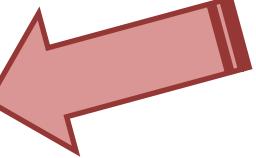


Overall functioning of HTTP clients: requests submission and responses processing

Web Engineering

What is an HTTP client?
What types are most common?



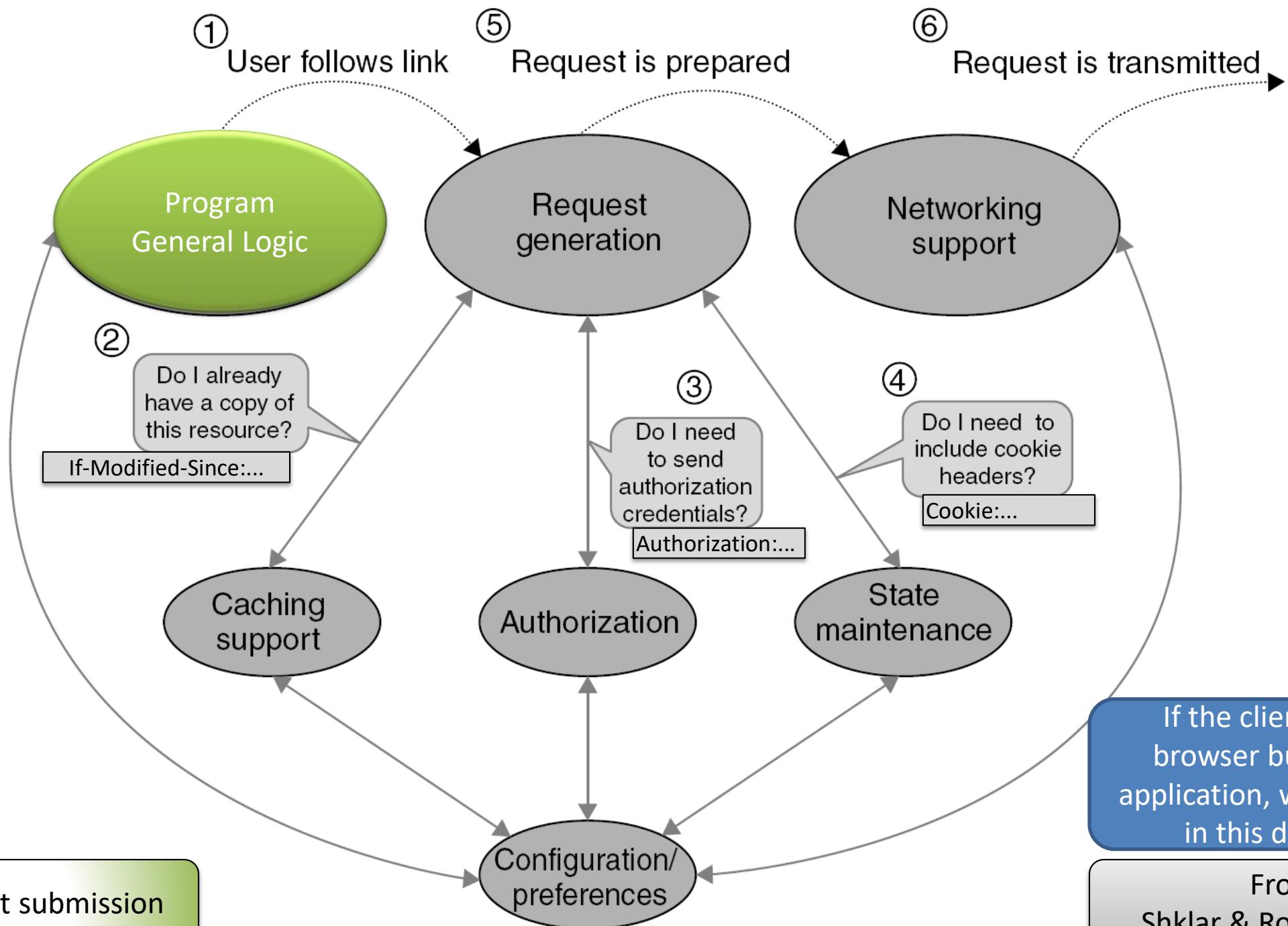
1. Browsers

2. Web servers that make requests to other servers
3. Code in any application (web or not) that contacts an HTTP server



Basically,
what does a browser do?

1. Sends HTTP requests to servers on your behalf or on its own initiative.
2. Receives HTTP responses from servers and interprets them.
3. Acts with the outcome of the interpretation (eg., Showing the results in the browser window).



If the client is not a browser but another application, what changes in this diagram?

From:
Shklar & Rosen, p. 158

What HTTP request is made to display the image?
What request is made when you click on the link?

Discworld **Books** **Meet Terry** **News** **Msg Boards** **Linx**


Photo by Robin Mathews

Terry
thirte
buy a
humorous fantasy
appeared in 19
People,
Publisher Colin
Smythe, T
or many years as a
journalist, press officer, writing in his spare
time and publishing a number of novels,
including his first Discworld novel, **The Color of
Magic**, in 1983. In 1987 he turned to writing full
time, and has not looked back since. To date
there are a total of 36 books in the Discworld
series, of which four (so far) are written for
children. The first of these, **The Amazing
Maurice and His Educated Rodents**, won the
Carnegie Medal. A non-Discworld book, **Good
Omens**, his 1990 collaboration with Neil
Gaiman, has been a longtime bestseller, and
was reissued in hardcover by William M
early 2006 (it is also availab
ket

[****](#)

[**Talk with Terry Pratchett**](#)

Second Life Q&A

Sign up for Terry Pratchett & Discworld News

Praise for Pratchett

Locus Magazine Interview

About Paul Kidby

Talk with Terry Pratchett

A Message from Terry Pratchett

```

```

Originates this ... Why? (As soon as the page loads, of course.)

GET /img/common/terry-big.jpg HTTP/1.1

Host:www.terrypratchettbooks.com



Photo by Robin Mathews

including his first Discworld novel, **The Color of Magic**, in 1983. In 1987 he turned to writing full time, and has not looked back since. To date there are a total of 36 books in the Discworld series, of which four (so far) are written for children. The first of these, **The Amazing Maurice and His Educated Rodents**, won the Carnegie Medal. A non-Discworld book, **Good Omens**, his 1990 collaboration with Neil Gaiman, has been a longtime bestseller, and was reissued in hardcover by William Morrow in early 2006 (it is also available as a mass market paperback (Harper Torch, 2006) and trade paperback (Harper Paperbacks, 2006). Terry's latest book, **Making Money**, was published in September 2007 and was an instant *New York Times* and *London Times* bestseller. In 2008, Harper Children's will publish Terry's new

[Praise for Pratchett](#)

[Locus Magazine Interview](#)

[About Paul Kidby](#)

[Talk with Terry Pratchett](#)

[A Message from Terry Pratchett](#)

TerryPratchettBooks.com

www.terrypratchettbooks.com/terry/

And if it was ...

What would originate?



Photo by Robin Mathews

Terry Pratchett sold his first story when he was thirteen, which earned him enough money to buy a second-hand typewriter. His first novel, a humorous fantasy entitled *The Carpet People*, appeared in 1971 from the publisher Colin Smythe. Terry worked for many years as a journalist and press officer, writing in his spare time and publishing a number of novels, including his first Discworld novel, **The Color of Magic**, in 1983. In 1987 he turned to writing full time, and has not looked back since. To date there are a total of 36 books in the Discworld series, of which four (so far) are written for children. The first of these, **The Amazing Maurice and His Educated Rodents**, won the Carnegie Medal. A non-Discworld book, **Good Omens**, his 1990 collaboration with Neil Gaiman, has been a longtime bestseller, and was reissued in hardcover by William Morrow in early 2006 (it is also available as a mass market paperback (Harper Torch, 2006) and trade paperback (Harper Paperbacks, 2006). Terry's latest book, **Making Money**, was published in September 2007 and was an instant *New York Times* and *London Times* bestseller. In 2008, Harper Children's will publish Terry's new

[< Meet Terry](#)

[Second Life Q&A](#)

[Sign up for Terry Pratchett & Discworld News](#)

[Praise for Pratchett](#)

[Locus Magazine Interview](#)

[About Paul Kidby](#)

[Talk with Terry Pratchett](#)

[A Message from Terry Pratchett](#)

If it were...

```

```

It would originate this ... Why?

GET /terry/img/common/terry-big.jpg HTTP/1.1
Host:www.terrypratchettbooks.com



time, and has not looked back since. To date there are a total of 36 books in the Discworld series, of which four (so far) are written for children. The first of these, **The Amazing Maurice and His Educated Rodents**, won the Carnegie Medal. A non-Discworld book, **Good Omens**, his 1990 collaboration with Neil Gaiman, has been a longtime bestseller, and was reissued in hardcover by William Morrow in early 2006 (it is also available as a mass market paperback (Harper Torch, 2006) and trade paperback (Harper Paperbacks, 2006). Terry's latest book, **Making Money**, was published in September 2007 and was an instant *New York Times* and *London Times* bestseller. In 2008, Harper Children's will publish Terry's new

PRAISE FOR PRATCHETT

Locus Magazine Interview

About Paul Kidby

Talk with Terry Pratchett

A Message from Terry Pratchett

Talk with Terry Pratchett

Originates this ... Why? (Only when clicking, of course ...)

GET /terry/talk.html HTTP/1.1
Host:www.terrypratchettbooks.com

Photo by Robin Mathews

series, of which four (so far) are written for children. The first of these, **The Amazing Maurice and His Educated Rodents**, won the Carnegie Medal. A non-Discworld book, **Good Omens**, his 1990 collaboration with Neil Gaiman, has been a longtime bestseller, and was reissued in hardcover by William Morrow in early 2006 (it is also available as a mass market paperback (Harper Torch, 2006) and trade paperback (Harper Paperbacks, 2006). Terry's latest book, **Making Money**, was published in September 2007 and was an instant *New York Times* and *London Times* bestseller. In 2008, Harper Children's will publish Terry's new

