Web Server Design

Lecture 3 – Conditionals, Redirections

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(Client-Side) Caching…

```
$ ls Profiles/7ngg6k69.default/Cache/
006D79AEd01  2BF3BF47d01  59BE1336d01  88A074F9d01  B2CD50F8d01
00E1A1DEd01  2C0192FFd01  5A4F43D1d01  88F5AD87d01  B481E3A5d01
027AAA03d01  2CD06959d01  5C4EA487d01  898C3E4Dd01  B4B13877d01
028080ACd01  2DB057E2d01  5FEA7F9Ad01  8C30E478d01  B659B544d01
[deletia…]
```

The client could:

1. do a HEAD, see if our copy is still "good", and only do a GET if not, OR
2. do a "conditional" GET

We need metadata to determine "goodness"

Last-Modified

```
$ telnet www.cs.odu.edu 80
Trying 128.82.4.2...
Connected to xenon.cs.odu.edu.
Escape character is '^]'.
GET /~mln/index.html HTTP/1.1
Connection: close
Host: www.cs.odu.edu

HTTP/1.1 200 OK
Date: Mon, 09 Jan 2006 17:07:04 GMT
Server: Apache/1.3.26 (Unix) ApacheJServ/1.1.2 PHP/4.3.4
Last-Modified: Sun, 29 May 2005 02:46:53 GMT
ETag: "1c52-14ed-42992d1d"
Accept-Ranges: bytes
Content-Length: 5357
Connection: close
Content-Type: text/html

<html>
<head>
<title>Home Page for Michael L. Nelson</title>

[lots of html deleted]
Connection closed by foreign host.
```

Last-Modified is not always present…

```
$ curl -I https://www.cs.odu.edu/~mln/index.html
HTTP/1.1 200 OK
Server: nginx
Date: Tue, 18 Sep 2018 21:48:53 GMT
Content-Type: text/html
Connection: keep-alive
Vary: Accept-Encoding
Front-End-Https: on

$ curl -I https://www.cs.odu.edu/~mln/images/mln-ad-100x130.jpg
HTTP/1.1 200 OK
Server: nginx
Date: Tue, 18 Sep 2018 21:50:46 GMT
Content-Type: image/jpeg
Content-Length: 2957
Connection: keep-alive
Last-Modified: Tue, 10 Jul 2007 17:06:47 GMT
ETag: "b8d-434ebc95b37c0"
Accept-Ranges: bytes
Front-End-Https: on
```

Generated from files on the filesystem

```php
<?php
$filename = 'somefile.txt';
if (file_exists($filename)) {
    echo "$filename was last modified: "
        . date("F d Y H:i:s.", filemtime($filename));
}
?>

// outputs e.g.:
// somefile.txt was last modified: December 29 2002 22:16:23.
```

Example from: http://php.net/manual/en/function.filemtime.php, other languages similar

Unix inodes – 1/2

```
$ echo "hello world" > foo.bar
$ stat foo.bar
  File: foo.bar
  Size: 12          Blocks: 0          IO Block: 65536  regular file
Device: 21h/33d     Inode: 941201749   Links: 1
Access: (0644/-rw-r--r--)  Uid: ( 2444/     mln)   Gid: (   13/   proxy)
Access: 2018-09-18 20:06:25.187249000 -0400
Modify: 2018-09-18 20:06:25.188242000 -0400
Change: 2018-09-18 20:06:25.188242000 -0400
 Birth: -
$ touch foo.bar
$ stat foo.bar
  File: foo.bar
  Size: 12          Blocks: 0          IO Block: 65536  regular file
Device: 21h/33d     Inode: 941201749   Links: 1
Access: (0644/-rw-r--r--)  Uid: ( 2444/     mln)   Gid: (   13/   proxy)
Access: 2018-09-18 20:06:35.637118000 -0400
Modify: 2018-09-18 20:06:35.637118000 -0400
Change: 2018-09-18 20:06:35.637118000 -0400
 Birth: -
$ cat foo.bar
hello world
$ stat foo.bar
  File: foo.bar
  Size: 12          Blocks: 0          IO Block: 65536  regular file
Device: 21h/33d     Inode: 941201749   Links: 1
Access: (0644/-rw-r--r--)  Uid: ( 2444/     mln)   Gid: (   13/   proxy)
Access: 2018-09-18 20:06:35.637118000 -0400
Modify: 2018-09-18 20:06:35.637118000 -0400
Change: 2018-09-18 20:06:35.637118000 -0400
 Birth: -
```

https://www.unixtutorial.org/2008/11/how-to-update-atime-and-mtime-for-a-file-in-unix/
http://ws-dl.blogspot.com/2010/11/2010-11-05-memento-datetime-is-not-last.html

