



Loading...

yes. your users hate spinners too!
click next!

Performance Tooling

Paul Irish

#perfmatters @
SF HTML5



Primary UX webperf buckets

Page Load

- Network waterfall
- Image assets
- Non-blocking delivery
- Critical path CSS
- @font-face load

Runtime

- Interaction
- Transitions & animations
- Scrolling
- Memory leaks & GC
- requestAnimationFrame



CANADIAN NATIONAL EXHIBITION
AUG 16 TO SEPT 2, 2013
Toronto, Canada



My Schedule

0 Items

search...



Search

Entertainment

Rides & Games

Food

Shopping

Schedule

Guest Info

Buy Tickets

Of Interest NOW



Lose Something at the CNE?

All items have been transferred to the Toronto Police Property Unit. Call **416-808-3750** to enquire about your lost item.



2013 CNE Ambassador of the Fairs

Stratford's Clare Milton was crowned the CNE's 2013 Ambassador of the Fairs on August 18th



Buttering Up Chris Hadfield!

As you have never seen him before!



Russia wins on all fronts!

The CNE is now closed

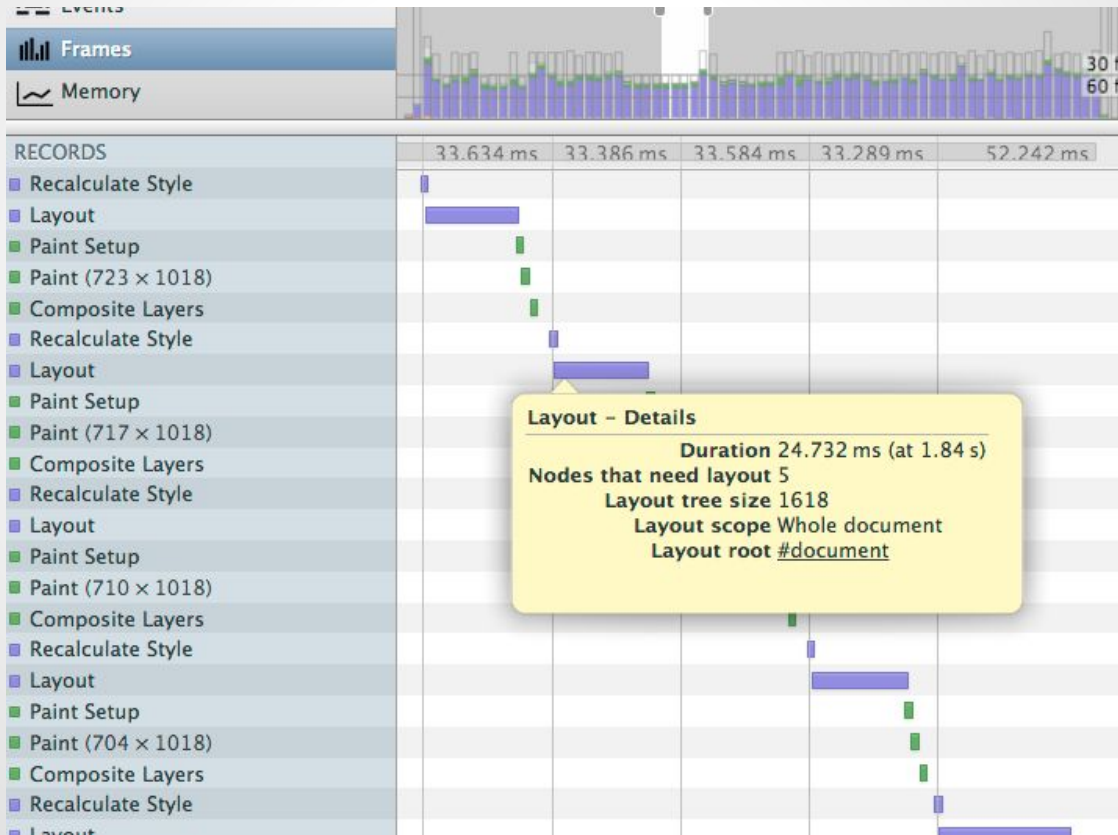
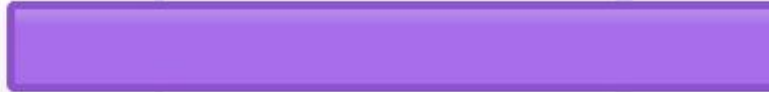
Rising Star Winners!

