Google™ 10 IO

# Optimize every bit of your site serving and web pages with Page Speed

Bryan McQuade and Richard Rabbat

May 20, 2010

## View live notes and ask questions about this session on Google Wave

http://bit.ly/io-speed

## What you will get from this talk

- How performance affects your site
- Become familiar with Page Speed
- Learn about 4 new product features
  - Page Speed exports
  - The Page Speed SDK
  - The Apache module
  - Page Speed for ads, analytics

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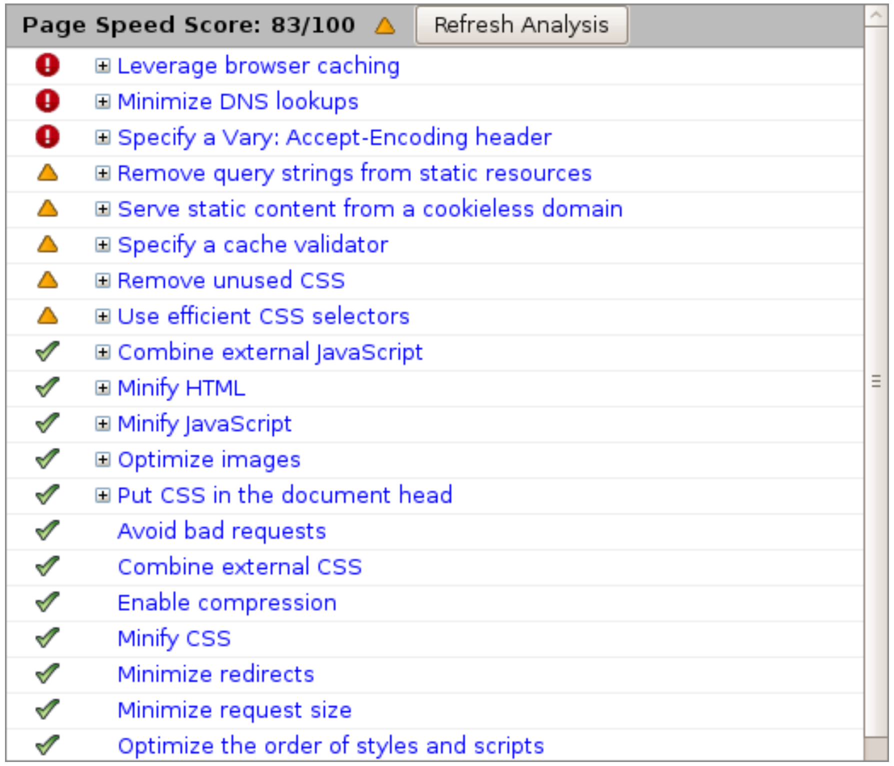


Page Speed Score: 83/100 ⚠ Refresh Analysis

| | |
|---|---|
| ❗ | ⊞ Leverage browser caching |
| ❗ | ⊞ Minimize DNS lookups |
| ❗ | ⊞ Specify a Vary: Accept-Encoding header |
| ⚠ | ⊞ Remove query strings from static resources |
| ⚠ | ⊞ Serve static content from a cookieless domain |
| ⚠ | ⊞ Specify a cache validator |
| ⚠ | ⊞ Remove unused CSS |
| ⚠ | ⊞ Use efficient CSS selectors |
| ✓ | ⊞ Combine external JavaScript |
| ✓ | ⊞ Minify HTML |
| ✓ | ⊞ Minify JavaScript |
| ✓ | ⊞ Optimize images |
| ✓ | ⊞ Put CSS in the document head |
| ✓ | Avoid bad requests |
| ✓ | Combine external CSS |
| ✓ | Enable compression |
| ✓ | Minify CSS |
| ✓ | Minimize redirects |
| ✓ | Minimize request size |
| ✓ | Optimize the order of styles and scripts |

## Web Performance 101

## Web Performance 101

### Why speed should matter to you

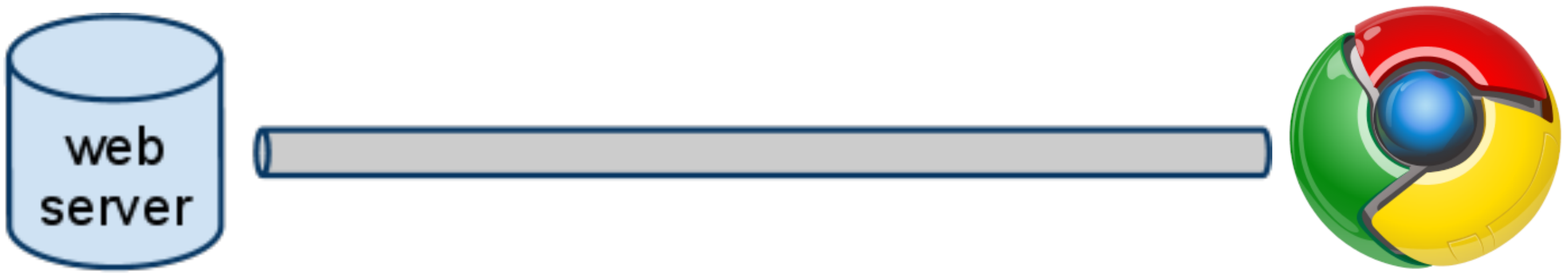
- Speed = eyeballs

- Google: 400 ms latency increase à 0.6% search decrease
- Yahoo!: 400 ms latency increase à 5-9% traffic decrease
- Shopzilla: 5 sec latency decrease à 12% revenue increase
  - But also decrease in 50% hardware costs

Source: O'Reilly Velocity Conference, May 2009

# Web performance 101

## Building blocks



- Processing time

- Bandwidth
- Round-trip time

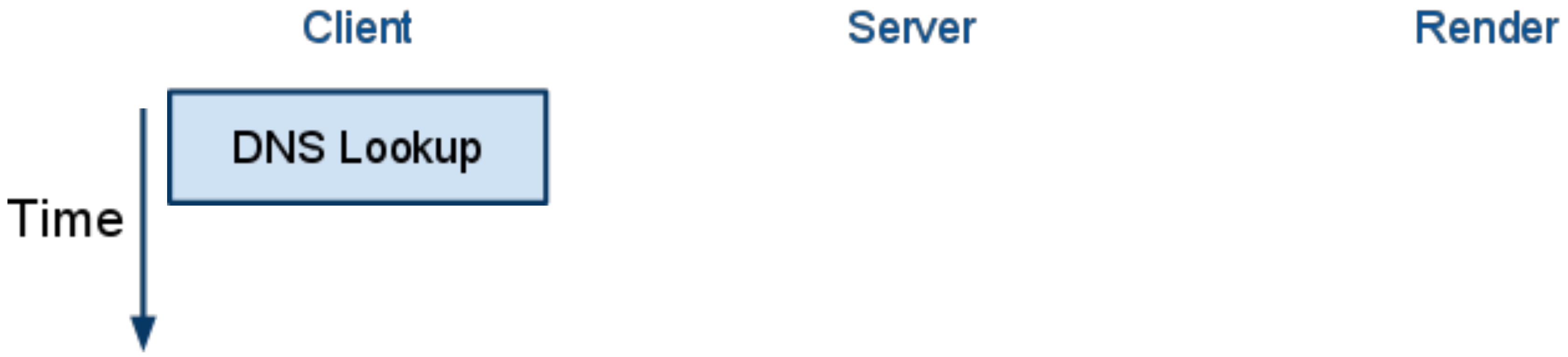
- Parse
- Resource fetches
- Layout and Render
- JavaScript

