



Beyond Resizing

The Image Performance Checklist

Kitt Hodsden









Front End Engineer

Back End Engineer

Dev Ops Infrastructure Engineer System Administrator







!!?

“Already resizing, what’s next?”

“Have I done enough?”

Our Goals

Deliver less.

**Deliver less.
Deliver faster.**

**Deliver less.
Deliver faster.
Render faster.**

Be like AMP.

-ish



User Experience > Developer Experience > Ease of Implementation.

When in doubt, do what's best for the end user experience, even if it means that it's harder for the page creator to build or for the library developer to implement.



Only do things if they can be made fast.

Don't introduce components or features to AMP that can't reliably run at 60fps or hinder the instant load experience on today's most common mobile devices.



Don't design for a hypothetical faster future browser.

We've chosen to build AMP as a library in the



Prioritise things that improve the user experience – but compromise when needed.

Some things can be made fast and are still a



AMP

ABOUT

DOCS

REFERENCE

TOOLS

THE LATEST

SUPPORT



ENGLISH ▾



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Some things can be made fast and are still a

**Deliver less.
Deliver faster.
Render faster.
Be like AMP*.**

* In this way, inspired by the goals of AMP (and this way only), be like AMP.

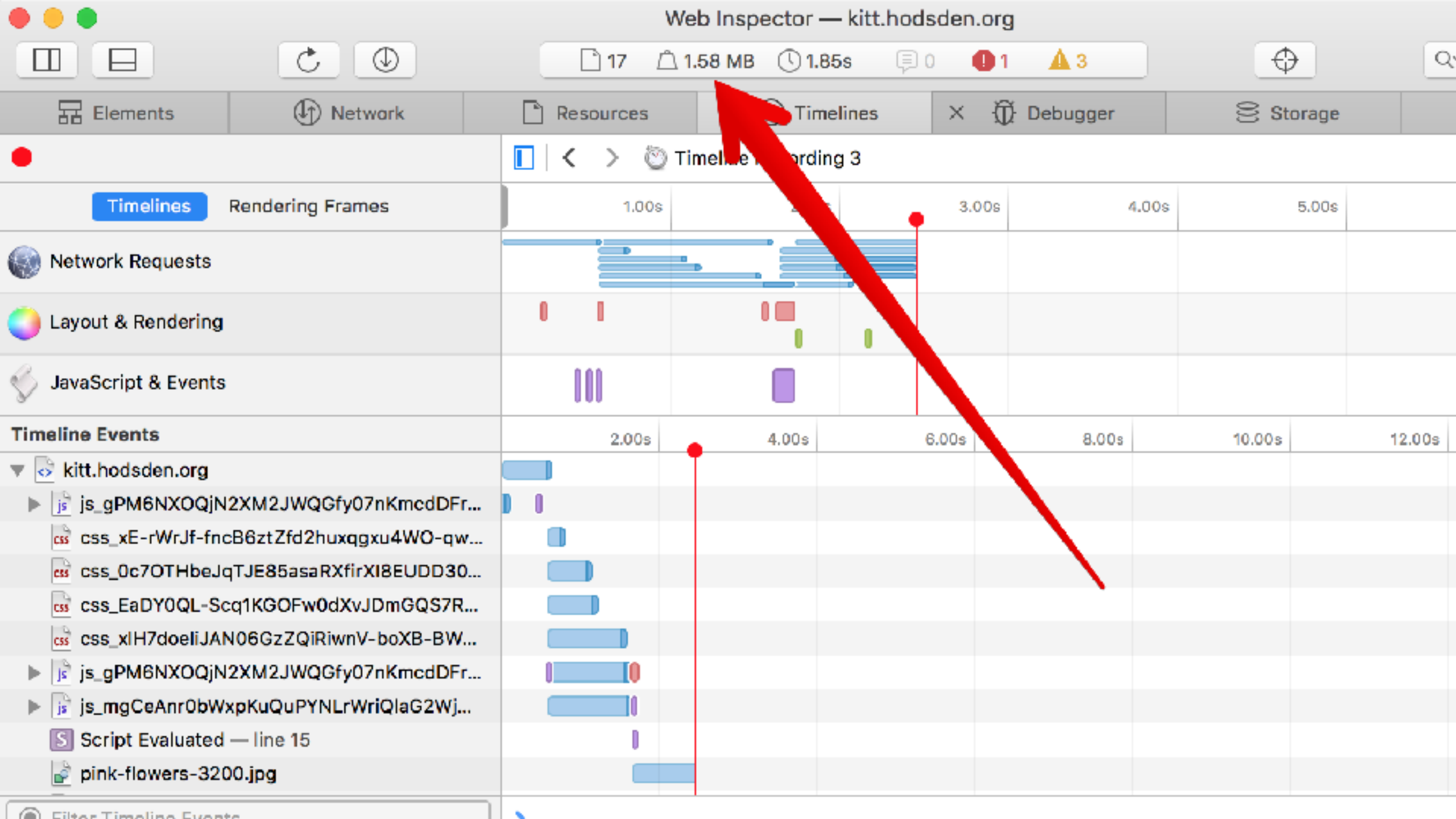


Define “less”