■ Recalculate Style

- Get all the style rules
- Evaluate the selectors and match against DOM
 - Selector matching cost is here, typically <10% of time
- Calculate the computed style for every element



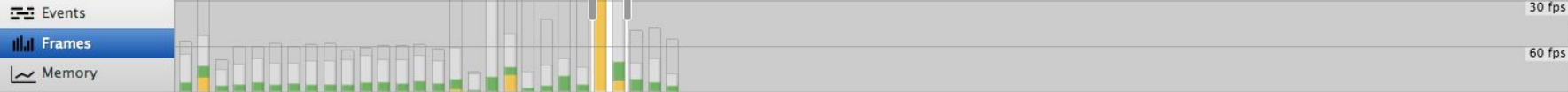
Layout



Paint



- Painting hurts on low-end devices.
- Painting hurts everywhere.
- Debug with [continuous paint mode](#)



RECORDS

Function Call

Recalculate Style

Layout

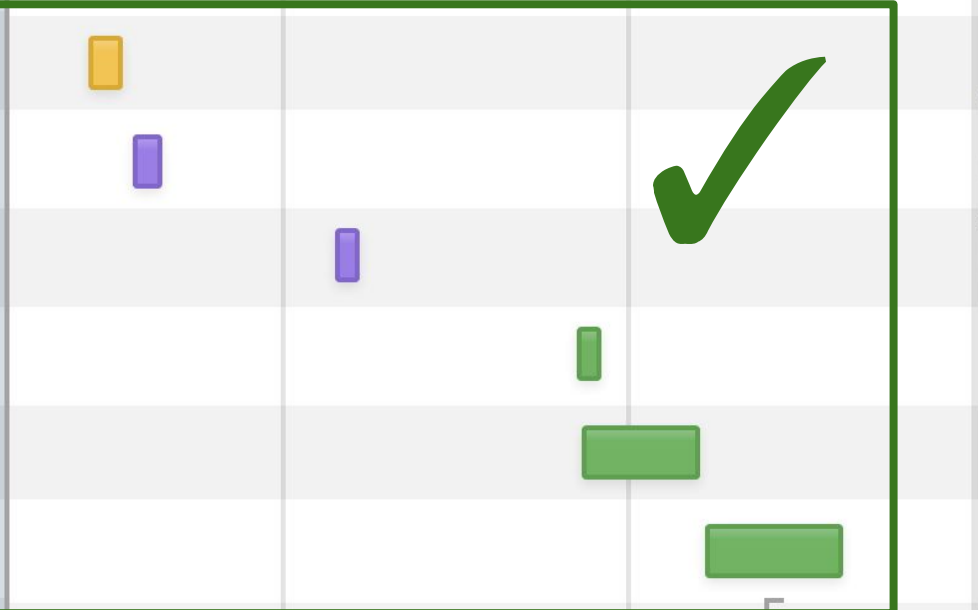
Paint Setup

Paint

Composite Layers

Timer Fired × 2

Function Call (core:...



Timeline Action Cheat Sheet

script-bound?

- JS Profiler. Flame chart it.

layout-bound?

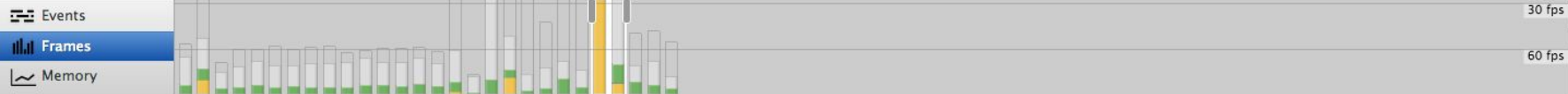
- Dig into JS triggering it.

paint-bound?

- Find your paints: turn on paint rects and layer borders
- Promote layers out of paint storms
- Bisect using continuous paint mode

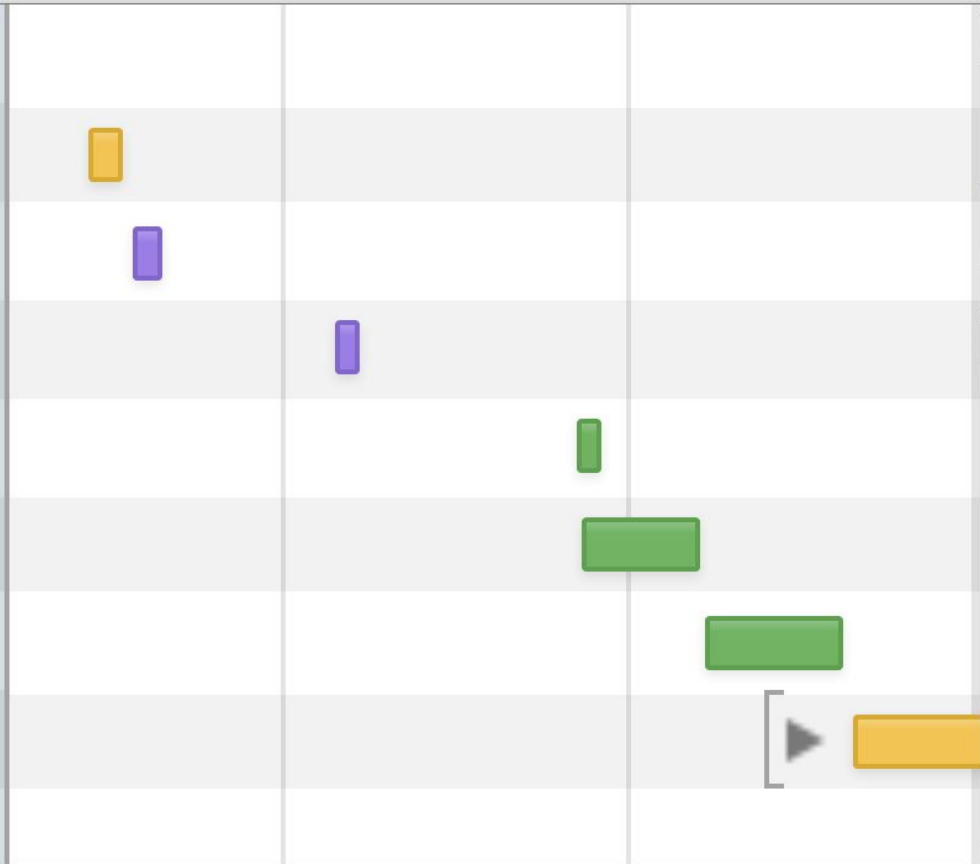
None of this worked?