Unix inodes – 2/2

```
$ chmod 600 foo.bar
$ stat foo.bar
  File: foo.bar
  Size: 12         Blocks: 0          IO Block: 65536  regular file
Device: 21h/33d    Inode: 941201749   Links: 1
Access: (0600/-rw-------)  Uid: ( 2444/     mln)  Gid: (   13/   proxy)
Access: 2018-09-18 20:06:35.637118000 -0400
Modify: 2018-09-18 20:06:35.637118000 -0400
Change: 2018-09-18 20:08:52.788535000 -0400
 Birth: -
$ touch foo.bar
$ stat foo.bar
  File: foo.bar
  Size: 12         Blocks: 0          IO Block: 65536  regular file
Device: 21h/33d    Inode: 941201749   Links: 1
Access: (0600/-rw-------)  Uid: ( 2444/     mln)  Gid: (   13/   proxy)
Access: 2018-09-18 20:12:00.965370000 -0400
Modify: 2018-09-18 20:12:00.965370000 -0400
Change: 2018-09-18 20:12:00.965370000 -0400
 Birth: -
$ touch -a foo.bar
$ stat foo.bar
  File: foo.bar
  Size: 12         Blocks: 0          IO Block: 65536  regular file
Device: 21h/33d    Inode: 941201749   Links: 1
Access: (0600/-rw-------)  Uid: ( 2444/     mln)  Gid: (   13/   proxy)
Access: 2018-09-18 20:12:43.915379000 -0400
Modify: 2018-09-18 20:12:00.965370000 -0400
Change: 2018-09-18 20:12:43.915379000 -0400
 Birth: -
```

Entity Tags: "ETag"

```
$ telnet www.cs.odu.edu 80
Trying 128.82.4.2...
Connected to xenon.cs.odu.edu.
Escape character is '^]'.
GET /~mln/index.html HTTP/1.1
Connection: close
Host: www.cs.odu.edu

HTTP/1.1 200 OK
Date: Mon, 09 Jan 2006 17:07:04 GMT
Server: Apache/1.3.26 (Unix) ApacheJServ/1.1.2 PHP/4.3.4
Last-Modified: Sun, 29 May 2005 02:46:53 GMT
ETag: "1c52-14ed-42992d1d"
Accept-Ranges: bytes
Content-Length: 5357
Connection: close
Content-Type: text/html

<html>
<head>
<title>Home Page for Michael L. Nelson</title>

[lots of html deleted]
Connection closed by foreign host.
```

"Entity" is left over from 2616:

2616 section 1.3:

entity

    The information transferred as the payload of a request or response. An entity consists of metainformation in the form of entity-header fields and content in the form of an entity-body, as described in section 7.

2616 section 7:

An entity

  consists of entity-header fields and an entity-body, although some responses will only include the entity-headers.

RFC 7230 calls it "message body"; "entity" as a term is removed but you can't rename the request/response header.

Last-Modified and ETag are *validator header fields*

RFC 7230:   7.2. Validator Header Fields

Validator header fields convey metadata about the selected representation (Section 3). In responses to safe requests, validator fields describe the selected representation chosen by the origin server while handling the response. Note that, depending on the status code semantics, the selected representation for a given response is not necessarily the same as the representation enclosed as response payload.

In a successful response to a state-changing request, validator fields describe the new representation that has replaced the prior selected representation as a result of processing the request.
…

```
+-------------------+---------------------------+
| Header Field Name | Defined in...             |
+-------------------+---------------------------+
| ETag              | Section 2.3 of [RFC7232] |
| Last-Modified     | Section 2.2 of [RFC7232] |
+-------------------+---------------------------+
```

RFC 7232

2.3. ETag

The "ETag" header field in a response provides the current entity-tag for the selected representation, as determined at the conclusion of handling the request. An entity-tag is an opaque validator for differentiating between multiple representations of the same resource, regardless of whether those multiple representations are due to resource state changes over time, content negotiation resulting in multiple representations being valid at the same time, or both. An entity-tag consists of an opaque quoted string, possibly prefixed by a weakness indicator.

Opacity

- A string / tag / pointer / data structure whose semantics / implementation are hidden/local
- Q: What does "1c52-14ed-42992d1d" mean?
  - A: it doesn't matter…
- Examples:
  - ATM & CC data strips
  - Hotel & Flight reservation codes
  - HTTP cookies

Weak and Strong Validators

An entity-tag can be more reliable for validation than a modification
date in situations where it is inconvenient to store modification
dates, where the one-second resolution of HTTP date values is not
sufficient, or where modification dates are not consistently
maintained.

Examples:

```
ETag: "xyzzy"
ETag: W/"xyzzy"
ETag: ""
```

RFC 7232 section 2.1 TL;DR
strong = exact match
weak = "good enough" match

An entity-tag can be either a weak or strong validator, with strong
being the default. If an origin server provides an entity-tag for a
representation and the generation of that entity-tag does not satisfy
all of the characteristics of a strong validator (Section 2.1), then
the origin server MUST mark the entity-tag as weak by prefixing its
opaque value with "W/" (case-sensitive).

Common Hash Functions

- Variable length input, fixed length output
- Can't be reversed
  - small changes in input, large changes in output
- MD5
  - http://www.ietf.org/rfc/rfc1321.txt
- SHA-1, SHA-2
  - https://en.wikipedia.org/wiki/SHA-1
  - https://en.wikipedia.org/wiki/SHA-2

```
$ cat aaa
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
$ cat aab
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaabaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
$ md5sum aaa
ab5e3552116660a492c1c12fa08da9d2
$ md5sum aab
015c1a591ba345438760b6aafc1f7b60
```

Possible Approaches

- Strong:
  - md5(representation data+metadata)
- Weak:
  - md5(representation data)
  - simhash(representation data)
    - http://matpalm.com/resemblance/simhash/
    - http://scholar.google.com/scholar?cluster=18431355887360639014

How Does Apache Do It?