## Web Performance 101

Example page load

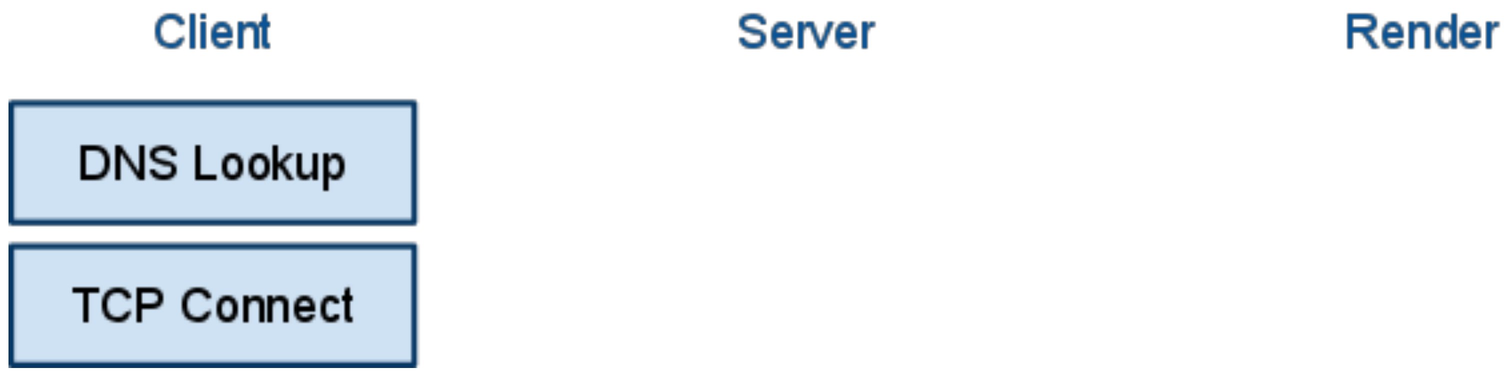
## Web performance 101

### Example page load



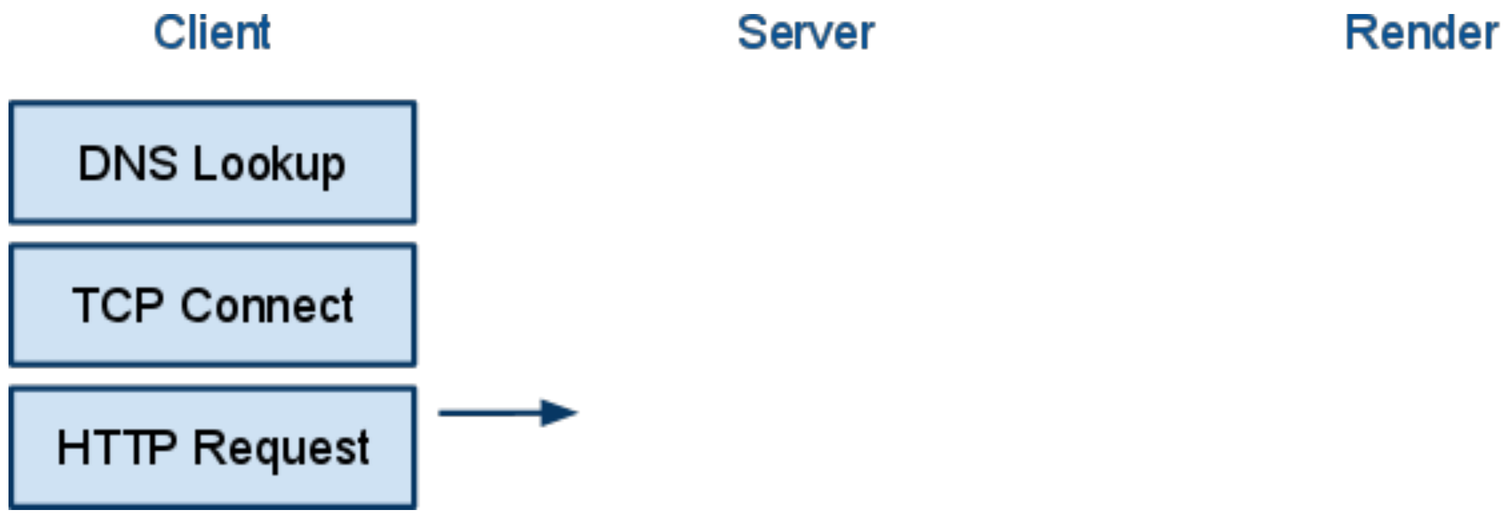
## Web performance 101

Example page load



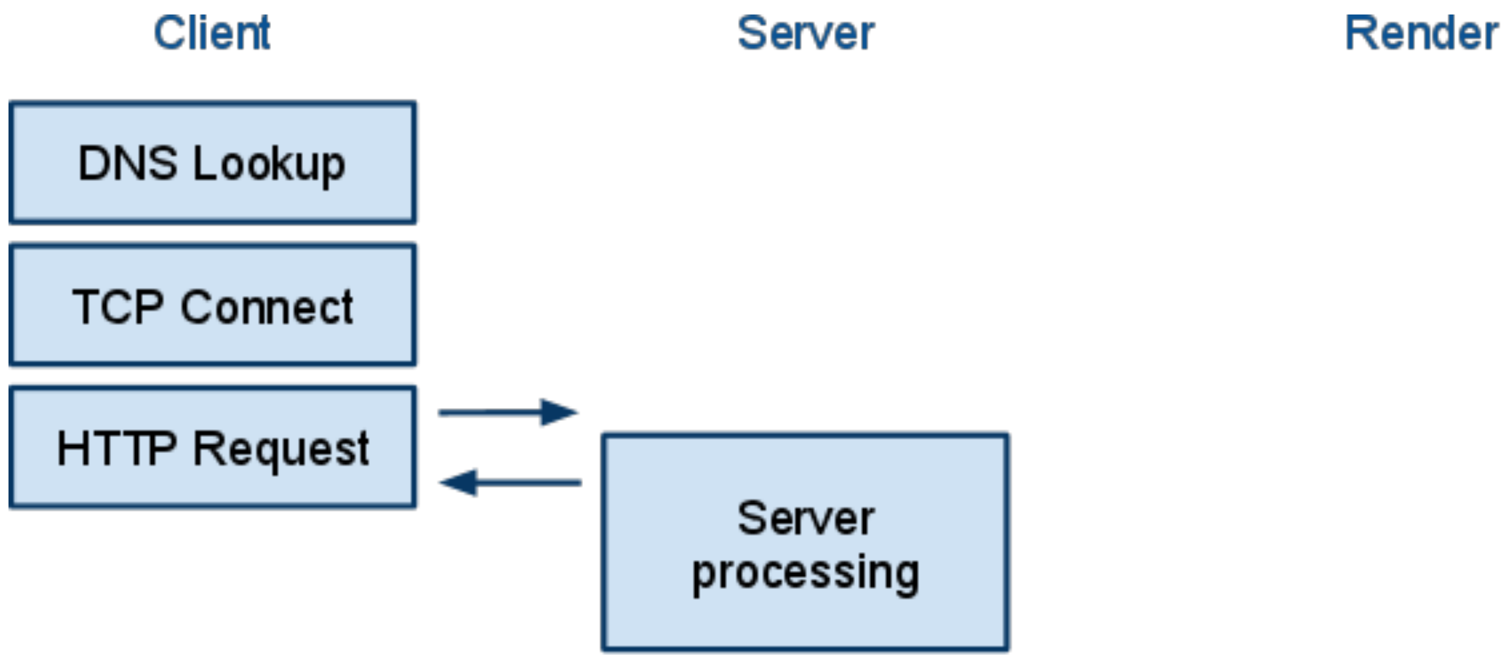
# Web performance 101

## Example page load



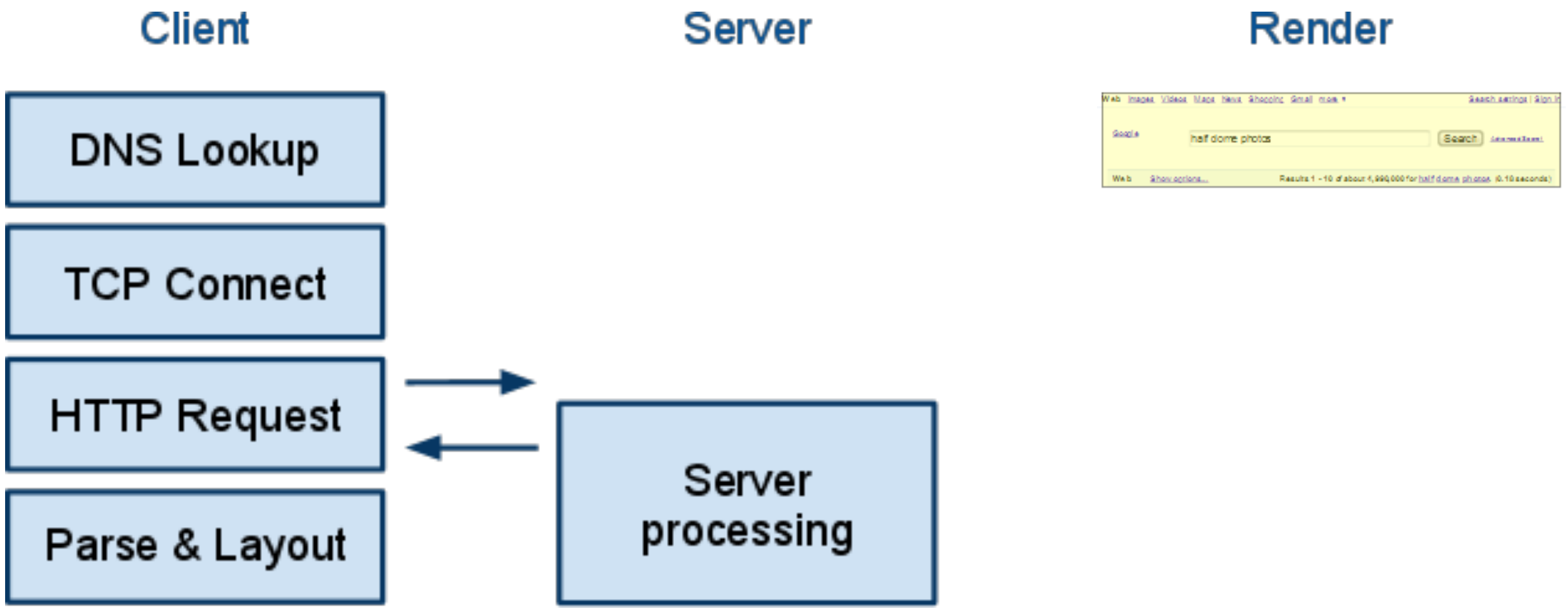
# Web performance 101

## Example page load



# Web performance 101

## Example page load


Client
Server
Render
DNS Lookup
TCP Connect
HTTP Request
Parse & Layout
Server processing
Web Images Videos Maps News Shopping Gmail more ▾
Search settings | Sign in
half dome photos
Search
Web Show options...
Results 1 - 10 of about 4,990,000 for half dome photos. (0.10 seconds)