- `about:tracing`



RECORDS

- Function Call
- Recalculate Style
- Layout
- Paint Setup
- Paint
- Composite Layers
- Timer Fired × 2
- Function Call (core:...

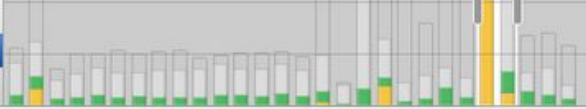


How do these map to CSS?



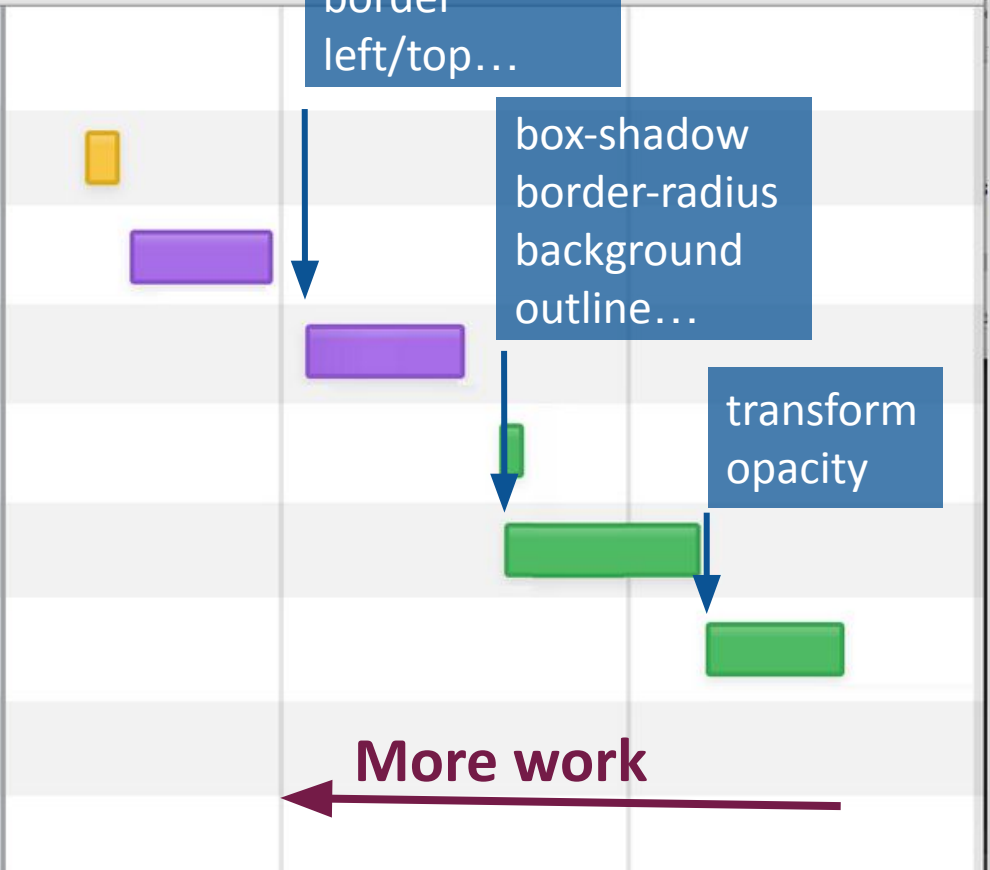
```
.results h2 {  
  height: 25px;  
  text-shadow: 1px 1px 3px black;  
}
```

- Recalculate Style
- Layout
- Paint



RECORDS

- Function Call
- Recalculate Style
- Layout
- Paint Setup
- Paint
- Composite Layers



