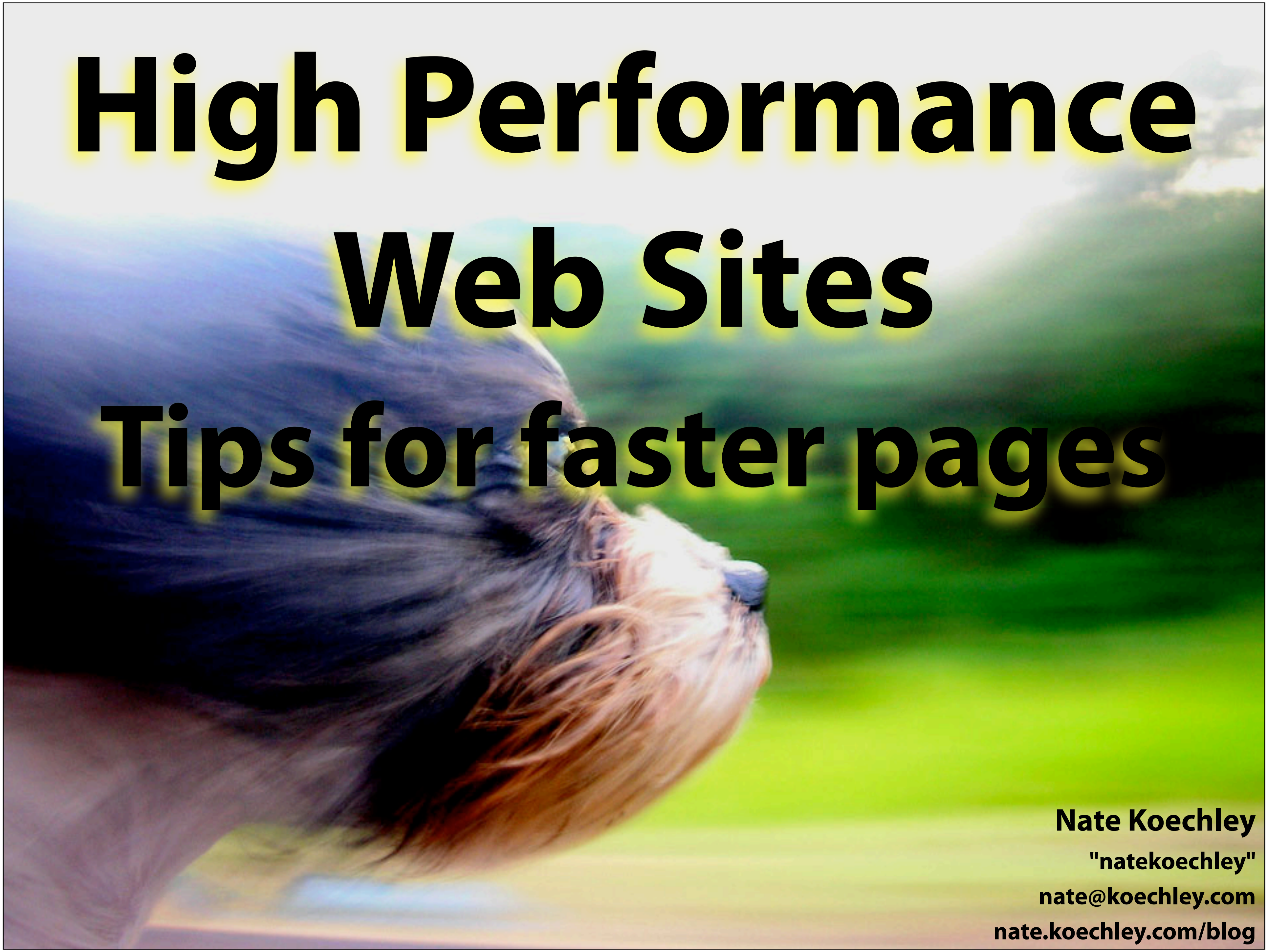


High Performance Web Sites

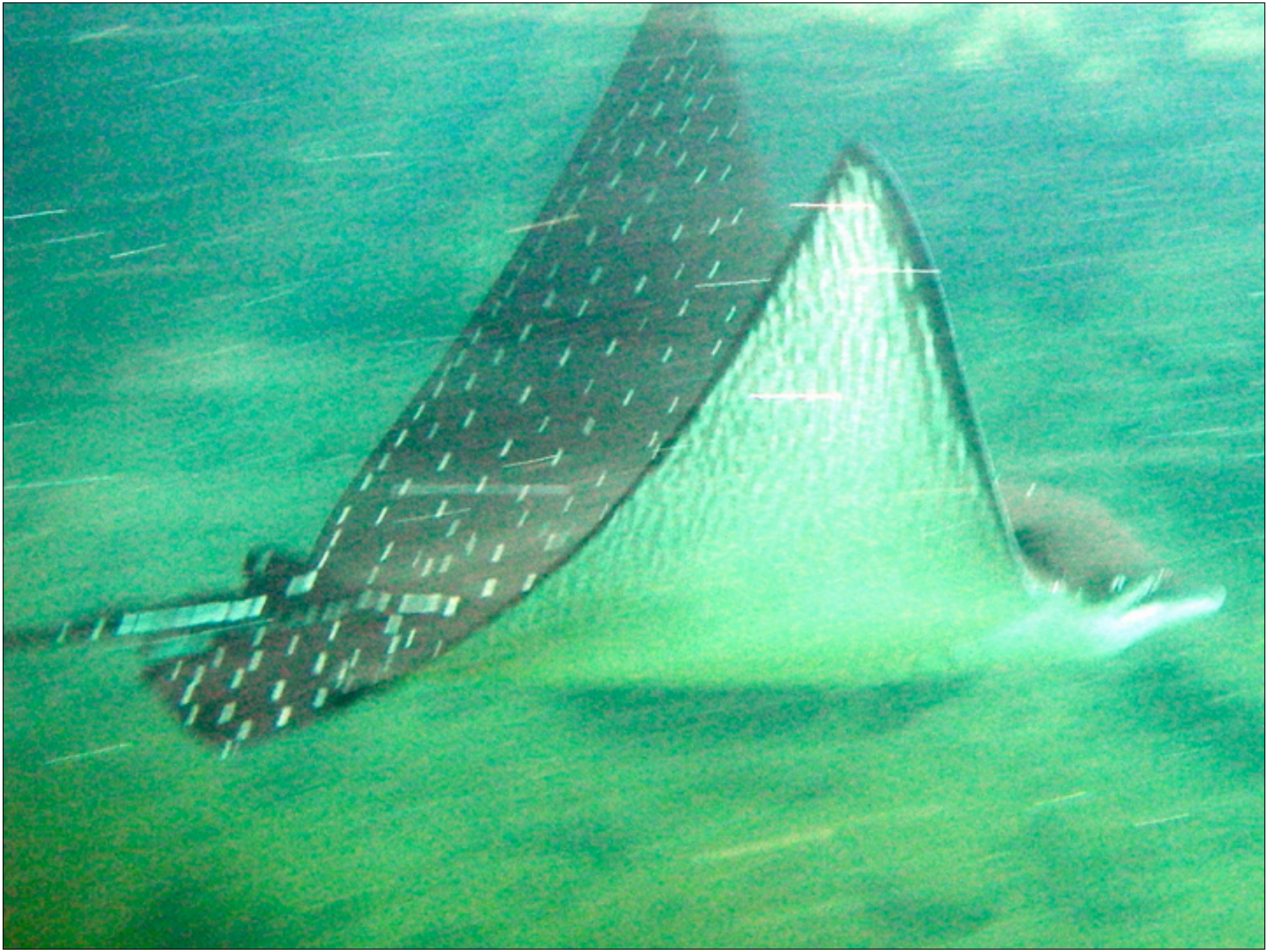
Tips for faster pages

Nate Koechley
"natekoechley"
nate@koechley.com
nate.koechley.com/blog

Why talk about performance?

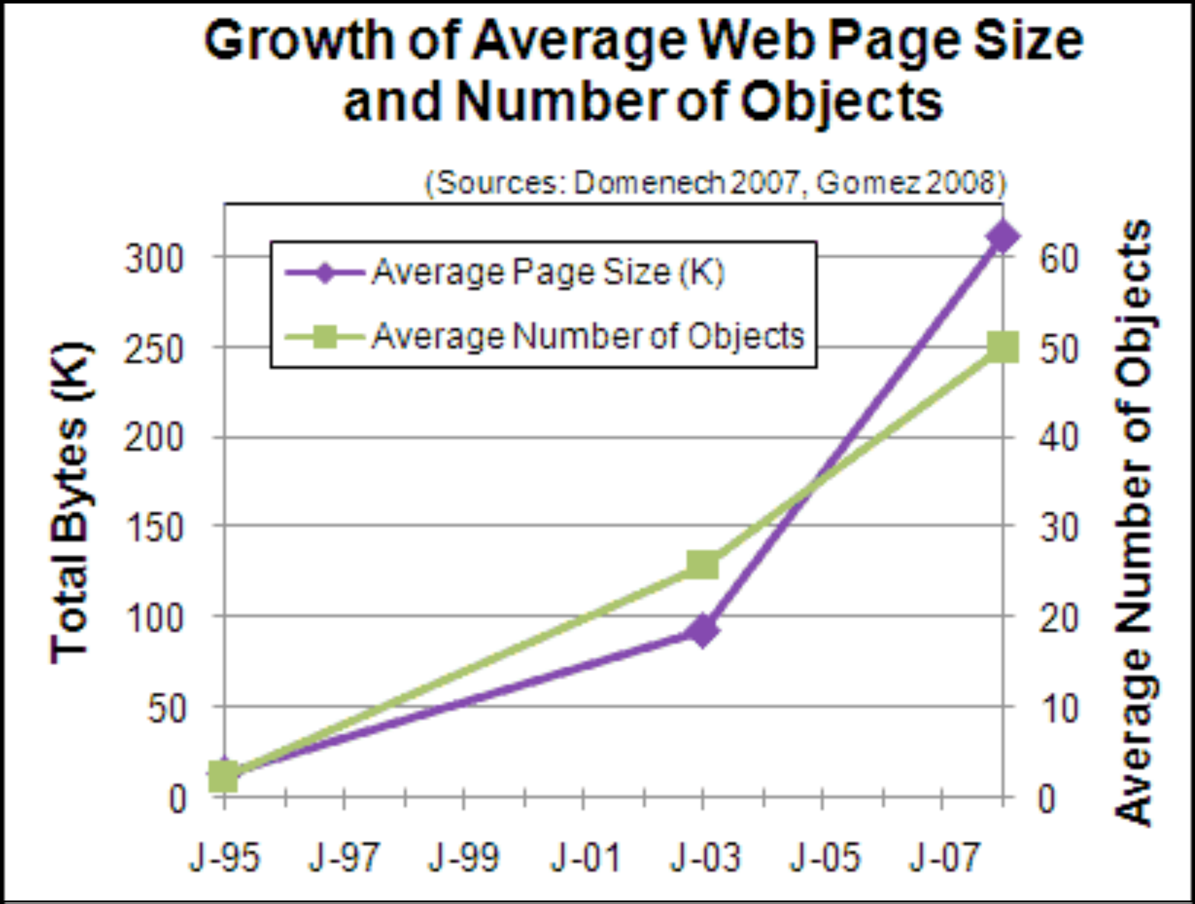
1: Because fast is better

MAX
15



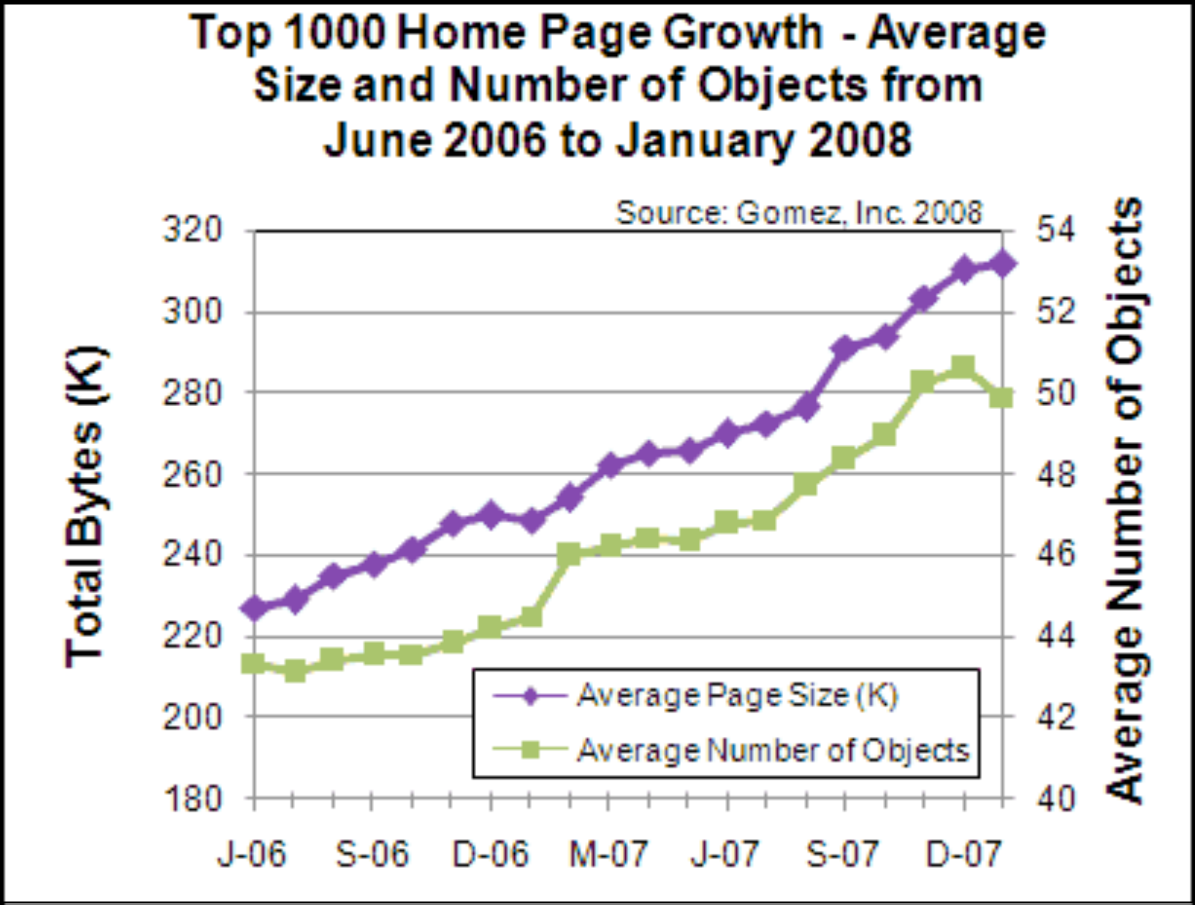
2: Because sites are bigger

Modern web sites & applications have changed architecturally.



(Sources: Domenech 2007, Gomez 2008)

From 2003 to 2008:
97K to 312K.
25.7 to 49.9 objects.



In past 12 months, Top 1000 sites:
From 250K to 310.4K.

WebSiteOptimization.com/speed/tweak/average-web-page

What *is* performance?

Two Flavors:

Response Time

&

System Efficiency

Our focus is the response time of web products

Foundational Research:

#1

Perception

perceived response time

slow crawl boring snail stagnant
performance speed enjoyable unexceptional yawn
urgent instant accelerate unresponsive impatient delay
perception snap achievement moderate blah subdue drag apathetic
better improve action pleasant prolong slack load sluggish sleepy
pace quick late promote swift cool unexciting reduced lag
maximum drive prompt advance complex heavy unmemorable
fast hurry rush satisfying obscure feel
exceptional brisk rapid exciting why wait

what is the end user’s experience?

It’s in the eye of the beholder

- Perception and usability are important performance metrics.
- More relevant than actual unload-to-onload time.
- Definition of "user onload" is undefined or varies from one web page to the next.

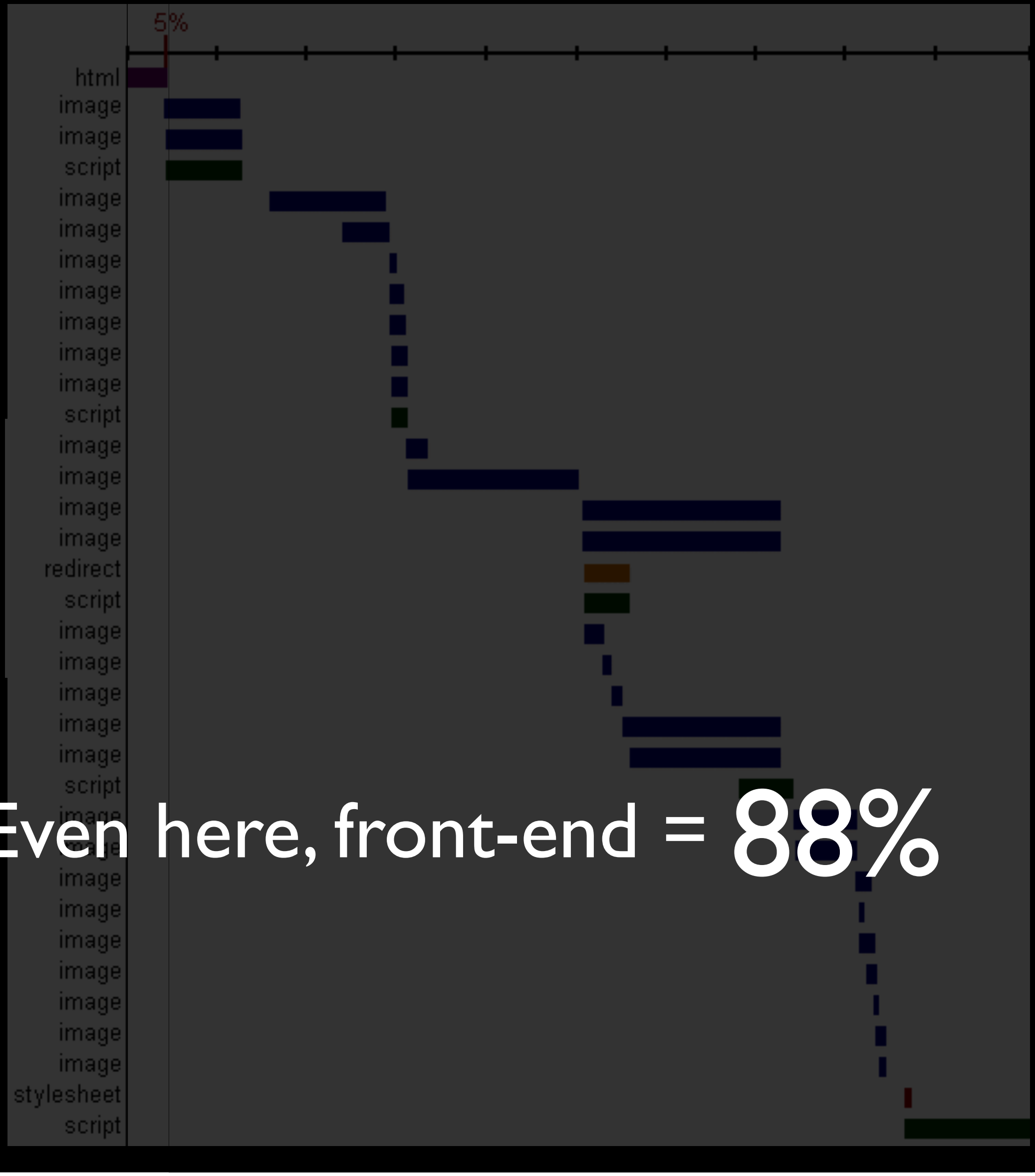
#2

> “80% of consequences come from 20% of causes”
>
> —Vilfredo Pareto

The Importance of Front-End Performance

Back-end

= 5%



Front-end

= 95%

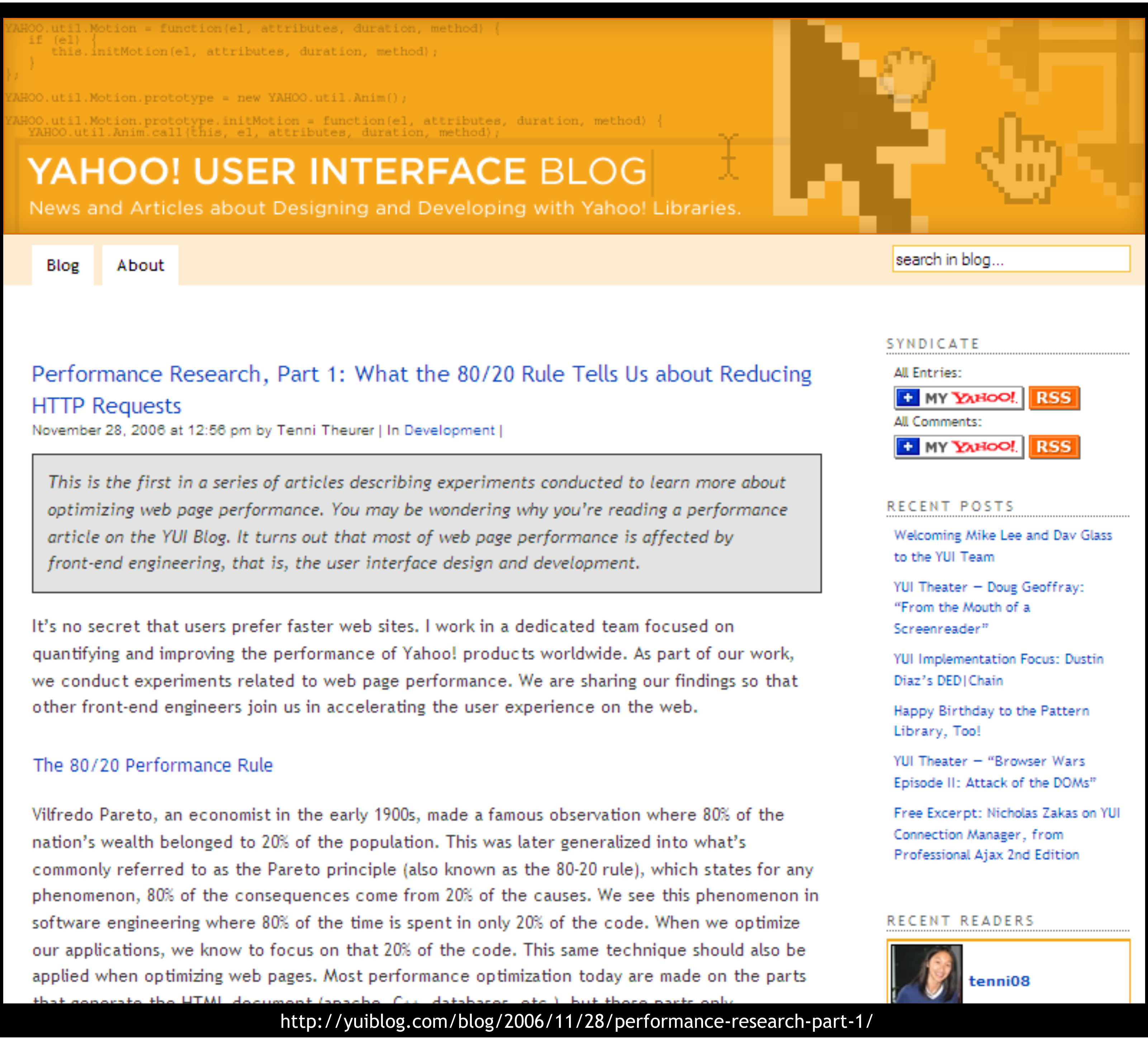
Even here, front-end = 88%

WICKED
GREGORY MAGUIRE
WICKED

Back-end vs. Front-end

	Empty Cache	Full Cache
amazon.com	82%	86%
aol.com	94%	86%
cnn.com	81%	92%
ebay.com	98%	92%
google.com	86%	64%
msn.com	97%	95%
myspace.com	96%	86%
wikipedia.org	80%	88%
yahoo.com	95%	88%
youtube.com	97%	95%