LOCUS Magazine Interview

About Paul Kidby

Talk with Terry Pratchett

A Message from Terry Pratchett

Pay attention to <base> HTML element

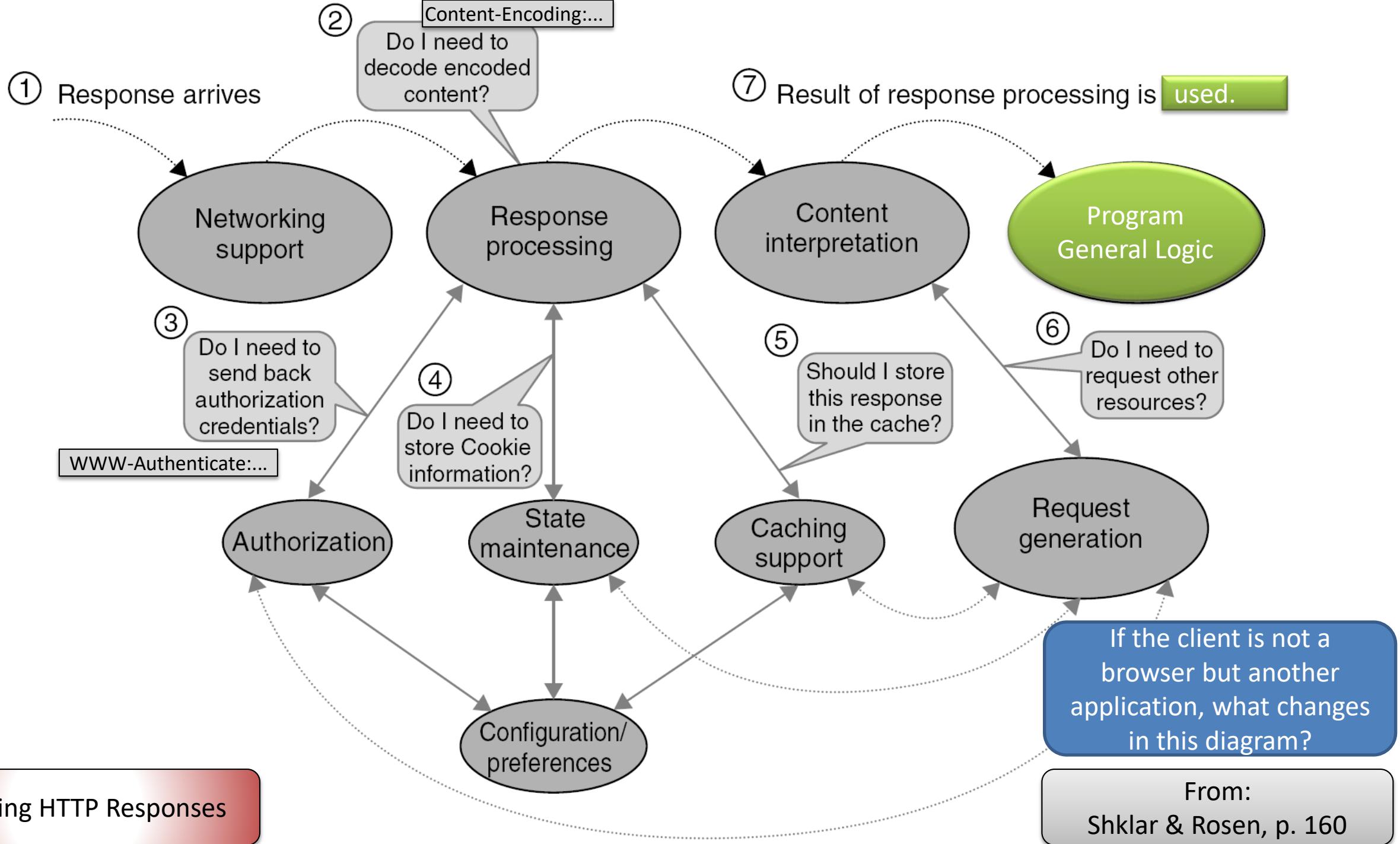
The `<base>` tag specifies the base URL and/or target for all relative URLs in a document.

The `<base>` tag must have either an href or a target attribute present, or both.

There can only be one single `<base>` element in a document, and it must be inside the `<head>` element.

```
<head>
    <base href="https://www.w3schools.com/" target="_blank">
</head>

<body>
    
    <a href="tags/tag_base.asp">HTML base Tag</a>
</body>
```



TerryPratchettBooks.com

www.terrypratchettbooks.com/terry/

Amplify it! Import to Mendeley PB PTLLS wiki / FrontPa... Traduções UTAD - Academic A... Outros marcadores

Discworld Books Meet Terry News Msg Boards Linx

Terry Pratchett sold his first story when he was thirteen, which earned him enough money to buy a second-hand typewriter. His first novel, a humor...
appeared in 1971. Terry's first Discworld novel, *Small Gods*, was published in 1989. Terry has written over 60 books, including the Discworld series, the *Witches* series, the *Discworld in Anansi City* series, the *Illustrated Discworld* series, the *Discworld* graphic novels, and the *Discworld* comic books. Terry's books have been translated into over 30 languages and have sold millions of copies worldwide. Terry has received numerous awards for his writing, including the Carnegie Medal, the Whitbread Award, and the Costa Book Award. Terry has also received honorary degrees from several universities and has been a guest at many literary festivals and events around the world.

< Meet Terry

Photo by Robin Mathews

Let's take a look at the response processing for this page.

Locus Magazine Interview

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Talk with Terry Pratchett

A Message from Terry Pratchett

HTTP/1.1 200 OK

Date:Tue, 12 Oct 2010 12:28:34 GMT

Server:Apache/1.3.31 (Unix) PHP/4.3.8 mod_ssl/2.8.19 OpenSSL/0.9.7d

Last-Modified:Wed, 29 Oct 2008 17:38:03 GMT

Etag:"21b019-2288-49089f7b"

Accept-Ranges:bytes

Content-Length:8914

Keep-Alive:timeout=15, max=100

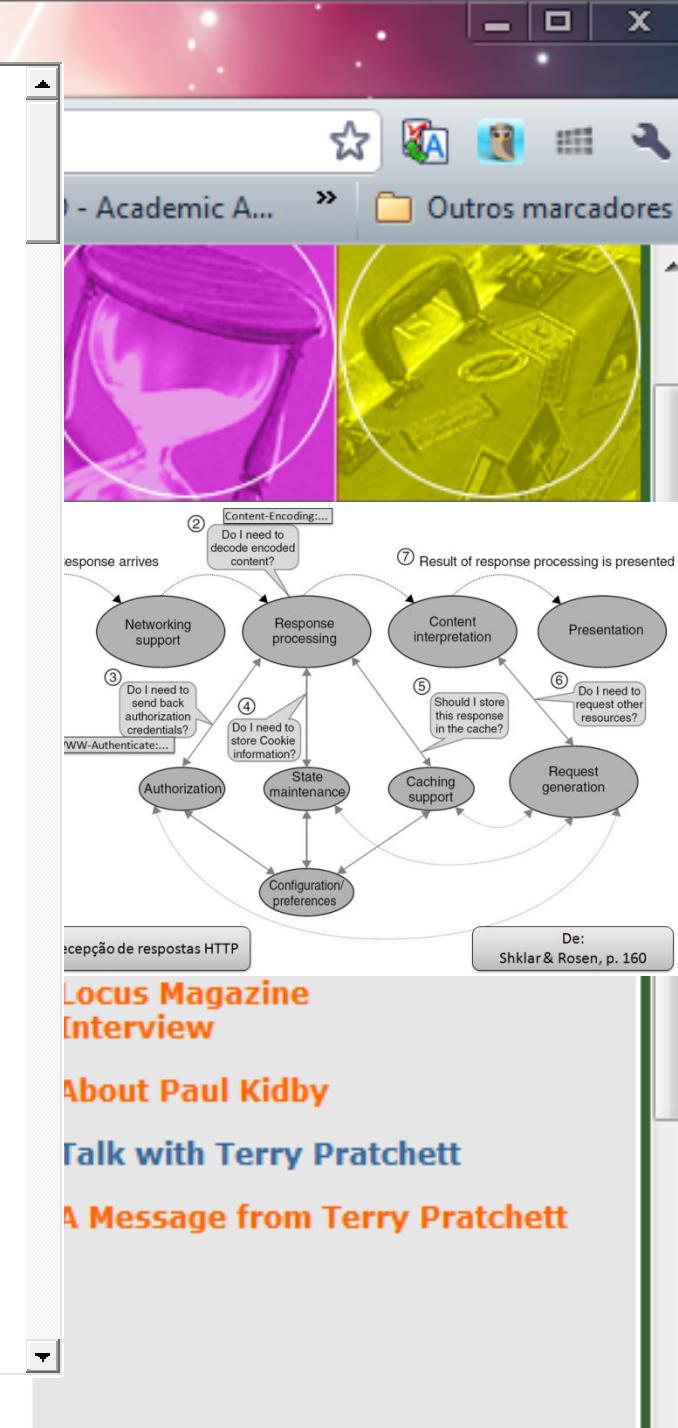
Connection:Keep-Alive

Content-Type:text/html

```
<html><script src="/A2EB891D63C8/avg_ls_dom.js" type="text/javascript"></script>
<head>
<meta name="generator" content=
"HTML Tidy for Mac OS, see www.w3.org">

<title>TerryPratchettBooks.com</title>
<link rel="stylesheet" type="text/css" href="../css/type.css">
<script language="JavaScript" type="text/javascript" src=
"../js/menu-roll.js">
</script>
<meta http-equiv="Content-Type" content=
"text/html; charset=iso-8859-1">
</head>

<body bgcolor="#336633" text="#000000" link="#FF6600" vlink=
"#FF0000" alink="#999999" leftmargin="8" marginwidth="8"
topmargin="8" marginheight="8" onload="menuflag=1;">
<table width="750" border="0" cellpadding="0" cellspacing="0"
summary="Layout">
```



TerryPratchettBooks.com - Mozilla Firefox

File Edit View History Delicious Bookmarks Tools Help

Most Visited Getting Started Latest Headlines MUVEnation Microsoft Language P...

Recently Bookmarked Microsoft Language P... <script
src="/A2EB891D63C8/avg_ls_dom.js"
type="text/javascript"></script>
<head>
 <meta name="generator" content=
 "HTML Tidy for Mac OS, see www.w3.org">