- A configurable function with default inputs of (inode, size, modification time):
  - http://httpd.apache.org/docs/2.2/mod/core.html#fileetag
  - Direct relationship to three parts of:
    ```
    ETag: "1c52-14ed-42992d1d"
    ```
  - ?? Probably, but look in the Apache source code to be sure
    - let's run a test…
    - read about ".htaccess" files
      - http://httpd.apache.org/docs/2.2/howto/htaccess.html

Black Box Test

Request:

```
$ telnet www.cs.odu.edu 80
Trying 128.82.4.2...
Connected to xenon.cs.odu.edu.
Escape character is '^]'.
HEAD /~mln/teaching/cs595-s09/etag-test/foo.txt HTTP/1.1
Host: www.cs.odu.edu
Connection: close
```

```
HTTP/1.1 200 OK
Date: Fri, 30 Jan 2009 20:38:01 GMT
Server: Apache/2.2.0
Last-Modified: Fri, 30 Jan 2009 20:36:03 GMT
ETag: "445d3f-c-274c52c0"
Accept-Ranges: bytes
Content-Length: 12
Connection: close
Content-Type: text/plain
```
`$ cat .htaccess`
`FileETag INode Size MTime`

```
HTTP/1.1 200 OK
Date: Fri, 30 Jan 2009 20:38:31 GMT
Server: Apache/2.2.0
Last-Modified: Fri, 30 Jan 2009 20:36:03 GMT
ETag: "445d3f-274c52c0"
Accept-Ranges: bytes
Content-Length: 12
Connection: close
Content-Type: text/plain
```
`$ cat .htaccess`
`FileETag INode MTime`

```
HTTP/1.1 200 OK
Date: Fri, 30 Jan 2009 20:38:49 GMT
Server: Apache/2.2.0
Last-Modified: Fri, 30 Jan 2009 20:36:03 GMT
ETag: "445d3f"
Accept-Ranges: bytes
Content-Length: 12
Connection: close
Content-Type: text/plain
```
`$ cat .htaccess`
`FileETag INode`

```
HTTP/1.1 200 OK
Date: Fri, 30 Jan 2009 20:39:27 GMT
Server: Apache/2.2.0
Last-Modified: Fri, 30 Jan 2009 20:36:03 GMT
Accept-Ranges: bytes
Content-Length: 12
Connection: close
Content-Type: text/plain
```
`$ cat .htaccess`
`FileETag None`

(contd)

(original) `ETag: "445d3f-c-274c52c0"`

```
HTTP/1.1 200 OK
Date: Fri, 30 Jan 2009 20:54:18 GMT
Server: Apache/2.2.0
Last-Modified: Fri, 30 Jan 2009 20:51:27 GMT
ETag: "445d3f-c-5e5f71c0"
Accept-Ranges: bytes
Content-Length: 12
Connection: close
Content-Type: text/plain
```

$ touch foo.txt

```
HTTP/1.1 200 OK
Date: Fri, 30 Jan 2009 20:54:57 GMT
Server: Apache/2.2.0
Last-Modified: Fri, 30 Jan 2009 20:54:47 GMT
ETag: "445d3f-10-6a4b33c0"
Accept-Ranges: bytes
Content-Length: 16
Connection: close
Content-Type: text/plain
```

$ echo "bar" >> foo.txt

301 Moved Permanently

```
$ telnet www.cs.odu.edu 80
Trying 128.82.4.2...
Connected to xenon.cs.odu.edu.
Escape character is '^]'.
GET /~mln/teaching/cs595-s06/a1-test/2 HTTP/1.1
Host: www.cs.odu.edu
Connection: close

HTTP/1.1 301 Moved Permanently
Date: Sun, 05 Feb 2006 17:12:03 GMT
Server: Apache/1.3.26 (Unix) ApacheJServ/1.1.2 PHP/4.3.4
Location: http://www.cs.odu.edu/~mln/teaching/cs595-s06/a1-test/2/
Connection: close
Transfer-Encoding: chunked
Content-Type: text/html; charset=iso-8859-1

14b
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">
<HTML><HEAD>
<TITLE>301 Moved Permanently</TITLE>
</HEAD><BODY>
<H1>Moved Permanently</H1>
The document has moved
<A HREF="http://www.cs.odu.edu/~mln/teaching/cs595-s06/a1-test/2/">here</A>.
<P>
<HR>
<ADDRESS>Apache/1.3.26 Server at www.cs.odu.edu Port 80</ADDRESS>
</BODY></HTML>

0
```

- Initial main use: redirect requests for directories not ending in a "/"
- Can be configured for other resources
- Browsers typically handle 301 (and 302, 303 & 307) transparently