Define “faster”





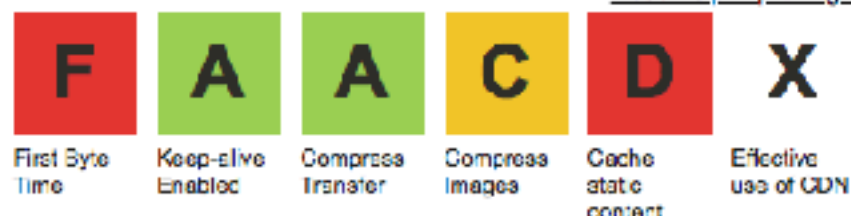


Web Page Performance Test for

<https://kitt.hodsdon.org>

From: Mumbai, India - EC2 - Chrome - 3GSlow
4/6/2018, 8:43:33 AM

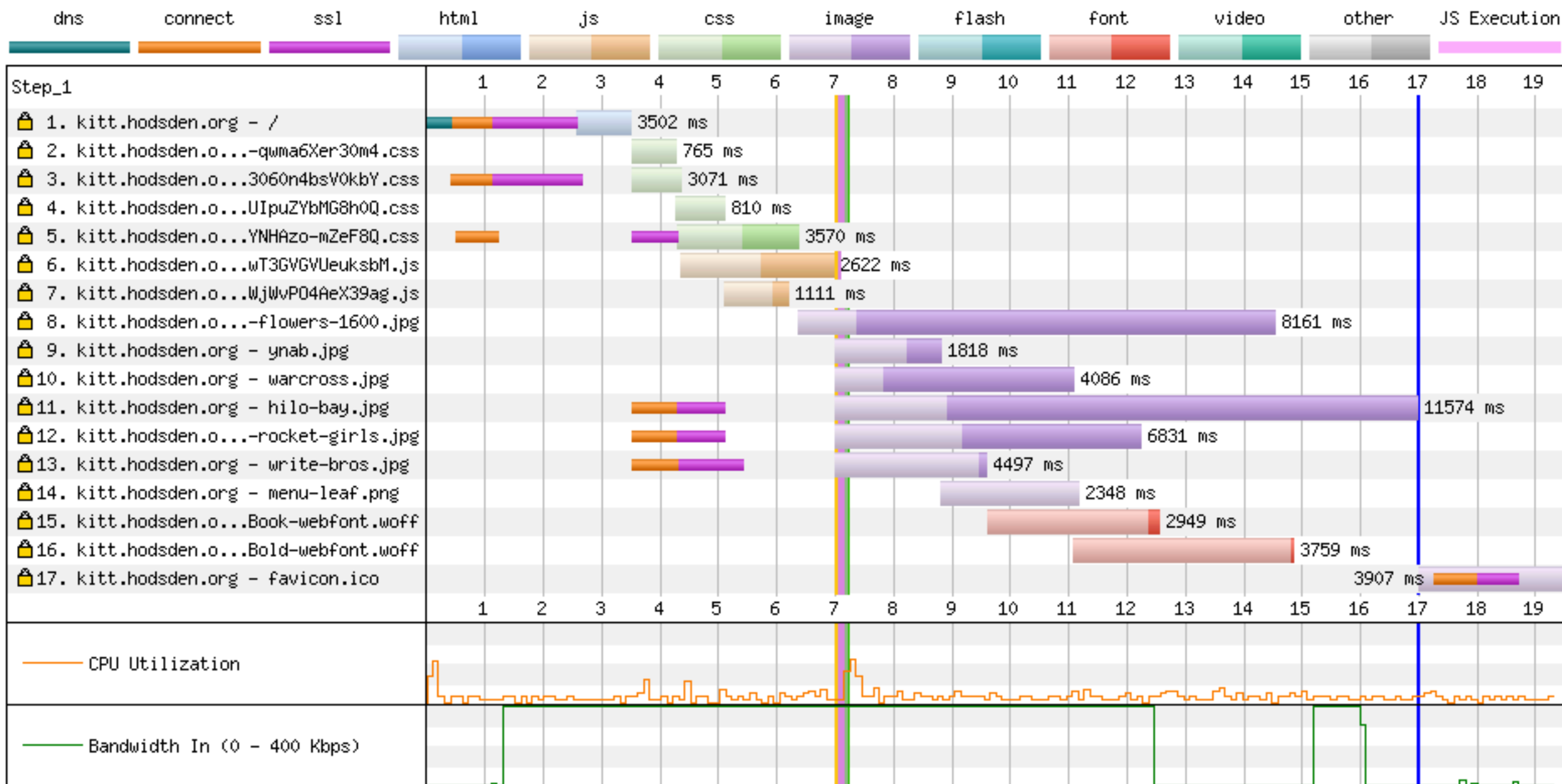
[Need help improving?](#)