CSS properties by style operation required : Sheet1

CSS Property	% of webpages	invasiveness	category
width	93.57%	layout	box
height	91.65%	layout	box
padding	91.14%	layout	box
margin	91.00%	layout	box
display	91.00%	layout	box
border-width	90.76%	layout	borders
border	90.28%	layout	borders
top	89.88%	layout	positioning
position	89.83%	layout	positioning
color	87.46%	paint	text
border-style	87.43%	paint	borders
font-size	87.39%	layout	text
float	86.12%	layout	positioning
background-color	86.04%	layout	backgrounds
border-color	85.90%	layout	borders
text-align	85.73%	layout	text
opacity	85.53%	composite	opacity
overflow-y	84.25%	layout	clip
font-weight	84.03%	layout	text
overflow	83.96%	layout	clip
left	83.35%	layout	positioning
visibility	82.07%	paint	opacity
font-family	81.08%	layout	text

animatable

One property, two values, endless possibilities

Animate on hover

Animate all

1

background-color

2

background-position

3

background-position

4

background-size

5

border-radius

6

border-radius

7

border-width

8

border-width

9

border-width

10

box-shadow

11

box-shadow

12

box-shadow

13

color

14

font-size

15

height

16

letter-spacing

17

line-height

18

opacity

19

outline-width

20

outline-offset

21

outline-color

4 things a browser can transition jank-free

- scale → transform: scale(**n**)
- move → transform: translateX(**npx**)
- rotate → transform: rotate(**ndeg**)
- fade → opacity: **0...1**;

translateZ()
or
translate3d()
may be required

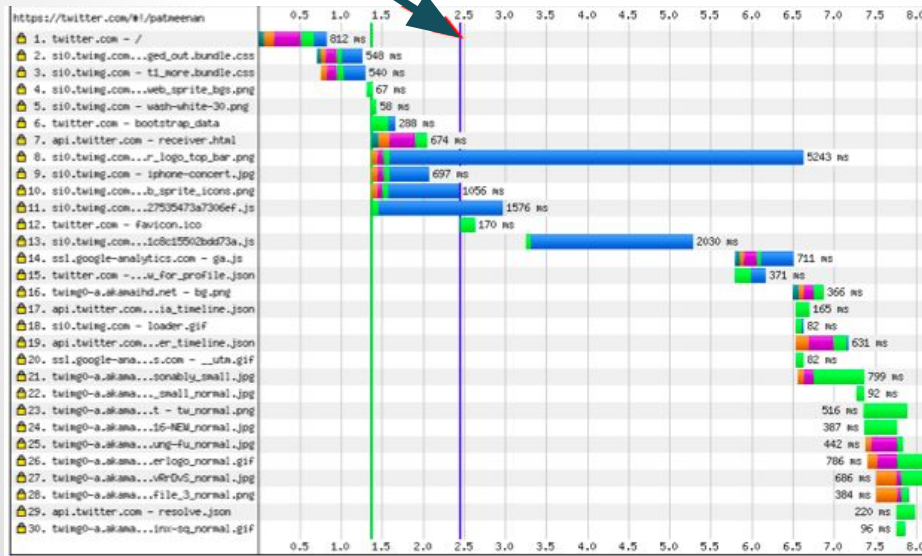
Move all your visual effects into these four things.
Transition everything else at your own risk.

Measuring Performance Success



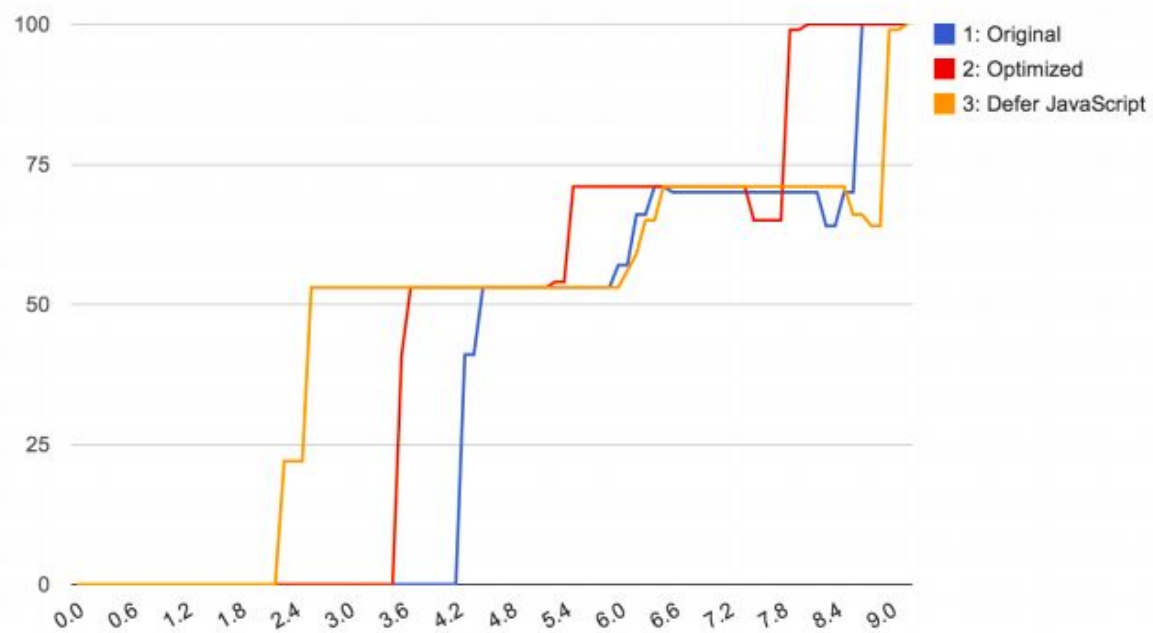
Twitter load event (2.4s)