Most URI Shorteners use 301

```
$ curl -i http://bit.ly/xM9Rv9
HTTP/1.1 301 Moved
Server: nginx
Date: Sun, 29 Jan 2012 21:24:21 GMT
Content-Type: text/html; charset=utf-8
Connection: keep-alive
Set-Cookie: _bit=4f25b905-0037f-02380-3e1cf10a;domain=.bit.ly;expires=Fri Jul 27 21:24:21 2012;
  path=/; HttpOnly
Cache-control: private; max-age=90
Location: http://ws-dl.blogspot.com/2012/01/2012-01-23-release-of-warrick-20-beta.html
MIME-Version: 1.0
Content-Length: 168

<html>
<head>
<title>bit.ly</title>
</head>
<body>
<a href="http://ws-dl.blogspot.com/2012/01/2012-01-23-release-of-warrick-20-beta.html">
moved here</a>
</body>
</html>
```

RFC 7231, 6.4.2 says "Moved Permanently"

See also: https://searchengineland.com/analysis-which-url-shortening-service-should-you-use-17204

6.4.2. 301 Moved Permanently

The 301 (Moved Permanently) status code indicates that the target resource has been assigned a new permanent URI and any future references to this resource ought to use one of the enclosed URIs. Clients with link-editing capabilities ought to automatically re-link references to the effective request URI to one or more of the new references sent by the server, where possible.

How could it be not permanent?

```
$ cd $WWW_home
$ mkdir foo
$ touch foo/bar
$ lynx http://www.some.edu/foo
[returns a directory listing]
…
$ rm -rf foo
$ echo "this is not a directory" > foo
$ lynx http://www.some.edu/foo
[returns a file]
```

Status 302 Found

6.4.3. 302 Found

The 302 (Found) status code indicates that the target resource resides temporarily under a different URI. Since the redirection might be altered on occasion, the client ought to continue to use the effective request URI for future requests.

The server SHOULD generate a Location header field in the response containing a URI reference for the different URI. The user agent MAY use the Location field value for automatic redirection. The server's response payload usually contains a short hypertext note with a hyperlink to the different URI(s).

Note: For historical reasons, a user agent MAY change the request method from POST to GET for the subsequent request. If this behavior is undesired, the 307 (Temporary Redirect) status code can be used instead.

```
$ telnet www.techsideline.com 80
Trying 209.9.232.81...
Connected to www.techsideline.com.
Escape character is '^]'.
GET / HTTP/1.1
Host: www.techsideline.com

HTTP/1.1 302 Found
Date: Sun, 04 Feb 2007
Server: Apache
Set-Cookie: PHPSESSID=
expires=Sun, 18 Feb 20
domain=techsideline.
Expires: Thu, 19 Nov
Cache-Control: no-st
 post-check=0, pre-c
Pragma: no-cache
Location: /home
Connection: close
Transfer-Encoding: chunked
Content-Type: text/html

0

Connection closed by foreign host.
```

RFC 2616 14.30 Location

The Location response-header field is used to redirect the recipient to a location other than the Request-URI for completion of the request or identification of a new resource. … The field value consists of a single absolute URI.

RFC 7231 Appendix B

The syntax of the Location header field has been changed to allow all URI references, including relative references and fragments, along with some clarifications as to when use of fragments would not be appropriate. (Section 7.1.2)

Multiple 302s…

```
$ curl -I -L http://www.craigslist.org/
HTTP/1.1 302 Found
Set-Cookie: cl_b=13278749562465615286602096;path=/;domain=.craigslist.org;
 expires=Fri, 01-Jan-2038 00:00:00 GMT
Location: http://geo.craigslist.org/

HTTP/1.1 302 Found
Content-Type: text/html; charset=iso-8859-1
Connection: close
Location: http://norfolk.craigslist.org
Date: Sun, 29 Jan 2012 22:09:16 GMT
Set-Cookie: cl_b=13278749561409265234747743564;path=/;domain=.craigslist.org;
 expires=Fri, 01-Jan-2038 00:00:00 GMT
Server: Apache

HTTP/1.1 200 OK
Connection: close
Cache-Control: max-age=3600, public
Last-Modified: Sun, 29 Jan 12 22:04:30 GMT
Set-Cookie: cl_def_lang=en; domain=.craigslist.org; path=/; expires=Mon, 28-Jan-13 22:04:30 GMT
Set-Cookie: cl_def_hp=norfolk; domain=.craigslist.org; path=/; expires=Mon, 28-Jan-13 22:04:30 GMT
Transfer-Encoding: chunked
Date: Sun, 29 Jan 2012 22:04:30 GMT
Vary: Accept-Encoding
Content-Type: text/html; charset=iso-8859-1;
Server: Apache
Expires: Sun, 29 Jan 12 23:04:30 GMT
```

303 See Other

6.4.4. 303 See Other

The 303 (See Other) status code indicates that the server is redirecting the user agent to a different resource, as indicated by a URI in the Location header field, which is intended to provide an indirect response to the original request. A user agent can perform a retrieval request targeting that URI (a GET or HEAD request if using HTTP), which might also be redirected, and present the eventual result as an answer to the original request. Note that the new URI in the Location header field is not considered equivalent to the effective request URI.