Optimizations too often only target the tip of the iceberg.



```
YAHOO.util.Motion = function(el, attributes, duration, method) {
   if (el) {
      this.initMotion(el, attributes, duration, method);
   }
};

YAHOO.util.Motion.prototype = new YAHOO.util.Anim();

YAHOO.util.Motion.prototype.initMotion = function(el, attributes, duration, method) {
   YAHOO.util.Anim.call(this, el, attributes, duration, method);
```

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Performance Research, Part 1: What the 80/20 Rule Tells Us about Reducing HTTP Requests

November 28, 2006 at 12:56 pm by Tenni Theurer | In Development |

> *This is the first in a series of articles describing experiments conducted to learn more about optimizing web page performance. You may be wondering why you're reading a performance article on the YUI Blog. It turns out that most of web page performance is affected by front-end engineering, that is, the user interface design and development.*

It's no secret that users prefer faster web sites. I work in a dedicated team focused on quantifying and improving the performance of Yahoo! products worldwide. As part of our work, we conduct experiments related to web page performance. We are sharing our findings so that other front-end engineers join us in accelerating the user experience on the web.

The 80/20 Performance Rule

Vilfredo Pareto, an economist in the early 1900s, made a famous observation where 80% of the nation's wealth belonged to 20% of the population. This was later generalized into what's commonly referred to as the Pareto principle (also known as the 80-20 rule), which states for any phenomenon, 80% of the consequences come from 20% of the causes. We see this phenomenon in software engineering where 80% of the time is spent in only 20% of the code. When we optimize our applications, we know to focus on that 20% of the code. This same technique should also be applied when optimizing web pages. Most performance optimization today are made on the parts that generate the HTML document (apache, C++, databases, etc.), but those parts only

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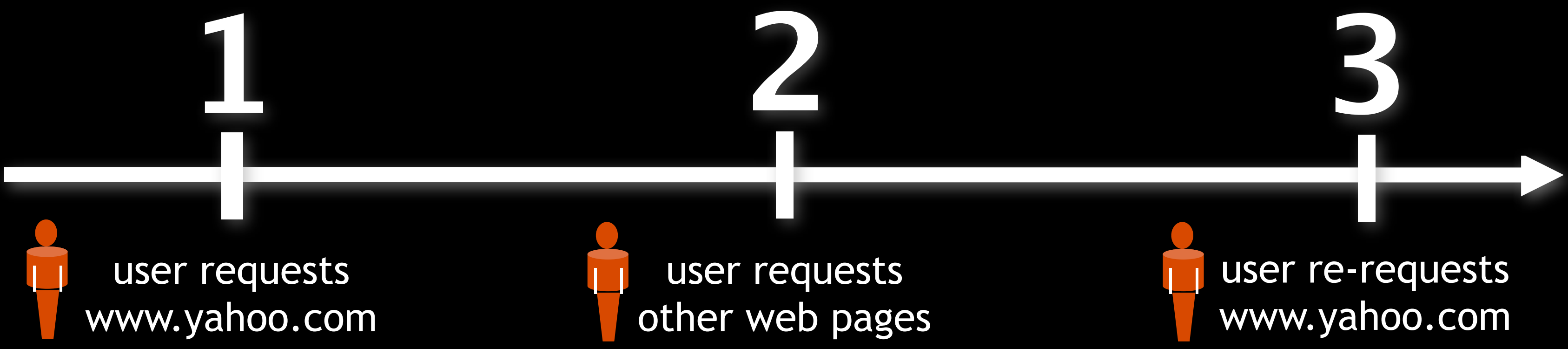
#3

Cache

Empty vs. Full Cache



1 user requests www.yahoo.com

2 user requests other web pages

3 user re-requests www.yahoo.com

Yahoo! - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.yahoo.com/?r1007=1175999730
Go pdf Go 0 PDF Links
Search Web My Web Messenger Yahoo! My Yahoo! Mail Yellow Pages Maps
Yahoo! Add Tab
Web Images Video Local Shopping more
Search:
Web Search
My Yahoo! My Mail
Page Options
Autos Calendar Finance Games GeoCities Groups HotJobs UPDATED! Local Maps Movies Music Personals Photos Real Estate Shopping Sports Tech Travel TV Yellow Pages
More Yahoo! Services
Featured Entertainment Sports Life
In the News World Local Video
Mail Messenger Radio Weather 58°F Local Horoscopes
Sign Out
Fidelity Smart move!
Done Internet

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AT&T Yahoo! DSL: $14.99/mo. Lots of speed for little cash.

Y! Answers: Ask a question | Answer questions

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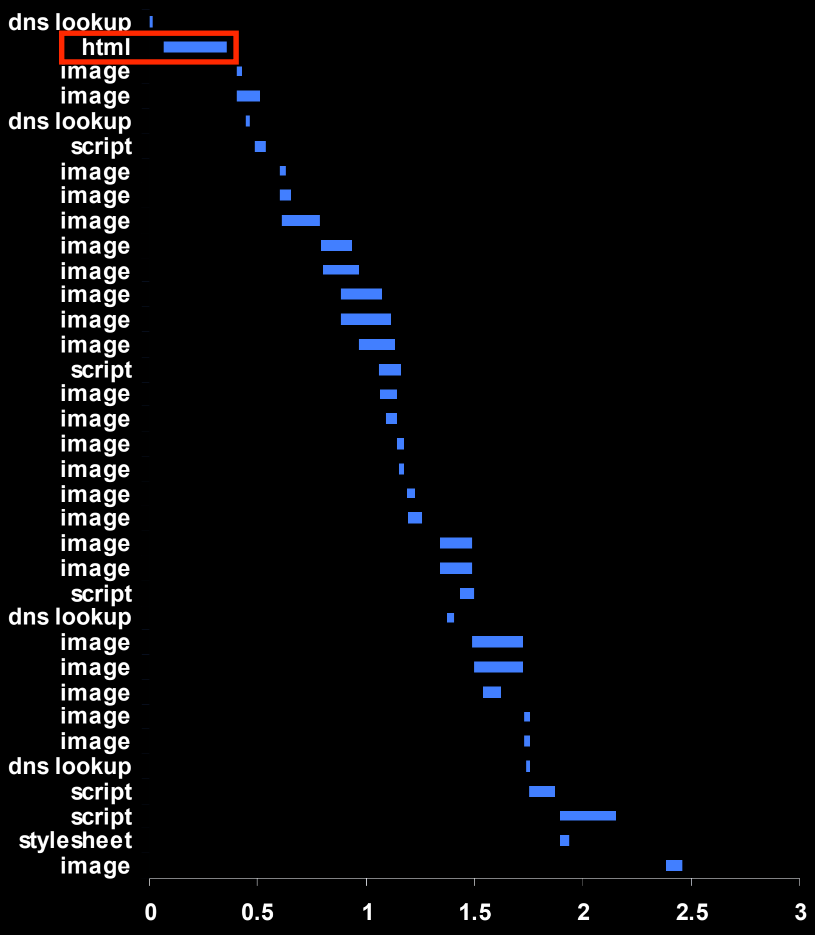
Empty vs. Full Cache

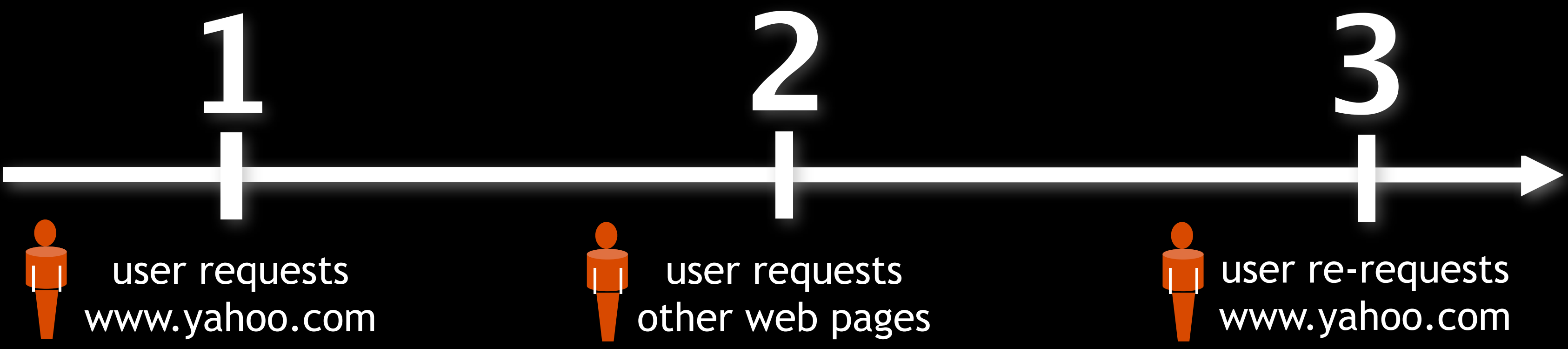
1

user requests www.yahoo.com

with an empty cache



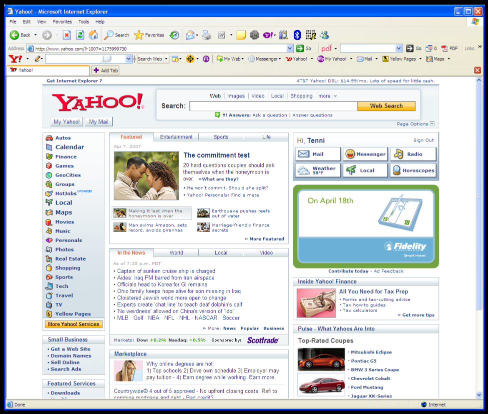
Empty vs. Full Cache



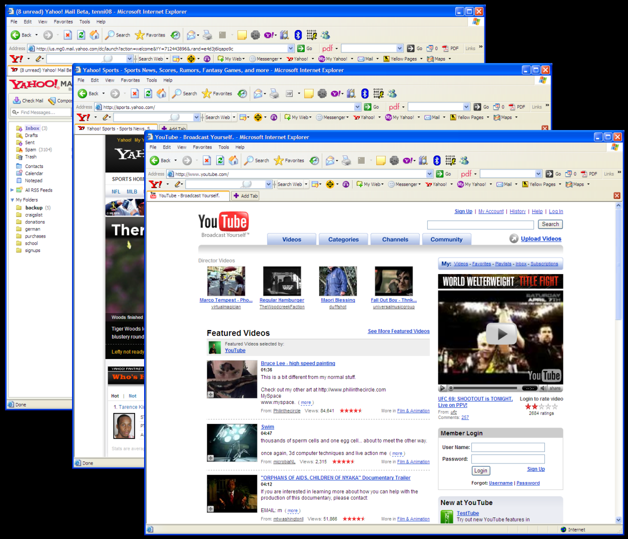
user requests
www.yahoo.com

user requests
other web pages

user re-requests
www.yahoo.com



Yahoo! - Microsoft Internet Explorer



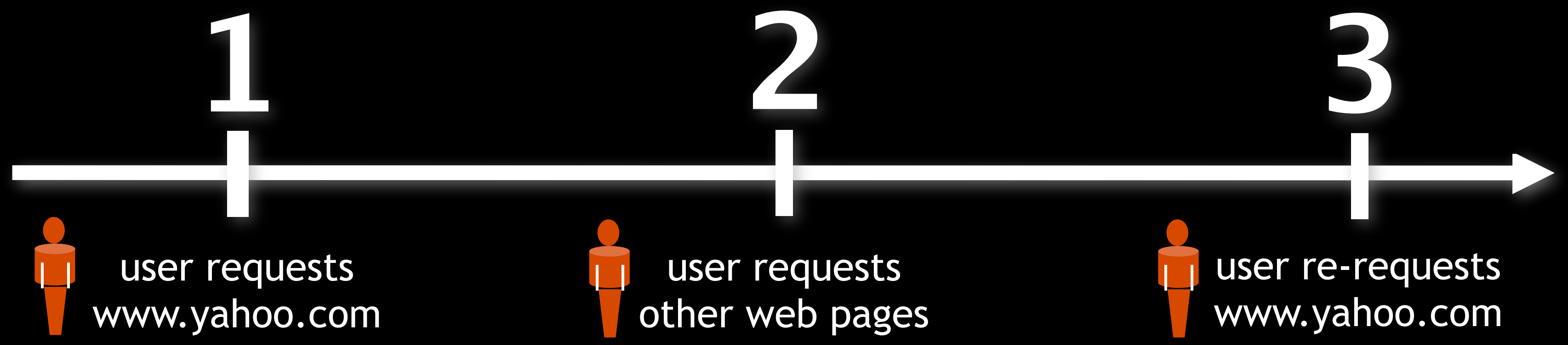
(8 unread) Yahoo! Mail Beta, tenni05 - Microsoft Internet Explorer

Yahoo! Sports - Sports News, Scores, Rumors, Fantasy Games, and more - Microsoft Internet Explorer

YouTube - Broadcast Yourself. - Microsoft Internet Explorer

Yahoo! - Microsoft Internet Explorer

Empty vs. Full Cache



1

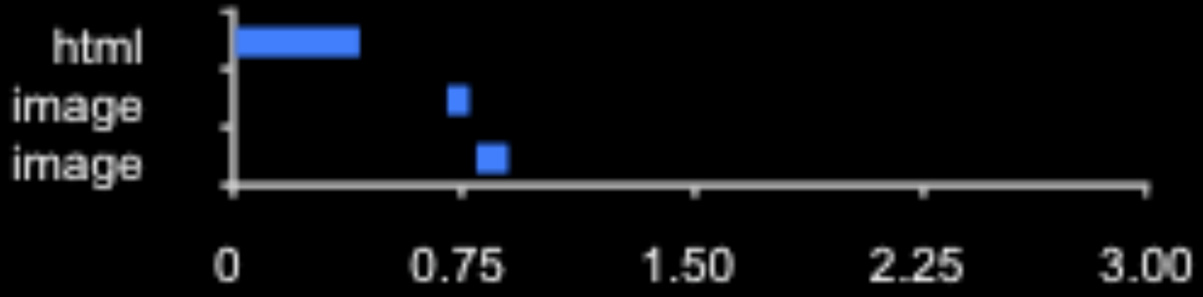
user requests www.yahoo.com

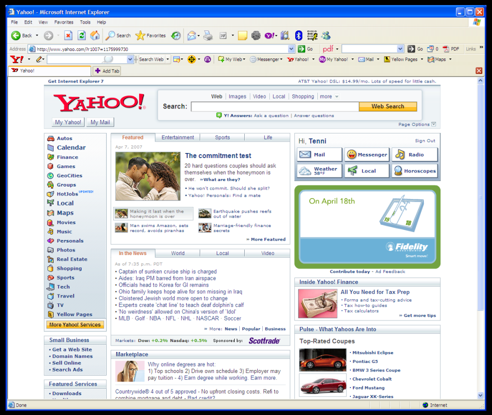
2

user requests other web pages

3

user re-requests www.yahoo.com




Yahoo! - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.yahoo.com/?r1007=1175999730
Go pdf Go PDF Links
Search Web My Web Messenger Yahoo! My Yahoo! Mail Yellow Pages Maps
Yahoo! Add Tab
Done Internet

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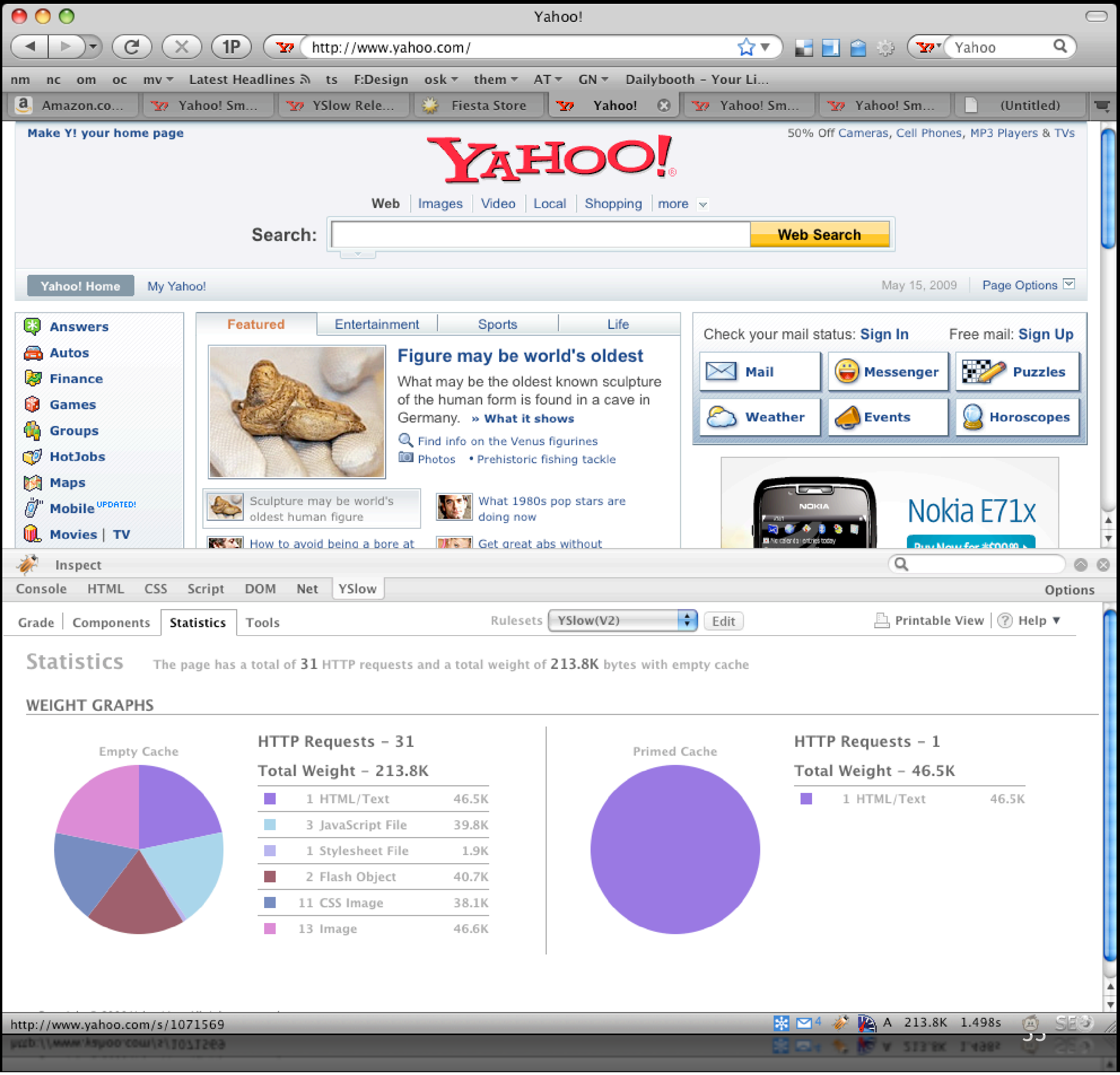