Full Optimization Checklist

Step	Keep Alive	ETag	Compress Img	Progressive	Cache static	CDN Detected
Step 1	100%	100%	72%	0%	58%	0%
1: kitt.hodsdon.org - /	✓	✓				
2: kitt.hodsdon.org...UJ-quraQerIOn4.css	✓	✓			✓	✗
3: kitt.hodsdon.org...UJ306ChikeYckbv.css	✓	✓			✓	✗
4: kitt.hodsdon.org...cvUlpZVhGSh0C.css	✓	✓			✓	✗
5: kitt.hodsdon.org...KwYMFzn-nZ-F0T.css	✓	✓			✓	✗
6: kitt.hodsdon.org...BIu73CVGvUckach.js	✓	✓			✓	✗
7: kitt.hodsdon.org...GdMjMUPNAer39sg.js	✓	✓			✓	✗
8: kitt.hodsdon.org...haeps-uul-1600.jpg	✓		⚠	✗	✓	✗
9: kitt.hodsdon.org - grab.jpg	✓		⚠	✗	✗	✗
10: kitt.hodsdon.org - warcross.jpg	✓		⚠	✗	✗	✗
11: kitt.hodsdon.org - nlio-bag.jpg	✓		⚠	✗	✗	✗
12: kitt.hodsdon.org...-mktel-girls.jpg	✓		⚠	✗	✗	✗
13: kitt.hodsdon.org - white-bros.jpg	✓		⚠	✗	✗	✗
14: kitt.hodsdon.org - venue-leaf.png	✓		✓		✓	✗
15: kitt.hodsdon.org...-Book-webFont.woff	✓				✓	✗
16: kitt.hodsdon.org...-folio-webFont.woff	✓				✓	✗
17: kitt.hodsdon.org - favicon.ico	✓				✓	✗
	Keep Alive	ETag	Compress Img	Progressive	Cache static	CDN Detected

Start Render RUM First Paint DOM Interactive DOM Content Loaded On Load Document Complete



Test all major parts

Use older, slower settings

Run tests multiple times

Automate performance testing

The Basics

Resize Images

**PRIVATE
STREET**

AWESOME

**ST
100**



Website tools
Photoshop
Local script
Production process

Website tools
Photoshop
Local script
Production process

Choose the right format!



statcounter
GlobalStats

[Press Releases](#) [FAQ](#) [About](#) [Feedback](#)

Chrome

57.69%

Safari

14.79%

UC Browser

7.35%

Firefox

5.4%

Opera

3.65%

IE

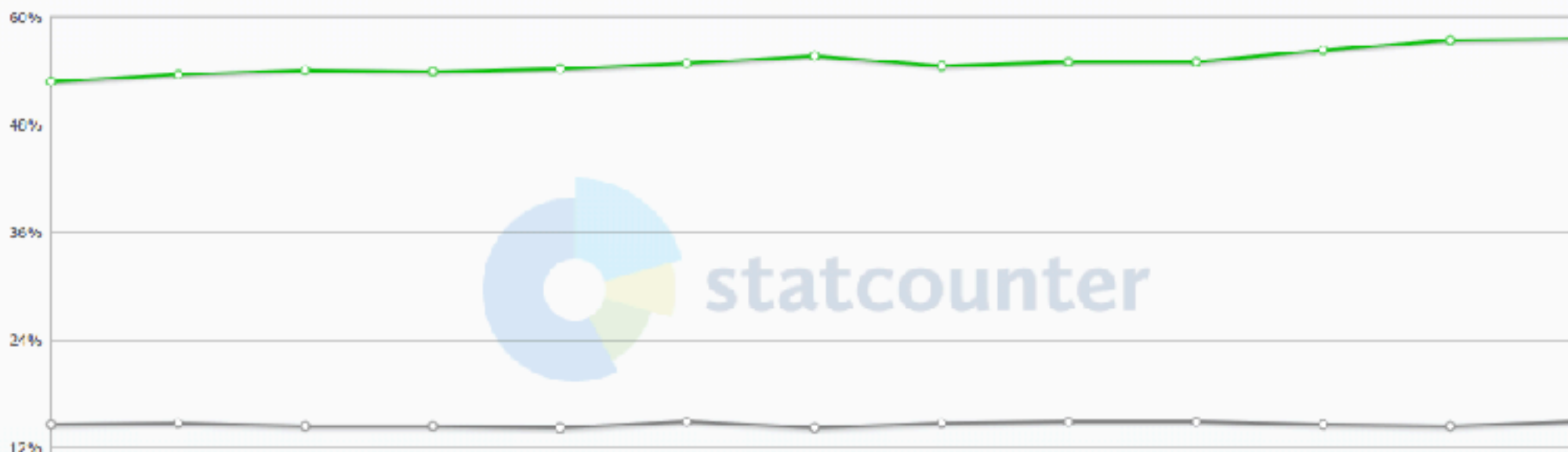
3.13%

Browser Market Share Worldwide - March 2018

Browser Market Share Worldwide

Mar 2017 - Mar 2018

[Edit Chart Data](#)