# Web performance 101

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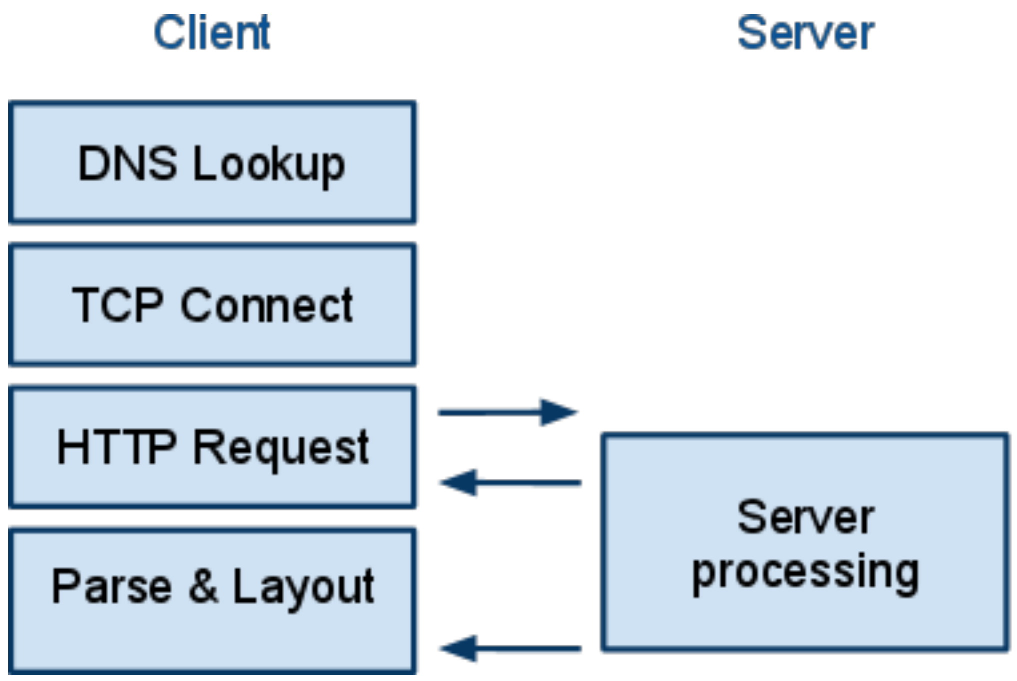

Render

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Google
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Search
Advanced Search

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Image results for half dome photos - Report images

Yosemite Half Dome Photo Gallery - Y

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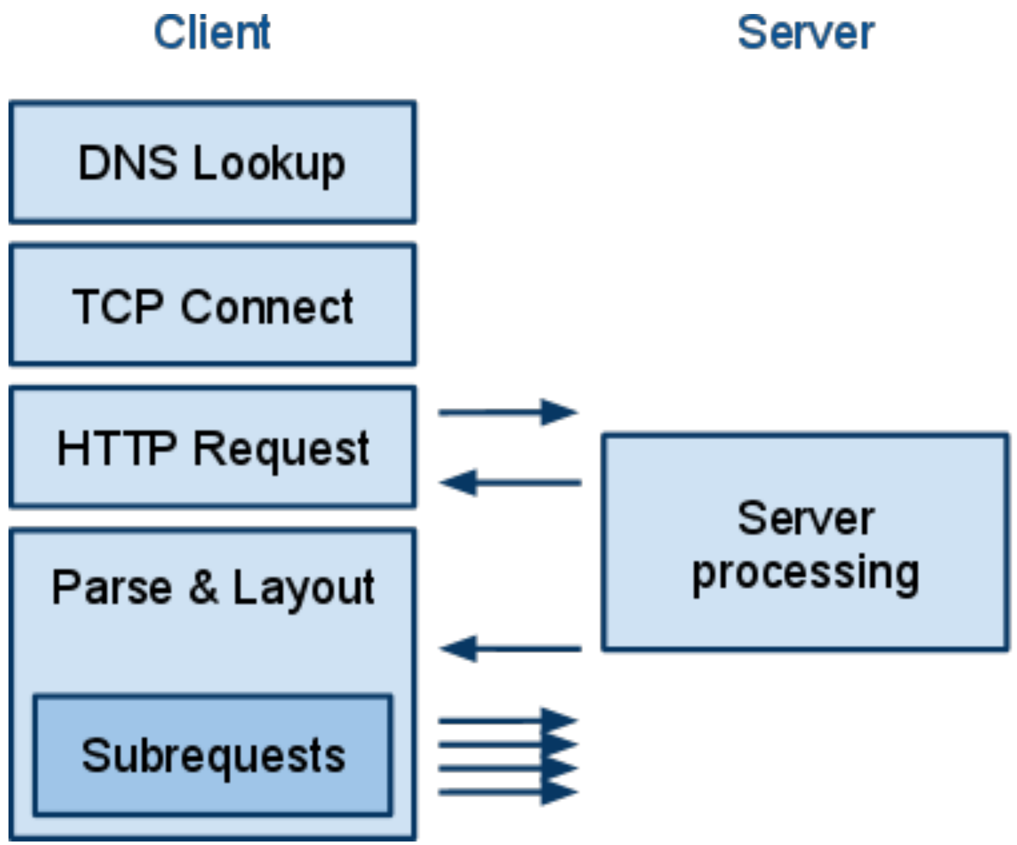

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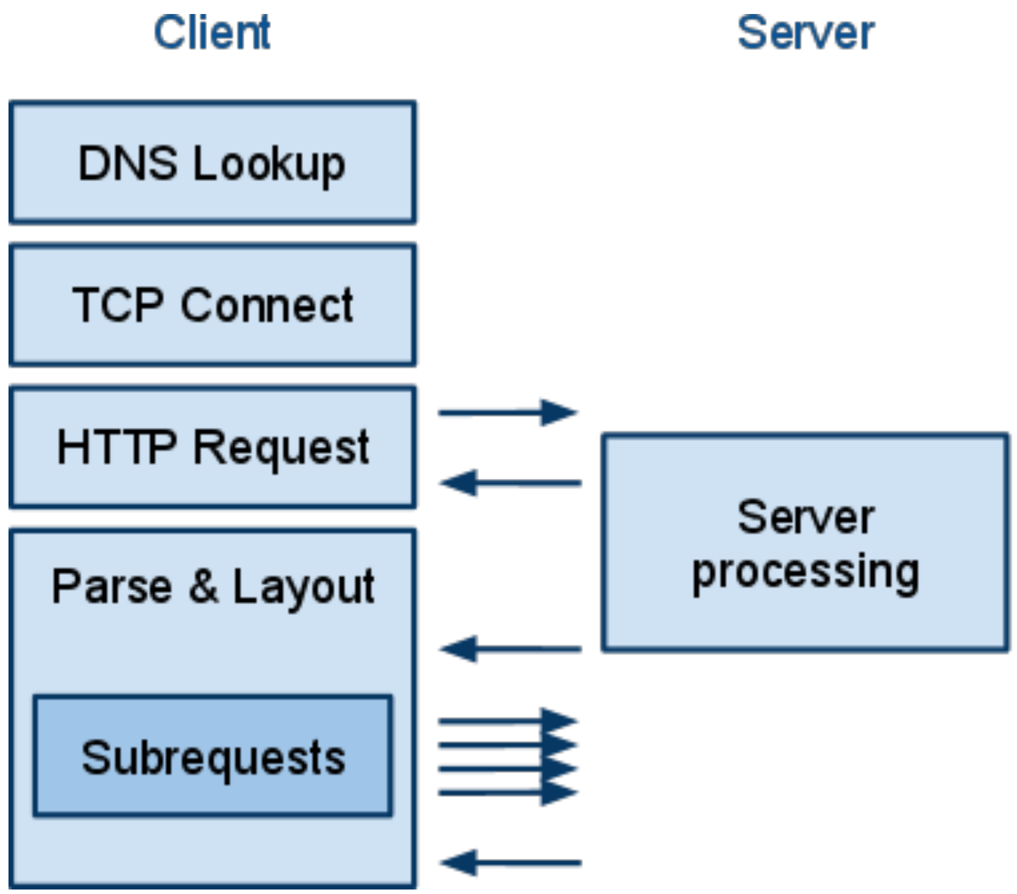

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This photo from the TrekEarth travel gallery is titled 'Half Dome Photo'.
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| | | | |
|---|---|---|---|
| yosemite national park half dome | half dome yosemite pictures | half dome hike pictures | half dome mist trail |
| half dome cables | half dome diving board | half dome topo | half dome gloves |

1

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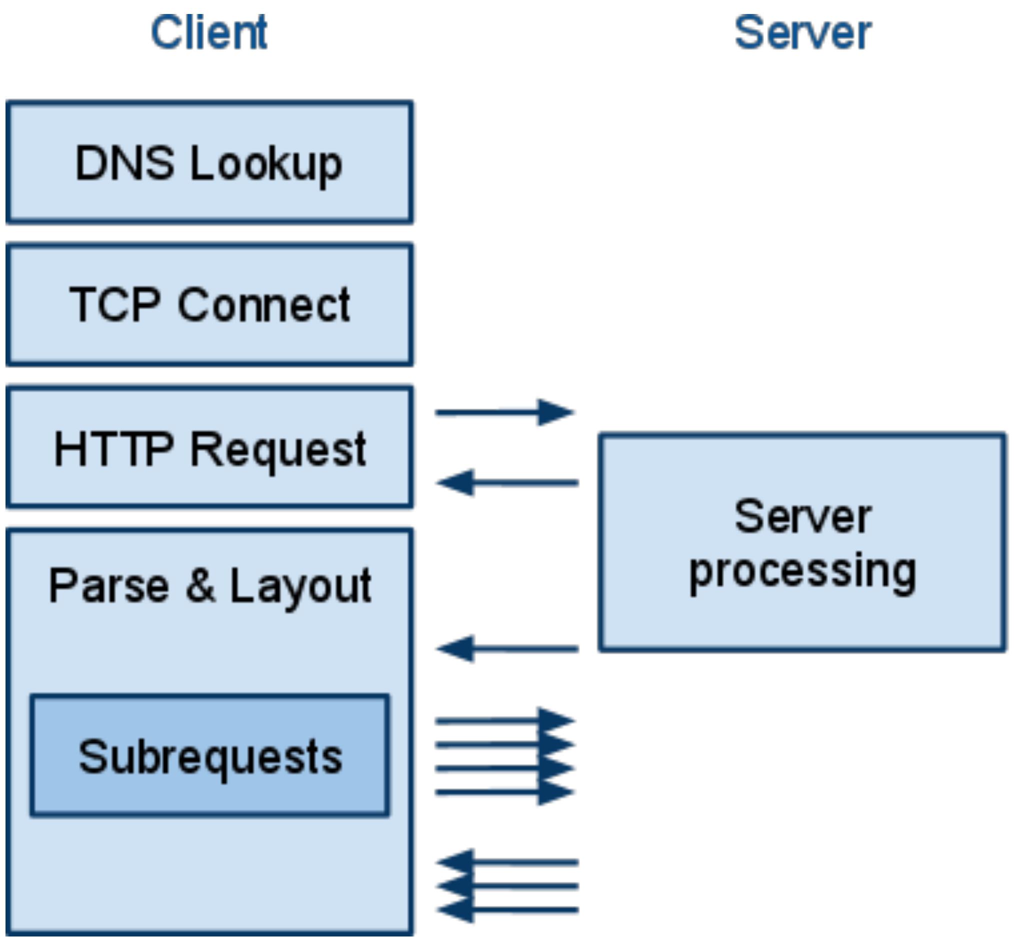