Yahoo!
http://www.yahoo.com/
Console HTML CSS Script DOM Net YSlow
Grade Components Statistics Tools
Rulesets YSlow(V2) Edit
Printable View Help
http://www.yahoo.com/s/1071569
213.8K 1.498s

Statistics The page has a total of **31** HTTP requests and a total weight of **213.8K** bytes with empty cache

WEIGHT GRAPHS

Empty Cache

HTTP Requests - 31

Total Weight - 213.8K

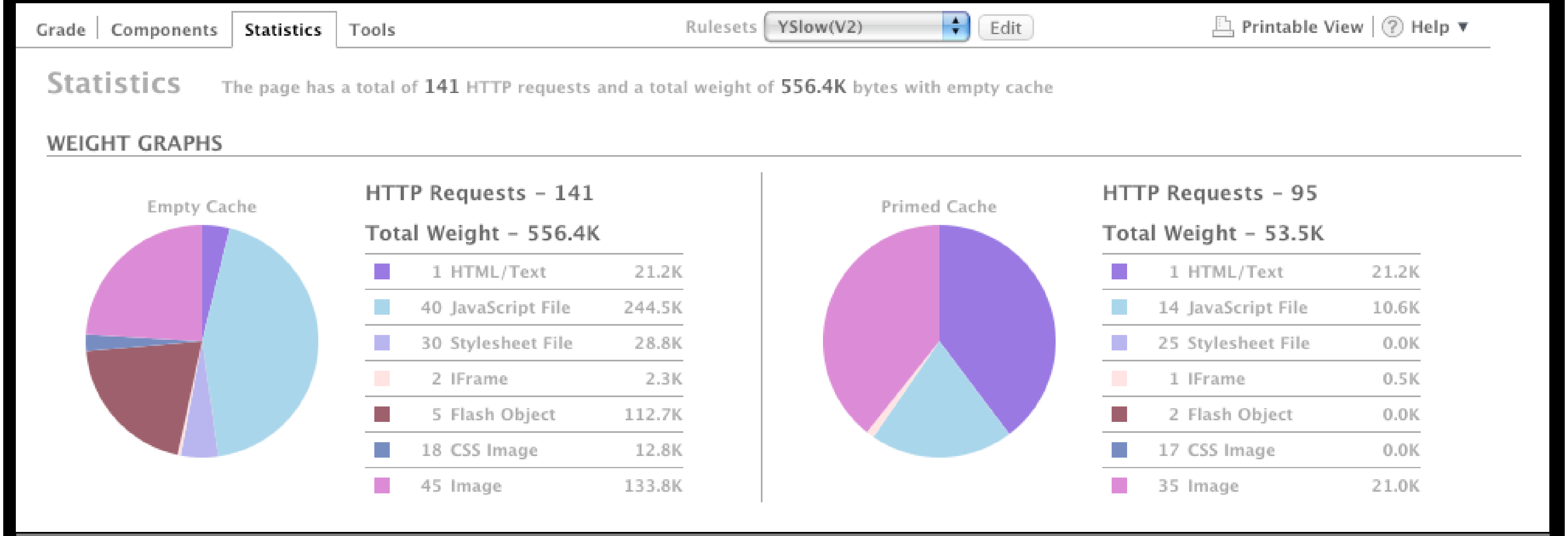
■	1 HTML/Text	46.5K
■	3 JavaScript File	39.8K
■	1 Stylesheet File	1.9K
■	2 Flash Object	40.7K
■	11 CSS Image	38.1K
■	13 Image	46.6K

Primed Cache

HTTP Requests - 1

Total Weight - 46.5K

■	1 HTML/Text	46.5K



Statistics

The page has a total of **141** HTTP requests and a total weight of **556.4K** bytes with empty cache

WEIGHT GRAPHS

HTTP Requests - 141 Total Weight - 556.4K		
■	1 HTML/Text	21.2K
■	40 JavaScript File	244.5K
■	30 Stylesheet File	28.8K
■	2 IFrame	2.3K
■	5 Flash Object	112.7K
■	18 CSS Image	12.8K
■	45 Image	133.8K

HTTP Requests - 95 Total Weight - 53.5K		
■	1 HTML/Text	21.2K
■	14 JavaScript File	10.6K
■	25 Stylesheet File	0.0K
■	1 IFrame	0.5K
■	2 Flash Object	0.0K
■	17 CSS Image	0.0K
■	35 Image	21.0K

#3b

(sadly, the cache doesn’t work as well as we wish it did.)

How much does caching benefit our users?

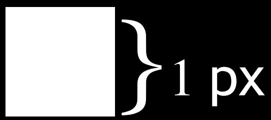
Q1: What % of **unique users** view a page with an empty cache?

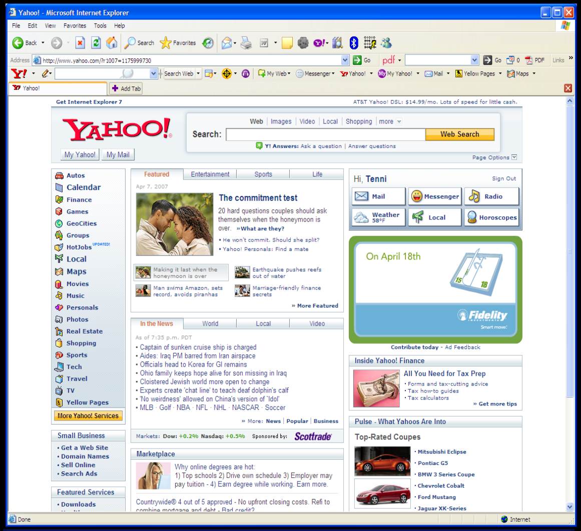
Q2: What % of **page views** are with an empty cache?

Browser Cache Experiment

Add a new image to your page

```
<img src="image/blank.gif" height="1" width="1"/>
```

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Back Search Favorites
Address http://www.yahoo.com/?r1007=1175999730
Go pdf Go 0 PDF Links
Search Web My Web Messenger Yahoo! My Yahoo! Mail Yellow Pages Maps
Yahoo! Add Tab
YAHOO!
Web Images Video Local Shopping more
Search:
Web Search
My Yahoo! My Mail
Page Options
Autos Calendar Finance Games GeoCities Groups HotJobs UPDATED! Local Maps Movies Music Personals Photos Real Estate Shopping Sports Tech Travel TV Yellow Pages
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Done
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- Chevrolet Cobalt
- Ford Mustang
- Jaguar XK-Series

with the following response headers:

```
Expires: Thu, 15 Apr 2004 20:00:00 GMT
Last-Modified: Wed, 28 Sep 2006 23:49:57 GMT
```

Browser Cache Experiment

Two possible response codes:

200 – The browser does not have the image in its cache.

304 – The browser has the image in its cache, but needs to verify the last modified date.

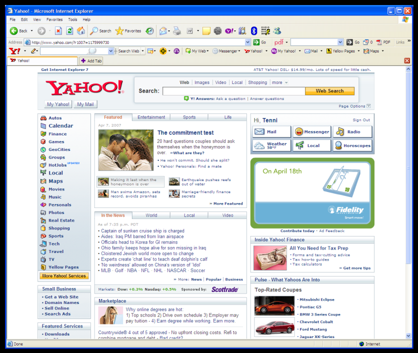
Browser Cache Experiment

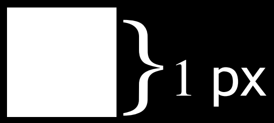
Q1: What % of **unique users** view with an empty cache?

$$\frac{\text{\# unique users with at least one 200 response}}{\text{total \# unique users}}$$

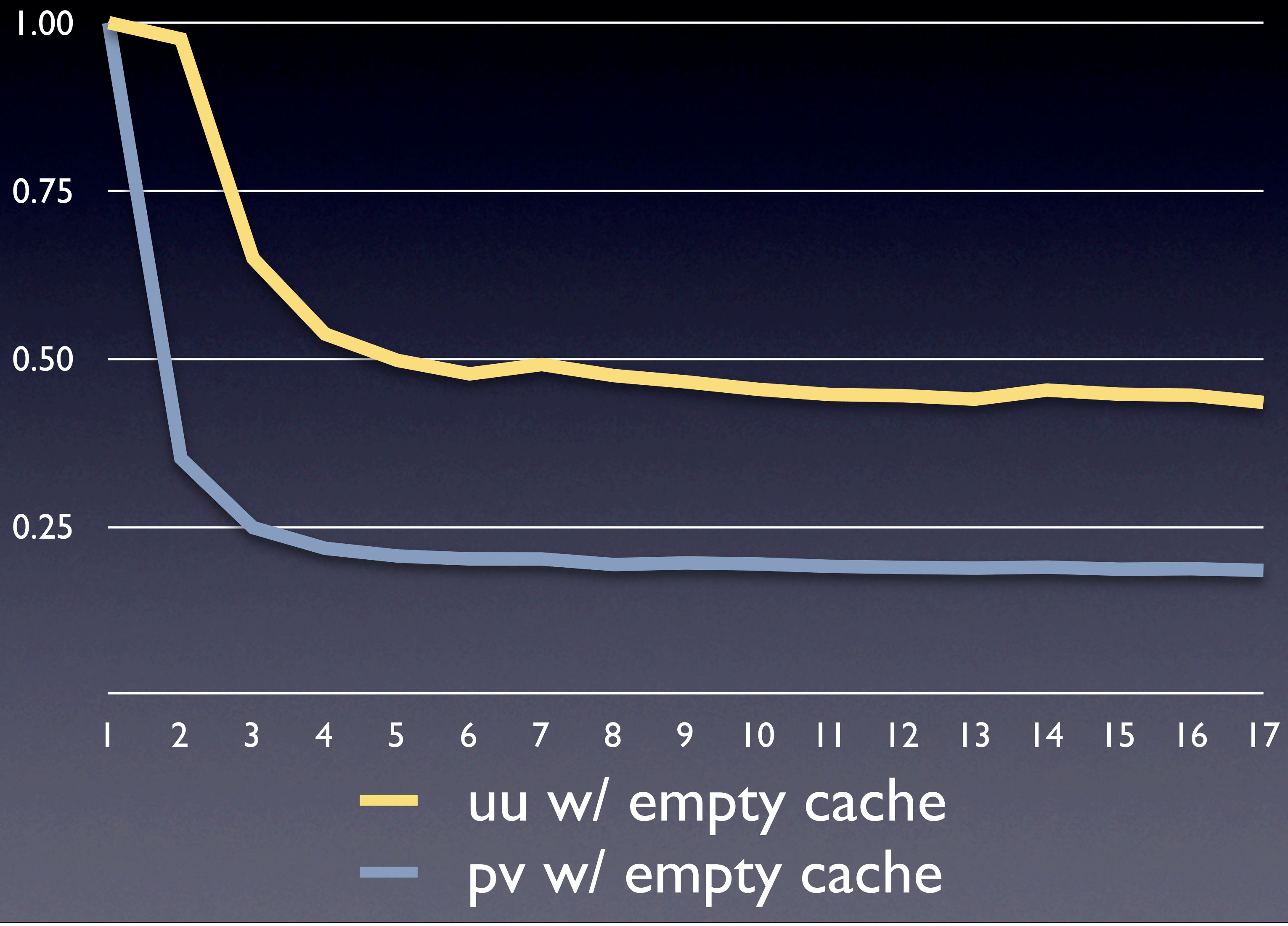
Q2: What % of **page views** are with an empty cache?

$$\frac{\text{total \# of 200 responses}}{\text{\# of 200 + \# of 304 responses}}$$