Twitter end of activity (8.2s)

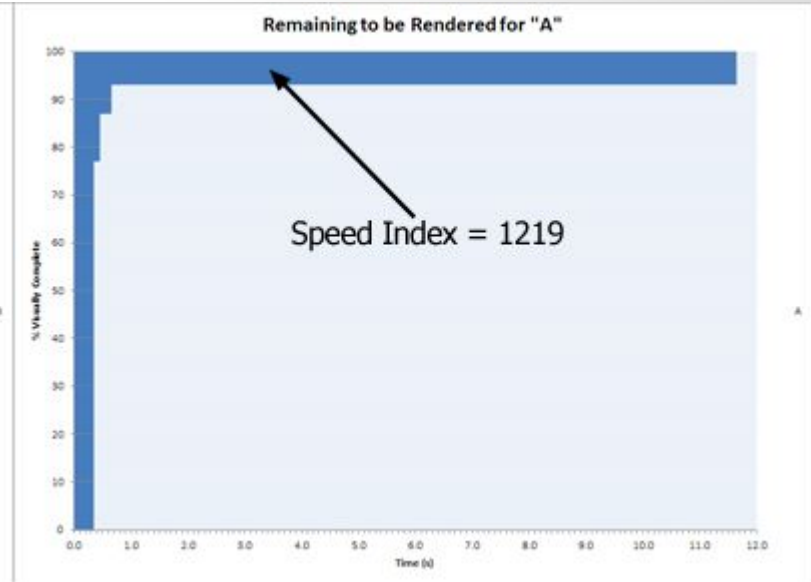
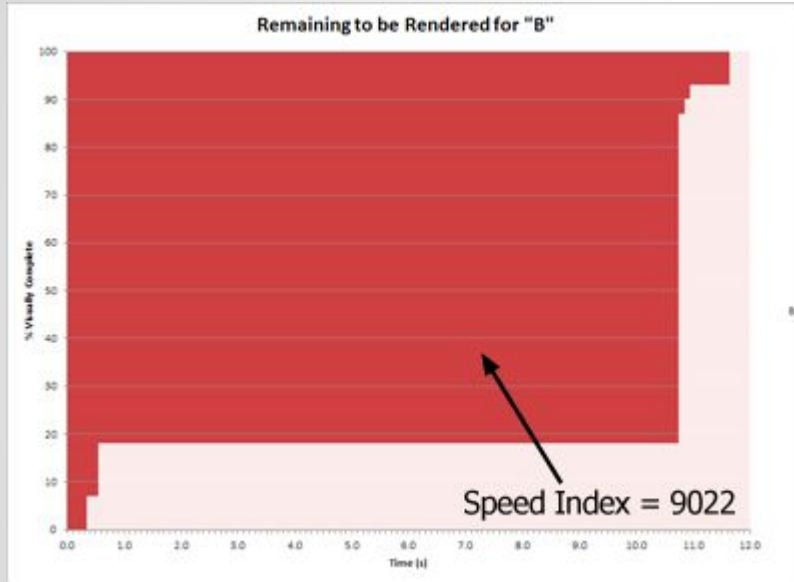




Visual Progress (%)



The Speed Index



$$\text{Speed Index} = \int_0^{\text{end}} 1 - \frac{VC}{100}$$

end = end time in milliseconds

VC = % visually complete

(yeah, lower is better)

Real world perf measurement



Topcoat

CSS for clean and fast web apps.

[Demo](#)

[Benchmarks](#)

[Blog](#)

[Download version 0.6.0](#)