This status code is applicable to any HTTP method. It is primarily used to allow the output of a POST action to redirect the user agent to a selected resource, since doing so provides the information corresponding to the POST response in a form that can be separately identified, bookmarked, and cached, independent of the original request.
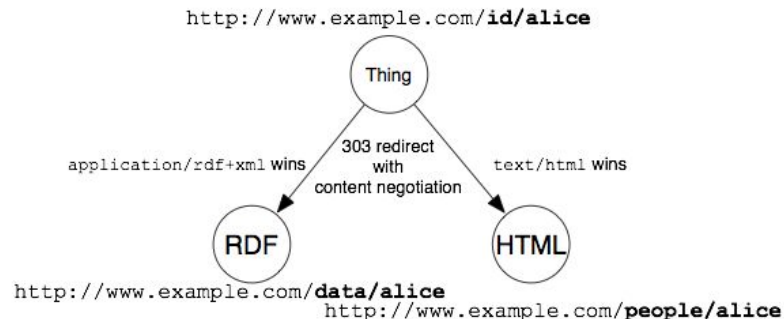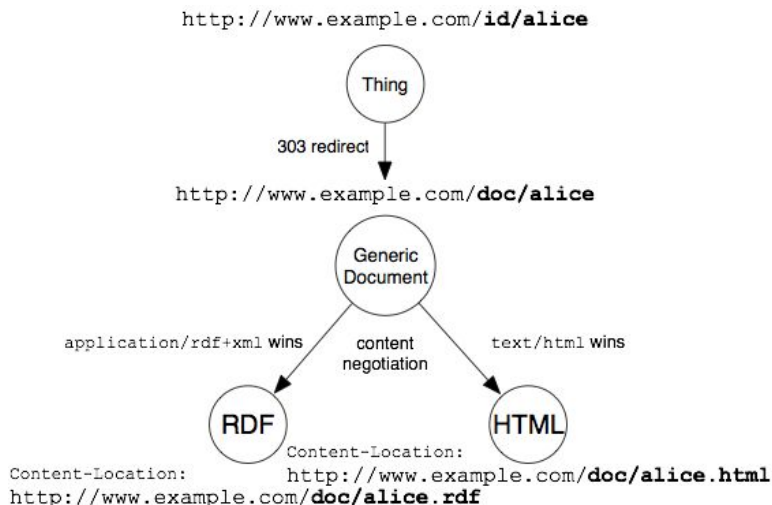
A 303 response to a GET request indicates that the origin server does not have a representation of the target resource that can be transferred by the server over HTTP. However, the Location field value refers to a resource that is descriptive of the target resource, such that making a retrieval request on that other resource might result in a representation that is useful to recipients without implying that it represents the original target resource. Note that answers to the questions of what can be represented, what representations are adequate, and what might be a useful description are outside the scope of HTTP.

This passage is new to RFC 7231

Cool URIs For The Semantic Web

- 303 Redirection was retroactively claimed for supporting using http URIs for identifying "real world objects" (not just web pages *about* real world objects)

  - see: http://www.w3.org/TR/cooluris/

303s for DOIs

```
$ curl -I -L http://dx.doi.org/10.1145/1592761.1592794
HTTP/1.1 303 See Other
Server: Apache-Coyote/1.1
Location: http://portal.acm.org/citation.cfm?doid=1592761.1592794
Expires: Mon, 30 Jan 2012 10:57:54 GMT
Content-Type: text/html;charset=utf-8
Content-Length: 196
Date: Sun, 29 Jan 2012 21:36:44 GMT

HTTP/1.1 301 Moved Permanently
Date: Sun, 29 Jan 2012 21:36:45 GMT
Server: Apache/2.2.3 (Red Hat)
Location: http://dl.acm.org/citation.cfm?doid=1592761.1592794
Connection: close
Content-Type: text/html; charset=iso-8859-1

HTTP/1.1 200 OK
Date: Sun, 29 Jan 2012 21:36:45 GMT
Server: Apache/2.2.3 (Red Hat)
Set-Cookie: CFID=82218306;path=/
Set-Cookie: CFTOKEN=15081455;path=/
Connection: close
Content-Type: text/html; charset=UTF-8
```

```
$ curl -I -L http://dx.doi.org/10.1145/1592761.1592794
HTTP/1.1 302
Date: Wed, 19 Sep 2018 03:42:40 GMT
Content-Type: text/html;charset=utf-8
Content-Length: 195
Connection: keep-alive
Set-Cookie: __cfduid=d08e99aa74a661d0e2da02fdccb38c3991537328560; expires=Thu, 19-Sep-19 03:42:40 GMT; path=/; domain=.doi.org; HttpOnly
Expires: Wed, 19 Sep 2018 03:59:44 GMT
Location: http://portal.acm.org/citation.cfm?doid=1592761.1592794
Vary: Accept
Server: cloudflare
CF-RAY: 45c90b2ef12cc09a-ORF

HTTP/1.1 301 Moved Permanently
Date: Wed, 19 Sep 2018 03:42:40 GMT
Server: Apache/2.4.6 (Red Hat Enterprise Linux) OpenSSL/1.0.2k-fips mod_jk/1.2.41
Location: https://dl.acm.org/citation.cfm?doid=1592761.1592794
Content-Type: text/html; charset=iso-8859-1

HTTP/1.1 302 Found
Date: Wed, 19 Sep 2018 03:42:40 GMT
Content-Type: text/html; charset=iso-8859-1
Connection: keep-alive
Set-Cookie: __cfduid=d9015a272920a699c9997f274d99fed971537328560; expires=Thu, 19-Sep-19 03:42:40 GMT; path=/; domain=.acm.org; HttpOnly
Location: https://dl.acm.org/errorpgs/403.html
Set-Cookie: __cflb=2605054591; path=/; expires=Thu, 20-Sep-18 02:42:40 GMT
Expect-CT: max-age=604800, report-uri="https://report-uri.cloudflare.com/cdn-cgi/beacon/expect-ct"
Server: cloudflare
CF-RAY: 45c90b3139ccc068-ORF

HTTP/1.1 200 OK
Date: Wed, 19 Sep 2018 03:42:41 GMT
Content-Type: text/html; charset=UTF-8
Connection: keep-alive
Set-Cookie: __cfduid=d9015a272920a699c9997f274d99fed971537328560; expires=Thu, 19-Sep-19 03:42:40 GMT; path=/; domain=.acm.org; HttpOnly
Last-Modified: Fri, 03 Dec 2010 17:26:35 GMT
Vary: Accept-Encoding
Set-Cookie: __cflb=2605054591; path=/; expires=Thu, 20-Sep-18 02:42:41 GMT
Expect-CT: max-age=604800, report-uri="https://report-uri.cloudflare.com/cdn-cgi/beacon/expect-ct"
Server: cloudflare
CF-RAY: 45c90b31c9dfc068-ORF
```