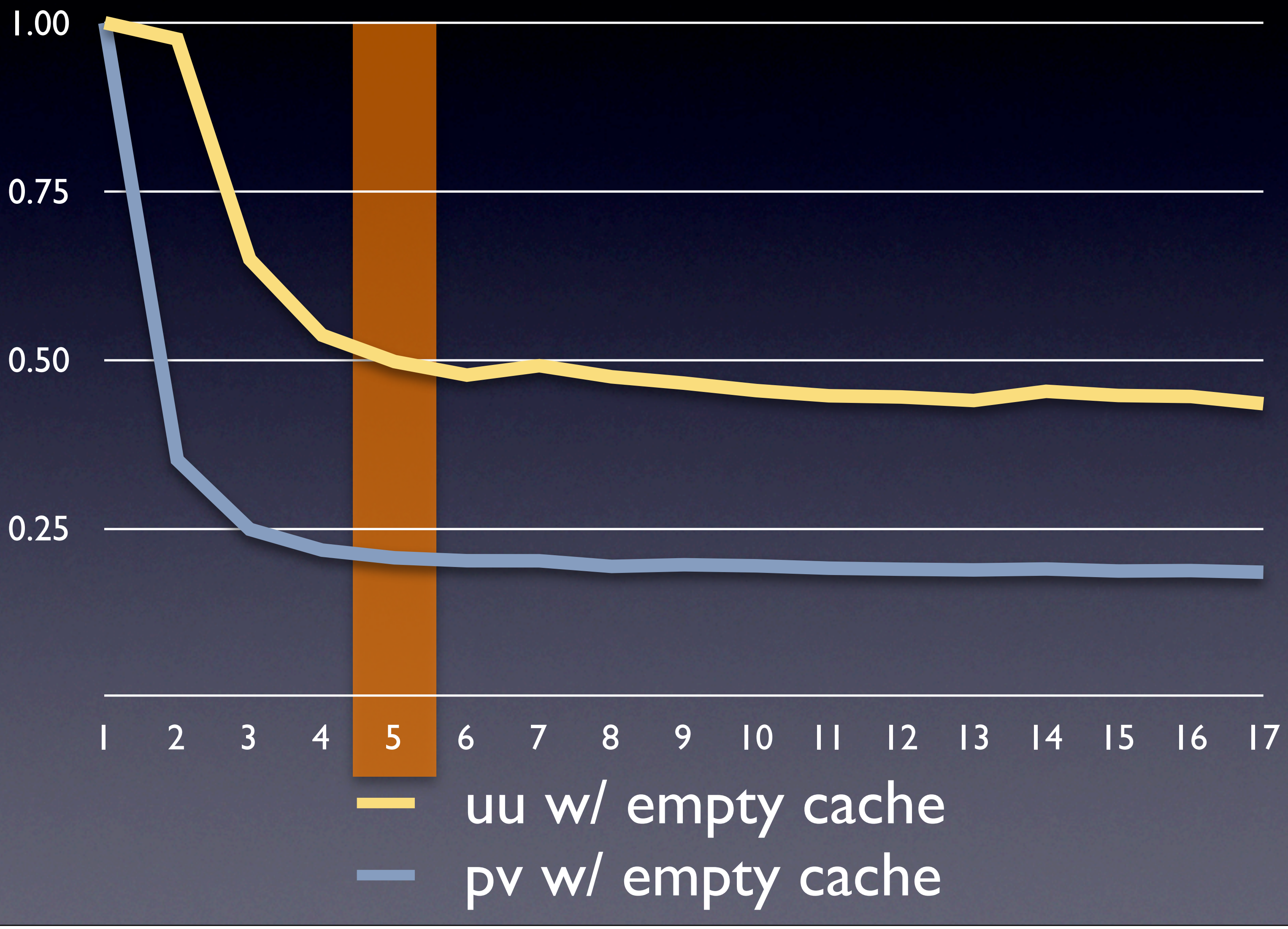




Surprising Results



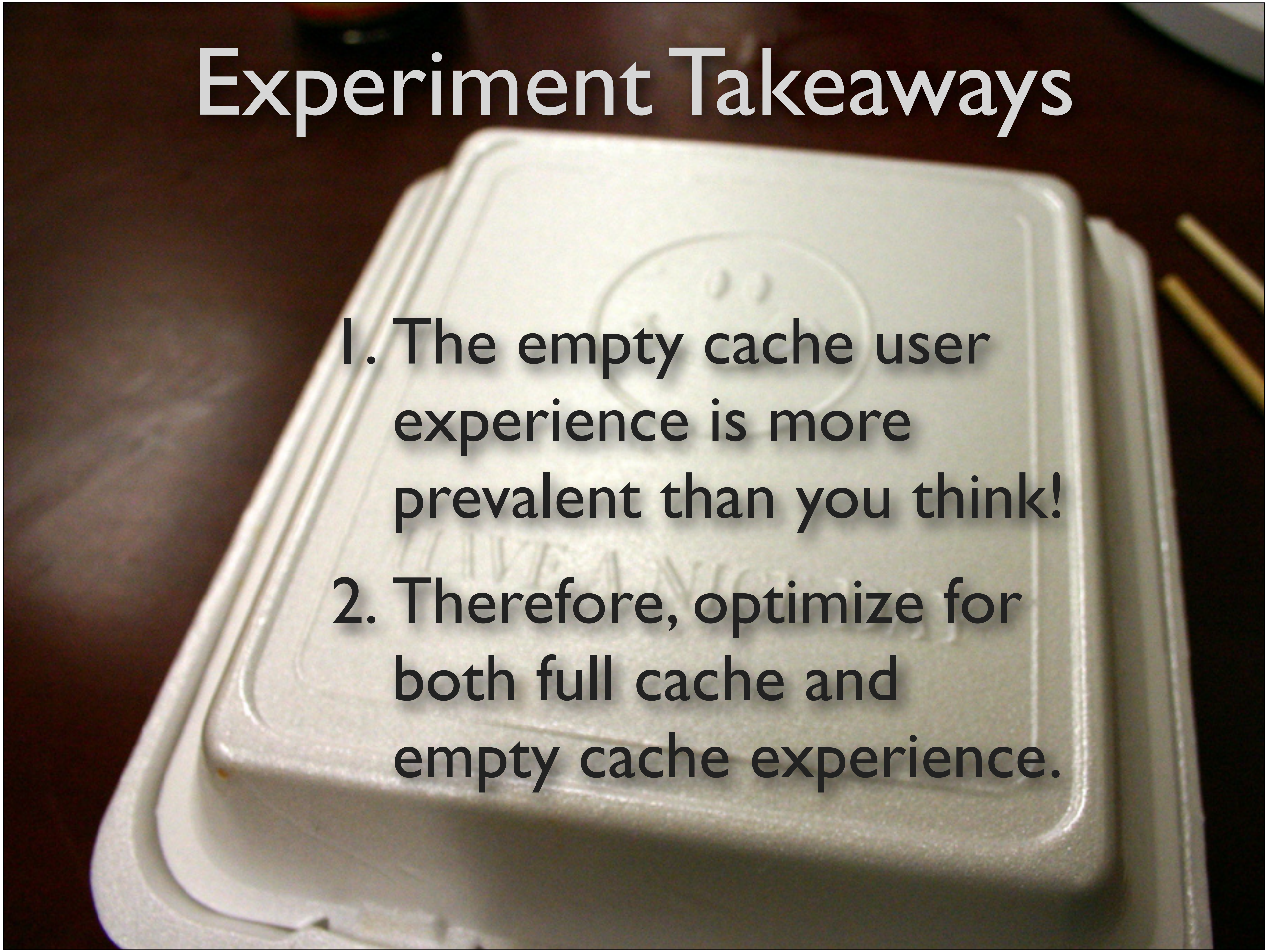
Surprising Results



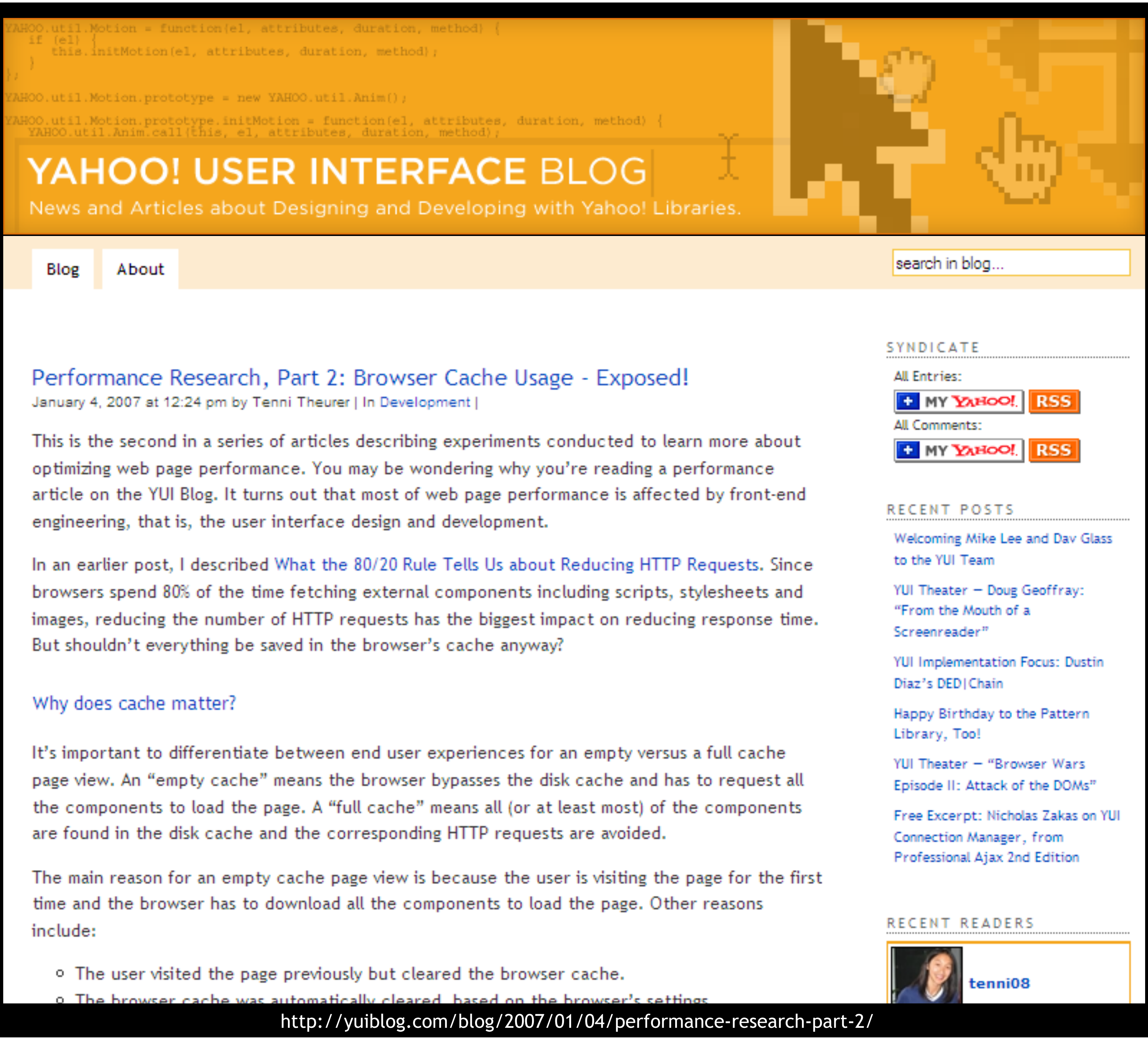
40-60% UUs w/ empty cache

20% PVs w/ empty cache

Experiment Takeaways



1. The empty cache user experience is more prevalent than you think!
2. Therefore, optimize for both full cache and empty cache experience.



```
YAHOO.util.Motion = function(el, attributes, duration, method) {
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};

YAHOO.util.Motion.prototype = new YAHOO.util.Anim();

YAHOO.util.Motion.prototype.initMotion = function(el, attributes, duration, method) {
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```

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Performance Research, Part 2: Browser Cache Usage - Exposed!

January 4, 2007 at 12:24 pm by Tenni Theurer | In Development |

This is the second in a series of articles describing experiments conducted to learn more about optimizing web page performance. You may be wondering why you're reading a performance article on the YUI Blog. It turns out that most of web page performance is affected by front-end engineering, that is, the user interface design and development.

In an earlier post, I described What the 80/20 Rule Tells Us about Reducing HTTP Requests. Since browsers spend 80% of the time fetching external components including scripts, stylesheets and images, reducing the number of HTTP requests has the biggest impact on reducing response time. But shouldn't everything be saved in the browser's cache anyway?

Why does cache matter?

It's important to differentiate between end user experiences for an empty versus a full cache page view. An "empty cache" means the browser bypasses the disk cache and has to request all the components to load the page. A "full cache" means all (or at least most) of the components are found in the disk cache and the corresponding HTTP requests are avoided.

The main reason for an empty cache page view is because the user is visiting the page for the first time and the browser has to download all the components to load the page. Other reasons include:

- The user visited the page previously but cleared the browser cache.
- The browser cache was automatically cleared, based on the browser's settings.

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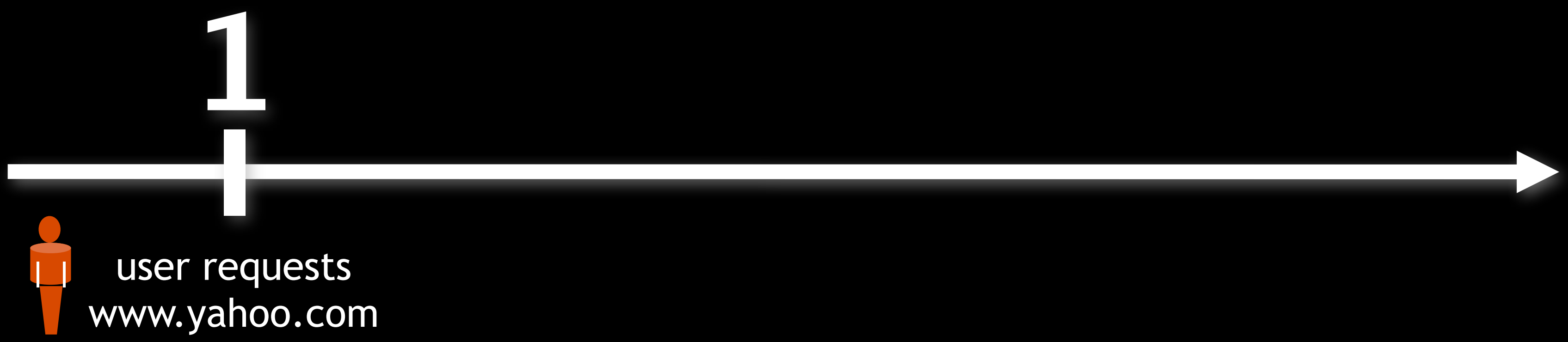
#4

Cookies

Set Scope Correctly



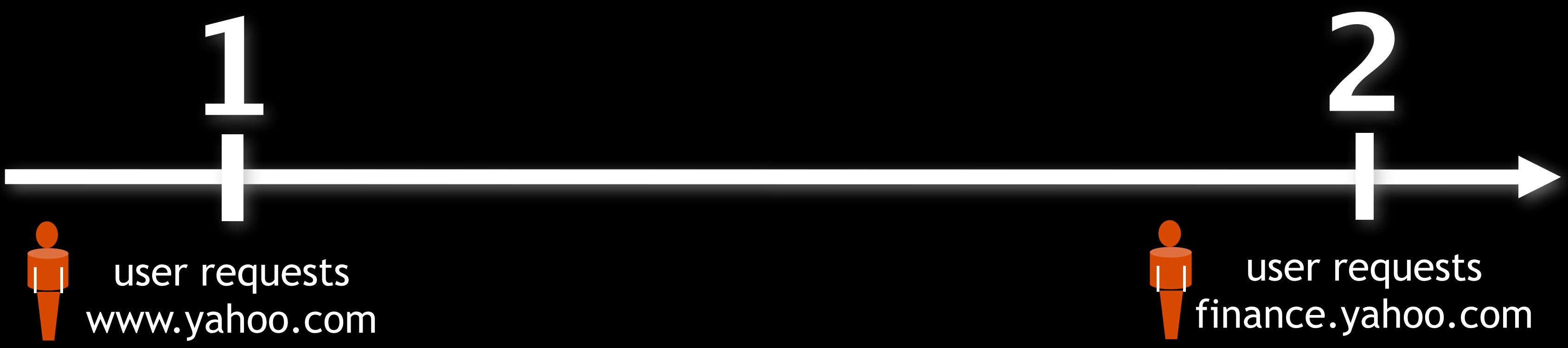
1

user requests www.yahoo.com

HTTP response header sent by the web server:

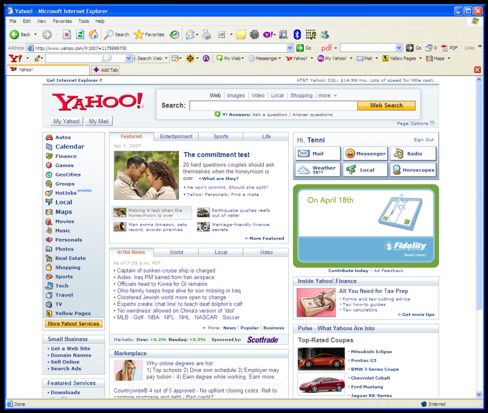
```
HTTP/1.1 200 OK
Content-Type: text/html; charset=utf-8
Set-Cookie: C=abcdefghijklmnopqrstuvwxyz; domain=.yahoo.com
```

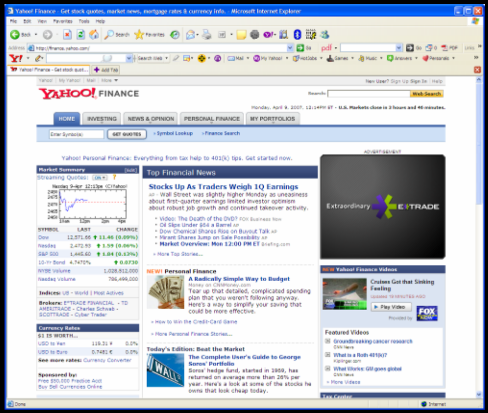
Because broad scope adds up



user requests www.yahoo.com

user requests finance.yahoo.com





HTTP request header sent by the browser:

```
GET / HTTP/1.1
Host: finance.yahoo.com
User-Agent: Mozilla/4.0 (compatible; MSIE 6.0; …
Cookie: C=abcdefghijklmnopqrstuvwxyz;
```

Impact on Response Time

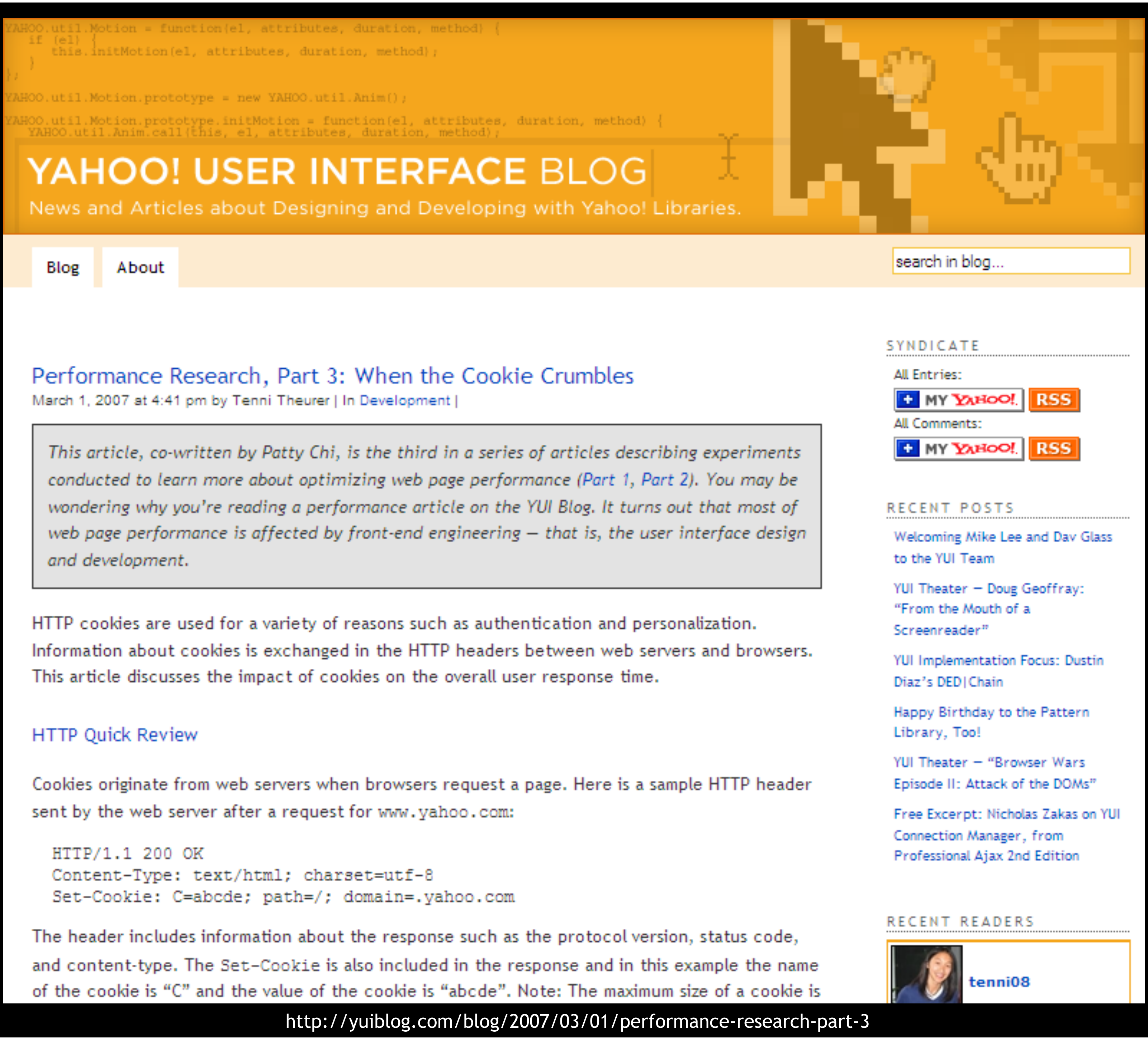
Cookie Size	Time	Delta
0 bytes	78 ms	0 ms
500 bytes	79 ms	+1 ms
1000 bytes	94 ms	+16 ms
1500 bytes	109 ms	+31 ms
2000 bytes	125 ms	+47 ms
2500 bytes	141 ms	+63 ms
3000 bytes	156 ms	**+78 ms**

Cookie Sizes across the Web

	Total Cookie Size
Amazon	60 bytes
Google	72 bytes
Yahoo	122 bytes
CNN	184 bytes
YouTube	218 bytes
MSN	268 bytes
eBay	331 bytes
MySpace	500 bytes

Experiment Takeaways

- eliminate unnecessary cookies
- keep cookie sizes low
- set cookies at the appropriate domain (or sub-domain) level
- set Expires date appropriately



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Performance Research, Part 3: When the Cookie Crumbles

March 1, 2007 at 4:41 pm by Tenni Theurer | In Development |

> *This article, co-written by Patty Chi, is the third in a series of articles describing experiments conducted to learn more about optimizing web page performance (Part 1, Part 2). You may be wondering why you're reading a performance article on the YUI Blog. It turns out that most of web page performance is affected by front-end engineering — that is, the user interface design and development.*

HTTP cookies are used for a variety of reasons such as authentication and personalization. Information about cookies is exchanged in the HTTP headers between web servers and browsers. This article discusses the impact of cookies on the overall user response time.

HTTP Quick Review

Cookies originate from web servers when browsers request a page. Here is a sample HTTP header sent by the web server after a request for `www.yahoo.com`:

```
HTTP/1.1 200 OK
Content-Type: text/html; charset=utf-8
Set-Cookie: C=abcde; path=/; domain=.yahoo.com
```

The header includes information about the response such as the protocol version, status code, and content-type. The `Set-Cookie` is also included in the response and in this example the name of the cookie is "C" and the value of the cookie is "abcde". Note: The maximum size of a cookie is

SYNDICATE

All Entries:

All Comments:

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- Welcoming Mike Lee and Dav Glass to the YUI Team
- YUI Theater — Doug Geoffray: "From the Mouth of a Screenreader"
- YUI Implementation Focus: Dustin Diaz's DED|Chain
- Happy Birthday to the Pattern Library, Too!
- YUI Theater — "Browser Wars Episode II: Attack of the DOMs"
- Free Excerpt: Nicholas Zakas on YUI Connection Manager, from Professional Ajax 2nd Edition

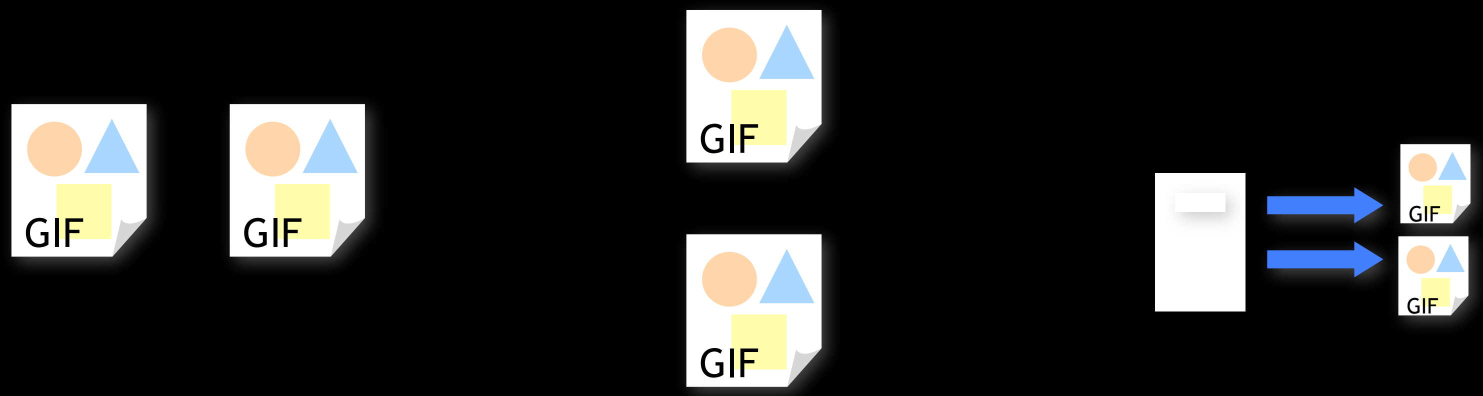
RECENT READERS

tenni08

http://yuiblog.com/blog/2007/03/01/performance-research-part-3

Parallel Downloads

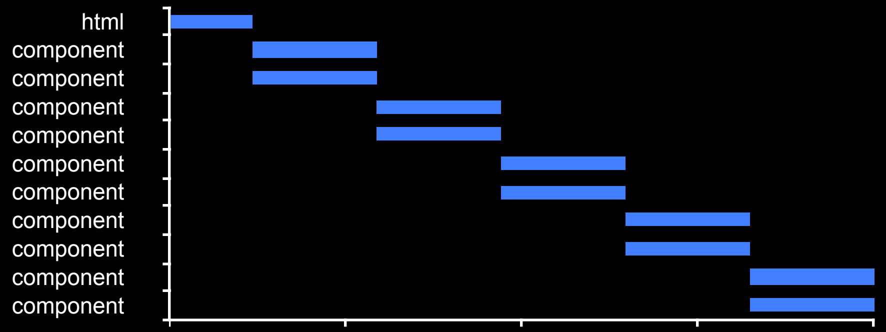
Two components **in parallel** **per hostname**



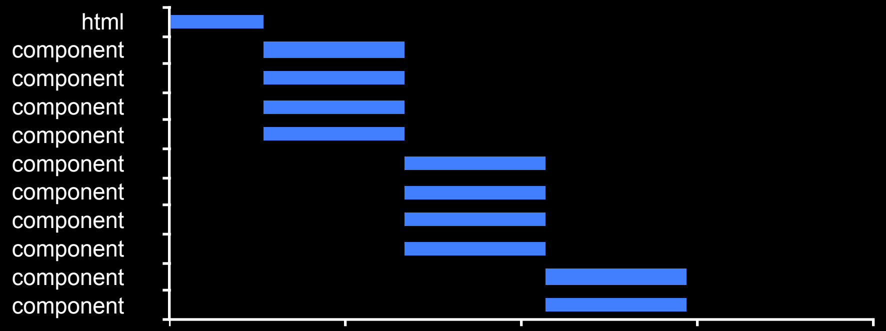
per HTTP/1.1

Parallel Downloads

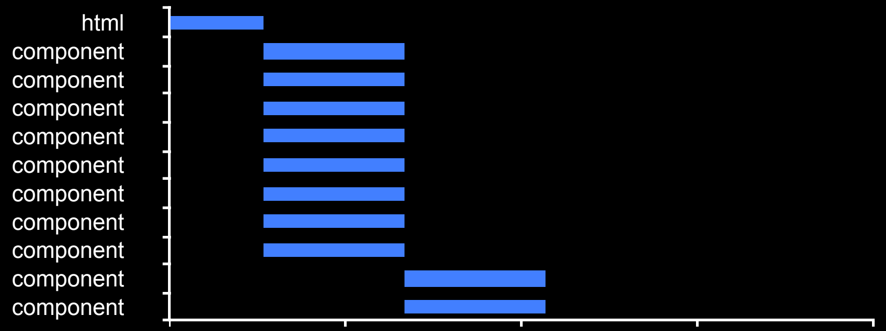
Two in parallel



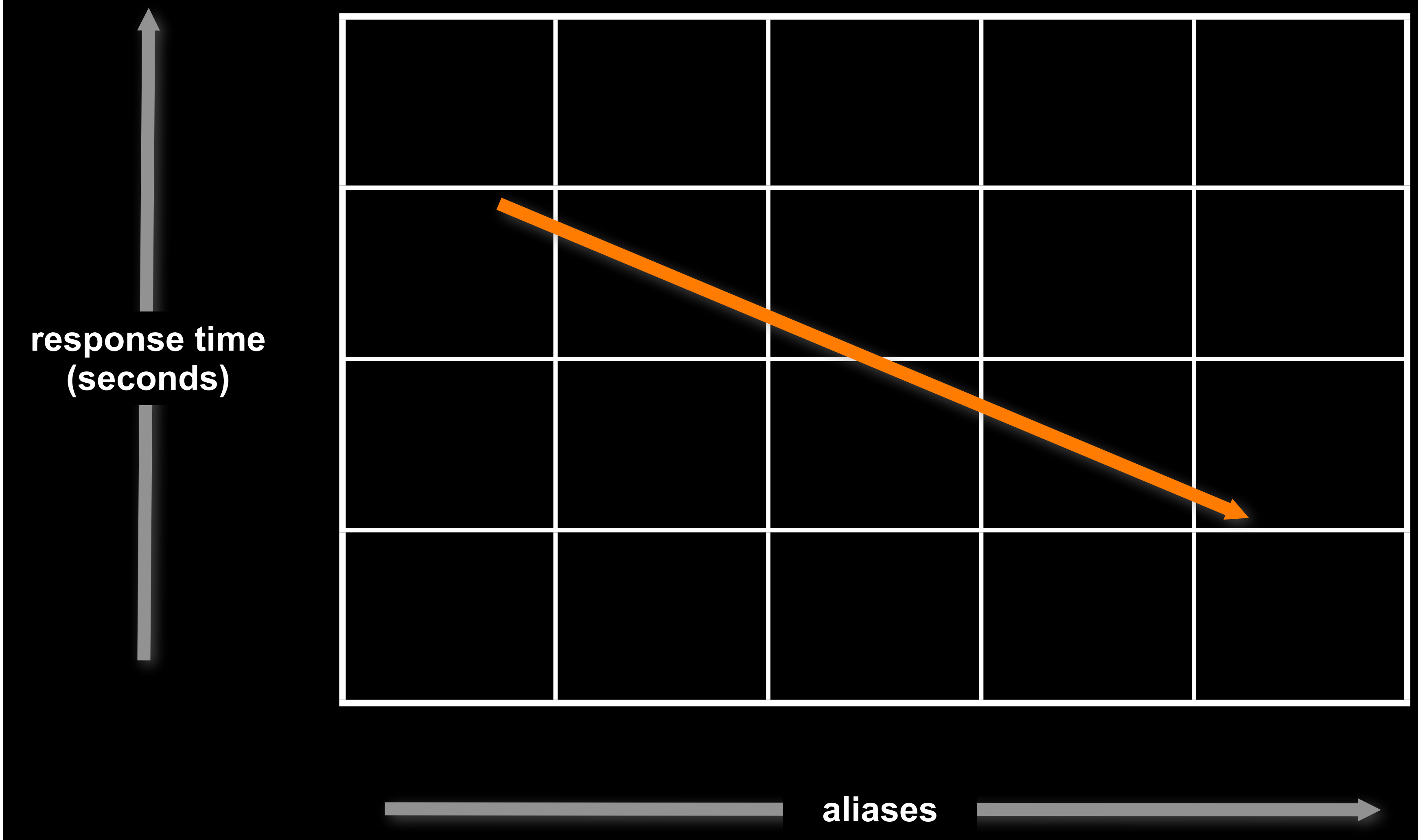
Four in parallel



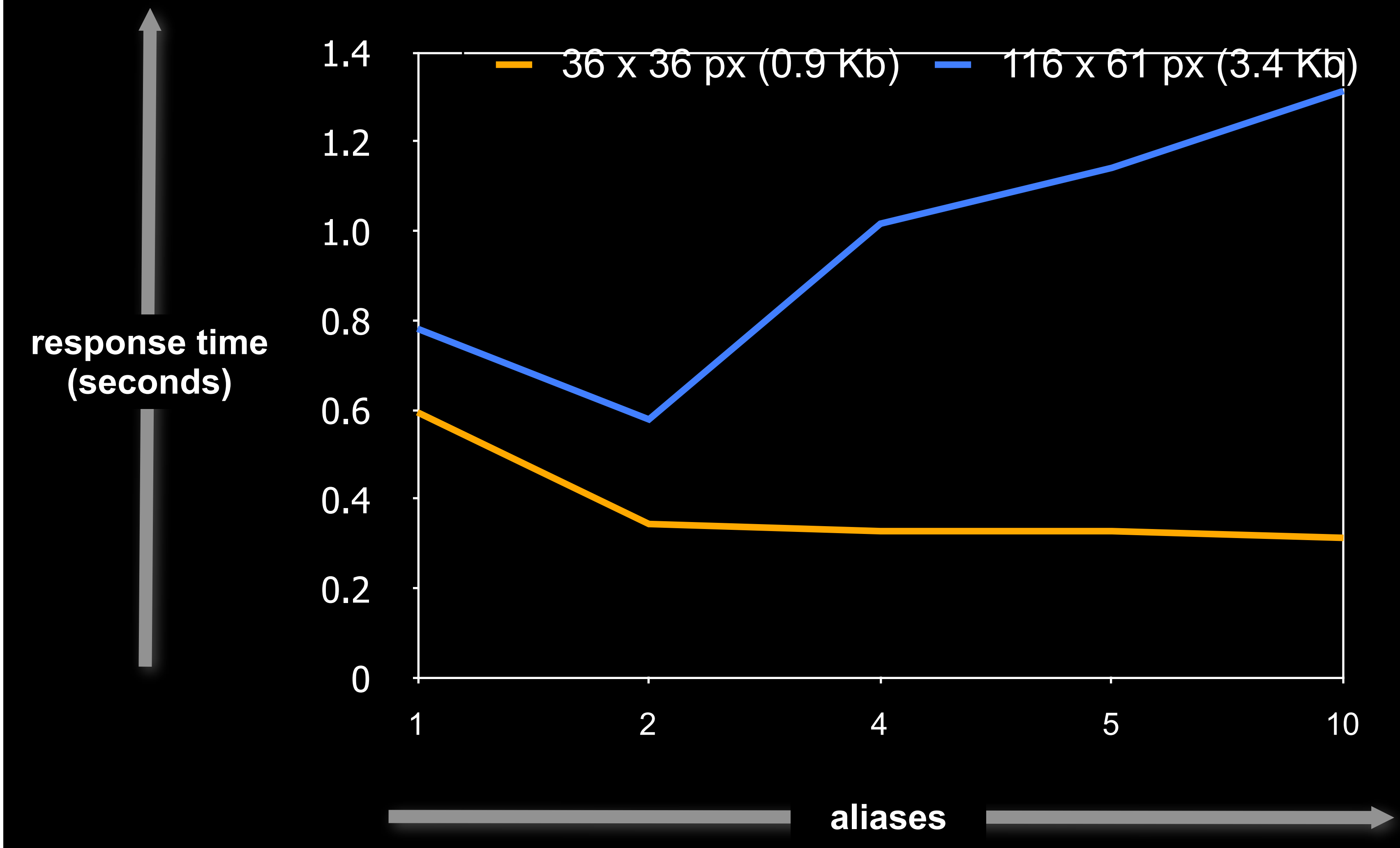
Eight in parallel



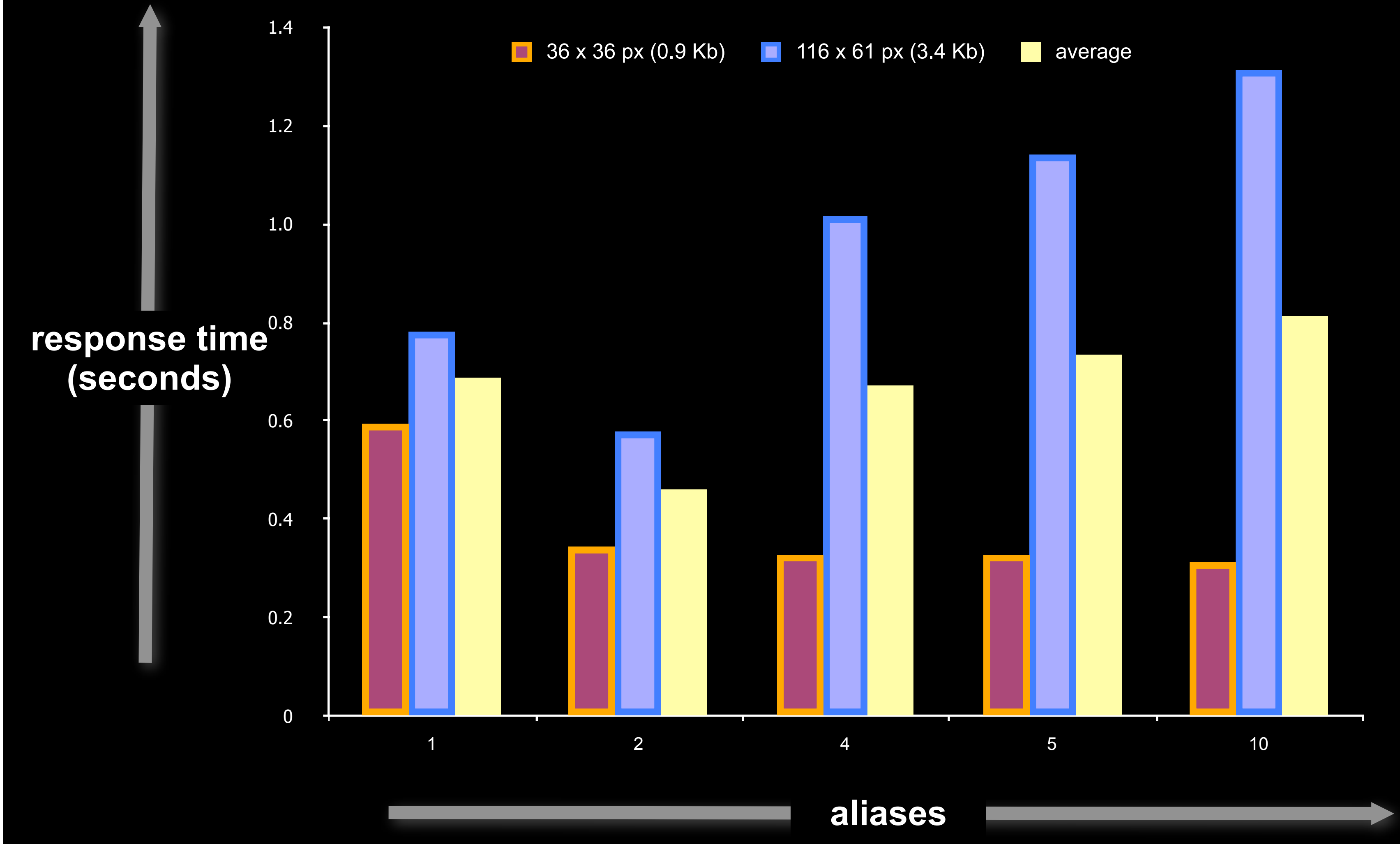
Maximizing Parallel Downloads



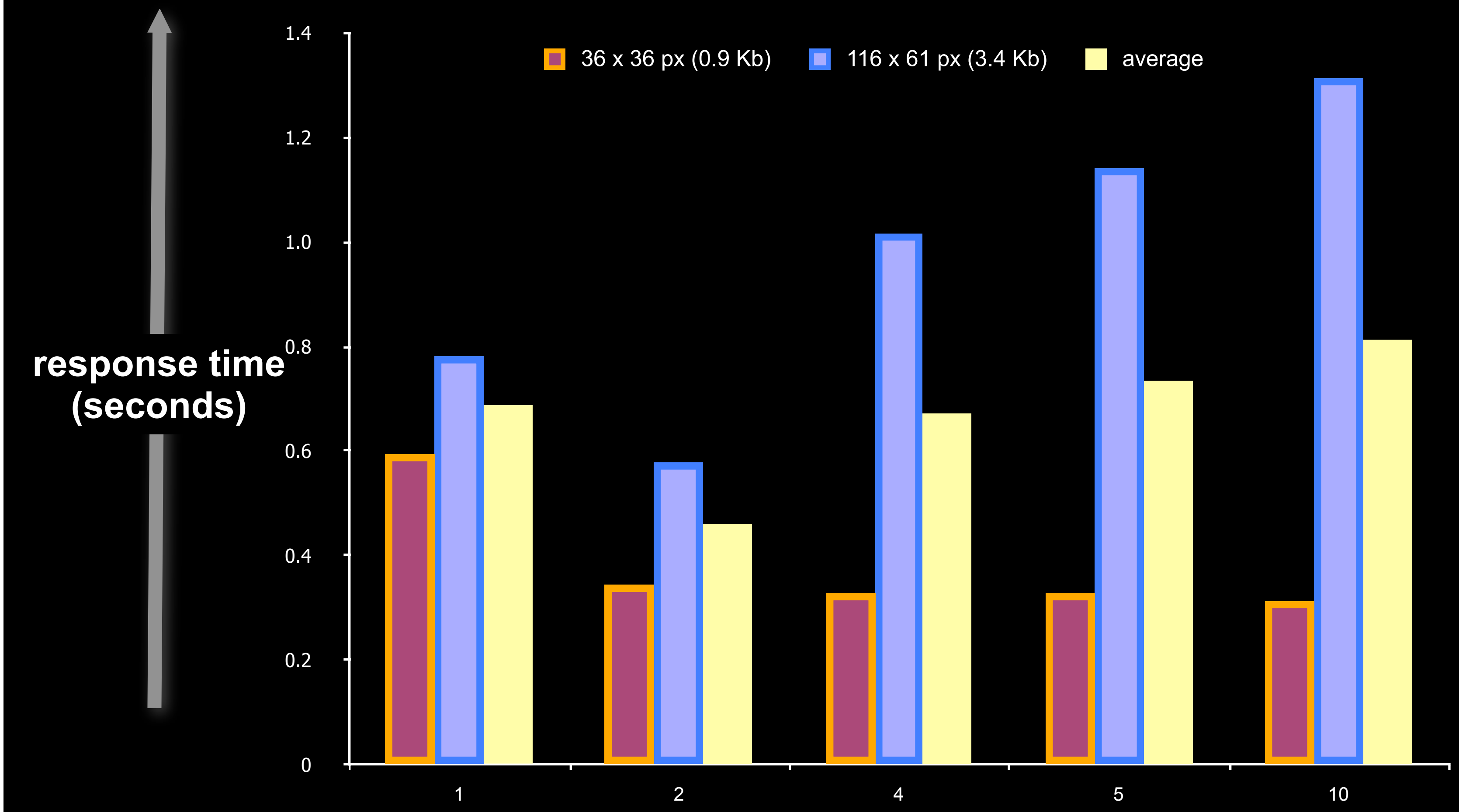
Maximizing Parallel Downloads



Maximizing Parallel Downloads



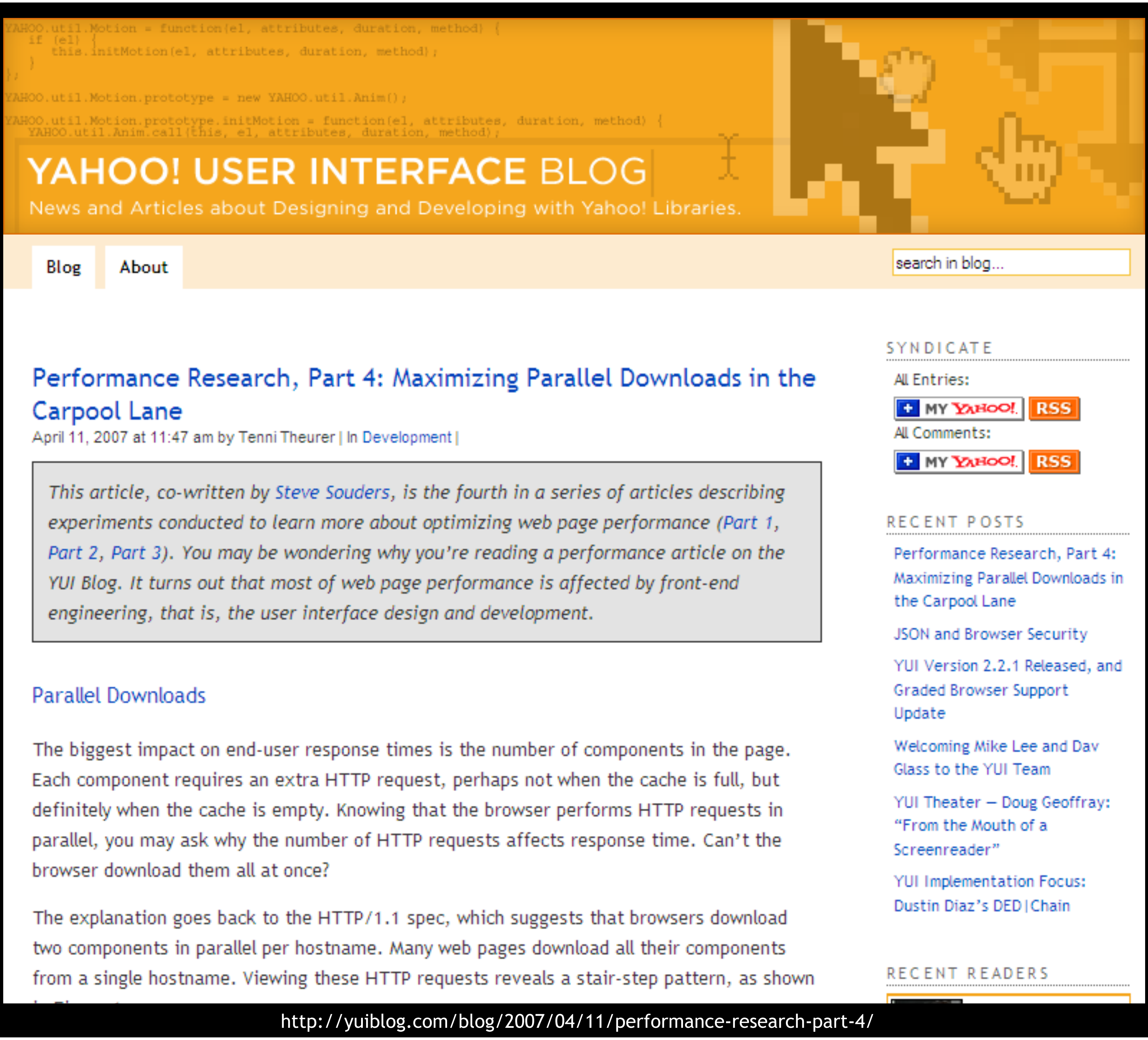
Maximizing Parallel Downloads



rule of thumb: use at least 2 but no more than 4 aliases

Experiment Takeaways

- beware the effects of CPU thrashing
- DNS lookup times vary across ISPs and geographic locations
- domain names may not be cached



```
YAHOO.util.Motion = function(el, attributes, duration, method) {
   if (el) {
      this.initMotion(el, attributes, duration, method);
   }
};

YAHOO.util.Motion.prototype = new YAHOO.util.Anim();

YAHOO.util.Motion.prototype.initMotion = function(el, attributes, duration, method) {
   YAHOO.util.Anim.call(this, el, attributes, duration, method);
```

YAHOO! USER INTERFACE BLOG

News and Articles about Designing and Developing with Yahoo! Libraries.

Performance Research, Part 4: Maximizing Parallel Downloads in the Carpool Lane

April 11, 2007 at 11:47 am by Tenni Theurer | In Development |

> *This article, co-written by Steve Souders, is the fourth in a series of articles describing experiments conducted to learn more about optimizing web page performance (Part 1, Part 2, Part 3). You may be wondering why you're reading a performance article on the YUI Blog. It turns out that most of web page performance is affected by front-end engineering, that is, the user interface design and development.*

Parallel Downloads

The biggest impact on end-user response times is the number of components in the page. Each component requires an extra HTTP request, perhaps not when the cache is full, but definitely when the cache is empty. Knowing that the browser performs HTTP requests in parallel, you may ask why the number of HTTP requests affects response time. Can't the browser download them all at once?

The explanation goes back to the HTTP/1.1 spec, which suggests that browsers download two components in parallel per hostname. Many web pages download all their components from a single hostname. Viewing these HTTP requests reveals a stair-step pattern, as shown

SYNDICATE

All Entries:

MY YAHOO! RSS

All Comments:

MY YAHOO! RSS

RECENT POSTS

- Performance Research, Part 4: Maximizing Parallel Downloads in the Carpool Lane
- JSON and Browser Security
- YUI Version 2.2.1 Released, and Graded Browser Support Update
- Welcoming Mike Lee and Dav Glass to the YUI Team
- YUI Theater — Doug Geoffray: "From the Mouth of a Screenreader"
- YUI Implementation Focus: Dustin Diaz's DED|Chain

RECENT READERS

http://yuiblog.com/blog/2007/04/11/performance-research-part-4/

Summary

What the 80/20 Rule Tells Us about Reducing HTTP Requests

http://yuiblog.com/blog/2006/11/28/performance-research-part-1/

Browser Cache Usage – Exposed!

http://yuiblog.com/blog/2007/01/04/performance-research-part-2/

When the Cookie Crumbles

http://yuiblog.com/blog/2007/03/01/performance-research-part-3/

Maximizing Parallel Downloads in the Carpool Lane

http://yuiblog.com/blog/2007/04/11/performance-research-part-4/

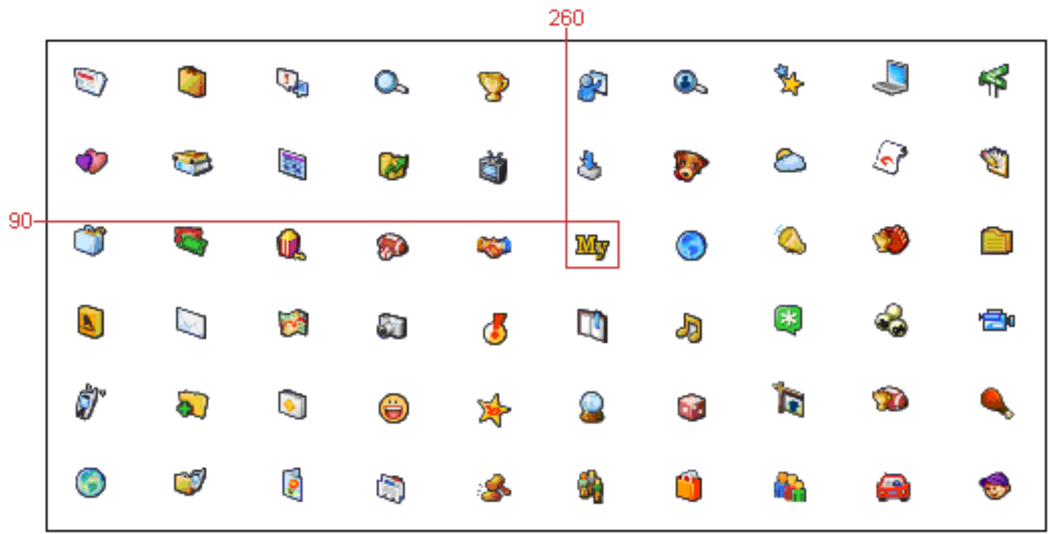
Performance Fruit

(some low, some high)

Rule: Make fewer HTTP requests.

- CSS sprites
- Combined / concatenated JS and CSS files
- image maps
- inline (data) images

CSS Sprites