Dashboard ▾

Button

Button base

Text Input

Search input

Radio input

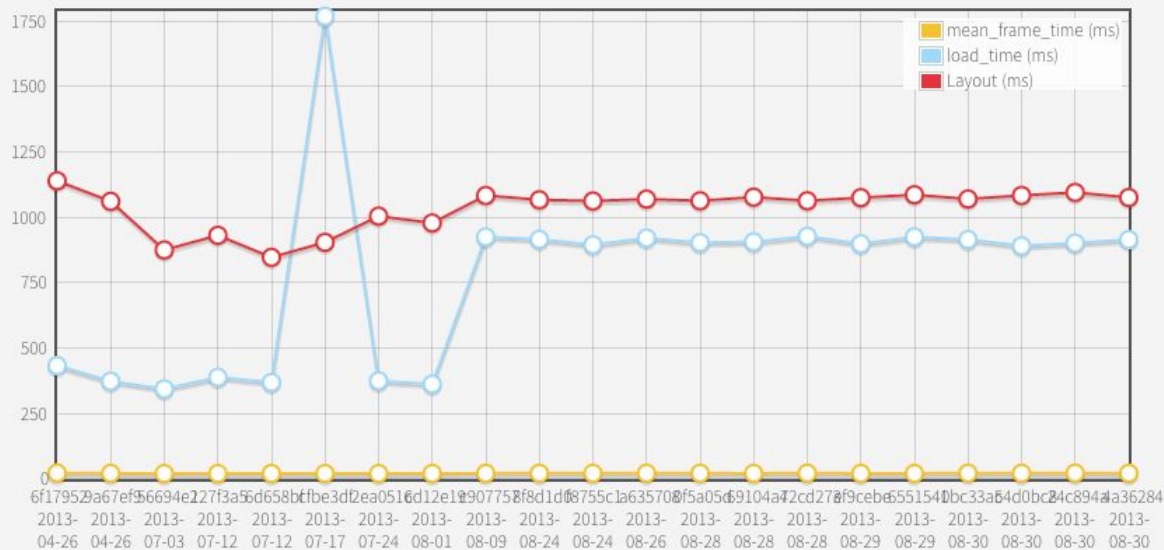
Checkbox

Checkbox base

Range input

Button on Nexus4

baseline

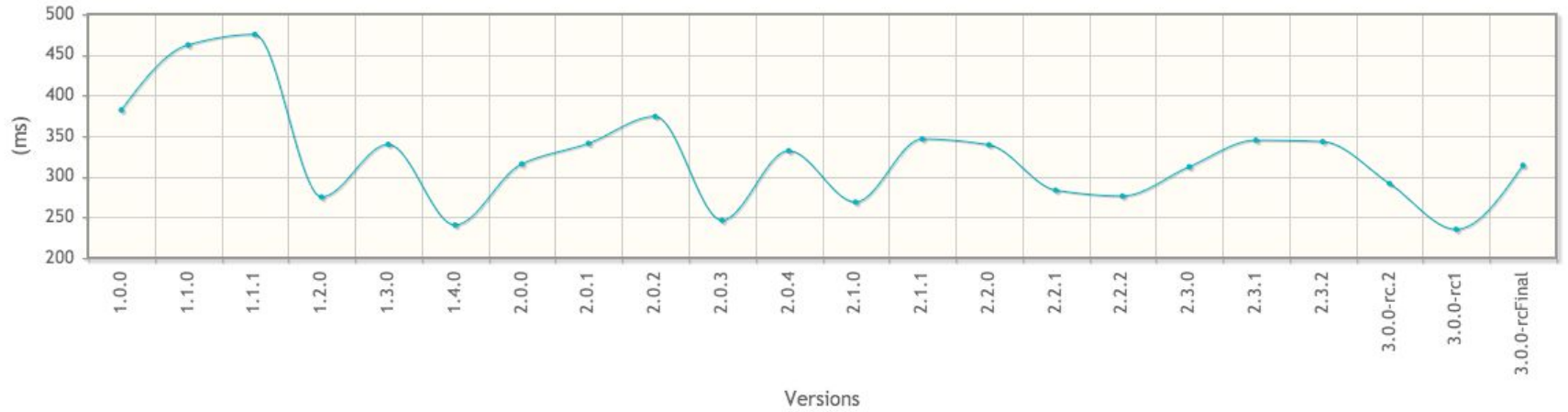


Bootstrap Performance using telemetry

Database located at <http://www.corsproxy.com/axemclion.cloudant.com/> (change)

View metrics for each component over various versions of the Bootstrap framework.

Component: dropdowns **Metric:** first_paint (ms)



Site Speed Overview

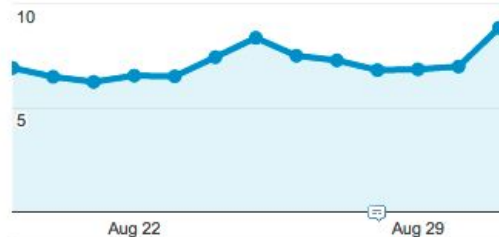
Advanced Segments | Email | Export ▾ | Add to Dashb

100.00%

Overview

Avg. Page Load Time (sec) ▾ vs. Select a metric

Avg. Page Load Time (sec)



323,427 of pageviews sent page load

Avg. Page Load Time (sec)

7.17

Avg. I

Avg. Server Connection Time (sec)