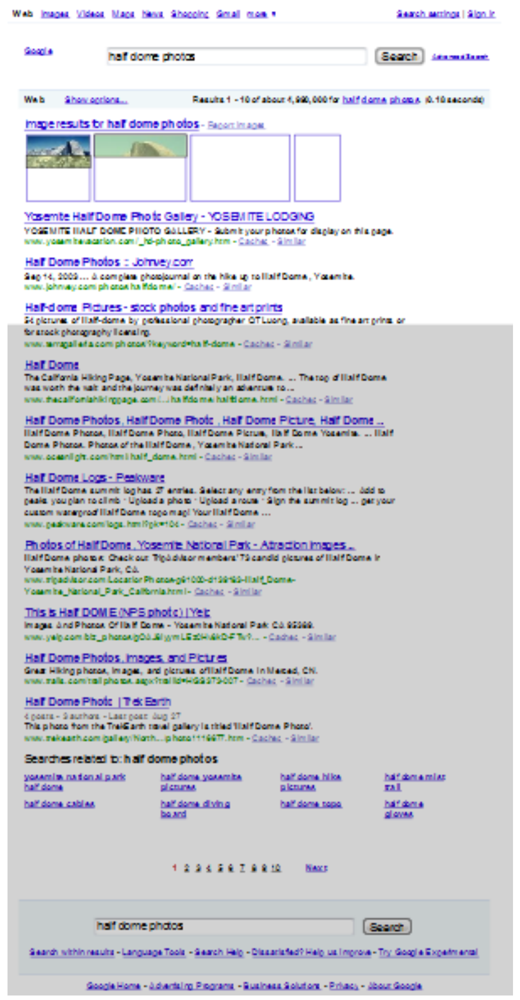
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Half Dome

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1 2 3 4 5 6 7 8 9 10 Next

half dome photos

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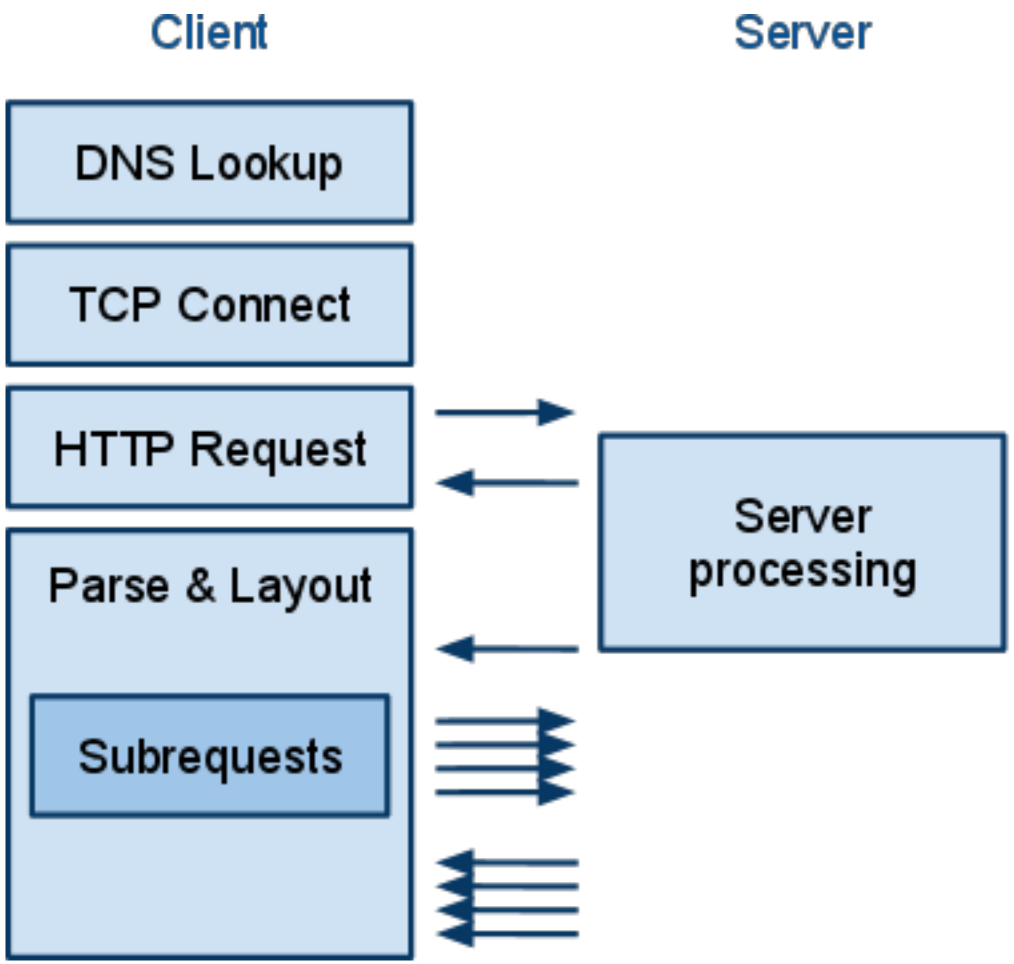
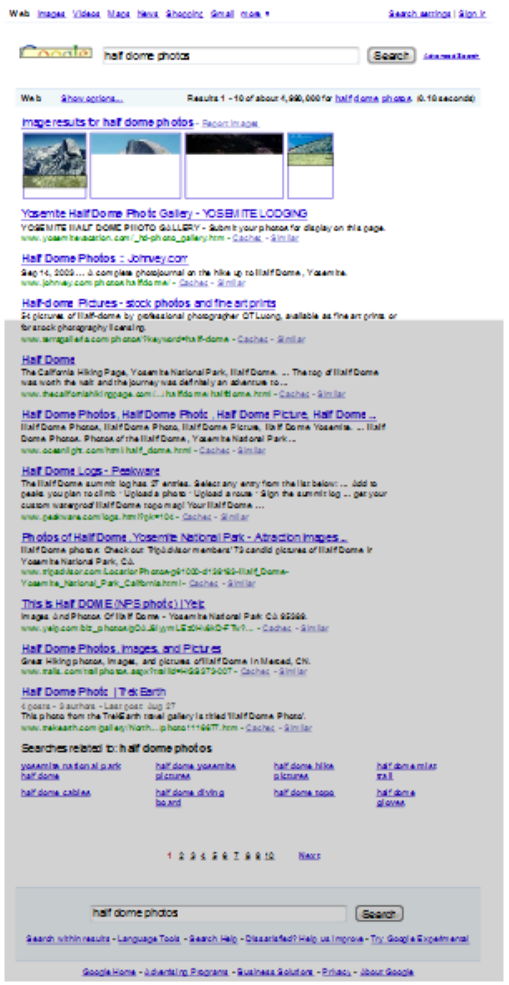


Render



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| half dome cables | half dome diving board | half dome topo | half dome gloves |

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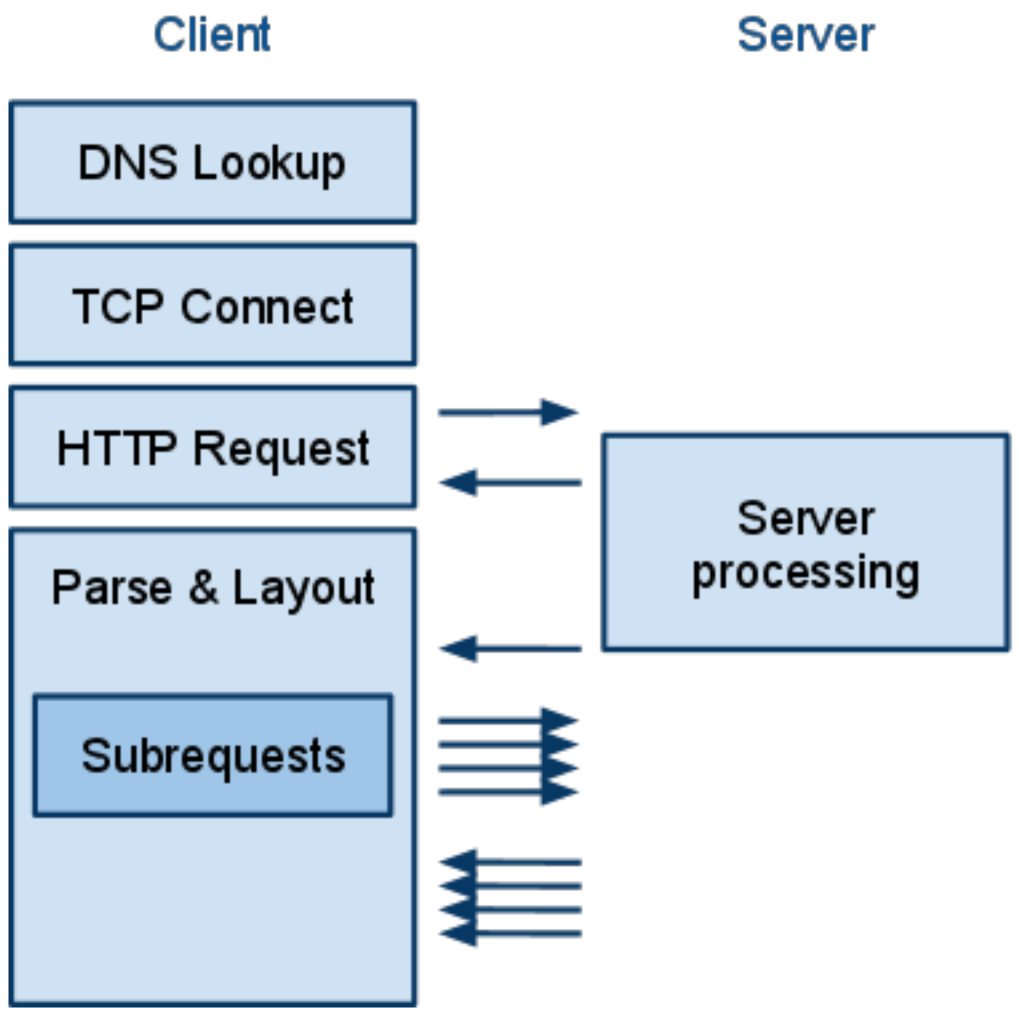