Back to 302s as of April 2018

acm.org wants `-A "mozilla"`

https://www.crossref.org/blog/redirecting-redirection/

307 Temporary Redirect

6.4.7. 307 Temporary Redirect

The 307 (Temporary Redirect) status code indicates that the target resource resides temporarily under a different URI and the user agent MUST NOT change the request method if it performs an automatic redirection to that URI. Since the redirection can change over time, the client ought to continue using the original effective request URI for future requests.

The server SHOULD generate a Location header field in the response containing a URI reference for the different URI. The user agent MAY use the Location field value for automatic redirection. The server's response payload usually contains a short hypertext note with a hyperlink to the different URI(s).

Note: This status code is similar to 302 (Found), except that it does not allow changing the request method from POST to GET. This specification defines no equivalent counterpart for 301 (Moved Permanently) ([RFC7238], however, defines the status code 308 (Permanent Redirect) for this purpose).

308 Permanent Redirect

	Permanent	Temporary
Allows changing the request method from POST to GET	301	302
Does not allow changing the request method from POST to GET	-	307

https://tools.ietf.org/html/rfc7538
(*not* defined in RFC 7232)

Pseudo-HTTP Redirection

```
$ telnet list.odu.edu 80
Trying 128.82.224.114...
Connected to list.odu.edu.
Escape character is '^]'.
GET / HTTP/1.1
Host: list.odu.edu

HTTP/1.1 200 OK
Date: Sun, 04 Feb 2007 20:28:07 GMT
Server: Apache
Last-Modified: Tue, 02 Aug 2005 13:21:52 GMT
ETag: "3d3c9-17d-3b2fbc00"
Accept-Ranges: bytes
Content-Length: 381
Content-Type: text/html; charset=ISO-8859-1

<HTML>
<HEAD>
<META http-equiv="Refresh" content="0; URL=http://occs.odu.edu/accounts/mailinglist/index.shtml">
<TITLE>Redirect to web.odu.edu...</TITLE>
</HEAD>

<BODY BGCOLOR=WHITE TEXT=BLACK LINK=BLUE ALINK=BLUE VLINK=BLUE>
Redirect to <A HREF="http://occs.odu.edu/instruction/mailinglist/index.shtml">
http://occs.odu.edu/instruction/mailinglist/index.shtml<a>
</BODY>
</HTML>

Connection closed by foreign host.
```

Compatible with: http://www.w3.org/TR/webarch/#orthogonal-specs ?
a simple robot would see a 200 and stop, but a smart robot has to peak into the entity to find http events!

A Simple Request…

- If the resource is large, we might not want to grab the whole thing frequently unless it has changed
- We could combine HEAD & GET, or we can modify our request with additional headers

```
Trying 128.82.4.2...
Connected to xenon.cs.odu.edu.
Escape character is '^]'.
HTTP/1.1 200 OK
Date: Sun, 05 Feb 2006 16:58:27 GMT
Server: Apache/1.3.26 (Unix) ApacheJServ/1.1.2 PHP/4.3.4
Last-Modified: Sun, 29 Jan 2006 18:43:15 GMT
ETag: "1f4de2-790-43dd0cc3"
Accept-Ranges: bytes
Content-Length: 1936
Connection: close
Content-Type: text/html

<html>
<head>
<title>
Michael Nelson's 1966 Ford Fairlane
</title>
</head>
<body>

[…]
```

