MP4 Report

Cache Miss

Cache Hit

Notice that the date field of the two responses are identical, indicating the second response is from the cache of the proxy.

Cache Replacement (LRU)

```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./proxy 127.0.0.1 8080
Proxy server listening on IP 127.0.0.1 and port 8080
```
```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./client 127.0.0.1 8080 http://example.com
Response from proxy server:
HTTP/1.0 200 OK
Age: 291980
Cache-Control: max-age=604800
Content-Type: text/html; charset=UTF-8
Date: Mon, 11 Nov 2024 03:51:01 GMT
Etag: "3147526947+gzip+ident"
Expires: Mon, 18 Nov 2024 03:51:01 GMT
Last-Modified: Thu, 17 Oct 2019 07:18:26 GMT
```

1st cache, dated 03:51:01 GMT

```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./proxy 127.0.0.1 8080
Proxy server listening on IP 127.0.0.1 and port 8080
```
```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./client 127.0.0.1 8080 http://example.com/1
Response from proxy server:
HTTP/1.0 400 Bad Request
Content-Type: text/html
Content-Length: 349
Connection: close
Date: Mon, 11 Nov 2024 04:05:46 GMT
Server: ECLF (dad/5FB8)
```

2nd cache, dated 04:05:46 GMT
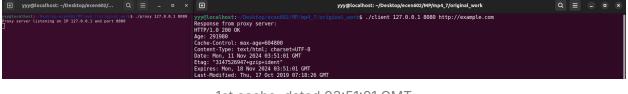
```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./proxy 127.0.0.1 8080
Proxy server listening on IP 127.0.0.1 and port 8080
```
```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./client 127.0.0.1 8080 http://example.com/2
Response from proxy server:
HTTP/1.0 400 Bad Request
Content-Type: text/html
Content-Length: 349
Connection: close
Date: Mon, 11 Nov 2024 04:07:45 GMT
Server: ECLF (dad/5FBA)
```

3rd cache, dated 04:07:45 GMT

```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./proxy 127.0.0.1 8080
Proxy server listening on IP 127.0.0.1 and port 8080
```
```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./client 127.0.0.1 8080 http://example.com/3
Response from proxy server:
HTTP/1.0 400 Bad Request
Content-Type: text/html
Content-Length: 349
Connection: close
Date: Mon, 11 Nov 2024 04:08:37 GMT
Server: ECLF (dad/5FC5)
```

4th cache, dated 04:08:37 GMT

```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./proxy 127.0.0.1 8080
Proxy server listening on IP 127.0.0.1 and port 8080
```
```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./client 127.0.0.1 8080 http://example.com/4
Response from proxy server:
HTTP/1.0 400 Bad Request
Content-Type: text/html
Content-Length: 349
Connection: close
Date: Mon, 11 Nov 2024 04:09:20 GMT
Server: ECLF (dad/5F8E)
```

5th cache, dated 04:09:28 GMT

```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./proxy 127.0.0.1 8080
Proxy server listening on IP 127.0.0.1 and port 8080
```
```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./client 127.0.0.1 8080 http://example.com/5
Response from proxy server:
HTTP/1.0 400 Bad Request
Content-Type: text/html
Content-Length: 349
Connection: close
Date: Mon, 11 Nov 2024 04:10:03 GMT
Server: ECLF (dad/5F82)
```

6th cache, dated 04:10:03 GMT

```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./proxy 127.0.0.1 8080
Proxy server listening on IP 127.0.0.1 and port 8080
```
```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./client 127.0.0.1 8080 http://example.com/6
Response from proxy server:
HTTP/1.0 400 Bad Request
Content-Type: text/html
Content-Length: 349
Connection: close
Date: Mon, 11 Nov 2024 04:10:40 GMT
Server: ECLF (dad/5FD3)
```