```
<span style="
background-image: url('sprites.gif');
background-position: -260px -90px;">
</span>
```

size of combined image is less

http://alistapart.com/articles/sprites

Combined Scripts, Combined Stylesheets

	Scripts	**Stylesheets**
amazon.com	3	1
aol.com	18	1
cnn.com	11	2
ebay.com	7	2
froogle.google.com	1	1
msn.com	9	1
myspace.com	2	2
wikipedia.org	3	1
yahoo.com	4	1
youtube.com	7	3
Average	**6.5**	**1.5**

(This could well be)

The End.

Rule: Use a CDN

amazon.com	Akamai
aol.com	Akamai
cnn.com	
ebay.com	Akamai, Mirror Image
google.com	
msn.com	SAVVIS
myspace.com	Akamai, Limelight
wikipedia.org	
yahoo.com	Akamai, Custom
youtube.com	

distribute your static content before distributing your dynamic content

Rule: Add an Expires header

(not just for images)

	Images	Stylesheets	Scripts	%	Median Age
amazon.com	0/62	0/1	0/3	0%	114 days
aol.com	23/43	1/1	6/18	48%	217 days
cnn.com	0/138	0/2	2/11	1%	227 days
ebay.com	16/20	0/2	0/7	55%	140 days
froogle.google.com	1/23	0/1	0/1	4%	454 days
msn.com	32/35	1/1	3/9	80%	34 days
myspace.com	0/18	0/2	0/2	0%	1 day
wikipedia.org	6/8	1/1	2/3	75%	1 day
yahoo.com	23/23	1/1	4/4	100%	n/a
youtube.com	0/32	0/3	0/7	0%	26 days

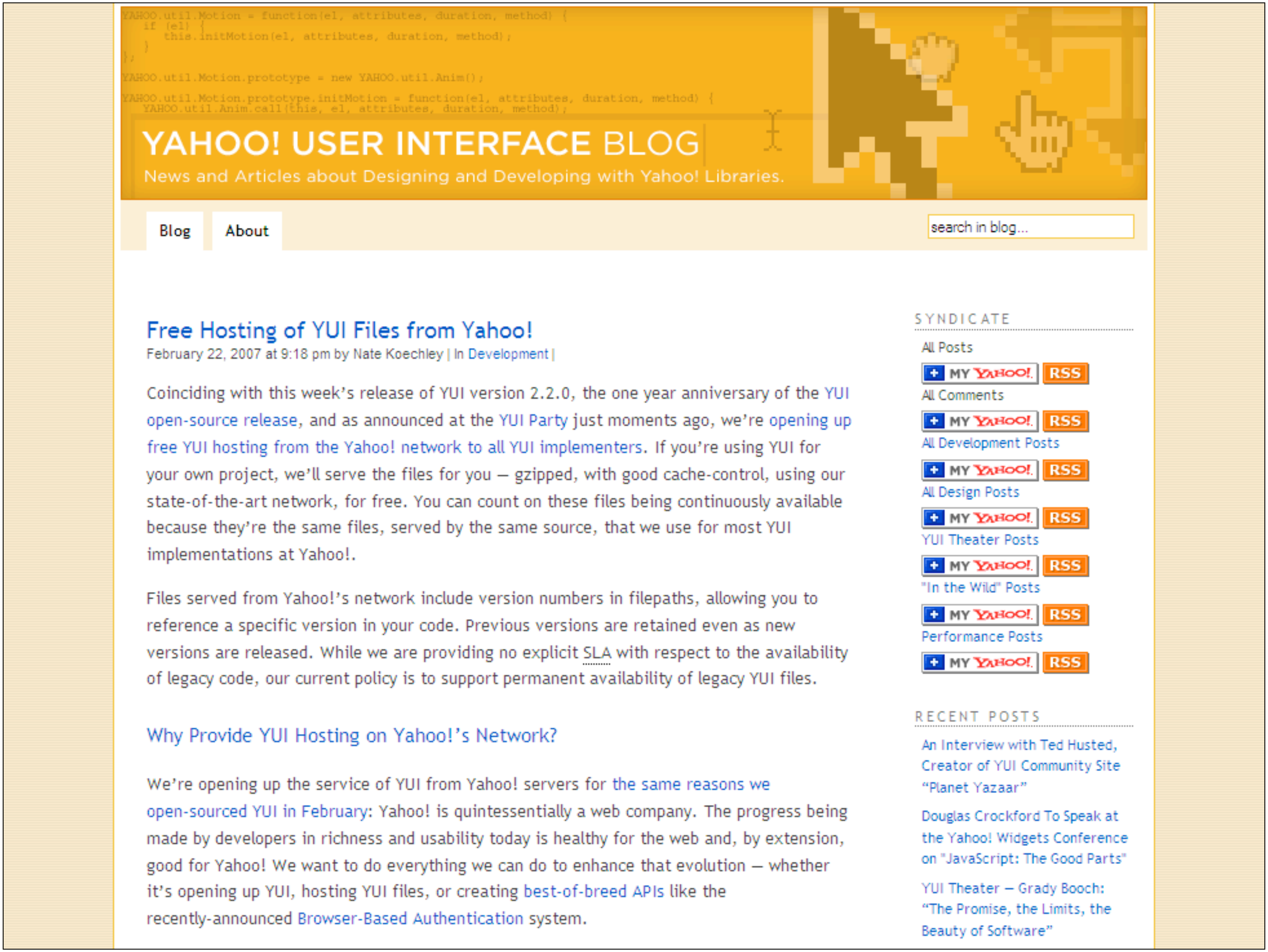
Rule: Gzip components

- you can affect users' download times
- 90%+ of browsers support compression

Gzip: not just for HTML

	HTML	Scripts	Stylesheets
amazon.com	x		
aol.com	x	some	some
cnn.com			
ebay.com	x		
froogle.google.com	x	x	x
msn.com	x	deflate	deflate
myspace.com	x	x	x
wikipedia.org	x	x	x
yahoo.com	x	x	x
youtube.com	x	some	some

gzip scripts, stylesheets, XML, JSON (not images, PDF)



```
YAHOO.util.Motion = function(el, attributes, duration, method) {
   if (el) {
      this.initMotion(el, attributes, duration, method);
   }
};

YAHOO.util.Motion.prototype = new YAHOO.util.Anim();

YAHOO.util.Motion.prototype.initMotion = function(el, attributes, duration, method) {
   YAHOO.util.Anim.call(this, el, attributes, duration, method);
```

YAHOO! USER INTERFACE BLOG

News and Articles about Designing and Developing with Yahoo! Libraries.

Free Hosting of YUI Files from Yahoo!

February 22, 2007 at 9:18 pm by Nate Koechley | In Development |

Coinciding with this week's release of YUI version 2.2.0, the one year anniversary of the YUI open-source release, and as announced at the YUI Party just moments ago, we're opening up free YUI hosting from the Yahoo! network to all YUI implementers. If you're using YUI for your own project, we'll serve the files for you – gzipped, with good cache-control, using our state-of-the-art network, for free. You can count on these files being continuously available because they're the same files, served by the same source, that we use for most YUI implementations at Yahoo!.

Files served from Yahoo!'s network include version numbers in filepaths, allowing you to reference a specific version in your code. Previous versions are retained even as new versions are released. While we are providing no explicit SLA with respect to the availability of legacy code, our current policy is to support permanent availability of legacy YUI files.

Why Provide YUI Hosting on Yahoo!'s Network?

We're opening up the service of YUI from Yahoo! servers for the same reasons we open-sourced YUI in February: Yahoo! is quintessentially a web company. The progress being made by developers in richness and usability today is healthy for the web and, by extension, good for Yahoo! We want to do everything we can do to enhance that evolution – whether it's opening up YUI, hosting YUI files, or creating best-of-breed APIs like the recently-announced Browser-Based Authentication system.

SYNDICATE

All Posts

All Comments

All Development Posts

All Design Posts

YUI Theater Posts

"In the Wild" Posts

Performance Posts

RECENT POSTS

An Interview with Ted Husted, Creator of YUI Community Site "Planet Yazaar"

Douglas Crockford To Speak at the Yahoo! Widgets Conference on "JavaScript: The Good Parts"

YUI Theater – Grady Booch: "The Promise, the Limits, the Beauty of Software"

YUI’s Free Hosting:

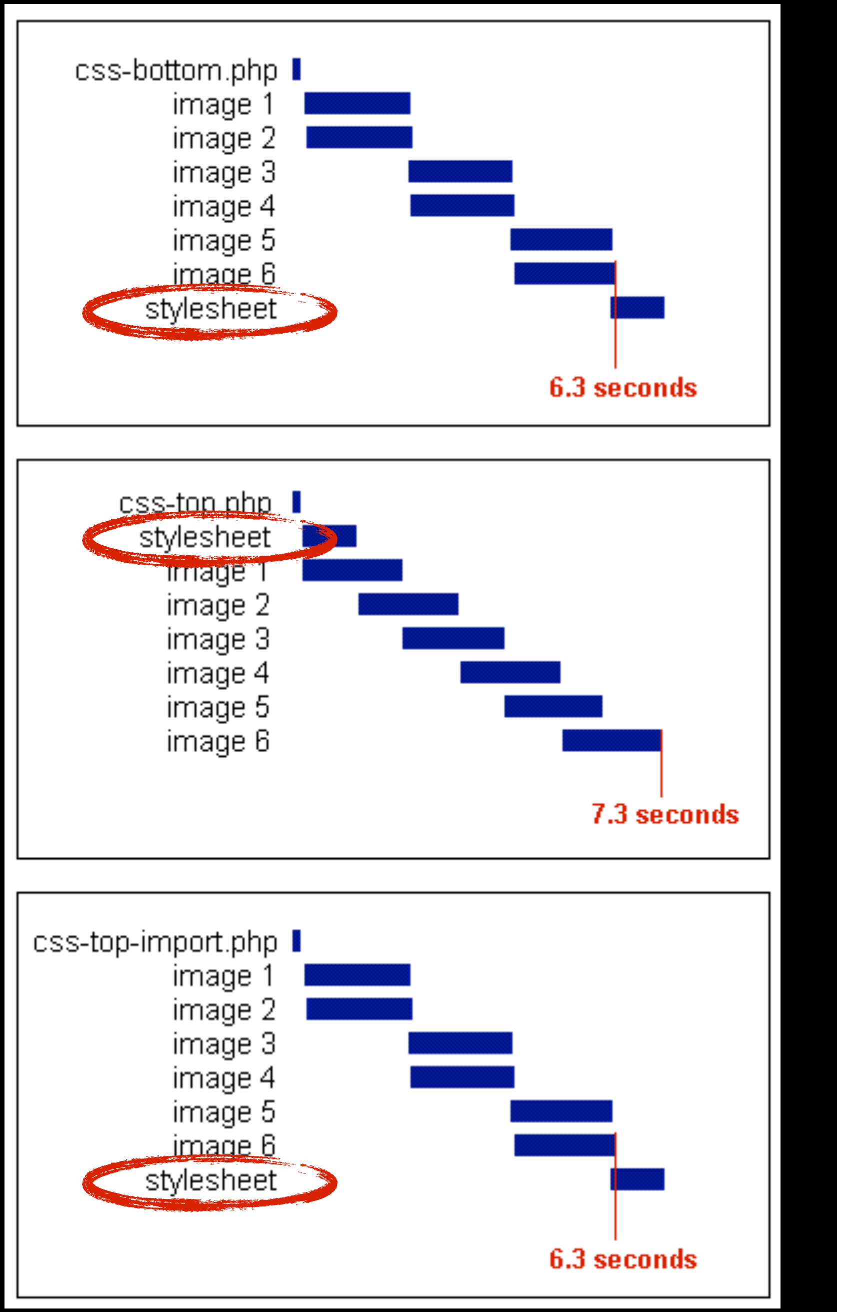
- Aggregated files
- With Expires headers
- On a CDN
- Gzipped

Rule: Put CSS at the top

- stylesheets block rendering in IE
- solution: put stylesheets in HEAD (per spec)
- avoids Flash of Unstyled Content

use `<link>` (not `@import`)

Slowest is actually the Fastest

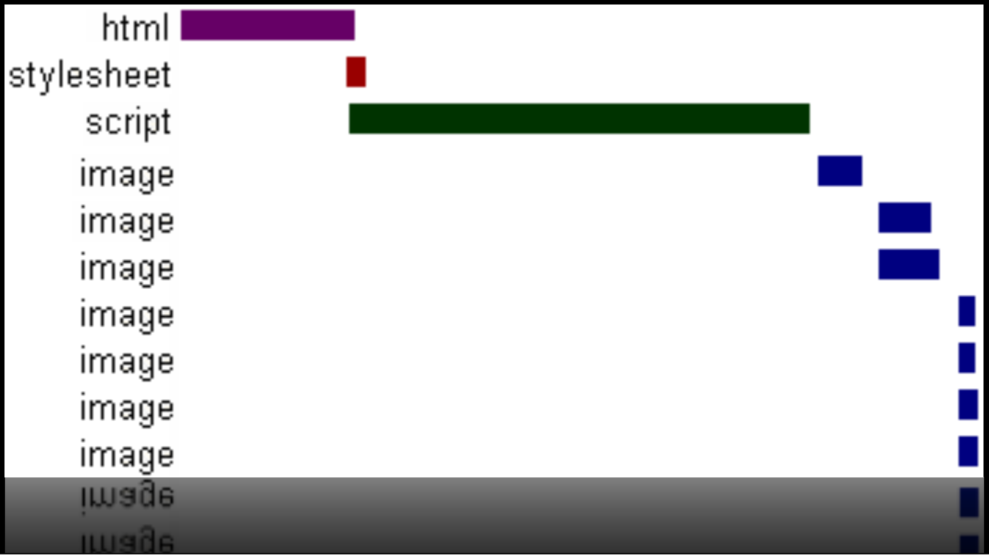


Rule: Choose <link> over @import

- When you use @import you override the browsers’ native performance assistance.

Rule: Move scripts to the bottom

- scripts block rendering of everything below them in the page
- scripts block parallel downloads across all hostnames



What about `defer`?

`script defer` attribute is not a solution

- blocks rendering and downloads in FF
- slight blocking in IE

Rule: Avoid CSS expressions

Can be used to set CSS properties dynamically in IE

```
width: expression(
  document.body.clientWidth < 600 ?
  “600px” : “auto” );
```

But problematic because expressions execute many times

- – mouse move, key press, resize, scroll, etc.

Rule: Make JS & CSS external

Inline: bigger HTML but no HTTP request

External: cachable but extra HTTP

Variables:

- page views per user (per session)
- empty vs. full cache stats
- component re-use

External is typically better

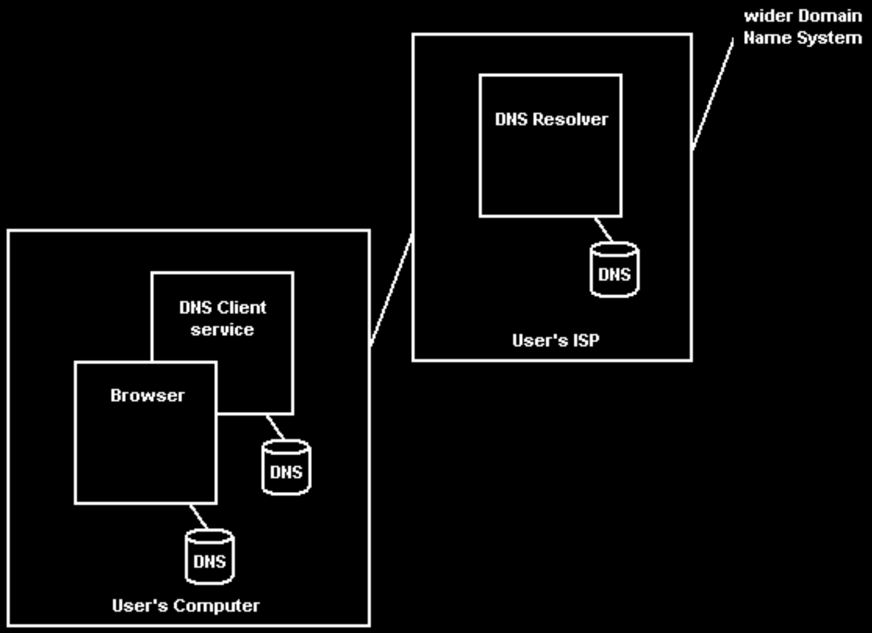
- home pages may be an exception due to cache behavior of browser’s startpage.

Rule: Reduce DNS lookups

typically 20-120 ms

block parallel downloads

OS and browser both have DNS caches



Best practice:

Max 2-4 hosts

Use keep-alive

Rule: Minify JavaScript

	Minify External?	Minify Inline?
www.amazon.com	no	no
www.aol.com	no	no
www.cnn.com	no	no
www.ebay.com	yes	no
froogle.google.com	yes	yes
www.msn.com	yes	yes
www.myspace.com	no	no
www.wikipedia.org	no	no
www.yahoo.com	yes	yes
www.youtube.com	no	no

don't forget to minify inline scripts, too

Which Compressor?

- YUI Compressor is highly regarded
- web search "CompressorRater"

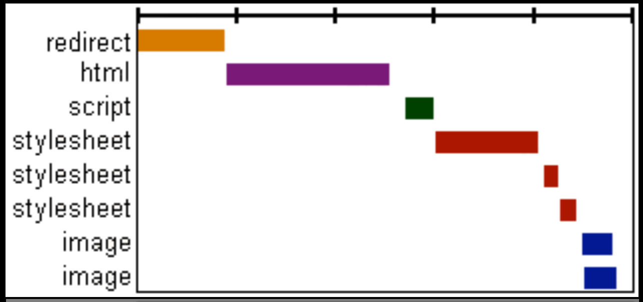
Rule: Avoid redirects

3xx status codes – mostly 301 and 302