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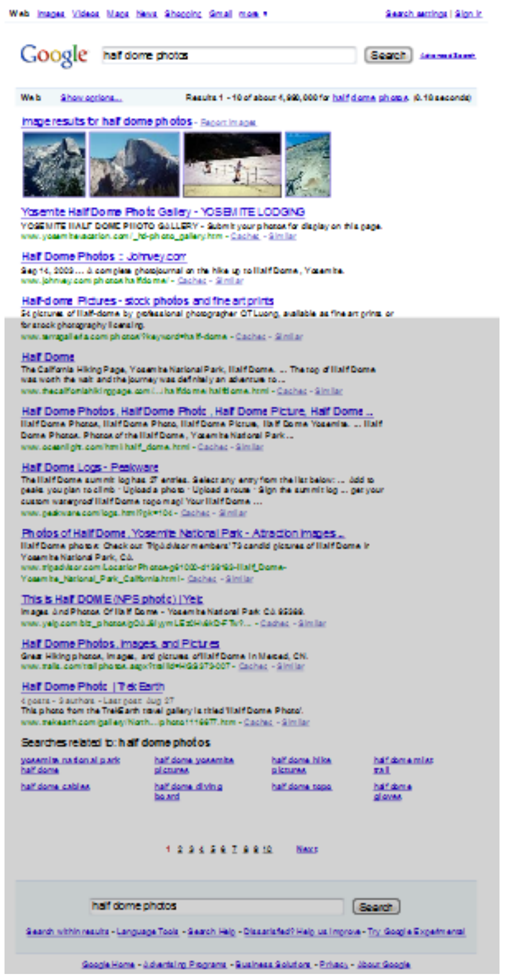

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| | | | |
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## Web performance 101

### Follow these three speed guidelines

- Serve fewer bytes
  - Compress at serving
  - Optimize images
  - Minify HTML, JS, CSS
  - Cache aggressively: fastest serving is when you don't have to
- Parallelize resource downloads
  - Optimize the order of styles and scripts (more later)
- Promote modern browsers

## The Page Speed tool (*demo time*)

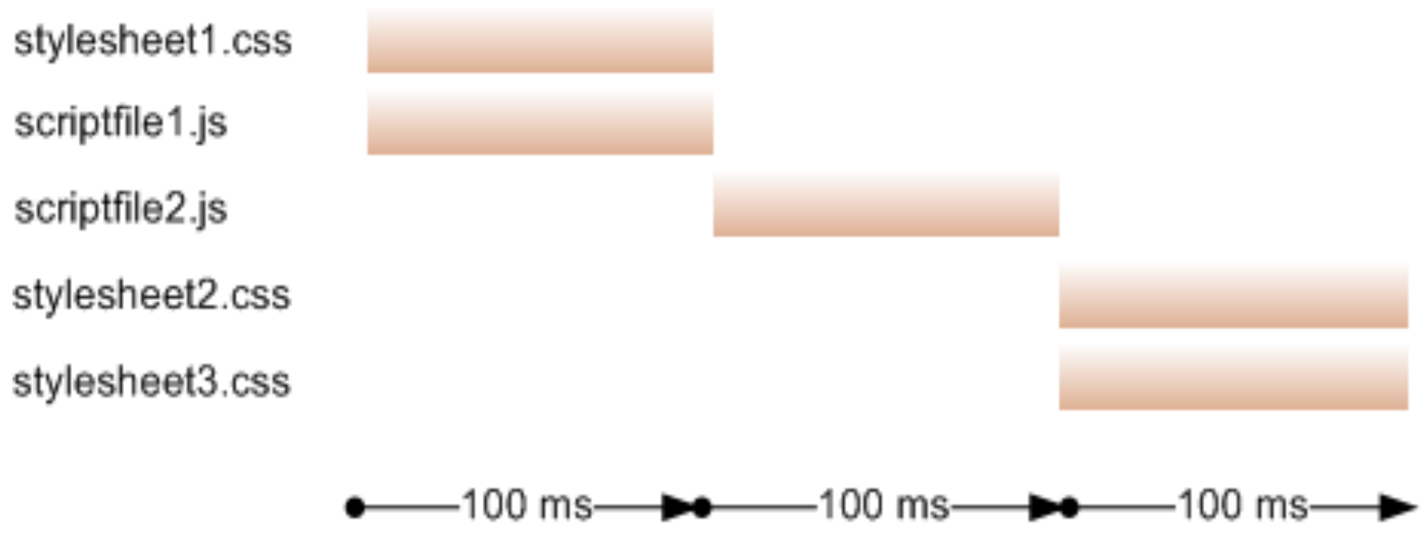
1 Million active users, join the fun!

## Why speed-minded development matters

## Why speed-minded development matters

### Random order of styles and scripts

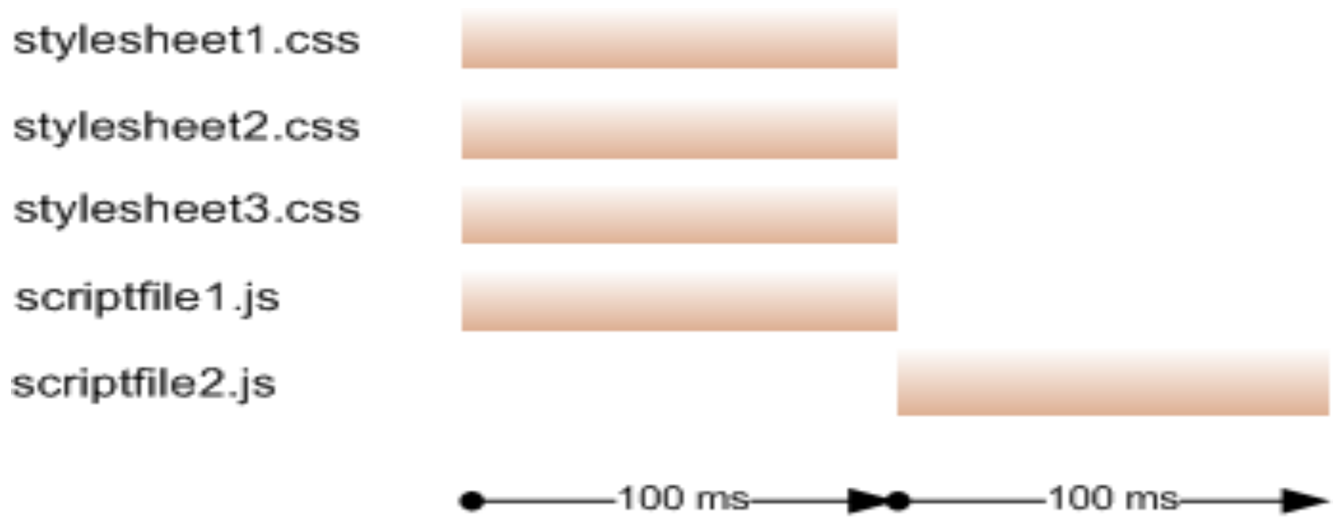
```
<head>
<link rel="stylesheet" type="text/css" href="stylesheet1.css" />
<script type="text/javascript" src="scriptfile1.js" />
<script type="text/javascript" src="scriptfile2.js" />
<link rel="stylesheet" type="text/css" href="stylesheet2.css" />
<link rel="stylesheet" type="text/css" href="stylesheet3.css" />
</head>
```



# Why speed-minded development matters

## Put styles before scripts

```
<head>
<link rel="stylesheet" type="text/css" href="stylesheet1.css" />
<link rel="stylesheet" type="text/css" href="stylesheet2.css" />
<link rel="stylesheet" type="text/css" href="stylesheet3.css" />
<script type="text/javascript" src="scriptfile1.js" />
<script type="text/javascript" src="scriptfile2.js" />
</head>
```