Status 304 Not Modified

```
$ telnet www.cs.odu.edu 80
Trying 128.82.4.2...
Connected to xenon.cs.odu.edu.
Escape character is '^]'.
GET /~mln/teaching/cs595-s06/a1-test/2/index.html HTTP/1.1
Host: www.cs.odu.edu
Connection: close
If-Modified-Since: Sun, 29 Jan 2006 18:43:15 GMT

HTTP/1.1 304 Not Modified
Date: Sun, 05 Feb 2006 16:58:41 GMT
Server: Apache/1.3.26 (Unix) ApacheJServ/1.1.2 PHP/4.3.4
Connection: close
ETag: "1f4de2-790-43dd0cc3"
```

```
$ telnet www.cs.odu.edu 80
Trying 128.82.4.2...
Connected to xenon.cs.odu.edu.
Escape character is '^]'.
GET /~mln/teaching/cs595-s06/a1-test/2/index.html HTTP/1.1
Host: www.cs.odu.edu
Connection: close
If-Modified-Since: Sun, 29 Jan 2006 18:43:14 GMT

HTTP/1.1 200 OK
Date: Sun, 05 Feb 2006 16:58:52 GMT
Server: Apache/1.3.26 (Unix) ApacheJServ/1.1.2 PHP/4.3.4
Last-Modified: Sun, 29 Jan 2006 18:43:15 GMT
ETag: "1f4de2-790-43dd0cc3"
Accept-Ranges: bytes
Content-Length: 1936
Connection: close
Content-Type: text/html

<html>
<head>
<title>
Michael Nelson's 1966 Ford Fairlane
</title>
</head>
<body>
```

A 304 response cannot contain a message-body;
it is always terminated by the first empty line
after the header fields.

sections 3.3 & 4.1, RFC 7232

Status 412 Precondition Failed

```
$ telnet www.cs.odu.edu 80
Trying 128.82.4.2...
Connected to xenon.cs.odu.edu.
Escape character is '^]'.
GET /~mln/teaching/cs595-s06/a1-test/2/index.html HTTP/1.1
Host: www.cs.odu.edu
Connection: close
If-Unmodified-Since: Sun, 29 Jan 2006 18:43:15 GMT

Connection closed by foreign host.
HTTP/1.1 200 OK
Date: Sun, 05 Feb 2006 17:01:54 GMT
Server: Apache/1.3.26 (Unix) ApacheJServ/1.1.2 PHP/4.3.4
Last-Modified: Sun, 29 Jan 2006 18:43:15 GMT
ETag: "1f4de2-790-43dd0cc3"
Accept-Ranges: bytes
Content-Length: 1936
Connection: close
Content-Type: text/html

<html>
<head>
<title>
Michael Nelson's 1966 Ford Fairlane
</title>
</head>
<body>
```

Sections 3.4, 4.2, RFC 7232

(If-Unmodified-Since makes more sense w/ PUT)

```
$ telnet www.cs.odu.edu 80
Trying 128.82.4.2...
Connected to xenon.cs.odu.edu.
Escape character is '^]'.
GET /~mln/teaching/cs595-s06/a1-test/2/index.html HTTP/1.1
Host: www.cs.odu.edu
Connection: close
If-Unmodified-Since: Sun, 29 Jan 2006 18:43:14 GMT

HTTP/1.1 412 Precondition Failed
Date: Sun, 05 Feb 2006 17:02:22 GMT
Server: Apache/1.3.26 (Unix) ApacheJServ/1.1.2 PHP/4.3.4
Connection: close
Transfer-Encoding: chunked
Content-Type: text/html; charset=iso-8859-1

159
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">
<HTML><HEAD>
<TITLE>412 Precondition Failed</TITLE>
</HEAD><BODY>
<H1>Precondition Failed</H1>
The precondition on the request for the URL
/~mln/teaching/cs595-s06/a1-test/2/index.html evaluated
to false.<P>
<HR>
<ADDRESS>Apache/1.3.26 Server at www.cs.odu.edu Port
80</ADDRESS>
</BODY></HTML>

0
```

Entity Tags as Conditionals

```
$ telnet www.cs.odu.edu 80 | tee 5-8.out
Trying 128.82.4.2...
Connected to xenon.cs.odu.edu.
Escape character is '^]'.
GET /~mln/teaching/cs595-s06/a1-test/2/index.html HTTP/1.1
Host: www.cs.odu.edu
Connection: close
If-Match: "1f4de2-790-43dd0cc3"

HTTP/1.1 200 OK
Date: Sun, 05 Feb 2006 17:07:12 GMT
Server: Apache/1.3.26 (Unix) ApacheJServ/1.1.2 PHP/4.3.4
Last-Modified: Sun, 29 Jan 2006 18:43:15 GMT
ETag: "1f4de2-790-43dd0cc3"
Accept-Ranges: bytes
Content-Length: 1936
Connection: close
Content-Type: text/html

<html>
<head>
<title>
Michael Nelson's 1966 Ford Fairlane
</title>
</head>
<body>
…
```

Section 3.1, RFC 7232

(If-Match also makes more sense w/ PUT)

```
$ telnet www.cs.odu.edu 80 | tee 5-9.out
Trying 128.82.4.2...
Connected to xenon.cs.odu.edu.
Escape character is '^]'.
GET /~mln/teaching/cs595-s06/a1-test/2/index.html HTTP/1.1
Host: www.cs.odu.edu
Connection: close
If-Match: "1f4de2-790-43dd0cc2"

HTTP/1.1 412 Precondition Failed
Date: Sun, 05 Feb 2006 17:07:21 GMT
Server: Apache/1.3.26 (Unix) ApacheJServ/1.1.2 PHP/4.3.4
Connection: close
Transfer-Encoding: chunked
Content-Type: text/html; charset=iso-8859-1

159
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">
<HTML><HEAD>
<TITLE>412 Precondition Failed</TITLE>
</HEAD><BODY>
<H1>Precondition Failed</H1>
The precondition on the request for the URL
/~mln/teaching/cs595-s06/a1-test/2/index.html evaluated to
false.<P>
<HR>
<ADDRESS>Apache/1.3.26 Server at www.cs.odu.edu Port
80</ADDRESS>
</BODY></HTML>

0
```