```
HTTP/1.1 301 Moved Permanently
Location: http://yahoo.com/newuri
```

add Expires headers so redirect headers are cached

Redirects are worst form of blocking



http://www.w3.org/Protocols/rfc2616/rfc2616-sec10.html

Rule: Make AJAX cacheable and small

- XHR, JSON, iframe, dynamic scripts can still be cached, minified, and gzipped
- a personalized response should still be cacheable by that person

Rule: Use GET for AJAX Requests

- POST is a two-step process.
- GET can send in one packet. Use if possible.
- Max payload is 2K in IE.

Rule: Post-load Components

- Delay all non-crucial elements.
  - YUI Image Loader offers precise control.
  - YUI Get makes on-the-fly JS & CSS easy.
- Used on www.yahoo.com homepage.

Rule: Preload Components

- Conditional preload - based on user action
  - Ex: search.yahoo.com's Search Assist
- Unconditional preload - all following onload
  - Ex: google.com's sprite
- Anticipated preload - give redesigns a boost

Rule: Minimize iFrames

- Costly even if blank
- Blocks page onload
- Questionable semantic value

Rule: Smart Event Handles

- Event Delegation to reduce total number
- onAvailable (etc) for earlier access
  - YUI Event has onAvailable, onContentReady, & onDomReady

Rule: Optimize CSS Sprites

- Horizontal alignment is usually smaller than vertical.
- Combine similar colors in a sprite to minimize color count.
  - Only 256 colors can fit in a PNG8.
- Be mobile-friendly. Avoid big gaps between images. Minimal impact on k-size, but takes more memory to decompress.

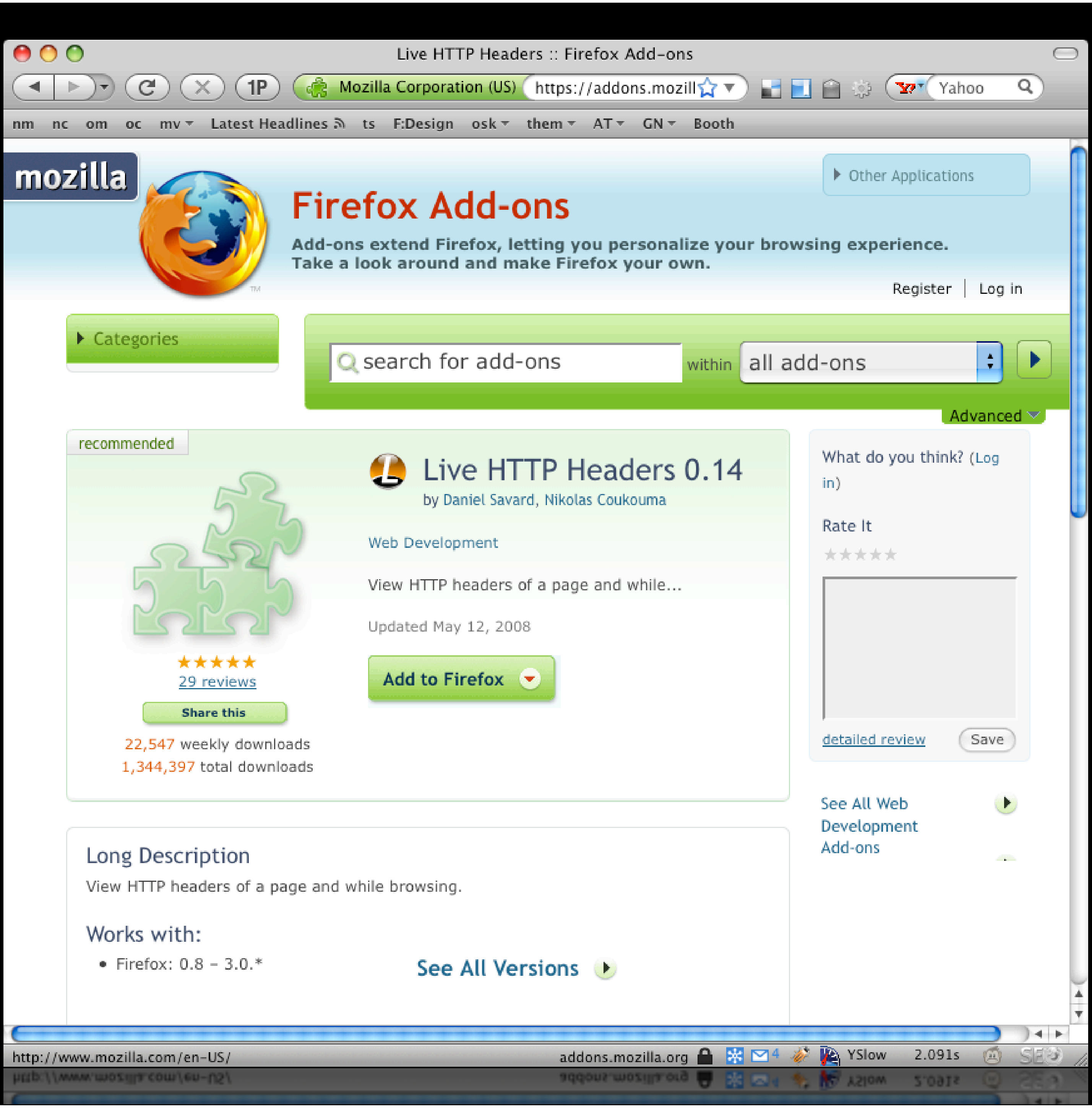
Rule: favicon.ico

- Always provide a favicon.ico so the request doesn't 404
- And the request carries cookies
- Mitigate by setting an expires header,
  - (but NOT forever since you can't rename the file.)
- Keep under 1K

Rule: iPhone-Friendly Tip

- iPhone will not cache assets larger than 25K
  - That’s 25K **un**compressed.
- http://yuiblog.com/blog/2008/02/06/iphone-cacheability/

Tools for your own analysis



Firefox Add-ons

Add-ons extend Firefox, letting you personalize your browsing experience. Take a look around and make Firefox your own.

Live HTTP Headers 0.14

by Daniel Savard, Nikolas Coukouma

Web Development

View HTTP headers of a page and while...

Updated May 12, 2008

★★★★★

29 reviews

22,547 weekly downloads

1,344,397 total downloads

What do you think? (Log in)

Rate It

☆☆☆☆☆

detailed review

See All Web Development Add-ons

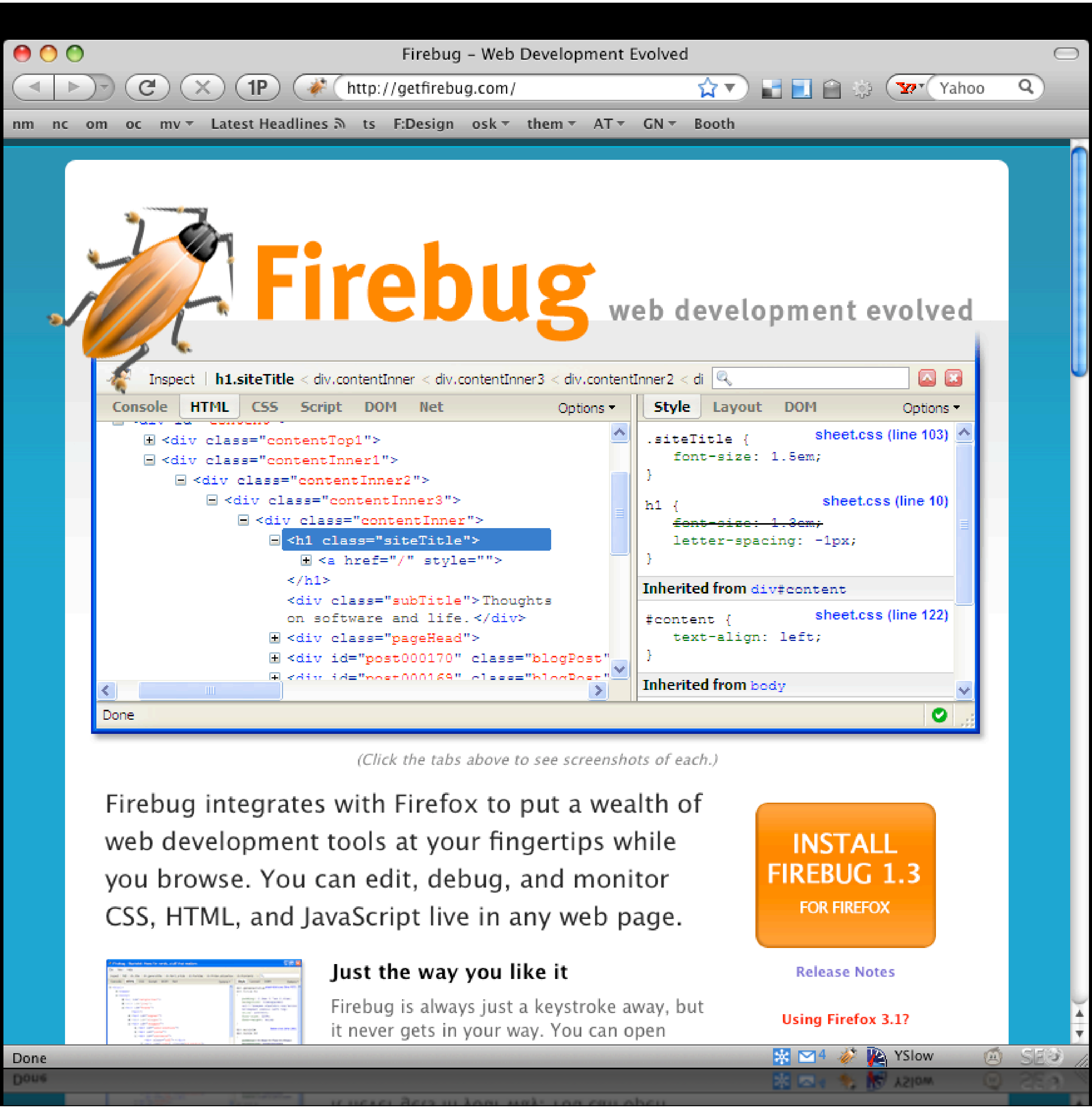
Long Description

View HTTP headers of a page and while browsing.

Works with:

- Firefox: 0.8 – 3.0.*

See All Versions



```
  ⊞ <div class="contentTop1">
  ⊟ <div class="contentInner1">
      ⊟ <div class="contentInner2">
          ⊟ <div class="contentInner3">
              ⊟ <div class="contentInner">
                  ⊟ <h1 class="siteTitle">
                      ⊞ <a href="/" style="">
                    </h1>
                    <div class="subTitle">Thoughts
                    on software and life.</div>
                  ⊞ <div class="pageHead">
                  ⊞ <div id="post000170" class="blogPost"
                  ⊞ <div id="post000169" class="blogPost"
```

```
.siteTitle {                sheet.css (line 103)
    font-size: 1.5em;
}
h1 {                        sheet.css (line 10)
    ~~font-size: 1.3em;~~
    letter-spacing: -1px;
}
Inherited from div#content
#content {                  sheet.css (line 122)
    text-align: left;
}
Inherited from body
```

(Click the tabs above to see screenshots of each.)

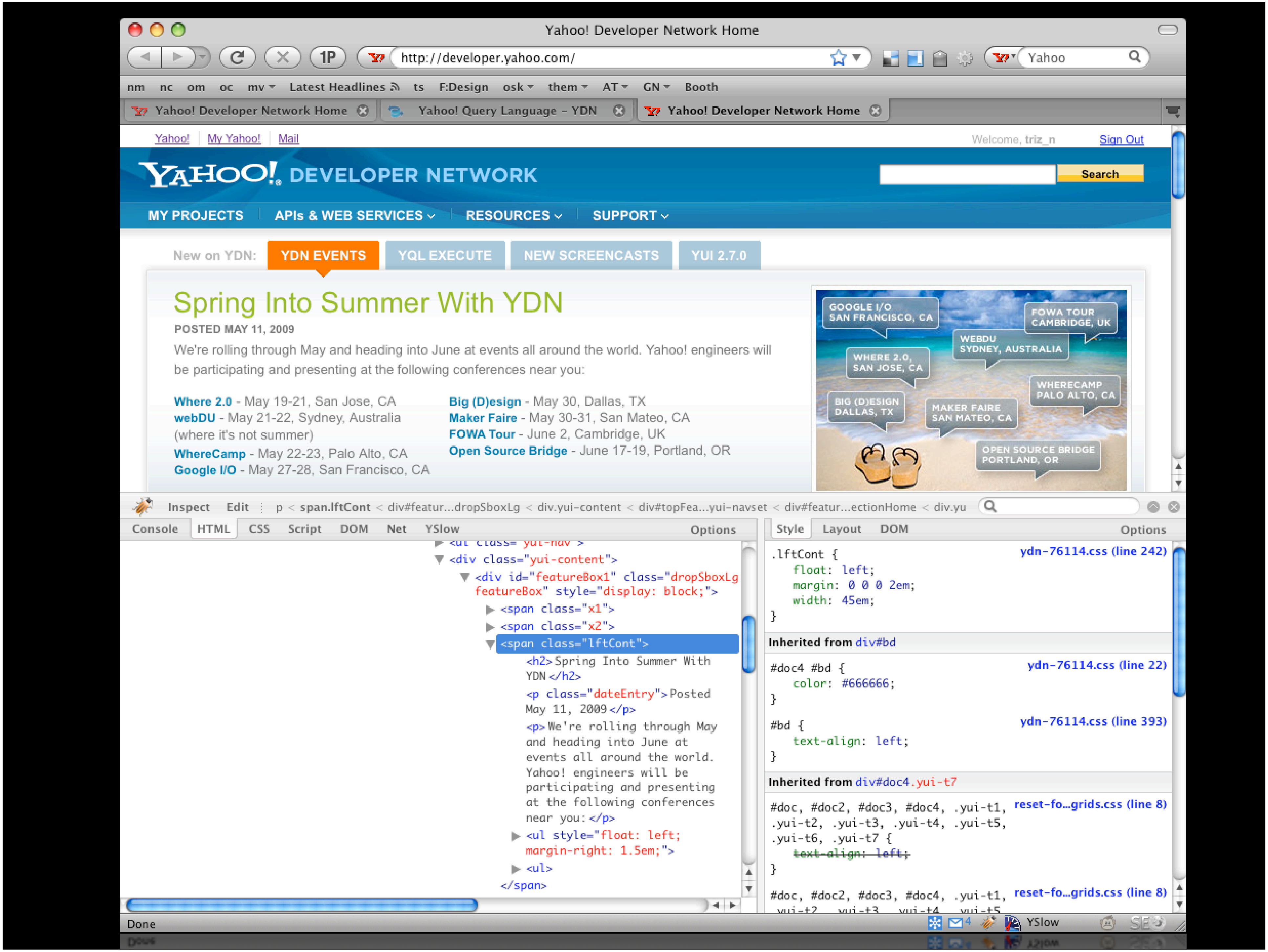
Firebug integrates with Firefox to put a wealth of web development tools at your fingertips while you browse. You can edit, debug, and monitor CSS, HTML, and JavaScript live in any web page.

Release Notes

Using Firefox 3.1?

Just the way you like it

Firebug is always just a keystroke away, but it never gets in your way. You can open


Yahoo! Developer Network Home
http://developer.yahoo.com/
Yahoo
nm nc om oc mv Latest Headlines ts F:Design osk them AT GN Booth
Yahoo! Developer Network Home
Yahoo! Query Language - YDN
Yahoo! Developer Network Home
Yahoo! My Yahoo! Mail
Welcome, triz_n Sign Out
YAHOO! DEVELOPER NETWORK
Search
MY PROJECTS APIs & WEB SERVICES RESOURCES SUPPORT
New on YDN: YDN EVENTS YQL EXECUTE NEW SCREENCASTS YUI 2.7.0
GOOGLE I/O SAN FRANCISCO, CA
FOWA TOUR CAMBRIDGE, UK
WEBDU SYDNEY, AUSTRALIA
WHERE 2.0, SAN JOSE, CA
WHERECAMP PALO ALTO, CA
BIG (D)ESIGN DALLAS, TX
MAKER FAIRE SAN MATEO, CA
OPEN SOURCE BRIDGE PORTLAND, OR
Inspect Edit
p < span.lftCont < div#featur...dropSboxLg < div.yui-content < div#topFea...yui-navset < div#featur...ectionHome < div.yu
Console HTML CSS Script DOM Net YSlow Options
Style Layout DOM Options
Done
YSlow

Spring Into Summer With YDN

POSTED MAY 11, 2009

We're rolling through May and heading into June at events all around the world. Yahoo! engineers will be participating and presenting at the following conferences near you:

- **Where 2.0** - May 19-21, San Jose, CA
- **webDU** - May 21-22, Sydney, Australia (where it's not summer)
- **WhereCamp** - May 22-23, Palo Alto, CA
- **Google I/O** - May 27-28, San Francisco, CA
- **Big (D)esign** - May 30, Dallas, TX
- **Maker Faire** - May 30-31, San Mateo, CA
- **FOWA Tour** - June 2, Cambridge, UK
- **Open Source Bridge** - June 17-19, Portland, OR

```
▶ <ul class="yui-nav">
▼ <div class="yui-content">
  ▼ <div id="featureBox1" class="dropSboxLg
    featureBox" style="display: block;">
    ▶ <span class="x1">
    ▶ <span class="x2">
    ▼ <span class="lftCont">
        <h2>Spring Into Summer With
        YDN</h2>
        <p class="dateEntry">Posted
        May 11, 2009</p>
        <p>We're rolling through May
        and heading into June at
        events all around the world.
        Yahoo! engineers will be
        participating and presenting
        at the following conferences
        near you:</p>
      ▶ <ul style="float: left;
        margin-right: 1.5em;">
      ▶ <ul>
      </span>
```

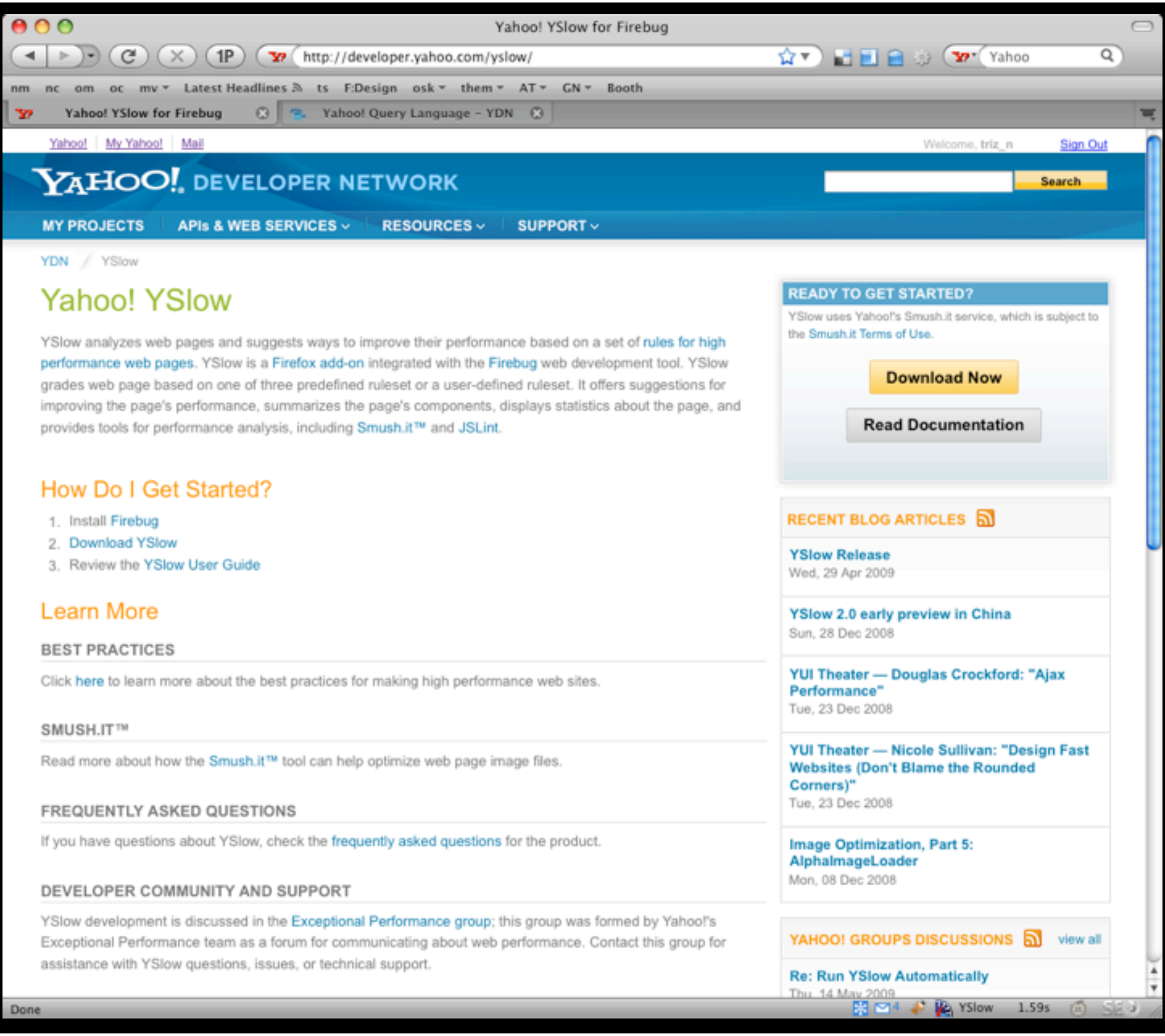
```
.lftCont {                                   ydn-76114.css (line 242)
    float: left;
    margin: 0 0 0 2em;
    width: 45em;
}
Inherited from div#bd
#doc4 #bd {                                  ydn-76114.css (line 22)
    color: #666666;
}

#bd {                                        ydn-76114.css (line 393)
    text-align: left;
}
Inherited from div#doc4.yui-t7
#doc, #doc2, #doc3, #doc4, .yui-t1,    reset-fo...grids.css (line 8)
.yui-t2, .yui-t3, .yui-t4, .yui-t5,
.yui-t6, .yui-t7 {
    ~~text-align: left;~~
}