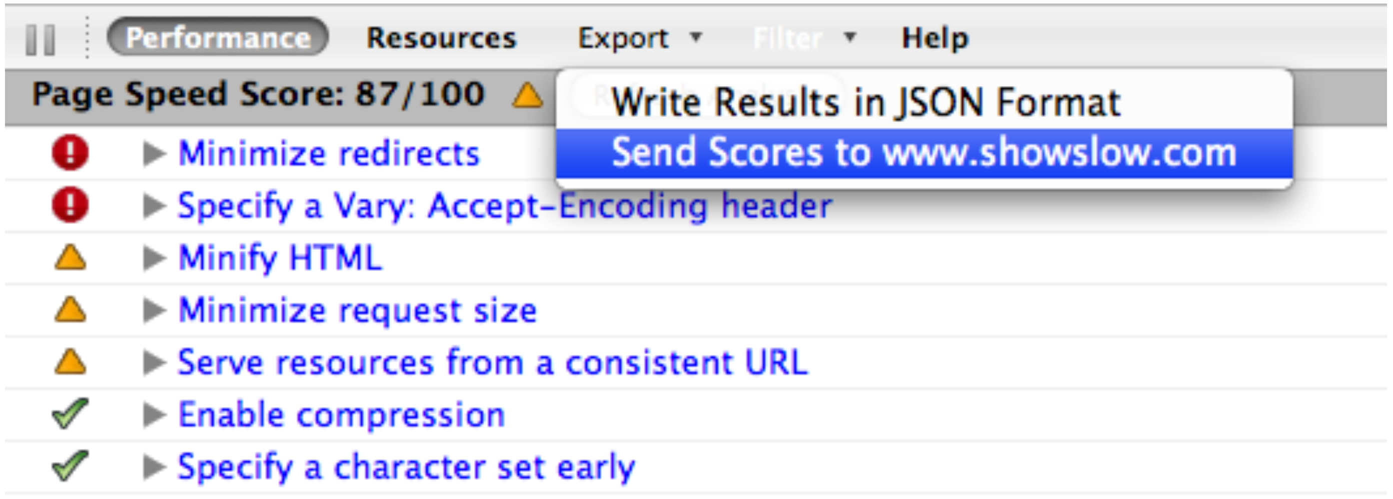


# New and improved optimization rules

## Be mindful of increasingly important deployments

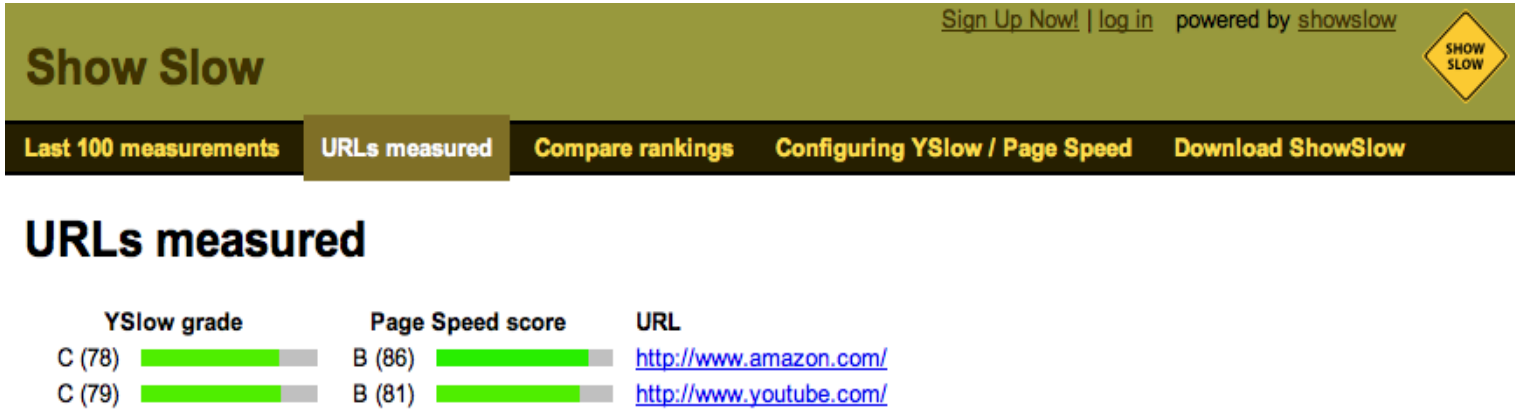
| | Mobile | Infrastructure | Rich web apps | Generally applicable |
|---|---|---|---|---|
| Minimize request size | ✓ | | | |
| Specify cache validator | | | | ✓ |
| Specify character set early | | | ✓ | |
| Minimize DNS lookups | | ✓ | | |

## New features: the beacon, export to ShowSlow



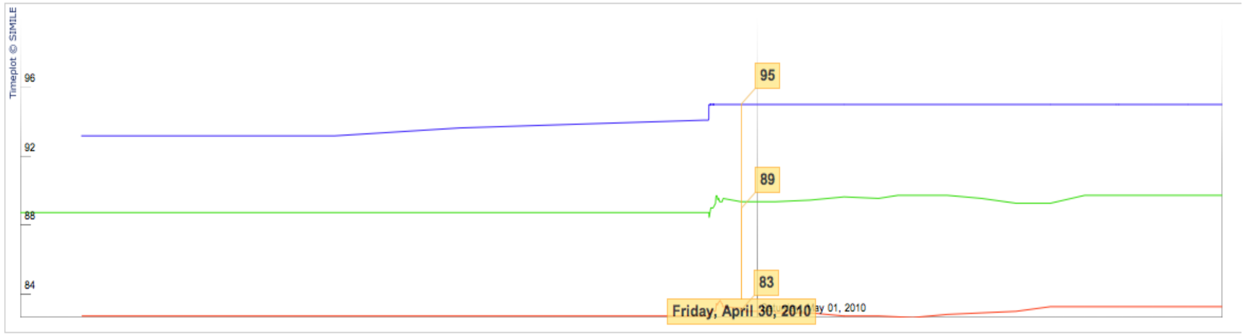
Page Speed Score: 87/100

| | |
|---|---|
| ❗ | Minimize redirects |
| ❗ | Specify a Vary: Accept-Encoding header |
| ⚠ | Minify HTML |
| ⚠ | Minimize request size |
| ⚠ | Serve resources from a consistent URL |
| ✓ | Enable compression |
| ✓ | Specify a character set early |



URLs measured

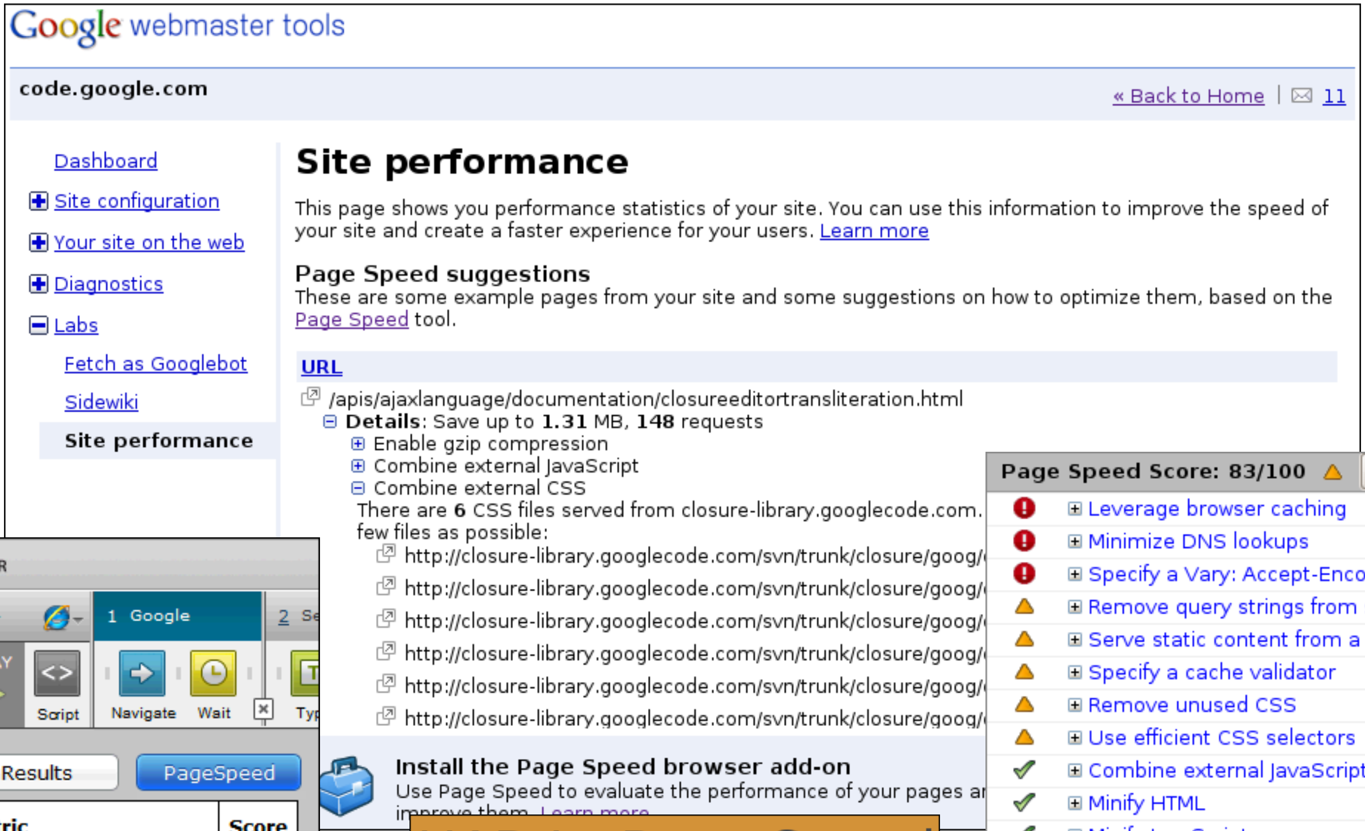
| YSlow grade | Page Speed score | URL |
|---|---|---|
| C (78) | B (86) | http://www.amazon.com/ |
| C (79) | B (81) | http://www.youtube.com/ |



## Page Speed SDK

## Page Speed SDK

- Initially, Page Speed was implemented in JavaScript, tightly coupled to Firefox
- Ported Page Speed rules to browser independent C++ library
- Recently released as a C++ SDK
- Download: http://bit.ly/cwx7JX



## Site performance

This page shows you performance statistics of your site. You can use this information to improve the speed of your site and create a faster experience for your users. Learn more

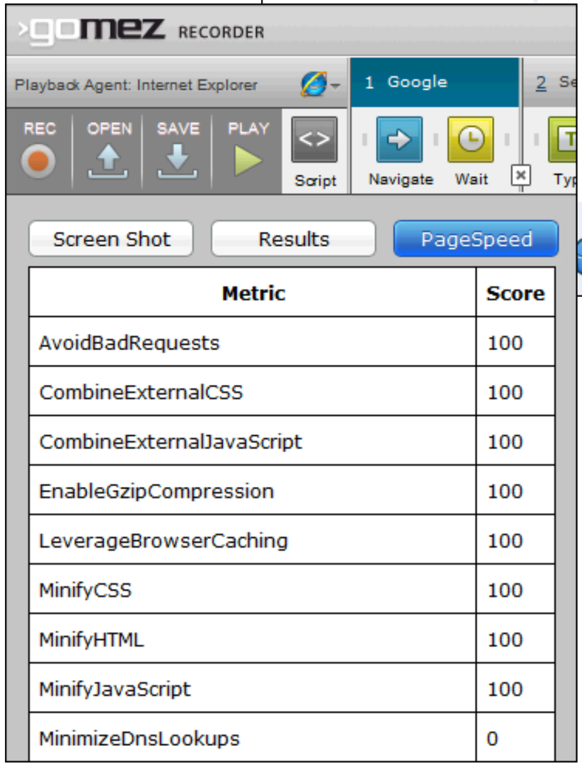
**Page Speed suggestions**
These are some example pages from your site and some suggestions on how to optimize them, based on the Page Speed tool.