Chrome

57.69%

Safari

14.79%

UC Browser

7.35%

Firefox

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Opera

3.65%

IE

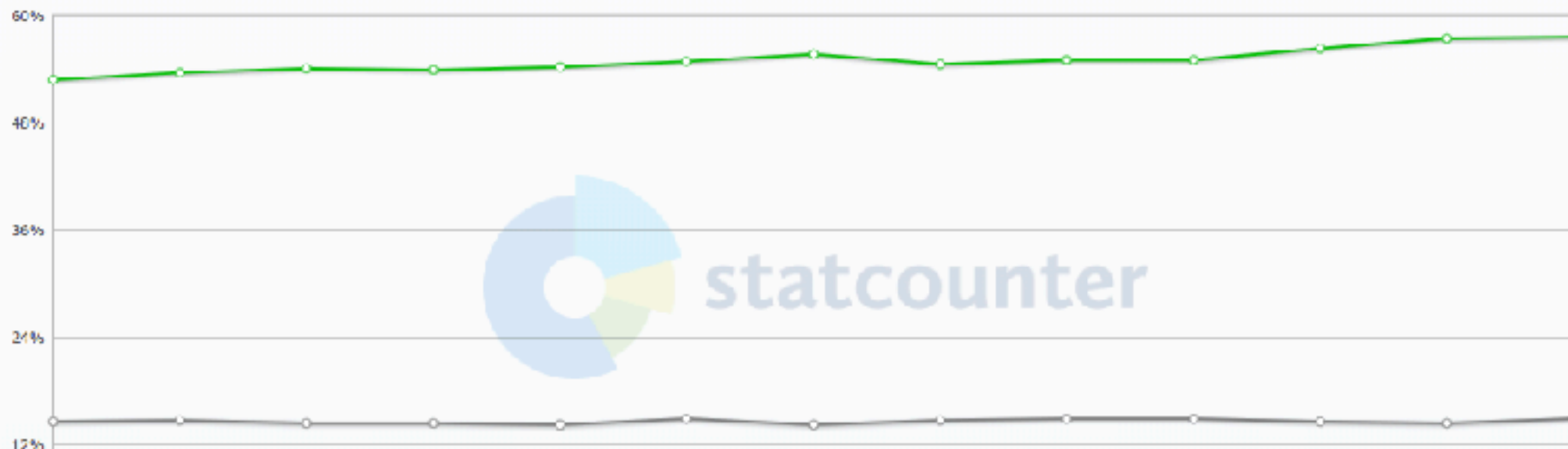
3.13%

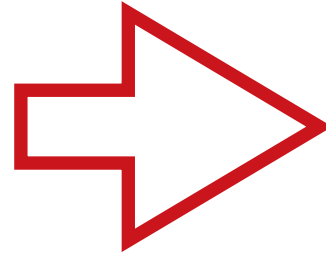
Browser Market Share Worldwide - March 2018

Browser Market Share Worldwide

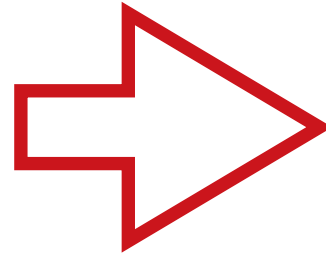
Mar 2017 - Mar 2018

Edit Chart Data

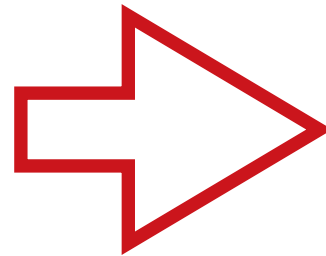




WEBP or JPEG



SVG



SVG, MP4, or
WEBM

Everything else

Use PNG



HEIF

Can I use

heif

?

Settings

1 result found

#

HEIF/ISO Base Media File Format OTHER

Usage % of all users
Global 0%

HEIF (High Efficiency Image File Format) is a standard developed by the Moving Picture Experts Group (MPEG) for storage and sharing of images and image sequences.

Current aligned

Usage relative

Date relative

Show all

IE	Edge *	Firefox	Chrome	Safari	iOS Safari *	Opera Mini *	Chrome for Android	UC Browser for Android	Samsung Internet
			49						
			63						
		58	64		10.3				4
11	16	59	65	11	11.2	all	64	11.8	6.2
	17	60	66	11.1	11.3				
		61	67	TP					
			68						

PNG

GIF

Animated GIF ➡ MP4

Sprites!

Sprites! ✨

Optimize

Website tools
ImageOptim
Local script
Production process

JPEG encoders

Modern ones, that is.