Getting Fancy With ETags...

```
$ telnet www.cs.odu.edu 80 | tee 5-11.out
Trying 128.82.4.2...
Connected to xenon.cs.odu.edu.
Escape character is '^]'.
GET /~mln/teaching/cs595-s06/a1-test/2/index.html HTTP/1.1
Host: www.cs.odu.edu
Connection: close
If-None-Match: "1f4de2-790-43dd0caa"

HTTP/1.1 200 OK
Date: Sun, 05 Feb 2006 17:10:00 GMT
Server: Apache/1.3.26 (Unix) ApacheJServ/1.1.2 PHP/4.3.4
Last-Modified: Sun, 29 Jan 2006 18:43:15 GMT
ETag: "1f4de2-790-43dd0cc3"
Accept-Ranges: bytes
Content-Length: 1936
Connection: close
Content-Type: text/html

<html>
<head>
<title>
Michael Nelson's 1966 Ford Fairlane
</title>
</head>
<body>
```

```
$ telnet www.cs.odu.edu 80 | tee 5-12.out
Trying 128.82.4.2...
Connected to xenon.cs.odu.edu.
Escape character is '^]'.
GET /~mln/teaching/cs595-s06/a1-test/2/index.html HTTP/1.1
Host: www.cs.odu.edu
Connection: close
If-None-Match: "1f4de2-790-43dd0caa", "1f4de2-790-43dd0cc3"

HTTP/1.1 304 Not Modified
Date: Sun, 05 Feb 2006 17:10:13 GMT
Server: Apache/1.3.26 (Unix) ApacheJServ/1.1.2 PHP/4.3.4
Connection: close
ETag: "1f4de2-790-43dd0cc3"

Connection closed by foreign host.
```

Section 3.2, RFC 7232

Combining Conditionals

```
AIHT.local:/Users/mln/Desktop/cs595-s06 %
telnet www.cs.odu.edu 80 | tee 5-14.out
Trying 128.82.4.2...
Connected to xenon.cs.odu.edu.
Escape character is '^]'.
GET /~mln/teaching/cs595-s06/a1-test/2/index.html
    HTTP/1.1
Host: www.cs.odu.edu
Connection: close
```

Not True ———————→ `If-Modified-Since: Sun, 29 Jan 2006 18:43:15 GMT`
True ———————→ `If-Match: "1f4de2-790-43dd0cc3"`

```
HTTP/1.1 304 Not Modified
Date: Sun, 05 Feb 2006 18:02:18 GMT
Server: Apache/1.3.26 (Unix) ApacheJServ/1.1.2
    PHP/4.3.4
Connection: close
ETag: "1f4de2-790-43dd0cc3"

Connection closed by foreign host.
```

Combining Conditionals, 2616

	If-Modified-Since	If-Unmodified-Since	If-Match	If-None-Match
If-Modified-Since	---			
If-Unmodified-Since	undefined	---		
If-Match	undefined	X	---	
If-None-Match	X	undefined	undefined	---

X = If the request normally (i.e., without the **** header) would result in anything other than a 2xx or 412 status, the **** header SHOULD be ignored.

Conditional Precedence, 7232

A recipient cache or origin server MUST evaluate the request preconditions defined by this specification in the following order:

1. When recipient is the origin server and If-Match is present, evaluate the If-Match precondition:

    * if true, continue to step 3

    * if false, respond 412 (Precondition Failed) unless it can be determined that the state-changing request has already succeeded (see Section 3.1)

https://tools.ietf.org/html/rfc7232#section-6

Conditional Precedence, 7232

2. When recipient is the origin server, If-Match is not present, and
    If-Unmodified-Since is present, evaluate the If-Unmodified-Since precondition:

    * if true, continue to step 3

    * if false, respond 412 (Precondition Failed) unless it can be
       determined that the state-changing request has already
       succeeded (see Section 3.4)

3. When If-None-Match is present, evaluate the If-None-Match precondition:

    * if true, continue to step 5

    * if false for GET/HEAD, respond 304 (Not Modified)

    * if false for other methods, respond 412 (Precondition Failed)

Conditional Precedence, 7232

4. When the method is GET or HEAD, If-None-Match is not present, and
    If-Modified-Since is present, evaluate the If-Modified-Since precondition:

    * if true, continue to step 5

    * if false, respond 304 (Not Modified)

5. When the method is GET and both Range and If-Range are present,
    evaluate the If-Range precondition:

    * if the validator matches and the Range specification is
       applicable to the selected representation, respond 206
       (Partial Content) [RFC7233]

6. Otherwise,

    * all conditions are met, so perform the requested action and
       respond according to its success or failure.