**URL**

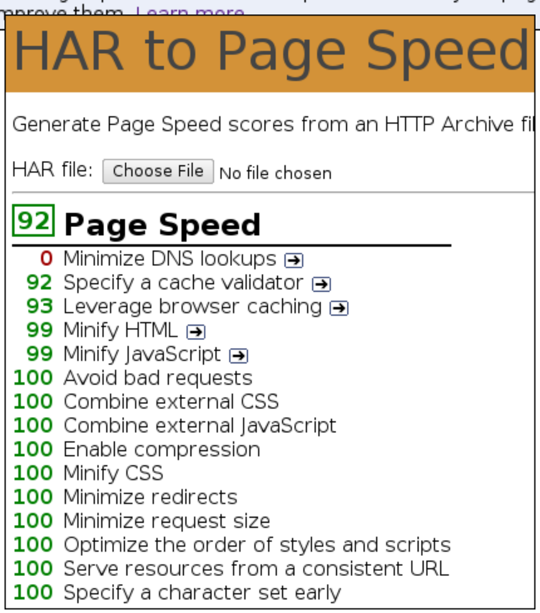
/apis/ajaxlanguage/documentation/closureeditortransliteration.html
- **Details**: Save up to **1.31** MB, **148** requests
  - Enable gzip compression
  - Combine external JavaScript
  - Combine external CSS

    There are **6** CSS files served from closure-library.googlecode.com.
    few files as possible:
    - http://closure-library.googlecode.com/svn/trunk/closure/goog/
    - http://closure-library.googlecode.com/svn/trunk/closure/goog/
    - http://closure-library.googlecode.com/svn/trunk/closure/goog/
    - http://closure-library.googlecode.com/svn/trunk/closure/goog/
    - http://closure-library.googlecode.com/svn/trunk/closure/goog/
    - http://closure-library.googlecode.com/svn/trunk/closure/goog/

**Install the Page Speed browser add-on**
Use Page Speed to evaluate the performance of your pages ar
improve them. Learn more



| Metric | Score |
|---|---|
| AvoidBadRequests | 100 |
| CombineExternalCSS | 100 |
| CombineExternalJavaScript | 100 |
| EnableGzipCompression | 100 |
| LeverageBrowserCaching | 100 |
| MinifyCSS | 100 |
| MinifyHTML | 100 |
| MinifyJavaScript | 100 |
| MinimizeDnsLookups | 0 |



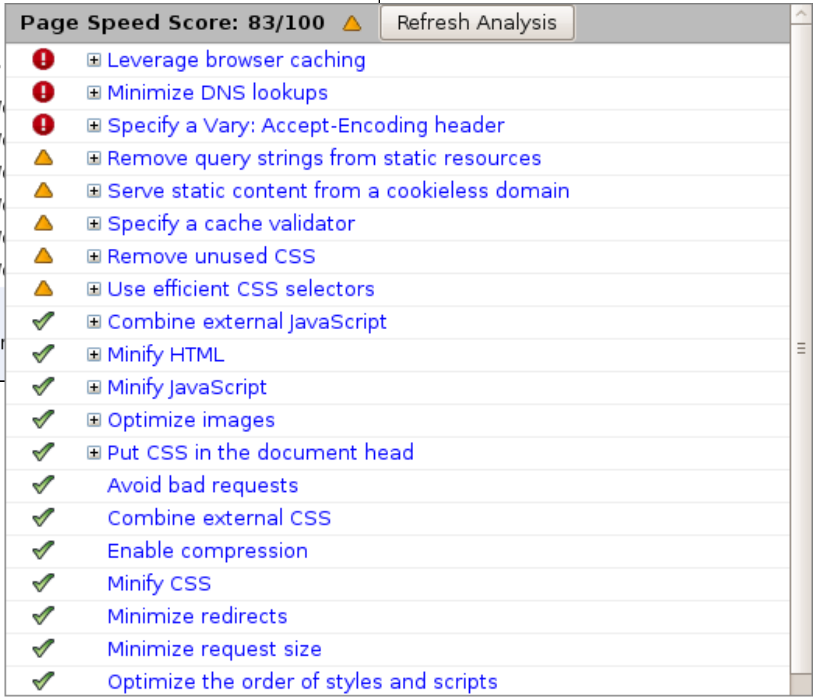
## HAR to Page Speed

Generate Page Speed scores from an HTTP Archive fi

HAR file: Choose File No file chosen

**92 Page Speed**

| | |
|---|---|
| 0 | Minimize DNS lookups |
| 92 | Specify a cache validator |
| 93 | Leverage browser caching |
| 99 | Minify HTML |
| 99 | Minify JavaScript |
| 100 | Avoid bad requests |
| 100 | Combine external CSS |
| 100 | Combine external JavaScript |
| 100 | Enable compression |
| 100 | Minify CSS |
| 100 | Minimize redirects |
| 100 | Minimize request size |
| 100 | Optimize the order of styles and scripts |
| 100 | Serve resources from a consistent URL |
| 100 | Specify a character set early |



**Page Speed Score: 83/100**

- ❗ Leverage browser caching
- ❗ Minimize DNS lookups
- ❗ Specify a Vary: Accept-Encoding header
- ⚠ Remove query strings from static resources
- ⚠ Serve static content from a cookieless domain
- ⚠ Specify a cache validator
- ⚠ Remove unused CSS
- ⚠ Use efficient CSS selectors
- ✓ Combine external JavaScript
- ✓ Minify HTML
- ✓ Minify JavaScript
- ✓ Optimize images
- ✓ Put CSS in the document head
- ✓ Avoid bad requests
- ✓ Combine external CSS
- ✓ Enable compression
- ✓ Minify CSS
- ✓ Minimize redirects
- ✓ Minimize request size
- ✓ Optimize the order of styles and scripts

## Page Speed SDK
### Code example

- Choose:
    - an output formatter
    - Page Speed rules
    - source of input data
- Invoke the Engine

```
using namespace pagespeed;

// Text formatter that writes to stdout
formatters::TextFormatter f(&std::cout);

// Choose the core ruleset
std::vector<Rule*> rules;
rule_provider::AppendCoreRules(&rules);

// Use HAR data as input
const char* har = "{{\"entries\":[...]}}";
PagespeedInput* i = ParseHttpArchive(har);

// Invoke the engine.
Engine engine(rules);
engine.Init();
engine.ComputeAndFormatResults(*i, &f);

// Clean up
delete i;
```

## Page Speed SDK
### Code example

- har_to_pagespeed command line tool
- Included in the Page Speed SDK
- Reads a HAR file, emits Page Speed results

```
$ ./har_to_pagespeed code.google.com.har

_Combine external CSS_ (score=100)
_Combine external JavaScript_ (score=100)
_Minimize request size_ (score=100)
_Leverage browser caching_ (score=13)
   The following cacheable resources have a short freshness
   lifetime. Specify an expiration at least one week in the
   future for the following resources:
   * http://code.google.com/css/codesite.pack.css (1 hour)
   * http://code.google.com/js/codesite_head.pack.js (1 hour)
   * http://code.google.com/js/codesite_tail.pack.js (1 hour)
```

## mod_pagespeed

## Automatic optimization

### mod_pagespeed Apache module

- Automatically apply Page Speed optimizations
- Minify HTML, JavaScript, CSS, images
- Content rewriting to reduce serialization
- Portable rewriting engine that can be reused in other environments
- Open source, under development: http://code.google.com/p/page-speed/

## Automatic optimization examples

```
<html>
 <head>
   <title>Example page</title>
   <link rel="stylesheet" href="a.css" type="text/css">
   <link rel="stylesheet" href="b.css" type="text/css">
   <script src="c.js">
   <script src="d.js">
 </head>
<body>
<h1>Hello, world!</h1>
</body>
</html>
```