MozJPEG

Guetzli

<https://github.com/google/guetzli/>

```
$ guetzli --quality 84 o3200.jpg n3200.jpg
```



800 x 160 JPG 65kB



800 x 160 JPG guetzli 33kB



800 x 160 WEBP 41kB

PJPG

Progressive JPG



<http://www.bookofspeed.com/chapter5.html>



<http://www.bookofspeed.com/chapter5.html>

Web Page Performance Test for

<https://kitt.hodsden.org>

From: Mumbai, India - EC2 - Chrome - 3GSlow

4/5/2018, 12:57:20 PM

[Need help improving?](#)



First Byte
Time



Keep-alive
Enabled



Compress
Transfer



Compress
Images



Cache
static
content

X

Effective
use of CDN

[Summary](#)

[Details](#)

[Performance Review](#)

[Content Breakdown](#)

[Domains](#)

[Screen Shot](#)

[Image Analysis](#)

Full Optimization Checklist

Step_1	Keep-Alive 100%	GZip 100%	Compress Img 50%	Progressive 0%	Cache Static 63%	CDN Detected 0%
1: kitt.hodsden.org - /	✓	✓				
2: kitt.hodsden.org...W0-qwma6Xer30m4.css	✓	✓			✓	✗
3: kitt.hodsden.org...D03060n4bsV0kbY.css	✓	✓			✓	✗
4: kitt.hodsden.org...cxUIpuZYbMG8h0Q.css	✓	✓			✓	✗
5: kitt.hodsden.org...KnYNHazo-mZeF8Q.css	✓	✓			✓	✗
6: kitt.hodsden.org...BlwT3GVGVUeuksbM.js	✓	✓			✓	✗
7: kitt.hodsden.org...G2WjlvP04AeX39ag.js	✓	✓			✓	✗
8: kitt.hodsden.org - peppers-1600.jpg	✓		⚠	✗	✓	✗
9: kitt.hodsden.org - ynab.jpg	✓		⚠	✗	✗	✗
10: kitt.hodsden.org - warcross.jpg	✓		⚠	✗	✗	✗
11: kitt.hodsden.org - hilc-bay.jpg	✓		⚠	✗	✗	✗
12: kitt.hodsden.org...e-rocket-girls.jpg	✓		⚠	✗	✗	✗
13: kitt.hodsden.org - write-bros.jpg	✓		⚠	✗	✗	✗
14: kitt.hodsden.org...-Bock-webfont.woff	✓				✓	✗
15: kitt.hodsden.org...-Bold-webfont.woff	✓				✓	✗
16: kitt.hodsden.org - menu-leaf.png	✓		✓		✓	✗
17: kitt.hodsden.org - favicon.ico	✓				✓	✗
	Keep-Alive	GZip	Compress Img	Progressive	Cache Static	CDN Detected



**Deliver less.
Deliver faster.**

Deliver less.
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Render faster.

```

```

```

```

Use HTML5 tags



```

```



<https://github.com/ausi/respimagelint>

Image #1



A fitting image source should be available for all screen sizes

At a viewport of 320x427 the image was displayed 320 pixels wide, but the closest provided image has a width of 800 which is 60% off. The affected viewports are 300x169-380x507.

Loading a large image and display it much smaller should be avoided to save bandwidth. Loading a small image and display it much larger should be avoided to prevent pixelated artifacts.

```
**  
**<https://github.com/ApoorvSaxena/lozad.js>**  
**<https://github.com/dinbror/blazy>**  
**<https://github.com/malchata/yall.js>**  
**<https://github.com/jasonslyvia/react-lazyload>**

# Can I use intersection ? [Settings](#)

1 result found

## # IntersectionObserver - WD

Usage

% of all users

Global

62.69% + 10.4% = 73.09%

API that can be used to understand the visibility and position of DOM elements relative to a containing element or to the top level viewport. The position is delivered asynchronously and is useful for understanding the visibility of elements and implementing pre-loading and deferred loading of DOM content.

Current aligned Usage relative Date relative [Show all](#)

| IE | Edge * | Firefox | Chrome | Safari | iOS Safari * | Opera Mini * | Chrome for Android | UC Browser for Android | Samsung Internet |
|----|--------|---------|--------|--------|--------------|--------------|--------------------|------------------------|------------------|
|    |        |         | 49     |        |              |              |                    |                        |                  |
|    |        |         | 63     |        |              |              |                    |                        |                  |
|    |        | 58      | 64     |        | 10.3         |              |                    |                        | 4                |
| 11 | 16     | 59      | 65     | 11     | 11.2         | all          | 64                 | 11.8                   | 6.2              |
|    | 17     | 60      | 66     | 11.1   | 11.3         |              |                    |                        |                  |
|    |        | 61      | 67     | TP     |              |              |                    |                        |                  |



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Usage relative

Date relative

Show all

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|----|-------------------|---------|--------|--------|-------------------------|-------------------------|--------------------|------------------------|------------------|
|    |                   |         | 49     |        |                         |                         |                    |                        |                  |
|    |                   |         | 63     |        |                         |                         |                    |                        |                  |
|    |                   | 58      | 64     |        | 10.3                    |                         |                    |                        | 4                |
| 11 | 16                | 59      | 65     | 11     | 11.2                    | all                     | 64                 | 11.8                   | 6.2              |
|    | 17                | 60      | 66     | 11.1   | 11.3                    |                         |                    |                        |                  |
|    |                   | 61      | 67     | TP     |                         |                         |                    |                        |                  |



**Deliver less.  
Deliver faster.  
Render faster.**

**Deliver less.  
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Be like AMP.**

# Front End



# Be Like AMP

The good parts.

# Remove unused content

CSS, HTML, JavaScript, and images



# display: none

# Inline critical CSS

# Profile third-party scripts

# Remove duplicate functionality

# Optimize webfonts

**font-display: optional**

# async

# Service workers



# Resource Hints

**prefetch**  
**preload**  
**dns-prefetch**  
**preconnect**

**prefetch**  
preload  
dns-prefetch  
preconnect

**<link rel="prefetch" href="/i/o3200.jpeg">**

prefetch  
preload  
**dns-prefetch**  
preconnect

**<link rel="dns-prefetch" href="//example.com">**

prefetch  
**preload**  
dns-prefetch  
preconnect

**<link rel="preload" as="image" href="/i/clever-girl.png">**