7th cache, dated 04:18:40 GMT

```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./proxy 127.0.0.1 8080
Proxy server listening on IP 127.0.0.1 and port 8080
```
```
yyy@localhost:~/Desktop/ecen602/MP/mp4_7/original_work$ ./client 127.0.0.1 8080 http://example.com/7
Response from proxy server:
HTTP/1.0 400 Bad Request
Content-Type: text/html
Content-Length: 349
Connection: close
Date: Mon, 11 Nov 2024 04:11:14 GMT
Server: ECLF (dad/5FC3)
```
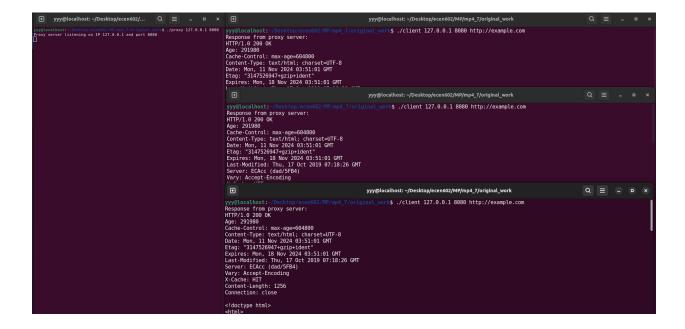
8th cache, dated 04:11:14 GMT

9th cache, dated 04:11:46 GMT

10th cache, dated 04:12:18 GMT

11th cache, dated 04:12:57 GMT, this replaces the 1st cache

Revisit 1st URL, the date field is updated to 04:13:42 GMT

Multiple Client Connections

Each client is served by an individual thread.

Stale Expires Header Replacement

Initiate proxy and client:

After modifying the "Expires header" to a past date to simulate a stale entry:

Running the client again:

```
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work$ .
/client 127.0.0.1 8080 http://example.com
Response from proxy server:
HTTP/1.0 200 OK
Age: 516810
Cache-Control: max-age=604800
Content-Type: text/html; charset=UTF-8
Date: Mon, 11 Nov 2024 19:19:59 GMT
Etag: "3147526947+ident"
Expires: Mon, 01 Jan 2000 00:00:00 GMT
Last-Modified: Thu, 17 Oct 2019 07:18:26 GMT
Server: ECAcc (dad/5FA8)
Vary: Accept-Encoding
X-Cache: HIT
Content-Length: 1256
Connection: close
```

Seeing the output.html, the cache entry is replaced with fresh data, and the Expires header reflects a future date:

```
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work$ c
at output.html
HTTP/1.0 200 OK
Accept-Ranges: bytes
Age: 0
Cache-Control: max-age=604800
Content-Type: text/html; charset=UTF-8
Date: Mon, 11 Nov 2024 19:01:07 GMT
Etag: "3147526947+ident"
Expires: Mon, 18 Nov 2024 19:01:07 GMT
Last-Modified: Thu, 17 Oct 2019 07:18:26 GMT
Server: ECAcc (dad/5FE4)
Vary: Accept-Encoding
X-Cache: MISS
Content-Length: 1256
Connection: close
```

Stale Entry Without Expires Header Replacement

Initiate proxy and client:

```
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work$ .
/proxy 127.0.0.1 8080
Proxy server listening on IP 127.0.0.1 and port 8080
Sending request to origin server: GET / HTTP/1.0
Host: example.com
Connection: close
```

```
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work$ .
/client 127.0.0.1 8080 http://example.com
Response from proxy server:
HTTP/1.0 200 OK
Age: 395245
Cache-Control: max-age=604800
Content-Type: text/html; charset=UTF-8
Date: Mon, 11 Nov 2024 19:25:44 GMT
Etag: "3147526947+ident"
Expires: Mon, 18 Nov 2024 19:25:44 GMT
Last-Modified: Thu, 17 Oct 2019 07:18:26 GMT
Server: ECAcc (dad/5FC1)
Vary: Accept-Encoding
X-Cache: HIT
Content-Length: 1256
Connection: close
```