## Automatic optimization examples

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<body>
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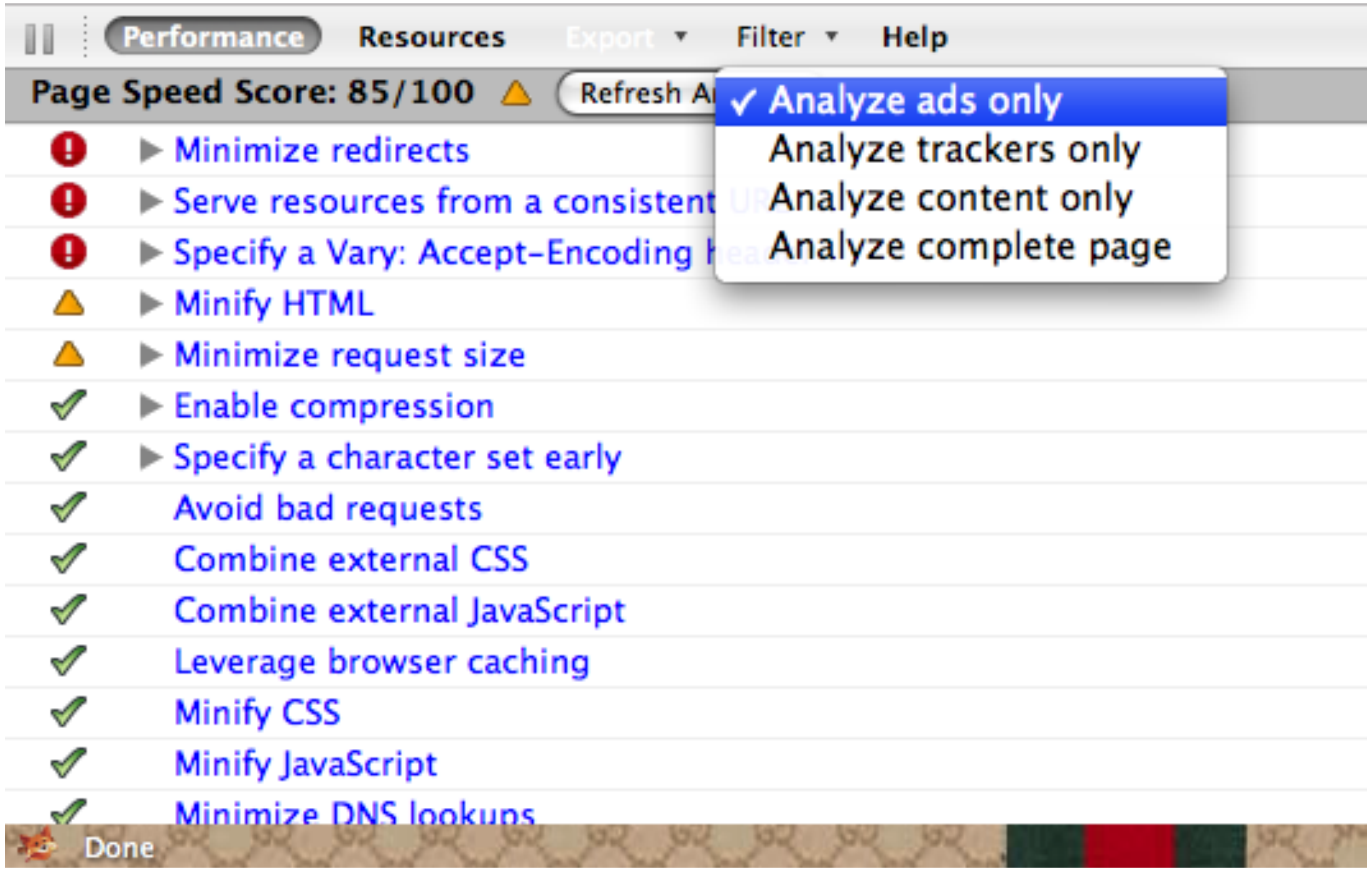
</body>
</html>
```

```
<html><head><title>Example page</title>
<link rel="stylesheet" href="/cache/aHR0cDovL2xvY2Fs.css" type="text/css">
<script src="/cache/aG9zdDo5OTk5L3Rlc3QvYS5jc3M.js">
</head><body><h1>Hello, world!</h1></body></html>
```

## Page Speed: looking at ads and trackers

# Page Speed for Ads and Trackers



Performance | Resources | Export ▾ | Filter ▾ | Help

Page Speed Score: 85/100 ⚠ Refresh A

[✓ Analyze ads only]
Analyze trackers only
Analyze content only
Analyze complete page

| | |
|---|---|
| ❗ | ▶ Minimize redirects |
| ❗ | ▶ Serve resources from a consistent UR |
| ❗ | ▶ Specify a Vary: Accept-Encoding hea |
| ⚠ | ▶ Minify HTML |
| ⚠ | ▶ Minimize request size |
| ✓ | ▶ Enable compression |
| ✓ | ▶ Specify a character set early |
| ✓ | Avoid bad requests |
| ✓ | Combine external CSS |
| ✓ | Combine external JavaScript |
| ✓ | Leverage browser caching |
| ✓ | Minify CSS |
| ✓ | Minify JavaScript |
| ✓ | Minimize DNS lookups |

Done

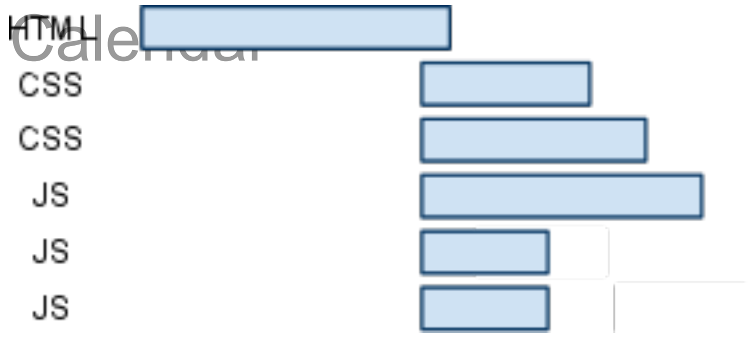
- Separate optimization recommendations
- Get visibility into performance of different ad and analytics services

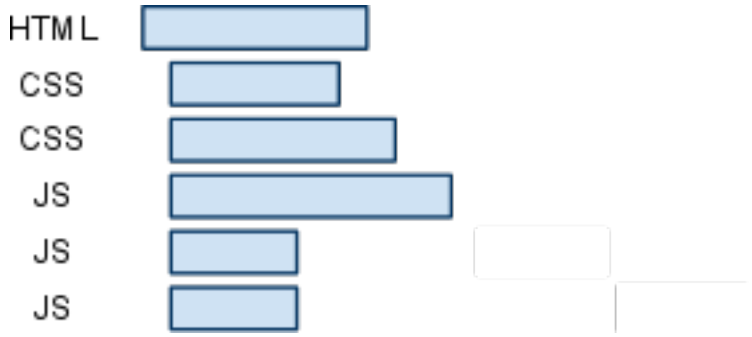
## Future work

# Possible future rules under evaluation

## Use chunked encoding

- Dynamic responses can be expensive to compute
- But boilerplate header is usually static
- Send header chunk first, then dynamic body later
- Allows browser to begin fetching external JS and CSS sooner
- Big wins for Google properties such as Search and Calendar





## Possible future rules under evaluation

### Minimize the size of early loaded resources

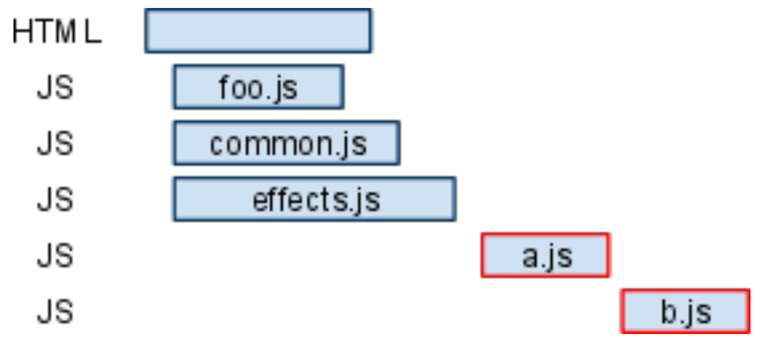
- Modern browsers are much more efficient when fetching resources declared in HTML
- But JavaScript and CSS in the <head> still blocks the renderer!
- Users stare at a blank screen until these resources are finished being fetched, parsed, and executed.
- Load only the minimal JavaScript and CSS needed to display something useful, then load the rest.
- Use Page Speed "Remove unused CSS" and "Defer loading of JavaScript" rules to identify code that can be deferred.

# Possible future rules under evaluation

## Minimize fetches from JavaScript

- Modern browsers use speculative fetching to fetch JavaScript resources in parallel
- But speculative fetchers only parse HTML
- So resources fetched using JavaScript are still serialized.
- Especially important for early loaded JavaScript!

```
<script src="foo.js">
<script src="common.js">
<script src="effects.js">
<script>
loader.load("a.js");
loader.load("b.js");
</script>
```



# Possible future rules under evaluation
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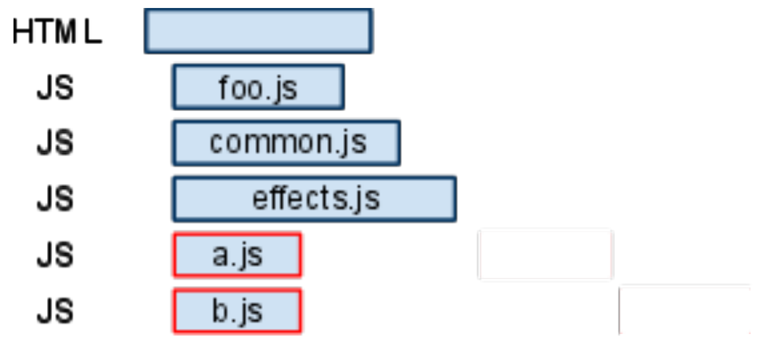

## Page Speed for Chrome

- Chrome extension
- Integrated with Chrome Developer Tools
- Coming later this year

## Thanks

- Learn and use
  - http://code.google.com/speed/page-speed/
- Contribute
  - http://code.google.com/p/page-speed/
- Discuss
  - http://groups.google.com/group/page-speed-discuss

## View live notes and ask questions about this session on Google Wave

http://bit.ly/io-speed

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