0.04

Avg. Ser

Site Speed Page Timings

Pages are grouped by Page

Aug 19, 2013 - Sep 18, 2013

Advanced Segments | Email | Export ▾ | Add to Dashboard | Shortcut

100.00%

Explorer | Distribution | Map Overlay

Primary Dimension: Page | Page Title | Operating System ▾

Secondary dimension: Browser ▾ | Sort Type: Default ▾

advanced

Operating System	Browser	Avg. Page Load Time (sec) (compared to site average)	7.15 Site Avg: 7.17 (-0.23%)
1. Windows	Chrome	5.29%	
2. Macintosh	Chrome	-20.44%	
3. Windows	Firefox	8.13%	
4. Linux	Chrome	6.22%	
5. Windows	Internet Explorer	-17.36%	
6. Macintosh	Safari	-14.82%	
7. Linux	Firefox	10.50%	
8. Macintosh	Firefox	-19.39%	
9. iOS	Safari	110.09%	
10. Android	Chrome	-3.06%	

ALL SITES AND ALL TEMPLATES IN ALL BROWSERS OVER 30 DAYS ▼

MEDIAN FULLY LOADED TIME

BACKEND | START RENDER

HTML5 Rocks

6.1s

Median over last 30 days. Average was 7.8s.

Amazon

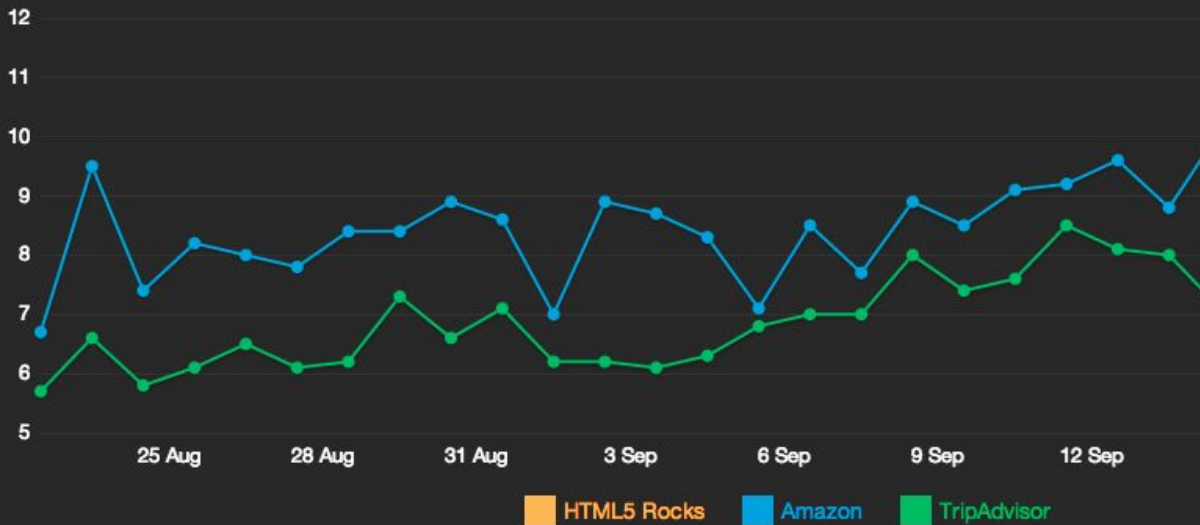
8.2s

Median over last 30 days. Average was 8.4s.

TripAdvisor

6.8s

Median over last 30 days. Average was 7.2s.



WebPageTest

- [Case study: retailmenot.com](#)
- [WPT results](#)
- WebPageTest:
 - Visual filmstrip correlated to waterfall
 - DevTools timeline capture
 - Summary of browser cost
 - Diff to any other recording
 - Basically: [It's insanely powerful.](#)



▼ Using WebPagetest

- Quick Start Guide
- ▶ Metrics
- Result Codes
- Scripting

▼ Developer Interfaces

- RESTful APIs
- Batch Library
- Batch Processing Command-line tool
- Raw Test Results

▼ Private Instances

- Locations
- ▶ Releases
- Node.js Agent

▼ System Design

- Overview
- WebPagetest Relay

▼ Other Resources

- Optimization Resources
- Hosting a Test Location
- 2011 FCC Broadband Data

▼ Developer Information

- Developer FAQ
- Code Guidelines
- ▶ Design Docs

Mobile Agents

Sitemap

Private Instances

WebPagetest is available as a software package for installation and running of private instances.

Releases

The latest release is [2.12](#)

System Requirements

WebPagetest can be configured to run all on one system (with the web server and test machines all running on the same PC) or with separate systems for the web server and testers.