After modifying the last access time to a past date and removing "Expires" header:

```
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work/ca
ched$ nano 1731353144.html
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work/ca
ched$ touch -a -d "2023-01-01" 1731353144.html
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work/ca
ched$ stat 1731353144.html
  File: 1731353144.html
  Size: 1618            Blocks: 8          IO Block: 4096   regular fi
le
Device: 830h/2096d      Inode: 37273       Links: 1
Access: (0644/-rw-r--r--)  Uid: ( 1000/  wizard)   Gid: ( 1001/  wizar
d)
Access: 2023-01-01 00:00:00.000000000 -0600
Modify: 2024-11-11 13:26:27.455412506 -0600
Change: 2024-11-11 13:26:52.835407242 -0600
 Birth: 2024-11-11 13:25:44.685421455 -0600
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work/ca
ched$ cat 1731353144.html
HTTP/1.0 200 OK
Age: 395245
Cache-Control: max-age=604800
Content-Type: text/html; charset=UTF-8
Date: Mon, 11 Nov 2024 19:25:44 GMT
Etag: "3147526947+ident"
Last-Modified: Thu, 17 Oct 2019 07:18:26 GMT
Server: ECAcc (dad/5FC1)
Vary: Accept-Encoding
X-Cache: HIT
Content-Length: 1256
Connection: close
```

After running the client again, output.html confirms the fresh data replaces the outdated cache entry:

```
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work$ s
tat output.html
  File: output.html
  Size: 1618          Blocks: 8          IO Block: 4096    regular fi
le
Device: 830h/2096d     Inode: 115363        Links: 1
Access: (0644/-rw-r--r--)  Uid: ( 1000/  wizard)   Gid: ( 1001/  wizar
d)
Access: 2024-11-11 13:52:50.405047339 -0600
Modify: 2024-11-11 13:51:09.025066457 -0600
Change: 2024-11-11 13:51:09.025066457 -0600
 Birth: 2024-11-10 19:28:57.576206694 -0600
```

```
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work$ c
at output.html
HTTP/1.0 200 OK
Accept-Ranges: bytes
Age: 0
Cache-Control: max-age=604800
Content-Type: text/html; charset=UTF-8
Date: Mon, 11 Nov 2024 19:01:07 GMT
Etag: "3147526947+ident"
Expires: Mon, 18 Nov 2024 19:01:07 GMT
Last-Modified: Thu, 17 Oct 2019 07:18:26 GMT
Server: ECAcc (dad/5FE4)
Vary: Accept-Encoding
X-Cache: MISS
Content-Length: 1256
Connection: close
```

Recent Access and Old Modification Cache Return

Initiate proxy and client:

```
ake all
make: Nothing to be done for 'all'.
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work$ m
ake clean
rm -f proxy client
rm -rf cached/*
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work$ m
ake all
gcc -Wall -g -pthread -o proxy proxy.c
gcc -Wall -g -pthread -o client client.c
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work$ .
/proxy 127.0.0.1 8080
Proxy server listening on IP 127.0.0.1 and port 8080
Sending request to origin server: GET / HTTP/1.0
Host: example.com
Connection: close
```

```
gcc -Wall -g -pthread -o client client.c
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work$ .
/client 127.0.0.1 8080 http://example.com
Response from proxy server:
HTTP/1.0 200 OK
Age: 492593
Cache-Control: max-age=604800
Content-Type: text/html; charset=UTF-8
Date: Mon, 11 Nov 2024 19:34:00 GMT
Etag: "3147526947+ident"
Expires: Mon, 18 Nov 2024 19:34:00 GMT
Last-Modified: Thu, 17 Oct 2019 07:18:26 GMT
Server: ECAcc (dad/5FE4)
Vary: Accept-Encoding
X-Cache: HIT
Content-Length: 1256
Connection: close
```