#doc, #doc2, #doc3, #doc4, .yui-t1,    reset-fo...grids.css (line 8)
.yui-t2, .yui-t3, .yui-t4, .yui-t5,
```

YSlow

- Extension for Firebug extension
- Performance report card
- HTTP/HTML summary
- List of components in the page
- Tools including JSLint and Smush.it



Yahoo! YSlow

YSlow analyzes web pages and suggests ways to improve their performance based on a set of rules for high performance web pages. YSlow is a Firefox add-on integrated with the Firebug web development tool. YSlow grades web page based on one of three predefined ruleset or a user-defined ruleset. It offers suggestions for improving the page's performance, summarizes the page's components, displays statistics about the page, and provides tools for performance analysis, including Smush.it™ and JSLint.

How Do I Get Started?

1. Install Firebug
2. Download YSlow
3. Review the YSlow User Guide

Learn More

BEST PRACTICES

Click here to learn more about the best practices for making high performance web sites.

SMUSH.IT™

Read more about how the Smush.it™ tool can help optimize web page image files.

FREQUENTLY ASKED QUESTIONS

If you have questions about YSlow, check the frequently asked questions for the product.

DEVELOPER COMMUNITY AND SUPPORT

YSlow development is discussed in the Exceptional Performance group; this group was formed by Yahoo!'s Exceptional Performance team as a forum for communicating about web performance. Contact this group for assistance with YSlow questions, issues, or technical support.

READY TO GET STARTED?

YSlow uses Yahoo!'s Smush.it service, which is subject to the Smush.it Terms of Use.

RECENT BLOG ARTICLES

YSlow Release
Wed, 29 Apr 2009

YSlow 2.0 early preview in China
Sun, 28 Dec 2008

YUI Theater — Douglas Crockford: "Ajax Performance"
Tue, 23 Dec 2008

YUI Theater — Nicole Sullivan: "Design Fast Websites (Don't Blame the Rounded Corners)"
Tue, 23 Dec 2008

Image Optimization, Part 5: AlphaImageLoader
Mon, 08 Dec 2008

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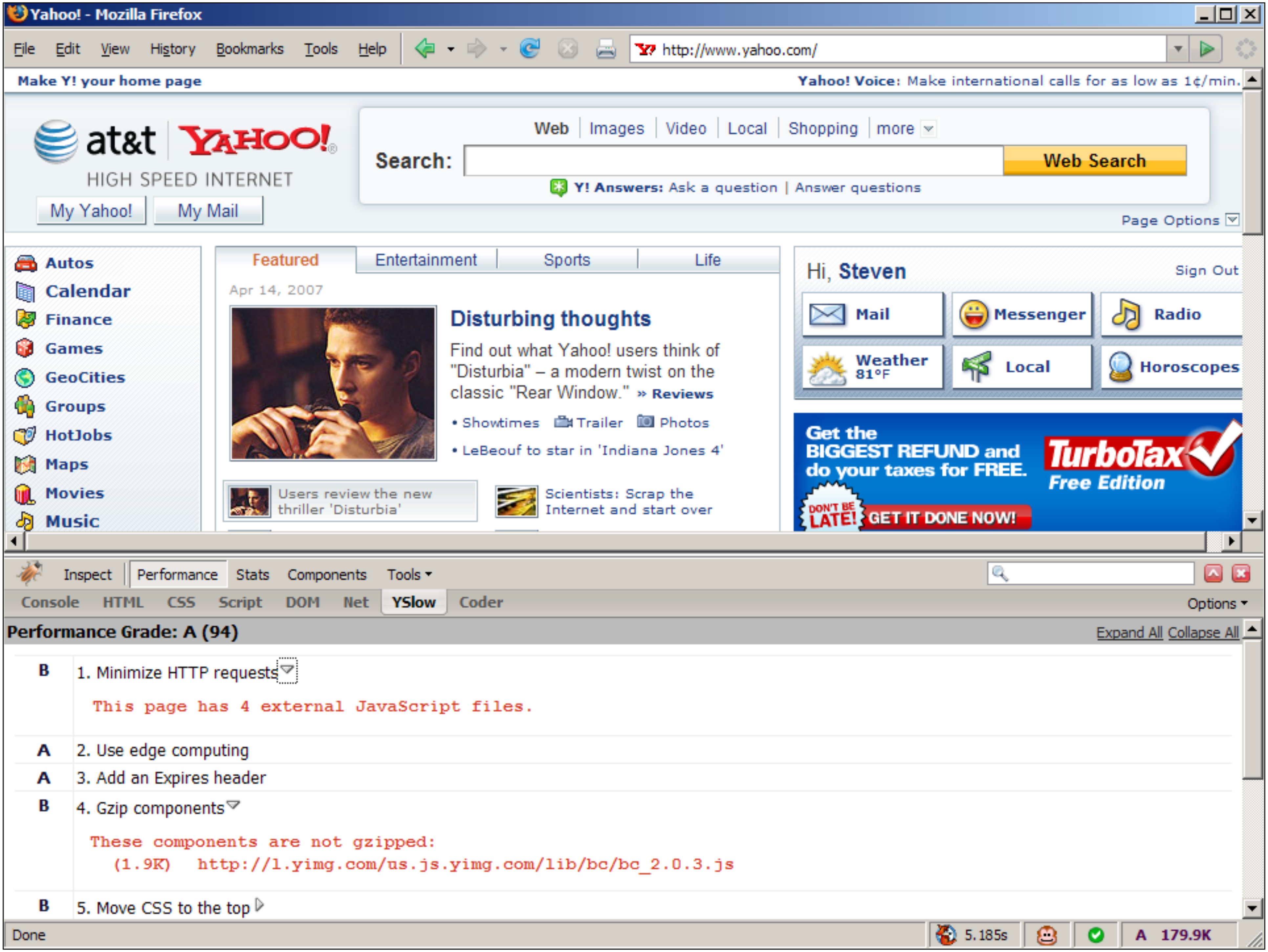
view all

Re: Run YSlow Automatically
Thu, 14 May 2009



Apr 14, 2007

Disturbing thoughts

Find out what Yahoo! users think of "Disturbia" – a modern twist on the classic "Rear Window." » Reviews

- Showtimes Trailer Photos
- LeBeouf to star in 'Indiana Jones 4'

Users review the new thriller 'Disturbia'

Scientists: Scrap the Internet and start over

```
Performance Grade: A (94)

B   1. Minimize HTTP requests
       This page has 4 external JavaScript files.
A   2. Use edge computing
A   3. Add an Expires header
B   4. Gzip components
       These components are not gzipped:
         (1.9K)   http://l.yimg.com/us.js.yimg.com/lib/bc/bc_2.0.3.js
B   5. Move CSS to the top
```

Conclusion

Takeaways

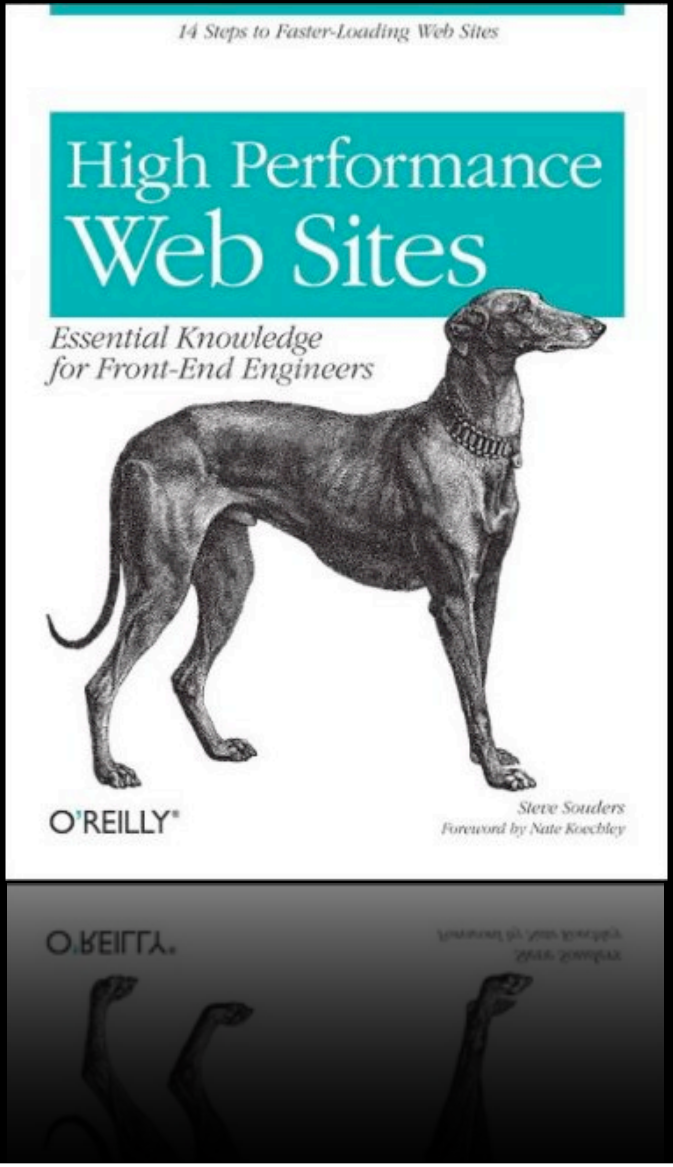
- focus on the front-end
- harvest the low-hanging fruit
    - **reduce HTTP requests**
    - enable caching
- you *do* control user response times
- LOFNO – be an advocate for your users

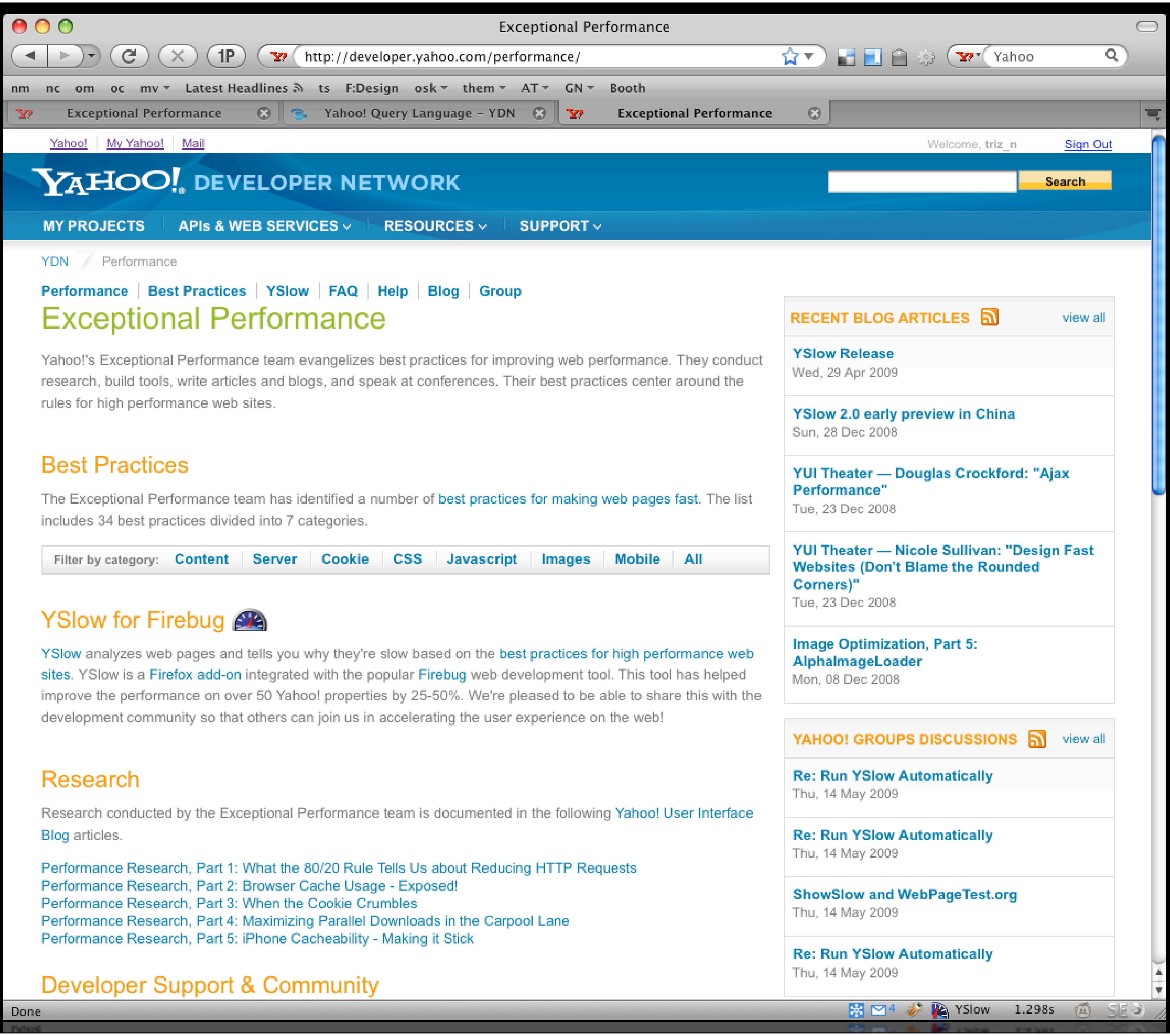
For more information:

High Performance Web Sites

Essential Knowledge for Front-End Engineers

by Steve Souders,
with research from Yahoo!'s
Performance Engineering team.


14 Steps to Faster-Loading Web Sites
High Performance Web Sites
Essential Knowledge for Front-End Engineers
O'REILLY
Steve Souders
Foreword by Nate Koechley


Exceptional Performance
1P
http://developer.yahoo.com/performance/
Yahoo
nm nc om oc mv Latest Headlines ts F:Design osk them AT GN Booth
Exceptional Performance
Yahoo! Query Language - YDN
Exceptional Performance
Done
YSlow 1.298s

Yahoo! | My Yahoo! | Mail

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YAHOO! DEVELOPER NETWORK

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YDN / Performance

Performance | Best Practices | YSlow | FAQ | Help | Blog | Group

Exceptional Performance

Yahoo!'s Exceptional Performance team evangelizes best practices for improving web performance. They conduct research, build tools, write articles and blogs, and speak at conferences. Their best practices center around the rules for high performance web sites.

Best Practices

The Exceptional Performance team has identified a number of best practices for making web pages fast. The list includes 34 best practices divided into 7 categories.

Filter by category: Content | Server | Cookie | CSS | Javascript | Images | Mobile | All

YSlow for Firebug

YSlow analyzes web pages and tells you why they're slow based on the best practices for high performance web sites. YSlow is a Firefox add-on integrated with the popular Firebug web development tool. This tool has helped improve the performance on over 50 Yahoo! properties by 25-50%. We're pleased to be able to share this with the development community so that others can join us in accelerating the user experience on the web!

Research

Research conducted by the Exceptional Performance team is documented in the following Yahoo! User Interface Blog articles.

Performance Research, Part 1: What the 80/20 Rule Tells Us about Reducing HTTP Requests
Performance Research, Part 2: Browser Cache Usage - Exposed!
Performance Research, Part 3: When the Cookie Crumbles
Performance Research, Part 4: Maximizing Parallel Downloads in the Carpool Lane
Performance Research, Part 5: iPhone Cacheability - Making it Stick

Developer Support & Community

RECENT BLOG ARTICLES view all

YSlow Release
Wed, 29 Apr 2009

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Sun, 28 Dec 2008

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Tue, 23 Dec 2008

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Re: Run YSlow Automatically
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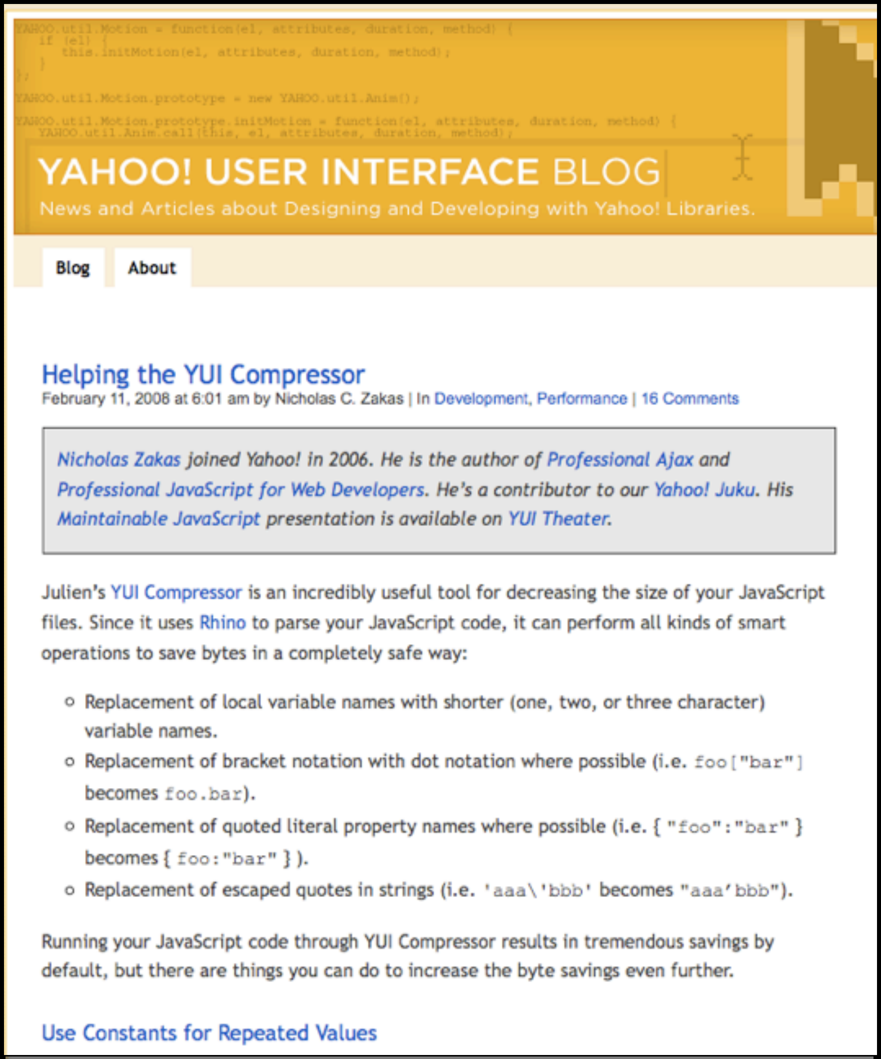
Re: Run YSlow Automatically
Thu, 14 May 2009

ShowSlow and WebPageTest.org
Thu, 14 May 2009

Re: Run YSlow Automatically
Thu, 14 May 2009

Articles on YUIBlog

http://yuiblog.com/blog/category/performance



```
YAHOO.util.Motion = function(el, attributes, duration, method) {
   if (el) {
      this.initMotion(el, attributes, duration, method);
   }
};

YAHOO.util.Motion.prototype = new YAHOO.util.Anim();

YAHOO.util.Motion.prototype.initMotion = function(el, attributes, duration, method) {
   YAHOO.util.Anim.call(this, el, attributes, duration, method);
```

YAHOO! USER INTERFACE BLOG

News and Articles about Designing and Developing with Yahoo! Libraries.

Helping the YUI Compressor

February 11, 2008 at 6:01 am by Nicholas C. Zakas | In Development, Performance | 16 Comments

Nicholas Zakas joined Yahoo! in 2006. He is the author of Professional Ajax and Professional JavaScript for Web Developers. He's a contributor to our Yahoo! Juku. His Maintainable JavaScript presentation is available on YUI Theater.

Julien's YUI Compressor is an incredibly useful tool for decreasing the size of your JavaScript files. Since it uses Rhino to parse your JavaScript code, it can perform all kinds of smart operations to save bytes in a completely safe way:

- Replacement of local variable names with shorter (one, two, or three character) variable names.
- Replacement of bracket notation with dot notation where possible (i.e. `foo["bar"]` becomes `foo.bar`).
- Replacement of quoted literal property names where possible (i.e. { `"foo":"bar"` } becomes { `foo:"bar"` }).
- Replacement of escaped quotes in strings (i.e. `'aaa\'bbb'` becomes `"aaa'bbb"`).

Running your JavaScript code through YUI Compressor results in tremendous savings by default, but there are things you can do to increase the byte savings even further.

Use Constants for Repeated Values

Let’s keep talking...

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http://nate.koechley.com/blog
@natekoechley

Thanks again to Yahoo!’s Exceptional Performance Engineering Team

Links

book: http://www.oreilly.com/catalog/9780596514211/
examples: http://stevesouders.com/examples/
image maps: http://www.w3.org/TR/html401/struct/objects.html#h-13.6
CSS sprites: http://alistapart.com/articles/sprites
inline images: http://tools.ietf.org/html/rfc2397
jsmin: http://crockford.com/javascript/jsmin
dojo compressor: http://dojotoolkit.org/docs/shrinksafe
HTTP status codes: http://www.w3.org/Protocols/rfc2616/rfc2616-sec10.html
IBM Page Detailer: http://alphaworks.ibm.com/tech/pagedetailer
Fasterfox: http://fasterfox.mozdev.org/
LiveHTTPHeaders: http://livehttpheaders.mozdev.org/
Firebug: http://getfirebug.com/
YUIBlog: http://yuiblog.com/blog/2006/11/28/performance-research-part-1/
http://yuiblog.com/blog/2007/01/04/performance-research-part-2/
http://yuiblog.com/blog/2007/03/01/performance-research-part-3/
http://yuiblog.com/blog/2007/04/11/performance-research-part-4/
YDN: http://developer.yahoo.net/blog/archives/2007/03/high_performanc.html
http://developer.yahoo.net/blog/archives/2007/04/rule_1_make_few.html

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“I wonder what flavour it is?” by blather: http://www.flickr.com/photos/deadlyphoto/411770353/

“takeout boxes from Grand Shanghai” by massdistraction: http://www.flickr.com/photos/sharynmorrow/11263821/

“takeout” by dotpolka : http://www.flickr.com/photos/dotpolka/249129144/

“ice cream cone melting/rome” by Megandavid : http://www.flickr.com/photos/megandavid/189332042/

“nikon em bokeh” by dsevilla: http://www.flickr.com/photos/dsevilla/249202834/

“maybe” by Tal Bright: http://www.flickr.com/photos/bright/118197469/

“how do they do that” by Fort Photo: http://www.flickr.com/photos/fortphoto/388825145/

“Gorgeous iceberg 7 [Le Toit du Monde]” by Adventure Addict http://www.flickr.com/photos/adventureaddict/35290307/

“molasses-spice cookies” ilmungo: http://www.flickr.com/photos/ilmungo/65345233/

“Driving is fun” by Ben McLeod: http://www.flickr.com/photos/benmcleod/59948935/

“Dozen eggs” by aeA: http://www.flickr.com/photos/raeallen/96238870/

“Max speed 15kmh” by xxxtoff: http://www.flickr.com/photos/xxxtoff/219781763/

“Stairway to heaven” ognita: http://www.flickr.com/photos/ognita/503915547/

“flaps up” by http://www.flickr.com/photos/jurvetson/74274113/

“Fast Cat” by **http://www.flickr.com/photos/raylopez/708023176/**

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http://nate.koechley.com/blog

@natekoechley = twitter, delicious, flickr, tripit, last.fm, linkedin, fireeagle, friendfeed, ... everywhere.

Thanks again to Yahoo!'s Exceptional Performance Engineering Team