Web Server

The Web Server can be any OS that supports Apache and PHP (Linux and Windows have both been tested). If the tester is going to be running on

Contents

[1 Releases](#)

[2 System Requirements](#)

[2.1 Web Server](#)

[2.2 Test Machine\(s\)](#)

[3 Configuring](#)

[3.1 Web Server](#)

[3.2 Test Machine\(s\)](#)

[3.2.1 General Machine Configuration](#)

(common for all browsers)

[3.2.2 wptdriver \(Chrome, Firefox, Safari, IE 6-10\)](#)

[3.2.3 URLBlaster \(legacy IE testing - IE 9 and earlier\)](#)

[3.2.4 Chrome Frame](#)

[3.2.5 If you connect a remote desktop to the test machine, make sure to reboot the machine when you are done, otherwise the desktop will remain locked and screen captures will not work.](#)

[4 EC2 Test Agents](#)

[4.1 Configuration](#)

[4.1.1 Parameters](#)

So, to sum up:



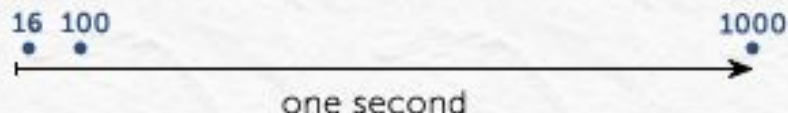
Timeline of Perception

< 16 ms Smooth animation @ 60fps.

< 100 ms Stuttery for animation but good for feedback.

< 1000 ms Users feel a wait but are not frustrated if progress shown.

> 1000 ms Frustration and boredom set in; joy is lost.



Aggressive, but good goals:

1. Mobile connectivity:
 - a. Show the above-the-fold content in **under 1 second**
 - b. Serve above-the-fold content, including critical path CSS, in **first 14kB of response**.
2. Maximum of **200ms** server response time
3. **60fps** scrolling, **60fps** transitions
4. Speed Index **under 1000**

What can you do?

- Use analytics to **correlate performance wins to key business wins.**
 - [Speed Index](#) correlation to [Conversion Rate](#)?
- Make the case to your boss/client that **performance trumps their feature requests**
- Set up infrastructure to **track your perf**
- **Contribute to open source** performance tooling

Thanks!

Stick around,
the Q&A will be a blast.

@ChromiumDev

#perfmatters



Paint Storms



Dashboard Control

- 5m
- 15m
- 1h
- 6h
- 12h**
- 24h
- 2d
- 5d

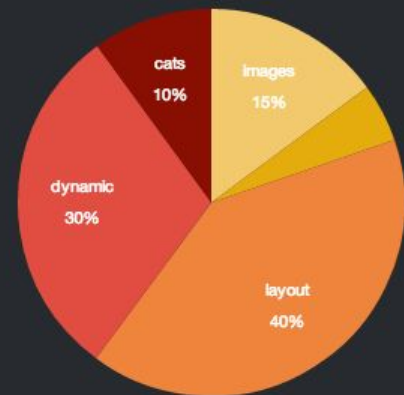
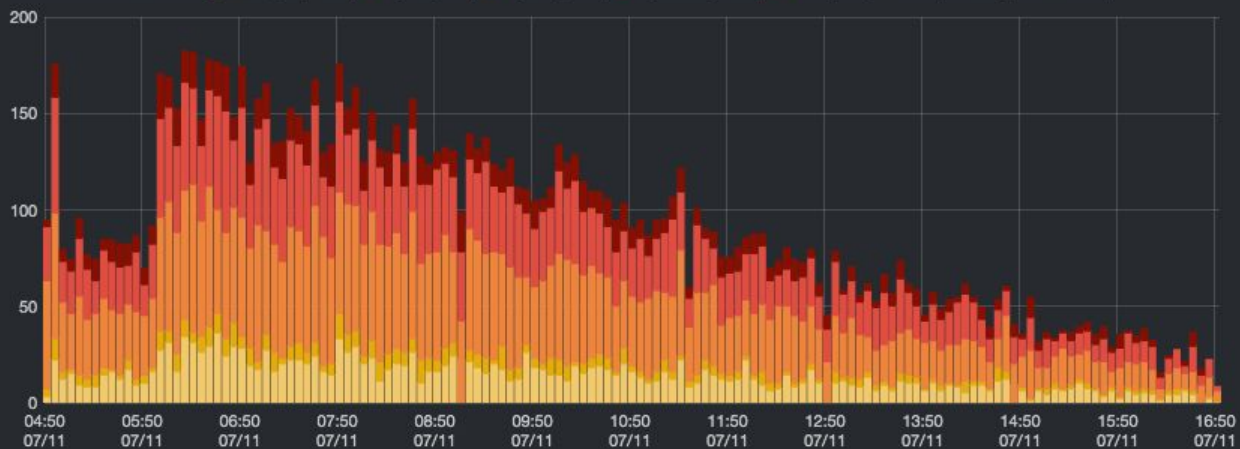
Relative | Absolute | Since | Auto-refresh

Search

- png OR jpg
- css
- html
- php OR pl
- gif

Zoom In Zoom Out |
 Images (1992) |
 styles (655) |
 layout (5412) |
 dynamic (3996) |
 cats (1344) |
 count per 5m | (13399 hits)

histogram



- ▼ -4.6% (images)
- ▲ 4.63% (styles)
- ▼ -0.62% (layout)
- ▼ -4.8% (dynamic)
- ▼ -1.18% (cats)

- cn (3554)
- us (1632)
- id (658)
- br (559)
- pk (494)
- bd (449)
- ng (412)
- ru (369)
- jp (235)
- mx (147)