After removing the "Expires" header and modifying the last modification time to more than one month ago at two months ago, and setting the last access time to within the last 24 hours:

```
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work/ca
ched$ nano 1731355630.html
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work/ca
ched$ touch -a -d "1 day ago" 1731355630.html wizard@MOORE-LAPTOP:~/EC
EN-602-Machine-Problems/mp4_7/original_work/cached$ touch -m -d "2 mon
ths ago" 1731355630.ht
ml
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work/ca
ched$ stat 1731355630.html
  File: 1731355630.html
  Size: 1623           Blocks: 8          IO Block: 4096   regular fi
le
Device: 820h/2080d      Inode: 115333      Links: 1
Access: (0644/-rw-r--r--)  Uid: ( 1000/  wizard)   Gid: ( 1001/  wizar
d)
Access: 2024-11-10 14:14:27.157055810 -0600
Modify: 2024-09-11 15:14:40.060277590 -0500
Change: 2024-11-11 14:14:40.046286693 -0600
 Birth: 2024-11-11 14:07:10.726306435 -0600
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work/ca
ched$ cat 1731355630.html
HTTP/1.0 200 OK
Age: 350658
Cache-Control: max-age=604800
Content-Type: text/html; charset=UTF-8
Date: Mon, 11 Nov 2024 20:07:11 GMT
Etag: "3147526947+gzip+ident"
Last-Modified: Thu, 17 Oct 2019 07:18:26 GMT
Server: ECAcc (dad/5FE2)
Vary: Accept-Encoding
X-Cache: HIT
Content-Length: 1256
Connection: close
```

Running the client again:

```
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work$ .
/client 127.0.0.1 8080 http://example.com
Response from proxy server:
HTTP/1.0 200 OK
Age: 350658
Cache-Control: max-age=604800
Content-Type: text/html; charset=UTF-8
Date: Mon, 11 Nov 2024 20:07:11 GMT
Etag: "3147526947+gzip+ident"
Last-Modified: Thu, 17 Oct 2019 07:18:26 GMT
Server: ECAcc (dad/5FE2)
Vary: Accept-Encoding
X-Cache: HIT
Content-Length: 1256
Connection: close
```

Once running the client, the output.html status:

```
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work$ s
tat output.html
  File: output.html
  Size: 1623          Blocks: 8          IO Block: 4096    regular fi
le
Device: 820h/2080d      Inode: 115363      Links: 1
Access: (0644/-rw-r--r--)  Uid: ( 1000/  wizard)   Gid: ( 1001/  wizar
d)
Access: 2024-11-11 14:15:07.566284108 -0600
Modify: 2024-11-11 14:14:55.566285294 -0600
Change: 2024-11-11 14:14:55.566285294 -0600
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work$ c
at output.html
HTTP/1.0 200 OK
Age: 350658
Cache-Control: max-age=604800
Content-Type: text/html; charset=UTF-8
Date: Mon, 11 Nov 2024 20:07:11 GMT
Etag: "3147526947+gzip+ident"
Last-Modified: Thu, 17 Oct 2019 07:18:26 GMT
Server: ECAcc (dad/5FE2)
Vary: Accept-Encoding
X-Cache: HIT
Content-Length: 1256
Connection: close
```

Whereas, the cache status:

```
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work/ca
ched$ stat 1731355630.html
  File: 1731355630.html
  Size: 1623          Blocks: 8          IO Block: 4096    regular fi
le
Device: 820h/2080d      Inode: 115333       Links: 1
Access: (0644/-rw-r--r--)  Uid: ( 1000/  wizard)   Gid: ( 1001/  wizar
d)
Access: 2024-11-11 14:14:47.696286048 -0600
Modify: 2024-09-11 15:14:40.060277590 -0500
Change: 2024-11-11 14:14:40.046286693 -0600
 Birth: 2024-11-11 14:07:10.726306435 -0600
wizard@MOORE-LAPTOP:~/ECEN-602-Machine-Problems/mp4_7/original_work/ca
ched$ cat 1731355630.html
HTTP/1.0 200 OK
Age: 350658
Cache-Control: max-age=604800
Content-Type: text/html; charset=UTF-8
Date: Mon, 11 Nov 2024 20:07:11 GMT
Etag: "3147526947+gzip+ident"
Last-Modified: Thu, 17 Oct 2019 07:18:26 GMT
Server: ECAcc (dad/5FE2)
Vary: Accept-Encoding
X-Cache: HIT
Content-Length: 1256
Connection: close
```

The proxy correctly serves the cached data without fetching new data from the web server, as shown by the X-Cache: HIT header. Although the cache entry was accessed recently, the Last-Modified date remains as 09-11, while the Access Time in output.html updates to 2024-11-11, confirming recent access. The Age and Last-Modified headers indicate that the data is old but accessed recently, meeting Test Case 6's requirements.