 <title>TerryPratchettBooks.com</title>
 <link rel="stylesheet" type="text/css"
 href="../css/type.css">
 <script language="JavaScript"
 type="text/javascript" src=
 "../js/menu-roll.js">
 </script>
 <meta http-equiv="Content-Type" content=
 "text/html; charset=iso-8859-1">
</head>
```

00:01:05.869	0.730	419	6263	GET	200	text/html
						http://www.terrypratchettbooks.com/terry/
00:01:06.216	0.231	431	10859	GET	200	text/javascript
						http://www.terrypratchettbooks.com/A2EB89
1D63C8/avg_ls_dom.js						
00:01:06.264	0.355	432	2143	GET	200	text/css
						http://www.terrypratchettbooks.com/css/type.
css						
00:01:06.272	0.361	420	1770	GET	200	application/x-javascript
						http://www.terrypratchettbooks.com/js/menu-
roll.js						
00:01:06.465	0.409	465	1609	GET	200	image/gif
						http://www.terrypratchettbooks.com/img/com-
mon/terry-title-off.gif						
00:01:06.473	0.415	462	727	GET	200	image/gif
						http://www.terrypratchettbooks.com/img/com-
mon/terry-select.gif						
00:01:06.481	0.659	421	6174	GET	200	application/x-javascript
						http://www.terrypratchettbooks.com/js/menu-
books.js						
00:01:06.489	0.388	464	506	GET	200	image/gif
						http://www.terrypratchettbooks.com/img/com-

The

content.

# How does the browser act against other non-HTML content?

- CSS
- Javascript
- Images
- Various documents (pdf, docx, xlsx, zip, etc.)

...

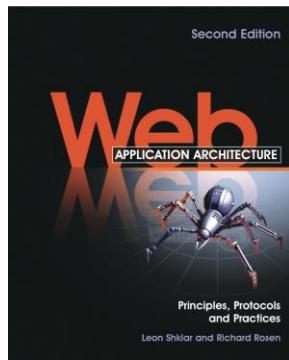
Helpers and Plugins

## Helpers and Plugins

The browser only has the ability to start the **helper application** and display the appropriate file.

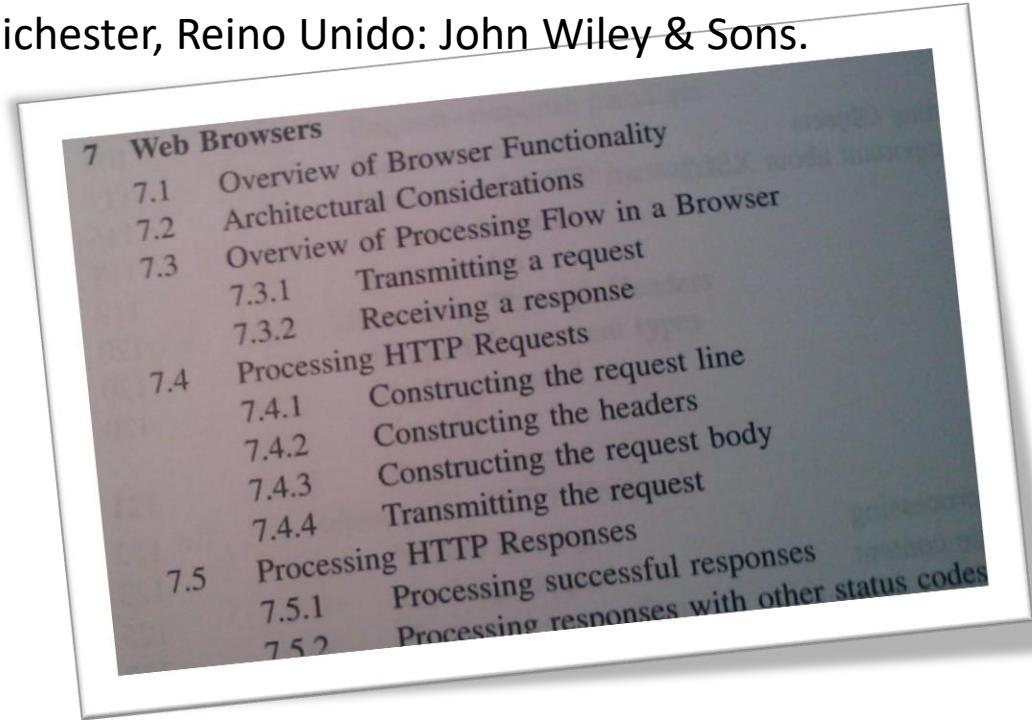
A **plug-in** is an application program invoked by the browser. It is a dynamic code module designed to extend the capabilities of the browser by integrating a third party application program into the browser.

# Continuing with HTTP clients...



Shklar, Leon & Rosen, Rich (2009). *Web Application Architecture: Principles, Protocols and Practices*. Chichester, Reino Unido: John Wiley & Sons.

Pages: 151 to 174

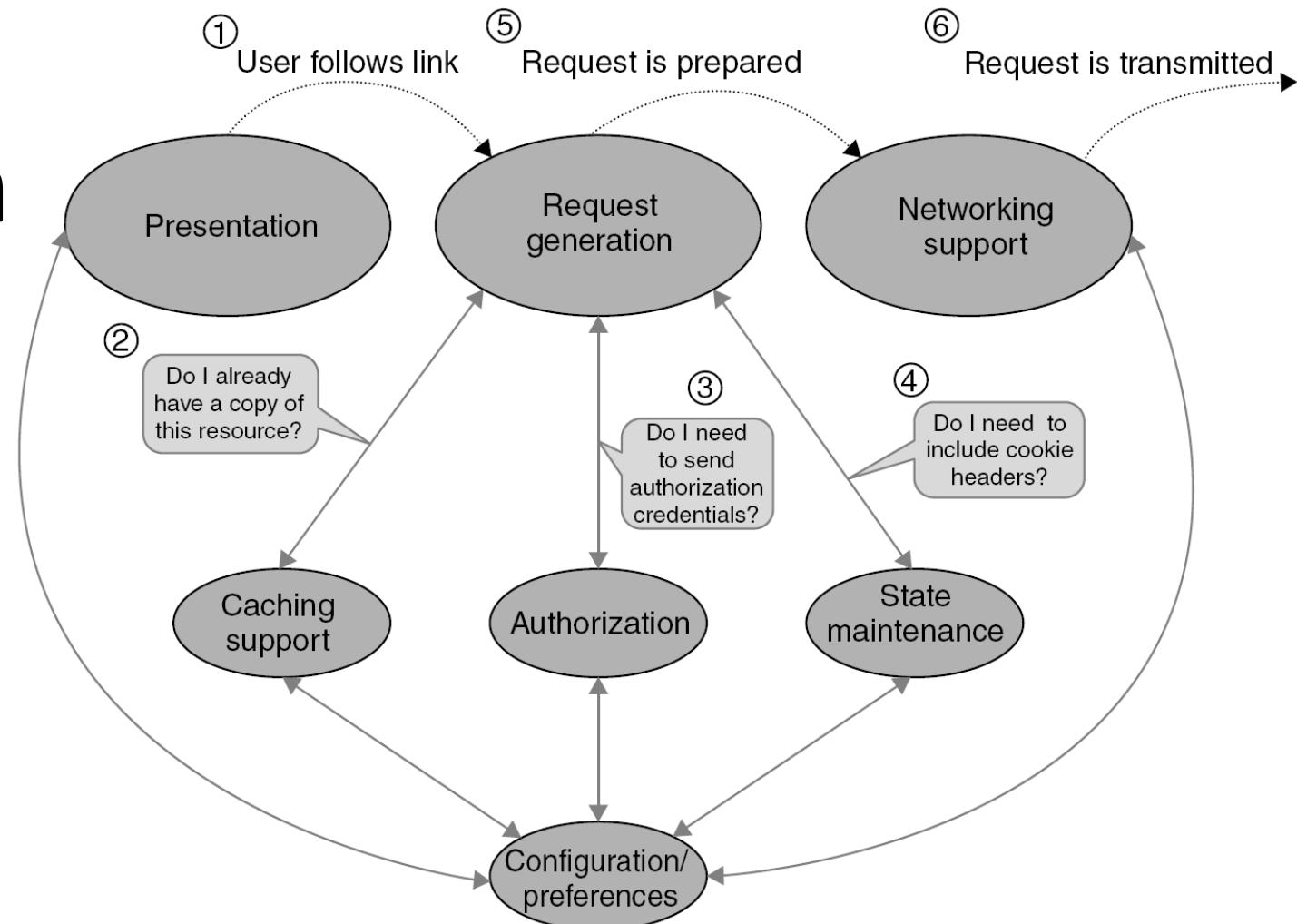


# Overall Functioning of HTTP Clients: Complex HTTP Interactions

Web Engineering

# Complex HTTP Interactions

Cache  
Authorization  
Cookies

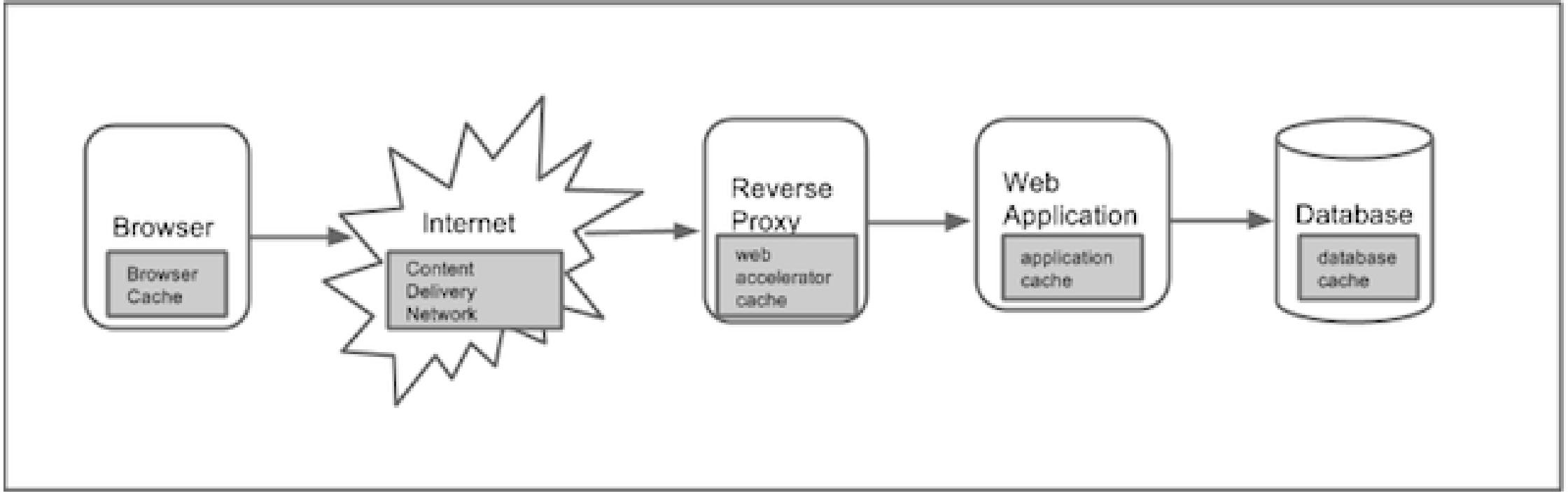


# Web Cache... what is it?

Web caching is temporary storage on the hard disk of web pages, images and other documents and files using caching techniques to reduce available bandwidth usage, increase access speed, among other advantages.

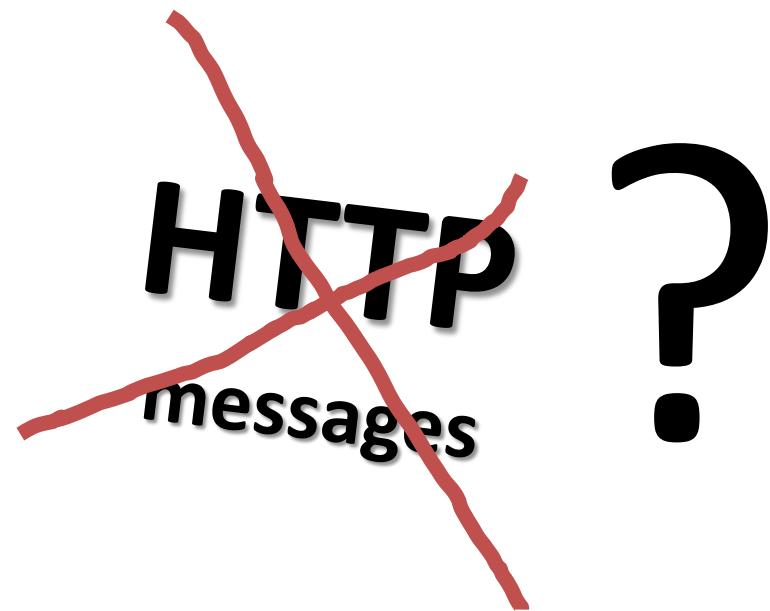
*From Wikipedia, the free encyclopedia*

# Cache Types



Server-side caching  
Client-side caching

# Server-side Caching



# Client-side Caching

Mechanisms involved:

*Request Generation* module

*Response Generation* module

...for saving retrieved resources

# Client-side Caching – HTTP Headers

If-Modified-Since

Date

304 Not Modified

Expires

**max-age**

Last-Modified

Cache-Control  
no-cache  
No-store  
private  
public

# Cacheable Response Codes

Code	Description	Explanation
200	Ok	success
203	Non-authoritative information	Same as 200, but sender has reason to believe that the entity headers are different from those the origin server would send
206	Partial content	Similar to 200, but response to a "range" request. Cacheable if the cache supports range requests.
300	Multiple choices	Response includes choices from which user could make a selection
301	Moved permanently	New URL is in the response headers
410	Gone	Requested resource moved permanently from origin server

# Cacheable Request Methods

<b>Request method</b>	<b>Cacheable ?</b>
GET	Yes, by default
POST	Uncachable by default, cacheable if Cache-control headers allow
HEAD	May be used to cache prev updated entry
PUT	No
DELETE	No
OPTIONS	No
TRACE	No

# Client-side Caching - examples

```
HTTP/1.1 200 OK
Date: Sun, 13 May 2001 12:36:04 GMT
Content-Type: image/jpeg
Content-Length: 34567
```

...