```
<link rel="preload" as="font" href="//fonts/
font.woff2" type="font/woff" crossorigin />
```

```
<link rel="preload" as="script" href="map.js"
media="(min-width: 601px)">
```

```
<link rel="preload" as="image" href="map.png"
media="(max-width: 600px)">
```

```
<link rel="preload" as="script" href="map.js"
media="(min-width: 601px)">
```

prefetch  
**preload**  
dns-prefetch  
preconnect





# Service workers

```

self.addEventListener('install', function(event) {
 event.waitUntil(
 caches.open('caching-v1').then(function(cache) {
 return cache.addAll([
 '/',
 '/styles/all.min.css',
 '/styles/imgs/needful.png',
 '/scripts/all.min.js'
]);
 })
);
});

self.addEventListener('fetch', function(event) {
 event.respondWith(
 caches.match(event.request).then(function(cachedResponse) {
 return cachedResponse || fetch(event.request);
 })
);
});

```



# Can I use serviceworkers ? ⚙️ Settings

1 result found

## # Service Workers 📄 - WD

Usage % of all users  
Global 74.42% + 0.18% = 74.59%

Method that enables applications to take advantage of persistent background processing, including hooks to enable bootstrapping of web applications while offline.

Current aligned Usage relative Date relative Show all

IE	Edge *	Firefox	Chrome	Safari	iOS Safari *	Opera Mini *	Chrome for Android	UC Browser for Android	Samsung Internet
			49						
			63						
		58	64		10.3				4
11	16	59	65	11	11.2	all	64	11.8	6.2
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	18	61	67	TP					
			68						

Notes Known Issues (0) Resources (8) Feedback

Details on partial support can be found on [is ServiceWorker Ready?](#)

MS Edge status: [Previous Release](#)

```
if ('serviceWorker' in navigator) {
 window.addEventListener('load', function() {
 navigator.serviceWorker.register('/sw.js');
 });
}
```

# Looks like you're offline.

---

Any pages you visited before going offline will still be available, though—they're listed here.

## Recipes

---

[Chili Oil](#)

[This is my second post.](#)

[Curry Rice](#)

<https://github.com/Wilto/wilto-makes-food>



**“80-90% of the end-user response time is spent on the front-end, start there.”**

Steve Souders Performance Golden Rule

**“80-90% of the end-user response time is spent on the front-end, start there.”**

Steve Souders Performance Golden Rule

# Back End

# Just deliver



# imagecreatefromjpeg()

php

```
image = new BufferedImage(w, h, type);
Graphics2D g2d = image.createGraphics();
```

java

