oct 2023 02:31:53 GMT
-----------------------------------------------
```

Test Cases:

Test Case 1 Cache Hit:

Using the chached URL from the verification test:

Client:

```
┌──(gnome㊙SparklingGnome06)-[~/ECEN_MP/MP4]
└─$ ./client3 127.0.0.1 8000 web.mit.edu/dimitrib/www/datanets.html
Request: web.mit.edu/dimitrib/www/datanets.html
File name:      datanets.html
```

Server:

```
----------------------------------------------
Socket new connection has been established! : 4

Client 4: requested web.mit.edu/dimitrib/www/datanets.html
Client 4: Already present in Cache , Cache Hit at Block 9
Client 4: If-Modified-Since: Mon, 30 Oct 2023 02:31:53 GMT

Access Time: Mon, 30 Oct 2023 02:38:57 GMT
File expiry time is: Mon, 30 Oct 2023 02:38:57 GMT
Serving from the cache block
----------------------------------------------
```

Test Case 2 Request Not in Cache:

Client:

```
┌──(gnome㊙SparklingGnome06)-[~/ECEN_MP/MP4]
└─$ ./client3 127.0.0.1 8000 www.evanjones.ca/crc32c.html
Request: www.evanjones.ca/crc32c.html
File name:      crc32c.html
```

Server:

```
----------------------------------------------
Socket new connection has been established! : 4

Client 4: requested www.evanjones.ca/crc32c.html
Client 4: Cache Missed/ Cache Entry is not present. Cache Block Allocated 7

Access Time: Mon, 30 Oct 2023 02:42:33 GMT
File expiry time is: Mon, 30 Oct 2023 02:42:33 GMT
----------------------------------------------
```

Test Case 3 Miss with 10 items in Cache:

Client (current working directory):

```
┌──(gnome㊙SparklingGnome06)-[~/ECEN_MP/MP4]
└─$ ls
0  client3                         nhttpServer.cpp
1  crc32c.html                     rdtsc.html
2  Cyber                           research
3  datanets.html                   server3
4  deep-learning-with-MATLAB.html  strftime.3.h
5  index.html                      strftime.3.html
6  loan_evans.html                 twoscomp.html
7  mini-project-snake-game-in-c.html  ver1
8  networks.html                   ver2
9  nhttpClient.cpp
```

Server:

```
Client 4: requested www.codeincodeblock.com/2011/06/mini-project-snake-game-in-c.html
Client 4: Cache Missed/ Cache Entry is not present. Cache Block Allocated 5

Access Time: Mon, 30 Oct 2023 02:53:56 GMT
File expiry time is: Mon, 30 Oct 2023 02:53:56 GMT
-------------------------------------------------
Socket new connection has been established! : 4

Client 4: requested www.cs.cornell.edu/~tomf/notes/cps104/twoscomp.html
Client 4: Cache Missed/ Cache Entry is not present. Cache Block Allocated 4

Access Time: Mon, 30 Oct 2023 02:54:16 GMT
File expiry time is: Mon, 30 Oct 2023 02:54:16 GMT
-------------------------------------------------
Socket new connection has been established! : 4

Client 4: requested www.mcs.anl.gov/~kazutomo/rdtsc.html
Client 4: Cache Missed/ Cache Entry is not present. Cache Block Allocated 3

Access Time: Mon, 30 Oct 2023 02:54:52 GMT
File expiry time is: Mon, 30 Oct 2023 02:54:52 GMT
-------------------------------------------------
Socket new connection has been established! : 4

Client 4: requested man7.org/linux/man-pages/manJ/strftime.3.h
Client 4: Cache Missed/ Cache Entry is not present. Cache Block Allocated 2

Access Time: Mon, 30 Oct 2023 02:55:25 GMT
File expiry time is: Mon, 30 Oct 2023 02:55:25 GMT
-------------------------------------------------
Socket new connection has been established! : 4

Client 4: requested man7.org/linux/man-pages/manJ/strftime.3.html
Client 4: Cache Missed/ Cache Entry is not present. Cache Block Allocated 1

Access Time: Mon, 30 Oct 2023 02:55:42 GMT
File expiry time is: Mon, 30 Oct 2023 02:55:42 GMT
-------------------------------------------------
Socket new connection has been established! : 4

Client 4: requested www.conference-service.com/conferences/networks.html
Client 4: Cache Missed/ Cache Entry is not present. Cache Block Allocated 0

Access Time: Mon, 30 Oct 2023 02:56:02 GMT
File expiry time is: Mon, 30 Oct 2023 02:56:02 GMT
-------------------------------------------------
Socket new connection has been established! : 4

Client 4: requested www.yahoo.com/
Client 4: Cache Missed/ Cache Entry is not present. Cache Block Allocated 9

Access Time: Mon, 30 Oct 2023 02:56:17 GMT
File expiry time is: Mon, 30 Oct 2023 02:56:17 GMT
-------------------------------------------------
```

The above snippets reflect that there has been more than 10 requests made to the server; the server code doesn't show as many requests. Additionally, with more than 10 cache requests, the server prompts for a cache miss, while maintaining the information for the original cache/URL requests.

Test Case 4 Stale Expires Header:

Client:

```
┌──(gnome☺SparklingGnome06)-[~/ECEN_MP/MP4]
└─$ ./client3 127.0.0.1 8001 fathersdayblog.com
Request: fathersdayblog.com
File name:       index.html

┌──(gnome☺SparklingGnome06)-[~/ECEN_MP/MP4]
└─$ ./client3 127.0.0.1 8001 fancycreative.com
Request: fancycreative.com
File name:       index.html
```

Server:

```
--------------------------------------------------
Socket new connection has been established! : 4

Client 4: requested fathersdayblog.com/
Client 4: Cache Missed/ Cache Entry is not present. Cache Block Allocated 6

Access Time: Mon, 30 Oct 2023 03:06:14 GMT
File expiry time is: Mon, 30 Oct 2023 03:06:14 GMT
--------------------------------------------------
Socket new connection has been established! : 4

Client 4: requested fancycreative.com/
Client 4: Cache Missed/ Cache Entry is not present. Cache Block Allocated 7

Access Time: Mon, 30 Oct 2023 03:07:05 GMT
File expiry time is: Mon, 30 Oct 2023 03:07:05 GMT
--------------------------------------------------
```
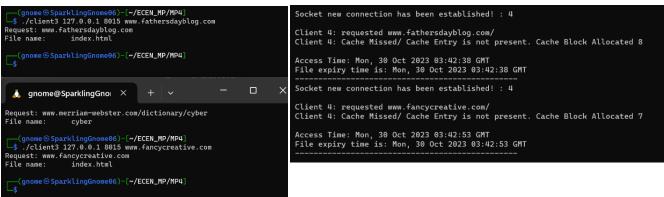
We verified the above URLs to ensure they were expired; however, the server automatically updated them and provided them to the client with fresh data and updated the cache appropriately.

Test Case 5 Stale Entry without Expires Header:

Client: **Server:**

We came back to do this test case last on cache entries which were expired. The output reflects different access and expiration times for the client to access the data from the server compared to "Test Case 4".

Test Case 6 Cache Entry without Expires Header:

Client:

Server:

The above website was last updated in 2022; The below screenshot reflects this URL doesn't have an "expires" header:

```
┌──(gnome☻SparklingGnome06)─[~]
└─$ curl -I https://kinsta.com/knowledgebase/add-expires-headers-wordpress/
HTTP/2 200
date: Mon, 30 Oct 2023 03:22:07 GMT
content-type: text/html; charset=UTF-8
vary: Accept-Encoding
link: <https://kinsta.com/wp-json/>; rel="https://api.w.org/"
link: <https://kinsta.com/wp-json/wp/v2/knowledgebase/86237>; rel="alternate"; type="application/json"
link: <https://kinsta.com/?p=86237>; rel=shortlink
x-frame-options: allow-from https://mydev.kinsta.com/
content-security-policy: frame-ancestors 'self' https://*.kinsta.com https://*.kinsta.ninja
x-content-type-options: nosniff
strict-transport-security: max-age=31536000
x-kinsta-cache: MISS
cf-cache-status: DYNAMIC
server: cloudflare
cf-ray: 81e088326ffce956-DFW
```

Test Case 7 Multiple Simultaneous Requests:

Test Case 8 (BONUS) If-Modified-Since:

Client:

```
┌──(gnome㉫SparklingGnome06)-[~/ECEN_MP/MP4]
└─$ ./client3 127.0.0.1 8015 library.tamu.edu/about/loan_evans.html
Request: library.tamu.edu/about/loan_evans.html
File name:      loan_evans.html

┌──(gnome㉫SparklingGnome06)-[~/ECEN_MP/MP4]
└─$ ./client3 127.0.0.1 8015 library.tamu.edu/about/loan_evans.html
Request: library.tamu.edu/about/loan_evans.html
File name:      loan_evans.html
```

Server:

```
Socket new connection has been established! : 4

Client 4: requested library.tamu.edu/about/loan_evans.html
Client 4: Cache Missed/ Cache Entry is not present. Cache Block Allocated 6

Access Time: Mon, 30 Oct 2023 03:52:32 GMT
File expiry time is: Mon, 30 Oct 2023 03:52:32 GMT
-------------------------------------------------
Socket new connection has been established! : 4

Client 4: requested library.tamu.edu/about/loan_evans.html
Client 4: Already present in Cache , Cache Hit at Block 6
Client 4: If-Modified-Since: Mon, 30 Oct 2023 03:52:32 GMT

Access Time: Mon, 30 Oct 2023 03:52:42 GMT
File expiry time is: Mon, 30 Oct 2023 03:52:42 GMT
-------------------------------------------------
```

Since the client requested the same URL twice, the server reflected that it was already present in the cache and reflects the "If-Modified-Since" statement along with the date that it corresponds to.

This concludes the read me an all eight test cases.