```
Cache-Control: no-cache
Pragma: no-cache
```

...

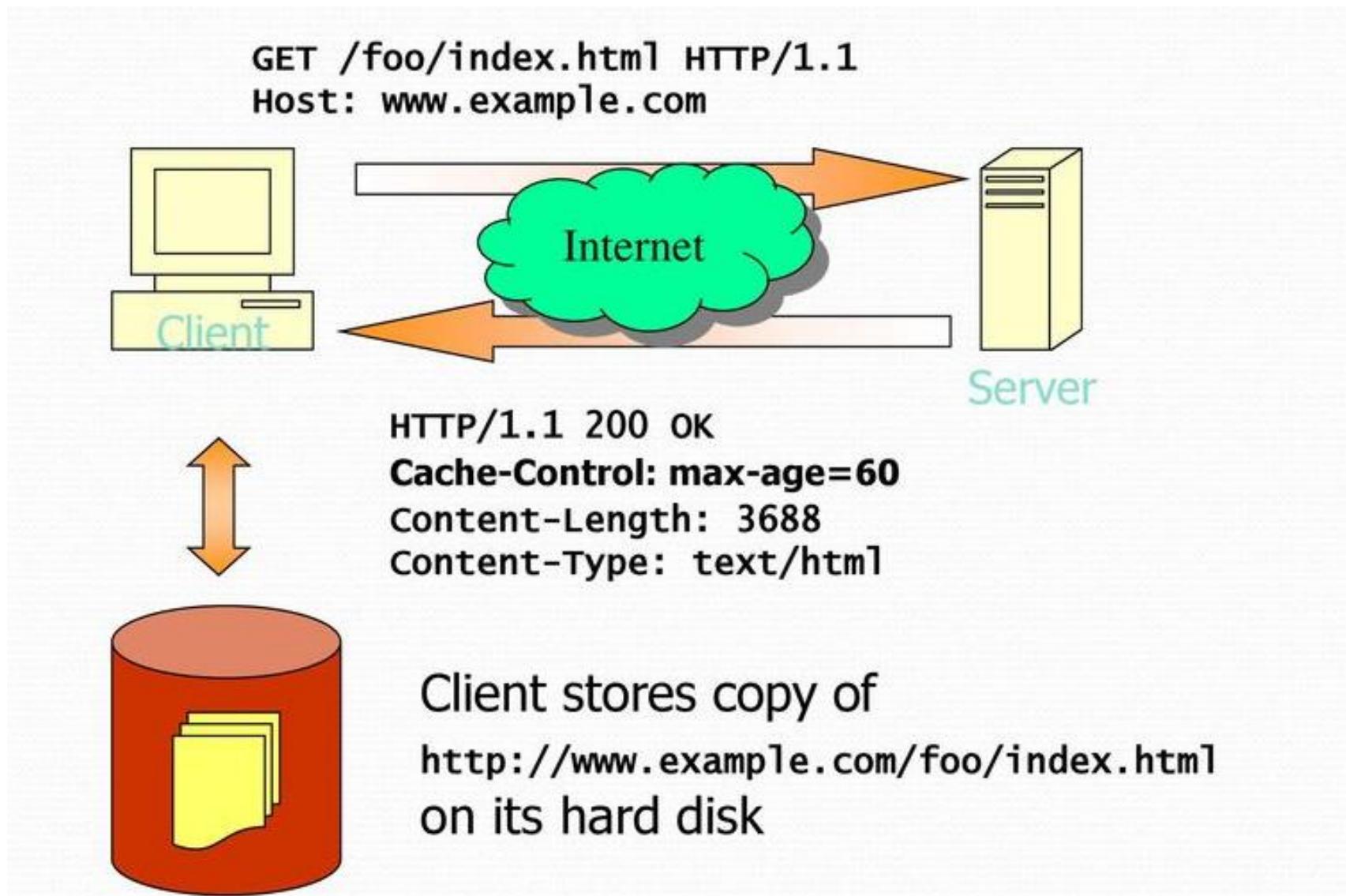
```
HTTP/1.1 200 OK
Date: Sun, 13 May 2001 12:36:04 GMT
Content-Type: image/jpeg
Content-Length: 34567
```