```
im = Image.open('image.jpg')
im.show()
```

python

# Placeholders

# Limited access

# Cache

# Expires

**logo.png**  
**new-logo.svg**  
**new-new-logo.svg**  
**new-new-new-logo.svg**



# Resource Hints

prefetch  
preload  
dns-prefetch  
**preconnect**

**<link rel="preconnect" href="//fonts.google.com">**

**Link: <https://fonts.google.com">; rel=preconnect; crossorigin**

**prefetch**  
**preload**  
**dns-prefetch**  
**preconnect**

# Be like AMP.

# Eliminate known 404s

# Minimize redirects



**http://example.com ↩**

**https://example.com ↩**

**https://www.example.com ↩**

**http://www.example.com**

**Deliver less.  
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# CDN

# Dev Ops

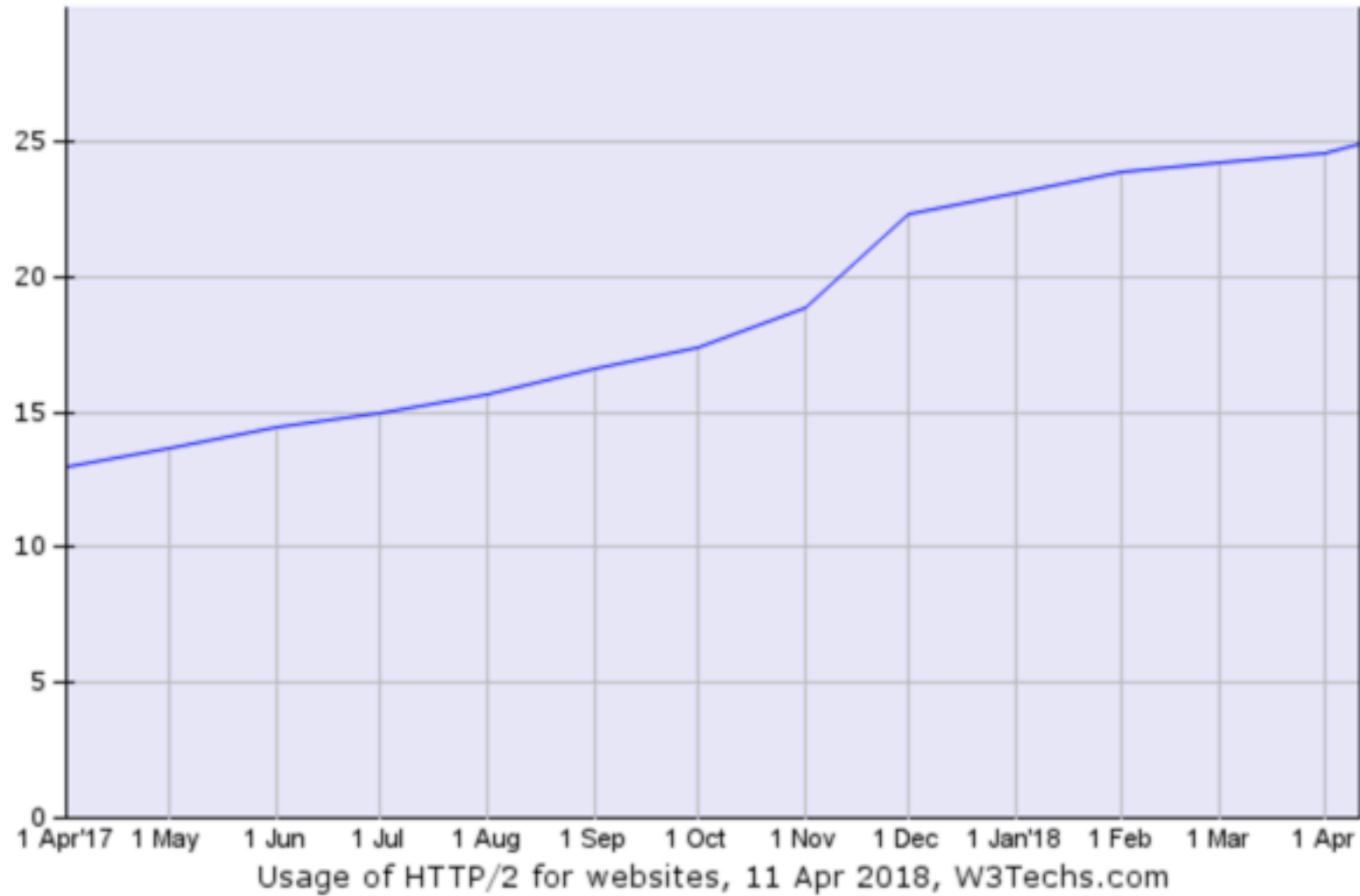
# Use a CDN.

# Optimize Server Configuration

**HTTP/2 + SSL  
Compression  
Cleanup  
Cache  
Break it**

# HTTP/2 + SSL





<https://w3techs.com/technologies/details/ce-http2/all/all>

# Binary

# Binary Multiplexed

# Binary Multiplexed Header compression

# SSL

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Let's Encrypt is a **free, automated, and open**  
Certificate Authority.

[Get Started](#)[Donate](#)

#### FROM OUR BLOG

Apr 4, 2018