```
Cache-Control: private
Expires: Mon, 14 May 2001 12:36:04 GMT
```

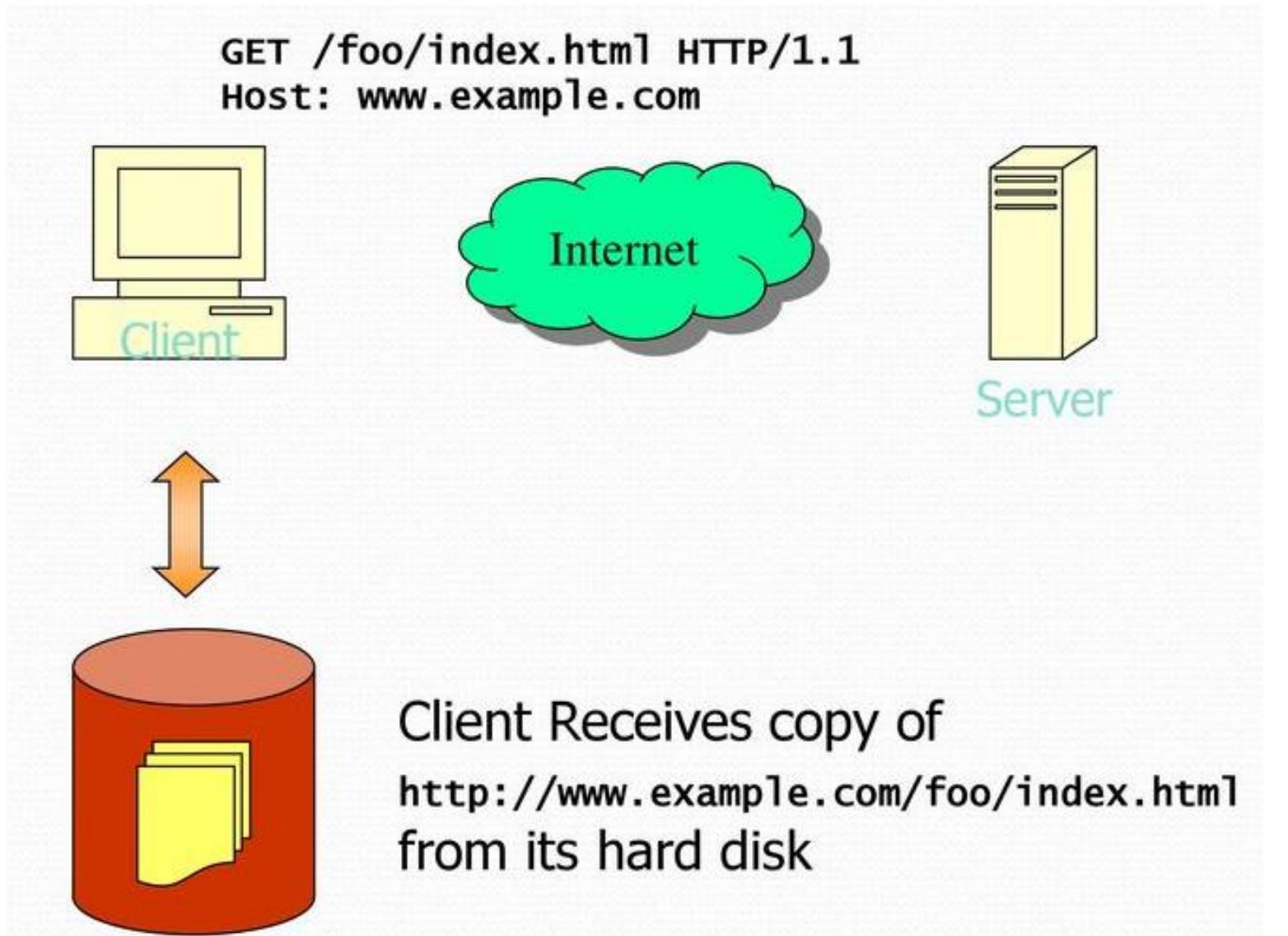
```
Last-Modified: Sun, 13 May 2001 12:36:04 GMT
```

...

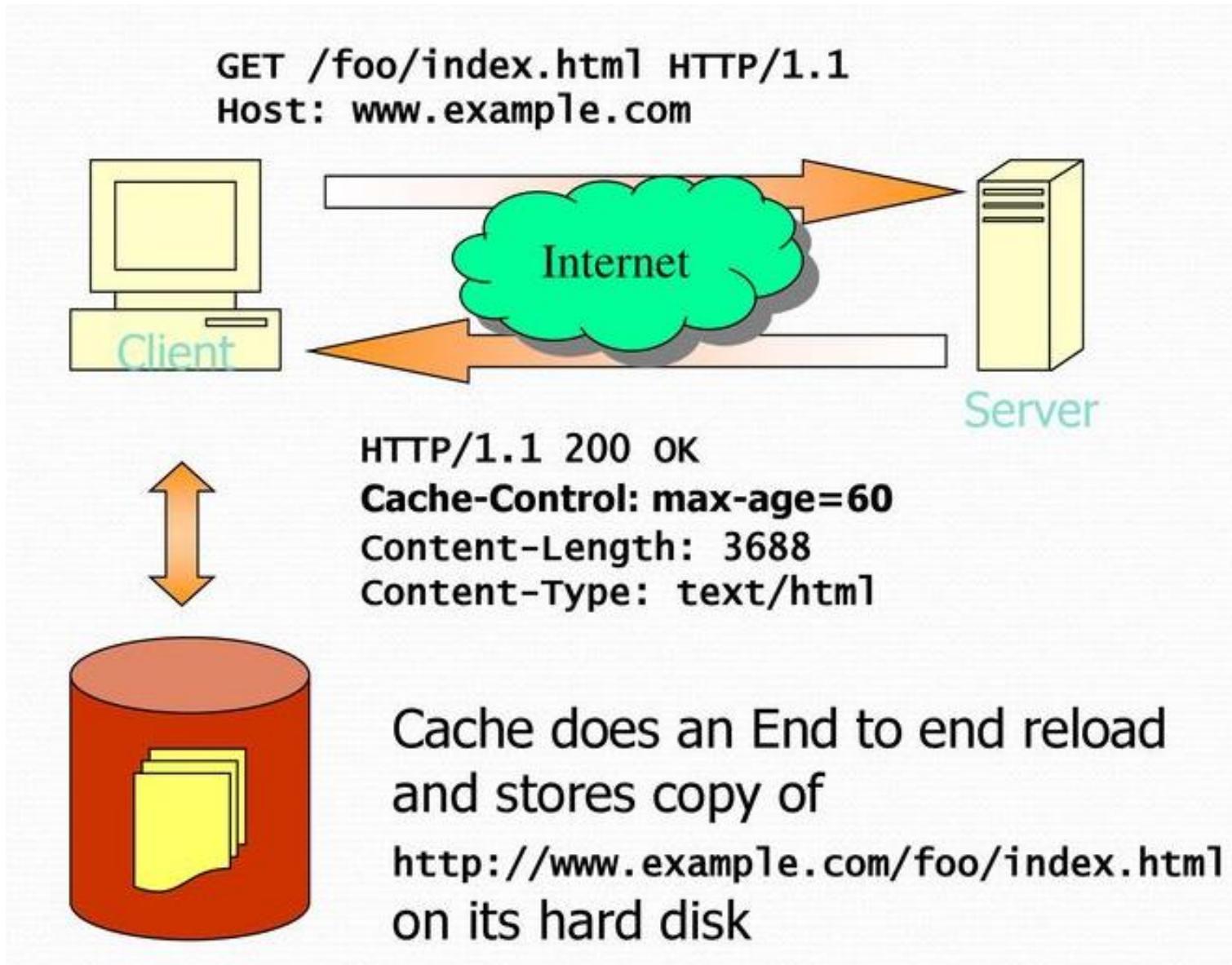
# Example 1 - Client caches a response



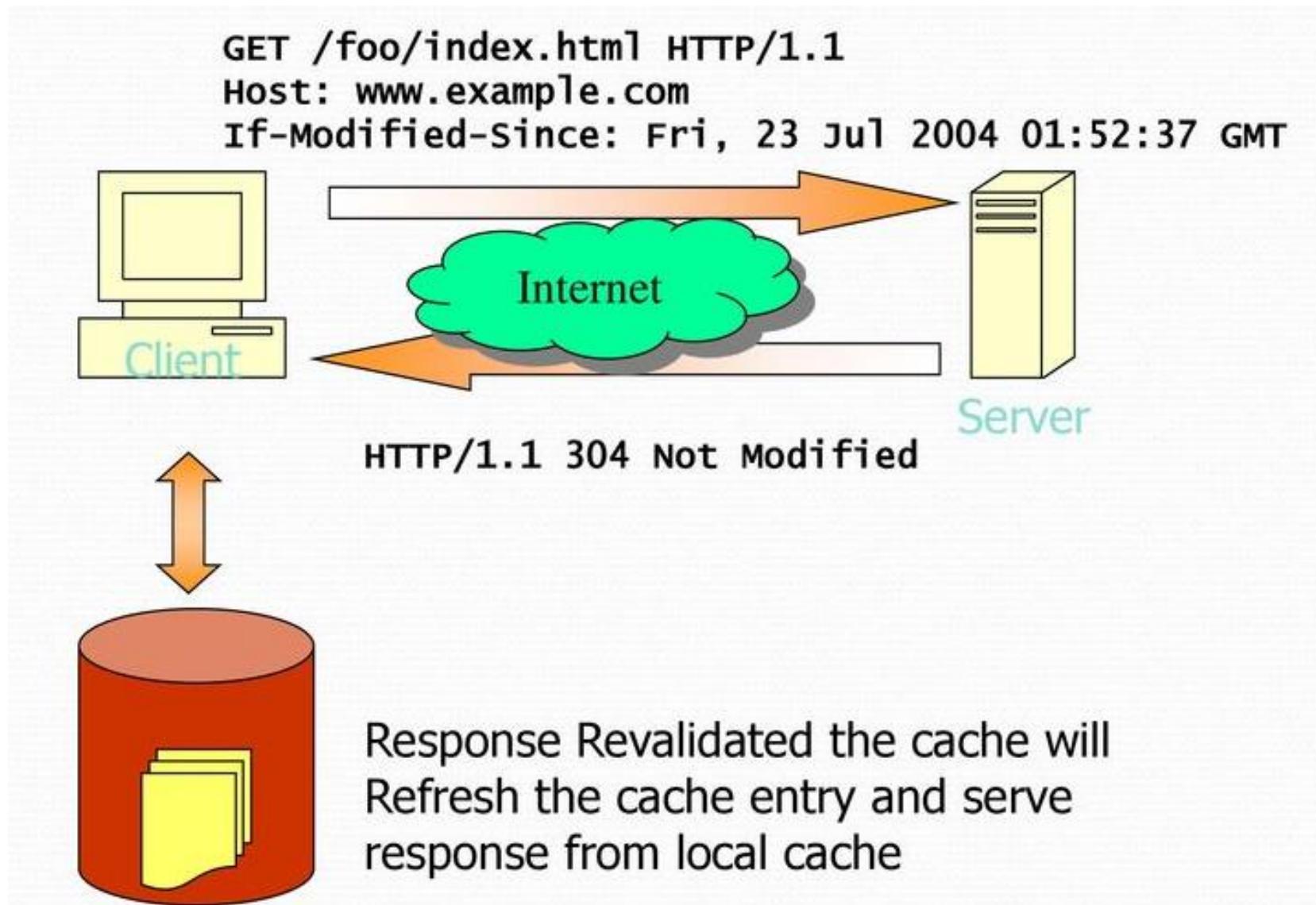
# Example 2 - Client cache hit



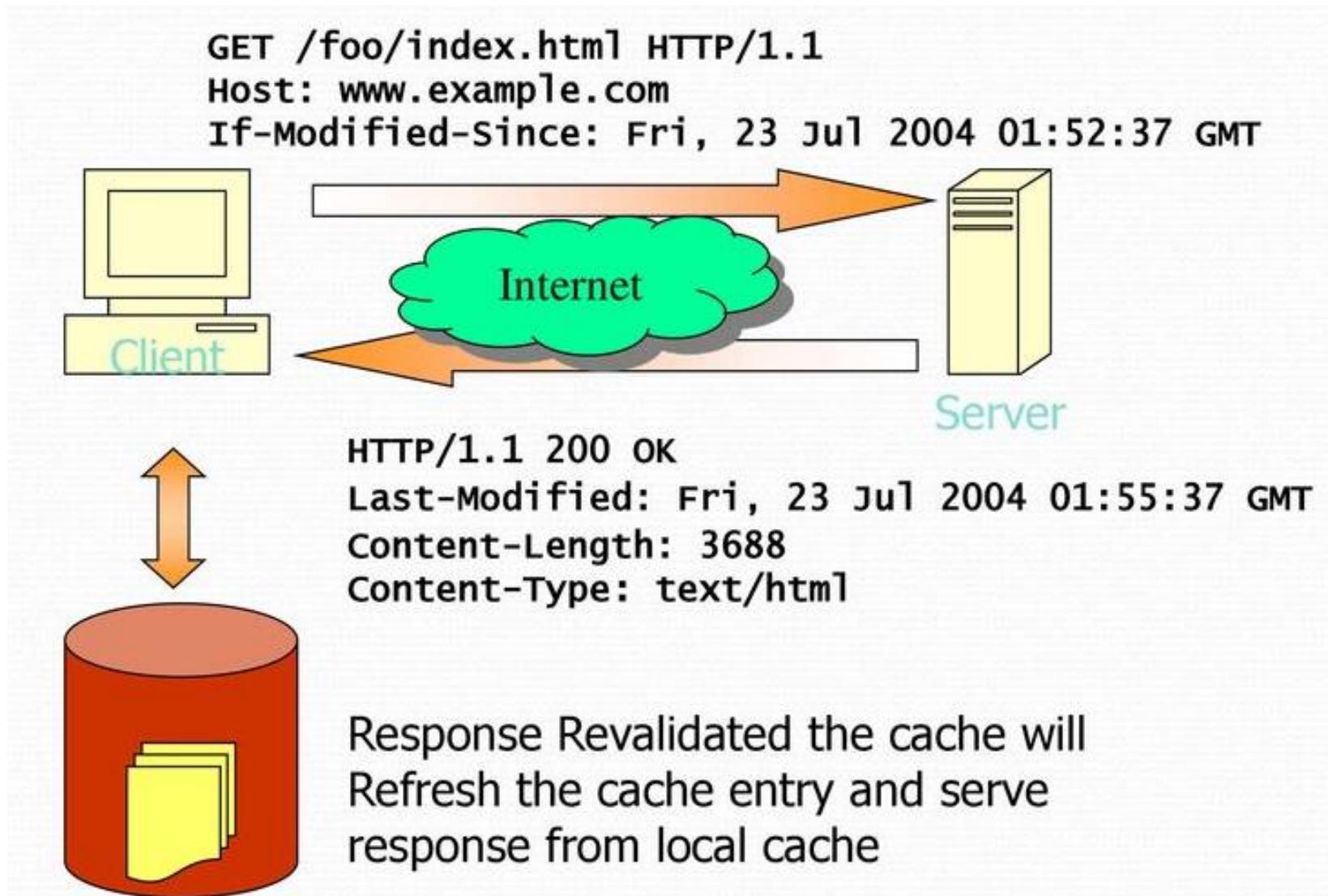
# Example 3 – Cached entry expires



# Example 4 – Revalidation on expiry (revalidate hit)



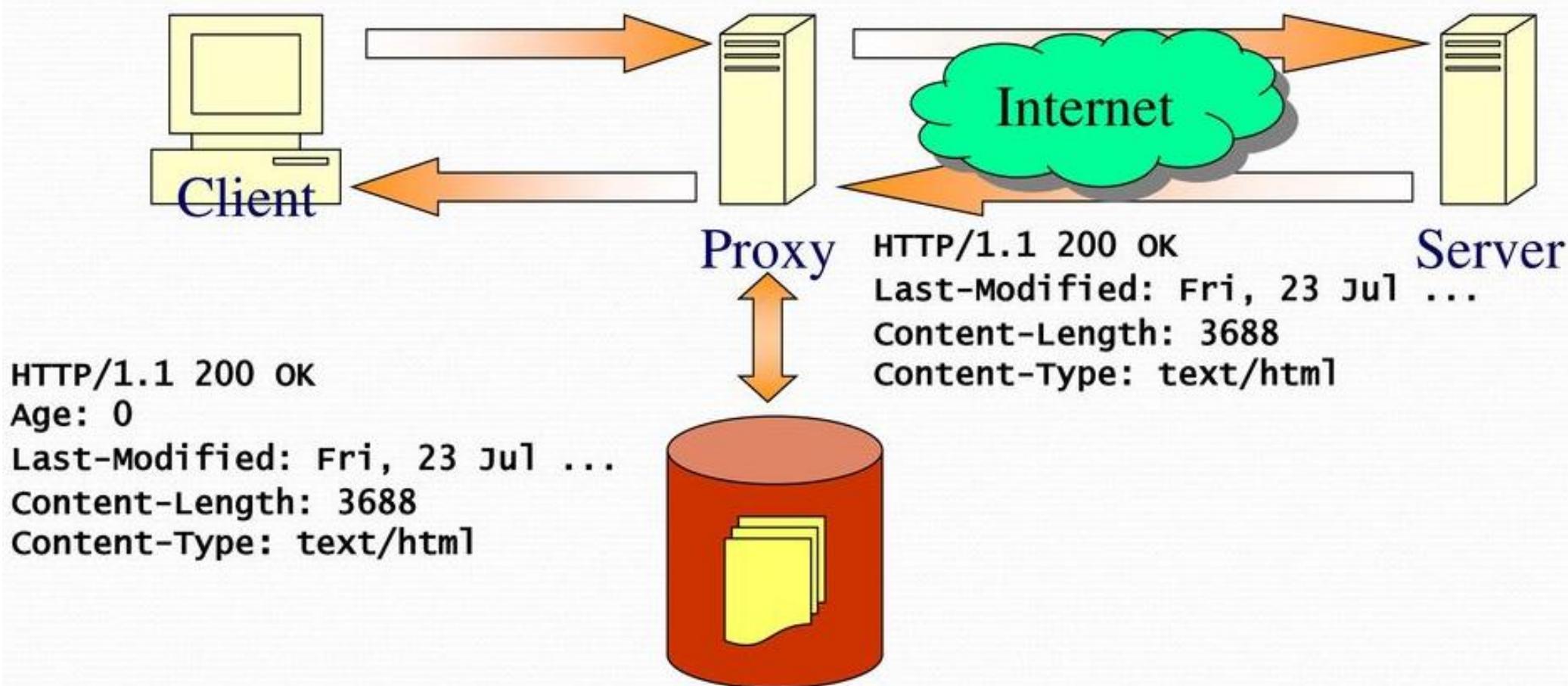
# Example 5 – Revalidation on expiry (revalidate miss)



# Example 6 – Proxy cache miss

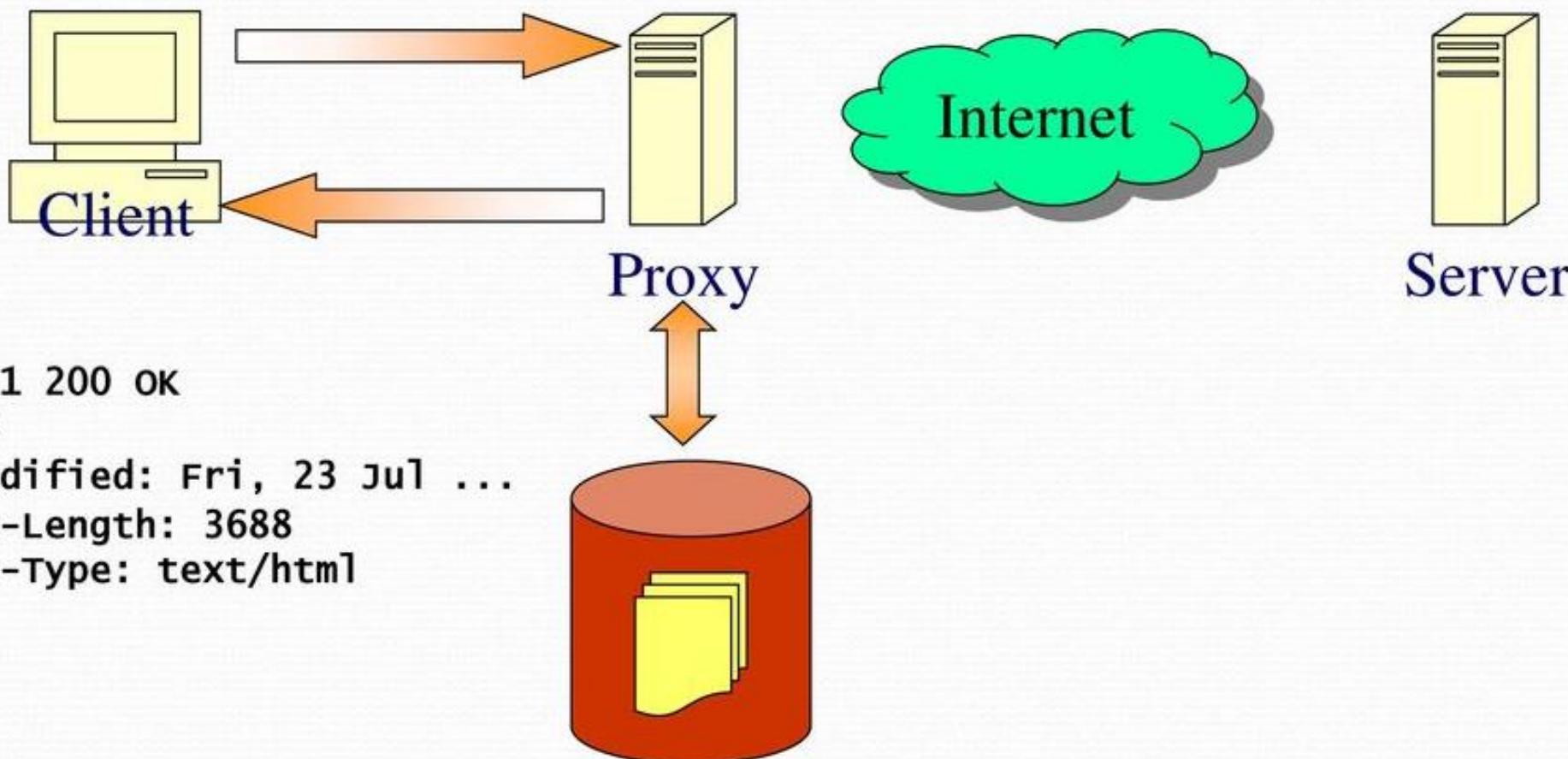
GET /foo/index.html HTTP/1.1  
Host: www.example.com

GET /foo/index.html HTTP/1.1  
Host: www.example.com



# Example 7 – Proxy cache hit

GET /foo/index.html HTTP/1.1  
Host: www.example.com



# Client-side Caching - examples

## **Cache Control with mod\_expires and mod\_headers**

For Apache/2.0, enable the modules in your httpd.conf file like this.

```
LoadModule expires_module modules/mod_expires.so
```

```
LoadModule headers_module modules/mod_headers.so
```

```
LoadModule deflate_module modules/mod_deflate.so
```



# Client-side Caching – examples (Apache server)

## Target Files by Extension for Caching

```
ExpiresActive On
...
<Directory "/home/website/public_html">
 Options FollowSymLinks MultiViews
 AllowOverride All
 Order allow,deny
 Allow from all

 ExpiresDefault A300
 <FilesMatch "\.html$">
 Expires A86400
 </FilesMatch>
 <FilesMatch "\.(gif|jpg|png|js|css)$">
 Expires A2592000
 </FilesMatch>

</Directory>
```

A300 sets the default expiry time to 300 seconds after access (A).

M300 set the expiry time to 300 seconds after file modification (M).



# Client-side Caching – examples (Apache server)

## Target Files by MIME Type

```
ExpiresActive On
```

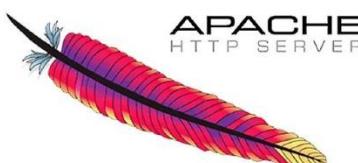
```
ExpiresDefault "access plus 300 seconds"
```

```
<Directory "/home/website/public_html">
 Options FollowSymLinks MultiViews
 AllowOverride All
 Order allow,deny Allow from all
```

```
 ExpiresByType text/html "access plus 1 day"
 ExpiresByType text/css "access plus 1 day"
 ExpiresByType text/javascript "access plus 1 day"
 ExpiresByType image/gif "access plus 1 month"
 ExpiresByType image/jpg "access plus 1 month"
 ExpiresByType image/png "access plus 1 month"
 ExpiresByType application/x-shockwave-flash "access plus 1 day"
```

```
</Directory>
```

For expiry commands  
can be used **access** or  
**modified**



# Client-side Caching – examples (IIS)

## Output Caching and ASP.NET Core MVC

**Cache profiles:** Instead of duplicating response cache settings on many controller action attributes, cache profiles can be configured as options when setting up MVC/Razor Pages in `Startup.ConfigureServices`.

```
public void ConfigureServices(IServiceCollection services)
{
 services.AddRazorPages();
 services.AddMvc(options =>
 {
 options.CacheProfiles.Add("Default30",
 new CacheProfile()
 {
 Duration = 30
 });
 });
}

[ResponseCache(CacheProfileName = "Default30")]
public ActionResult CachedDateTime()
{
 ViewBag.Message = DateTime.Now.ToString();
 return View();
}
```

# Client-side Caching – exemples (IIS)

## Properties

---

### Duration

Gets or sets the duration in seconds for which the response is cached. If this property is set to a non null value, the "max-age" in "Cache-control" header is set in the [Response](#).

---

### Location

Gets or sets the location where the data from a particular URL must be cached. If this property is set to a non null value, the "Cache-control" header is set in the [Response](#).

---

### NoStore

Gets or sets the value which determines whether the data should be stored or not. When set to `true`, it sets "Cache-control" header in [Response](#) to "no-store". Ignores the "Location" parameter for values other than "None". Ignores the "Duration" parameter.

---

### VaryByHeader

Gets or sets the value for the Vary header in [Response](#).

---

### VaryByQueryKeys

Gets or sets the query keys to vary by.

# Client-side Caching – examples (IIS)

## Vary

This header is only written when the `VaryByHeader` property is set. The property set to the `Vary` property's value. The following sample uses the `VaryByHeader` property:

```
[ResponseCache(VaryByHeader = "User-Agent", Duration = 30)]
public class Cache1Model : PageModel
{
```

```
Cache-Control: public,max-age=30
Vary: User-Agent
```

# Client-side Caching – examples (IIS)

## NoStore and Location.None

`NoStore` overrides most of the other properties. When this property is set to `true`, the `Cache-Control` header is set to `no-store`. If `Location` is set to `None`:

- `Cache-Control` is set to `no-store,no-cache`.
- `Pragma` is set to `no-cache`.

If `NoStore` is `false` and `Location` is `None`, `Cache-Control`, and `Pragma` are set to `no-cache`.

`NoStore` is typically set to `true` for error pages.