[Engineering deep dive: Encoding of SCTs in certificates](#)

#### MAJOR SPONSORS AND DONORS



# SSL

# Compression

gzip, at a minimum



# Static / Dynamic

# Clean up.

# Caching

# Break it

**HTTP/2 + SSL  
Compression  
Cleanup  
Cache  
Break it**

# Be Like AMP

# CDN

# Before and After



# Automate it.

# Everyone else

# Embrace less



BUSINESS

CULTURE

GADGETS

FUTURE

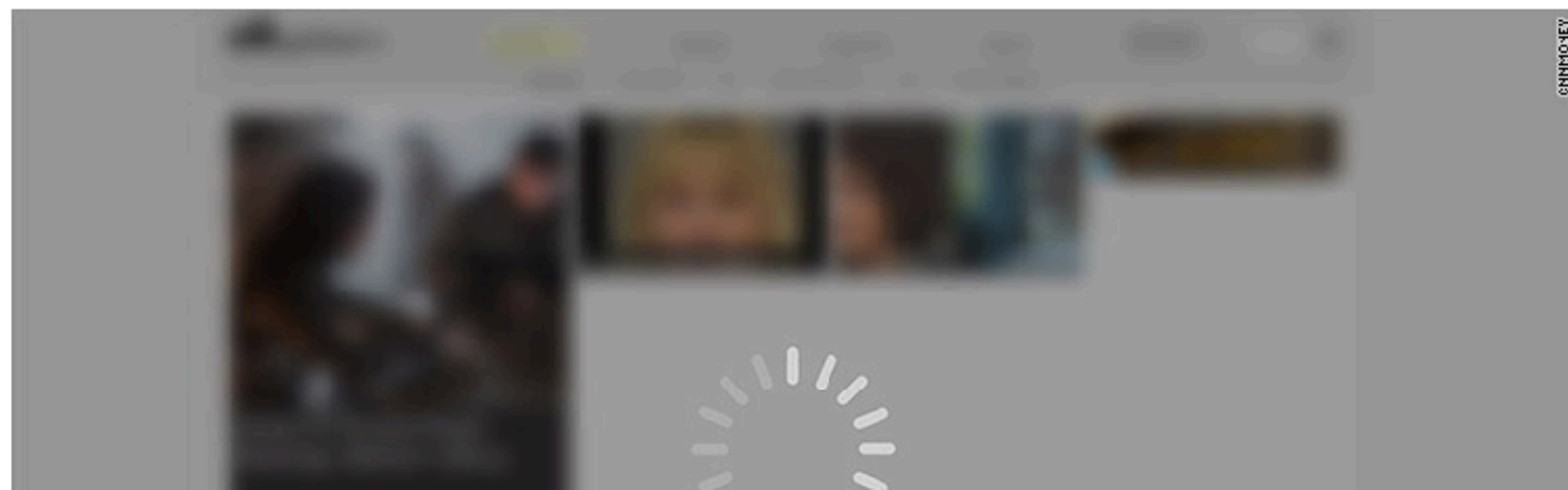
STARTUPS

Connect

# The Web is getting slower

by Hope King @lisahopeking

June 16, 2015: 11:48 AM ET



uBlock Origin 1.15.18



requests blocked

on this page

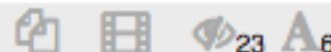
**23 or 29%**

since install

**118,313 or 6%**

domains connected

**11 out of 29**





BUSINESS

CULTURE

GADGETS

FUTURE

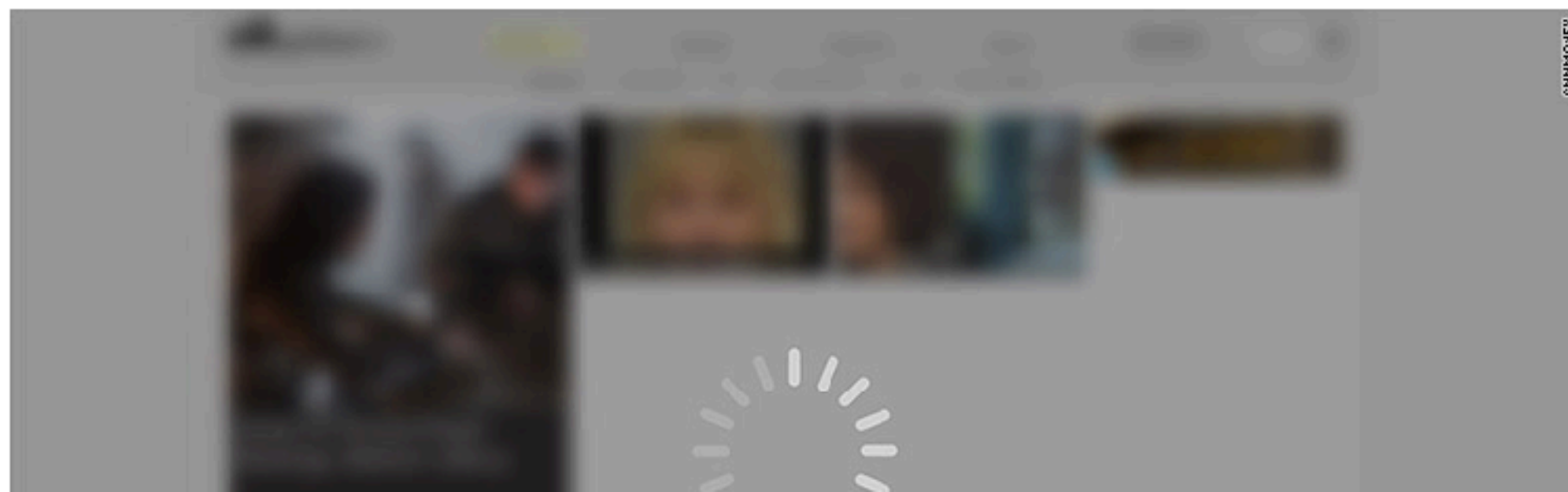
STARTUPS

Connect

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requests blocked

on this page

23 or 29%

since install

domains connected

11 out of 29



# Summary

**Deliver less.  
Deliver faster.  
Render faster.  
Be like AMP.**

# 1. Resize Images



## 2. Small Images

# 3. Resource Hints

prefetch, preload, dns-prefetch, preconnect

# 4. CDN

prefetch, preload, dns-prefetch, preconnect

# Victoire!



# Thanks!