```
[ResponseCache(Duration = 0, Location = ResponseCacheLocation.None, NoStore = true)]
public class Cache2Model : PageModel
{
```

`Cache-Control: no-store,no-cache`  
`Pragma: no-cache`

# Client-side Caching – examples (IIS)

## Location and Duration

To enable caching, `Duration` must be set to a positive value and `Location` must be either `Any` (the default) or `client`. The framework sets the `Cache-Control` header to the location value followed by the `max-age` of the response.

`Location`'s options of `Any` and `Client` translate into `Cache-Control` header values of `public` and `private`, respectively. As noted in the [NoStore](#) and [Location.None](#) section, setting `Location` to `None` sets both `Cache-Control` and `Pragma` headers to `no-cache`.

`Location.Any` (`Cache-Control` set to `public`) indicates that the *client or any intermediate proxy* may cache the value, including [Response Caching Middleware](#).

`Location.Client` (`Cache-Control` set to `private`) indicates that *only the client* may cache the value. No intermediate cache should cache the value, including [Response Caching Middleware](#).

# Client-side Caching – examples (IIS)

## Location and Duration

```
[ResponseCache(Duration = 10, Location = ResponseCacheLocation.Any, NoStore = false)]
public class Cache3Model : PageModel
{
```

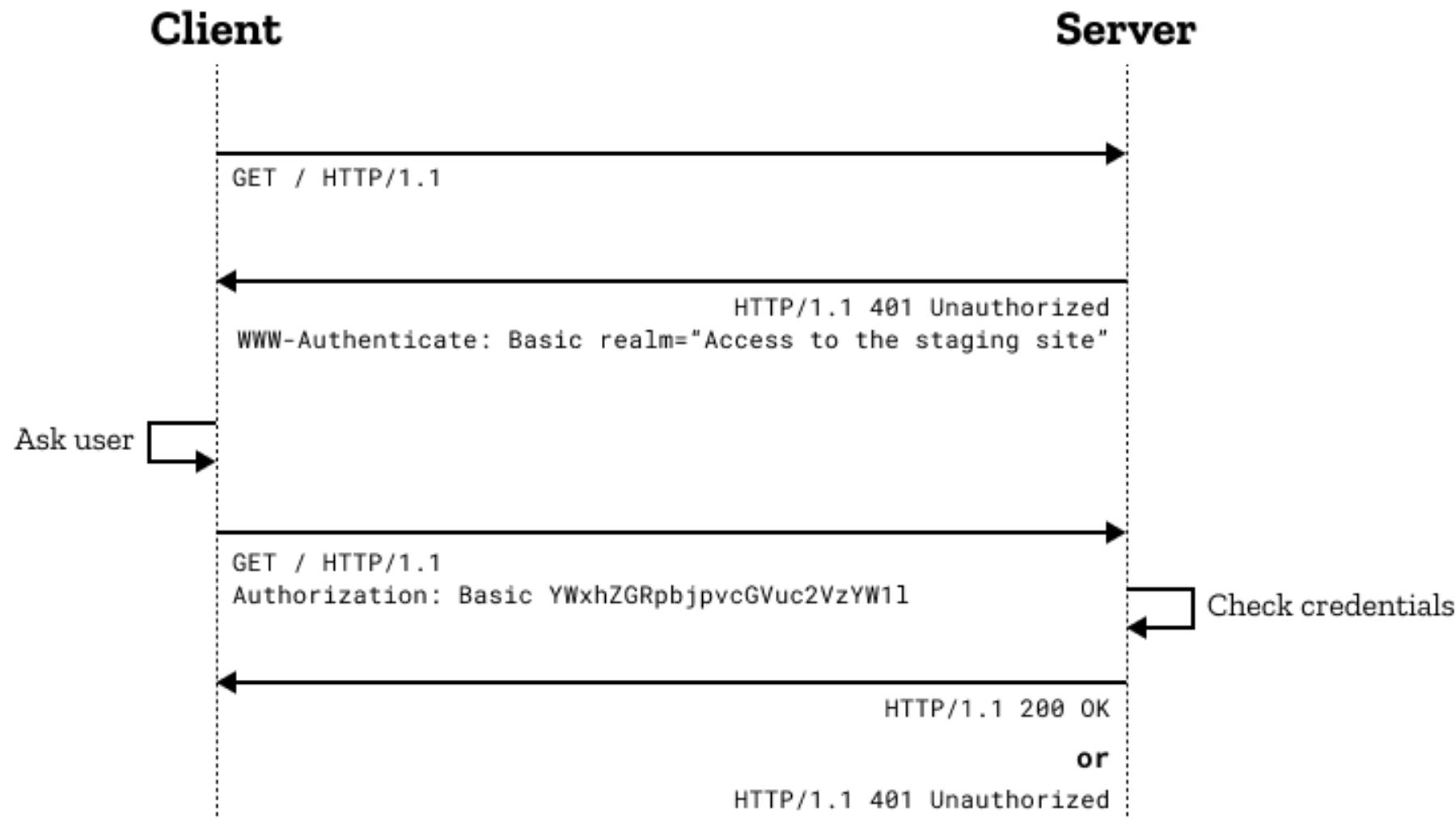
```
Cache-Control: public,max-age=10
```

# HTTP Authentication

HTTP Authentication is a security mechanism to verify the user who is eligible to access the web resource.

It involves communication between client and server using HTTP header where server requests user's credentials for authentication. The client in response provides the information in the header.

# Authorization



# Authorization

The **WWW-Authenticate** header is sent along with a **401 Unauthorized** response.

**WWW-Authenticate: <type> realm=<realm>**

**<type>**

Authentication type (HTTP Authentication Scheme). A common type is "Basic".

**realm=<realm>**

A description of the protected area. If no realm is specified, clients often display a formatted hostname instead.

# Authorization

## HTTP Authentication Schemes

- **Basic** [RFC7617]
- **Bearer** [RFC6750]
- **Digest** [RFC7616]
- **HOBA** [RFC7486, Section 3] The HOBA scheme can be used with either HTTP servers or proxies. When used in response to a 407 Proxy Authentication Required indication, the appropriate proxy authentication header fields are used instead, as with any other HTTP authentication scheme.
- **Mutual** [RFC8120]
- **Negotiate** [RFC4559, Section 3] This authentication scheme violates both HTTP semantics (being connection-oriented) and syntax (use of syntax incompatible with the WWW-Authenticate and Authorization header field syntax).
- **OAuth** [RFC5849, Section 3.5.1]
- **SCRAM-SHA-1** [RFC7804]
- **SCRAM-SHA-256** [RFC7804]
- **vapid** [RFC-ietf-webpush-vapid-04, Section 3]

# Web Cookies... what are they?



# Cookies

*Session*

*Persistent*

A **session cookie** exists only in temporary memory while the user navigates a website. Session cookies expire or are deleted when the user closes the web browser. Session cookies are identified by the browser by the absence of an expiration date assigned to them.

**Persistent cookies** are stored on a user's device to help remember information, settings, preferences, or sign-on credentials that a user has previously saved. These cookies have an expiration date issued to it by the webserver. Basically, this type of cookie is saved on your computer so when you close it and start it up again, the cookie is still there. Once the expiration date is reached, it is destroyed by the owner.

# Cookies

## *First and Third-Party Cookies ?*

**First-party cookies** are stored by the domain (website) you are visiting directly. They allow website owners to collect analytics data, remember language settings, and perform other useful functions that help provide a good user experience.

**Third-party cookies** are created by domains other than the one you are visiting directly, hence the name third-party. They are used for cross-site tracking, retargeting and ad-serving.

# Cookies

*Malicious Cookies?  
(Tracking Cookies)*



## What Are Tracking Cookies?



**Tracking cookies** are a type of internet cookie used primarily for advertising purposes.

As a user surfs the web, the cookies follow them, keeping track of information about the user's preferences, habits, past website visits, and purchases.

With this information, you can send advertisements to the user and show them the products and services they're most likely interested in — among other actions.

# Tracking cookies

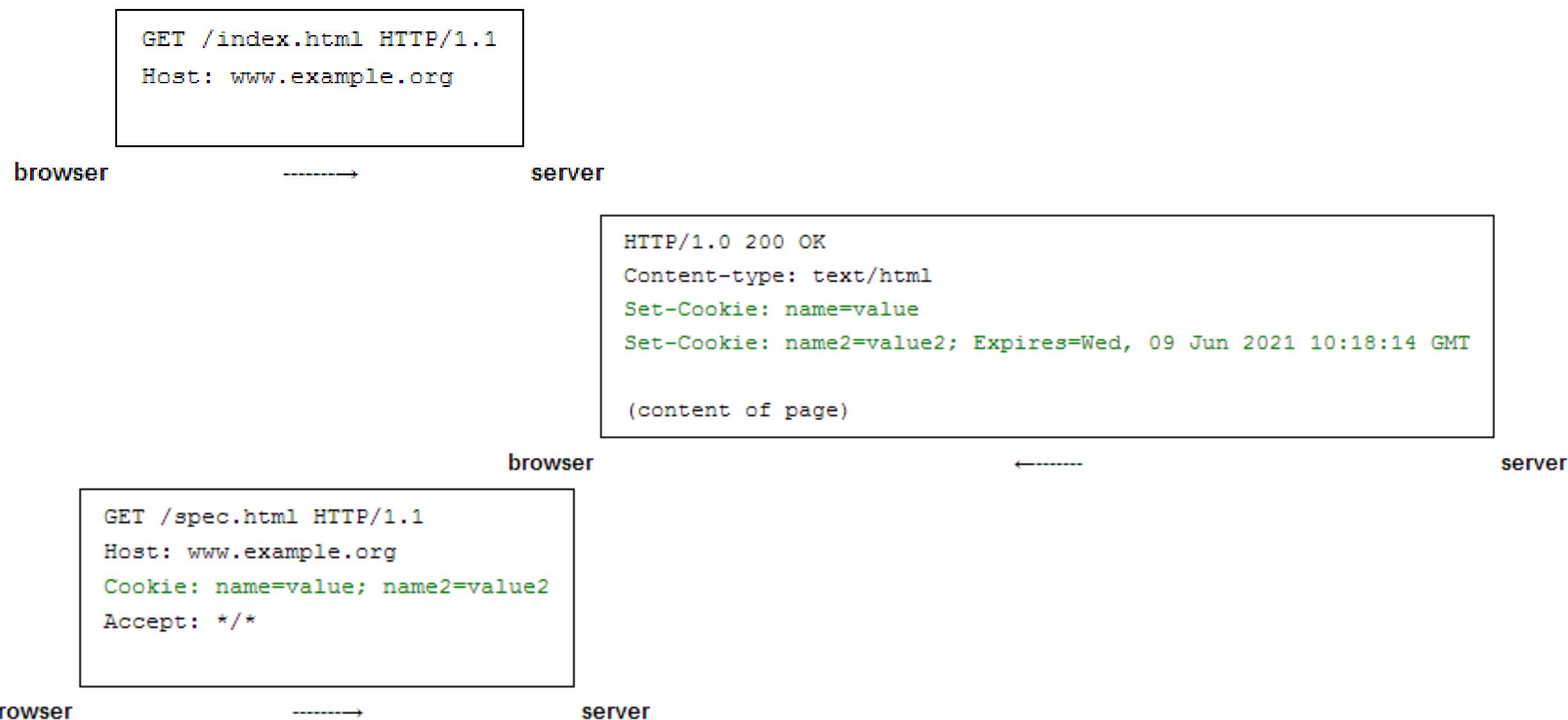
## What Data Do Tracking Cookies Store?

Common pieces of personal information collected include:

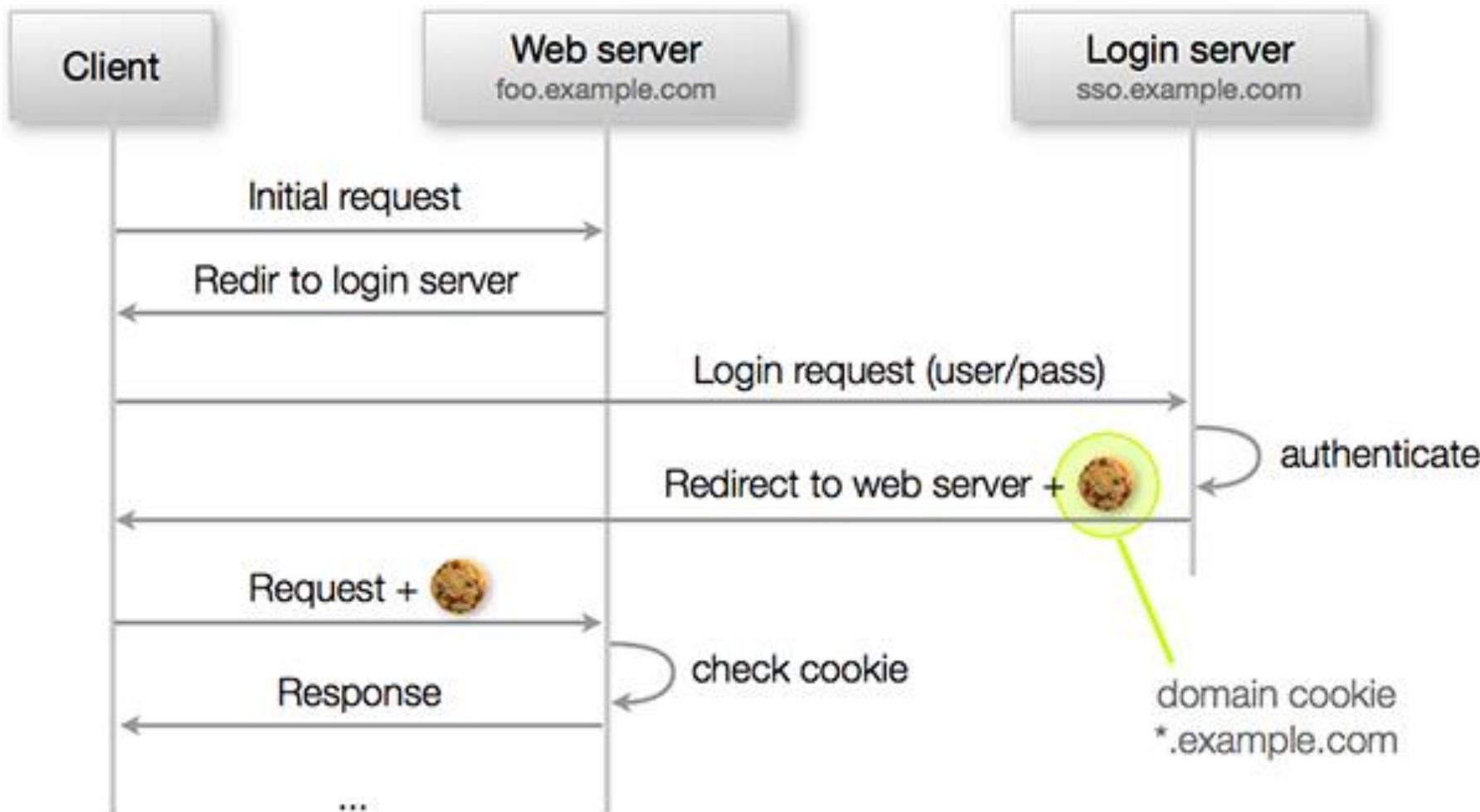
- Type of device the user used (e.g., computer, tablet, mobile phone)
- Name and age
- Website preferences, themes, and settings (language, notifications, time zone)
- IP address
- Email address and passwords
- History and prior purchases
- Time spent on webpages
- Browsing history
- Websites visited
- Advertisement interactions and clicks
- Search engine inputs



# Cookies



# Cookies – Authentication example



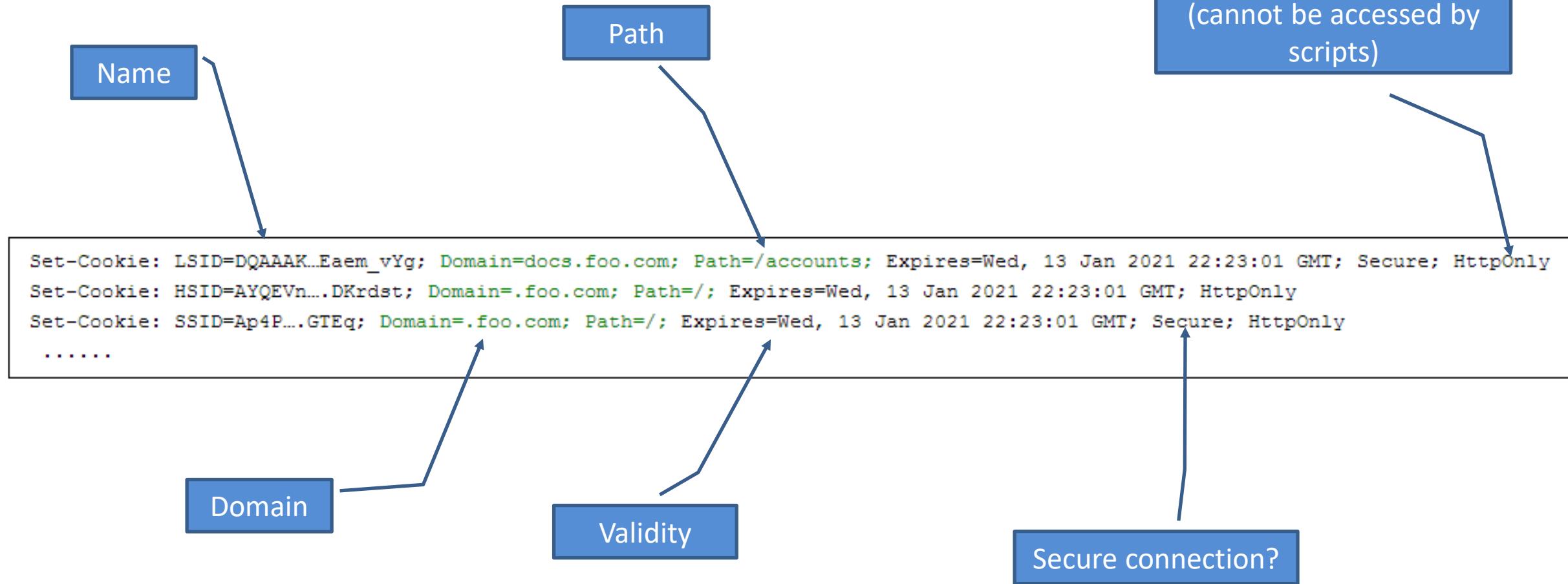
# Cookies

## Structure

- Name
- Value
- Date to expire
- Path where it applies
- Domain where it applies
- Need secure connection
- Can be accessed by means other than HTTP  
(javascript, etc.)

*Cookie: key1=value1; key2=value2; ...*

# Cookies



Cookies are a problem?

How to use sessions without cookies?

*cookieless*

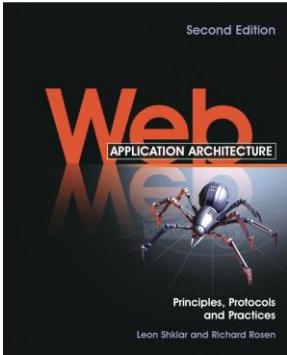
*querystring*

*url part*

<http://www.somewebsite.com/page.aspx?sid=jrkwojeqrojq3op349023231234r23rf2>

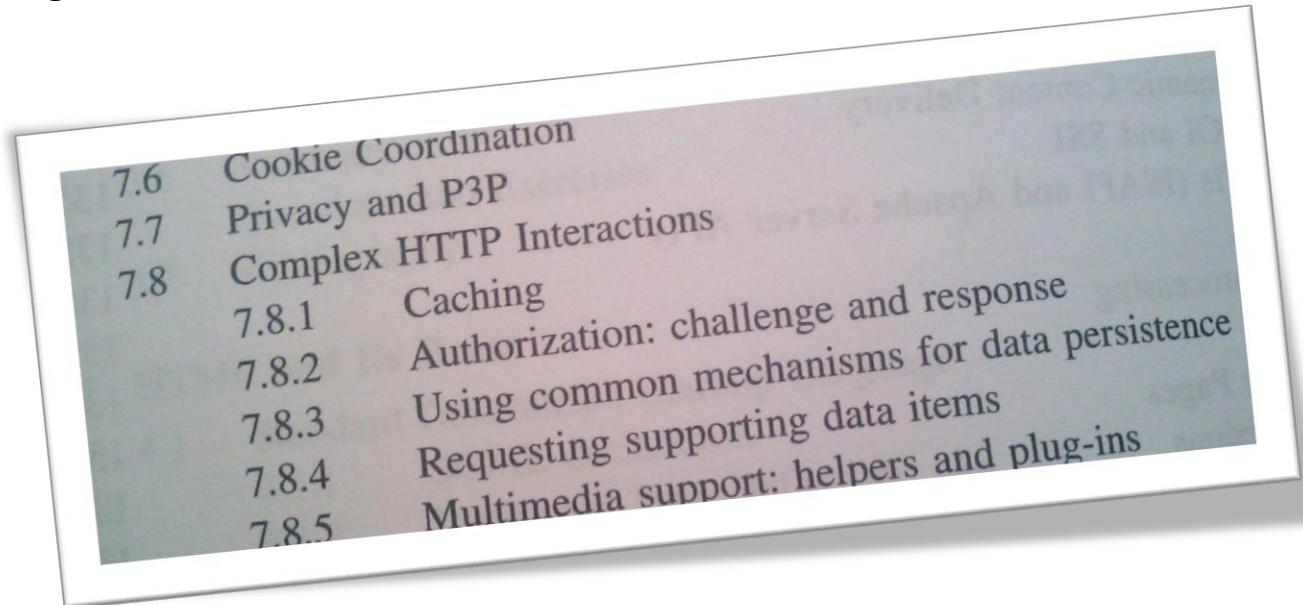
[http://yourserver/folder/\(session ID here\)/default.aspx](http://yourserver/folder/(session ID here)/default.aspx)

# Bibliography



Shklar, Leon & Rosen, Rich (2009). *Web Application Architecture: Principles, Protocols and Practices*. Chichester, Reino Unido: John Wiley & Sons.

Pages: 172 to 182



Resume

## HTTP CLIENTS

- WHAT ARE AND HOW THEY WORK?
- HOW BROWSER GENERATE REQUESTS?
- HOW BROWSER PROCESSES RESPONSES?
- WHAT ARE HELPERS AND PLUGINS? WHY BROWSER NEED THEM?

## COMPLEX HTTP INTERACTIONS

WEB CACHE:

CONCEPT, HTTP HEADERS INVOLVED, AGENTS BEHAVIOR (BROWSER, SERVER, PROXIES)

HTTP AUTHORIZATION:

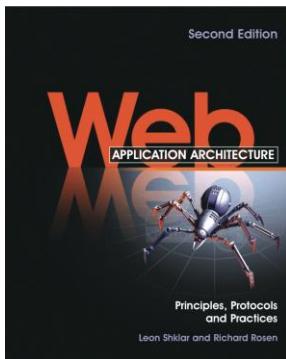
CONCEPT, HTTP HEADERS INVOLVED, AGENTS BEHAVIOR (BROWSER, SERVER, PROXIES)

WEB COOKIES:

CONCEPT, TYPES, STRUCTURE, HTTP HEADERS INVOLVED, AGENTS BEHAVIOR (BROWSER, SERVER, PROXIES)

# Next class

## HTML and its origins



Shklar, Leon & Rosen, Rich (2009). *Web Application Architecture: Principles, Protocols and Practices*. Chichester, Reino Unido: John Wiley & Sons.

Pages: 63 to 83

4	<b>HTML and Its Roots</b>
4.1	Standard Generalized Markup Language
4.1.1	SGML declaration
4.1.2	Document Type Definition
4.2	<b>HTML</b>
4.2.1	Evolution of HTML
4.2.2	Structure and syntax
4.3	<b>HTML Rendering</b>
4.3.1	Cascading Style Sheets
4.3.2	Associating styles with HTML documents