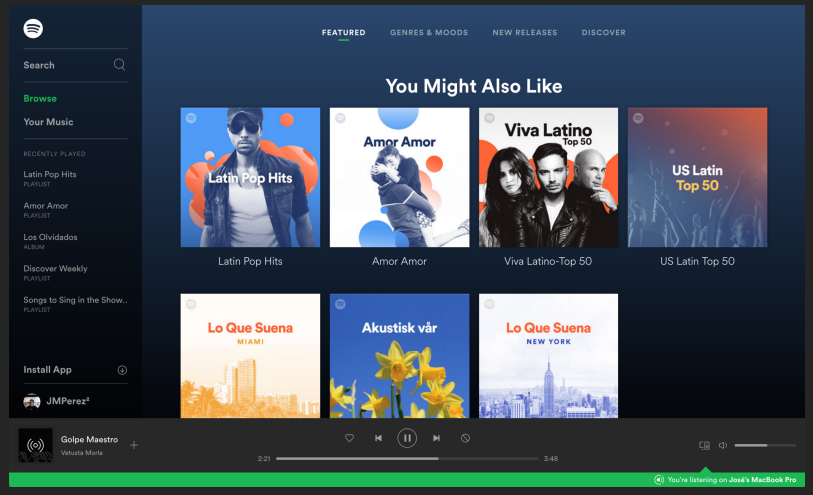
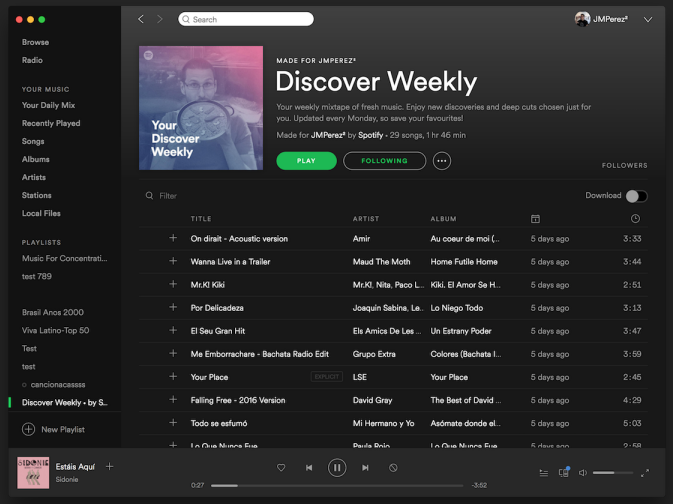
Progressive image rendering

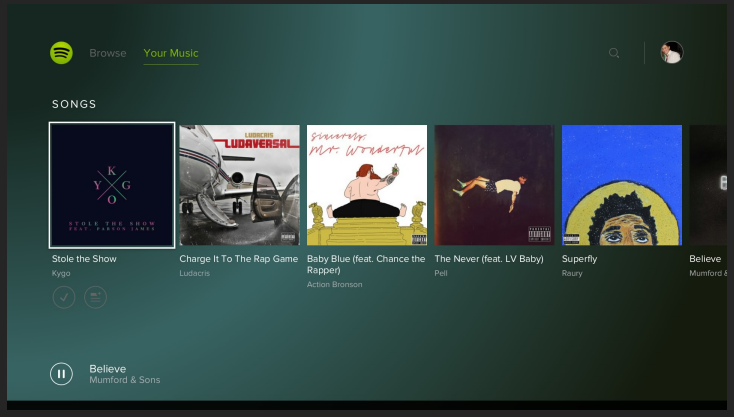
José M. Pérez · Web dev at Spotify
@jmperezperez

JS DayES

About me

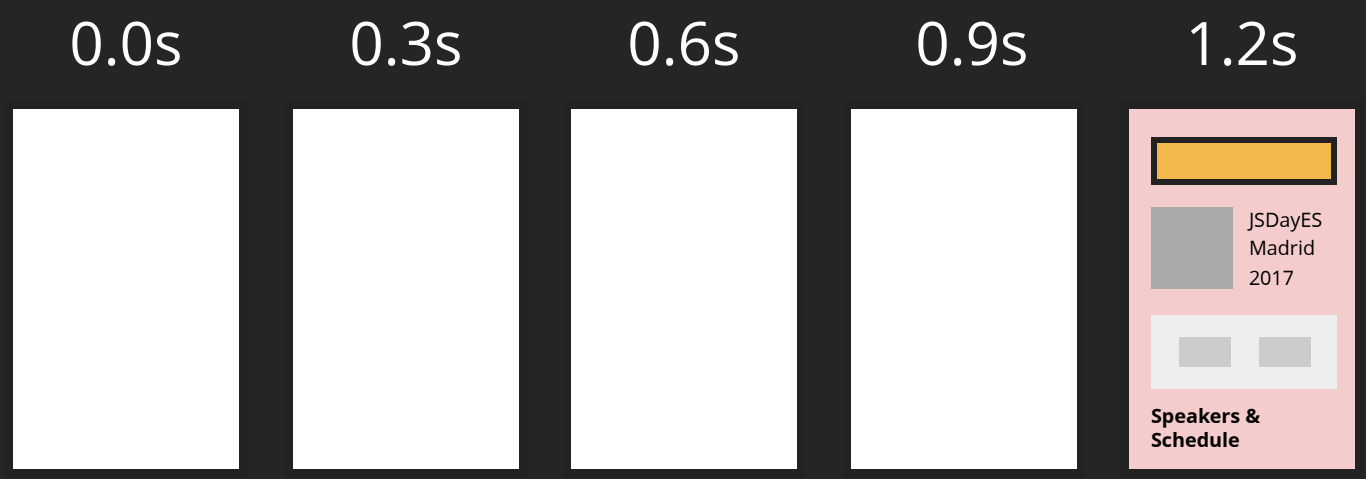

FEATURED
GENRES & MOODS
NEW RELEASES
DISCOVER
Search
Browse
Your Music
RECENTLY PLAYED
Latin Pop Hits
Amor Amor
Los Olvidados
Discover Weekly
Install App
JMPerez²
You Might Also Like
Latin Pop Hits
Amor Amor
Viva Latino
Top 50
US Latin
Top 50
Lo Que Suena
MIAMI
Akustisk vår
Lo Que Suena
NEW YORK
Golpe Maestro
Vetusta Morla
You're listening on José's MacBook Pro


Browse
Radio
YOUR MUSIC
Your Daily Mix
Recently Played
Songs
Albums
Artists
Stations
Local Files
PLAYLISTS
New Playlist
MADE FOR JMPEREZ²
Discover Weekly
Your Discover Weekly
PLAY
FOLLOWING
FOLLOWERS
Download
TITLE
ARTIST
ALBUM
On dirait - Acoustic version
Wanna Live in a Trailer
Maud The Moth
Home Futile Home
Por Delicadeza
El Seu Gran Hit
Me Emborrachare - Bachata Radio Edit
Your Place
Falling Free - 2016 Version
David Gray
The Best of David ...
Todo se esfumó
Estáte Aquí
Sidonie

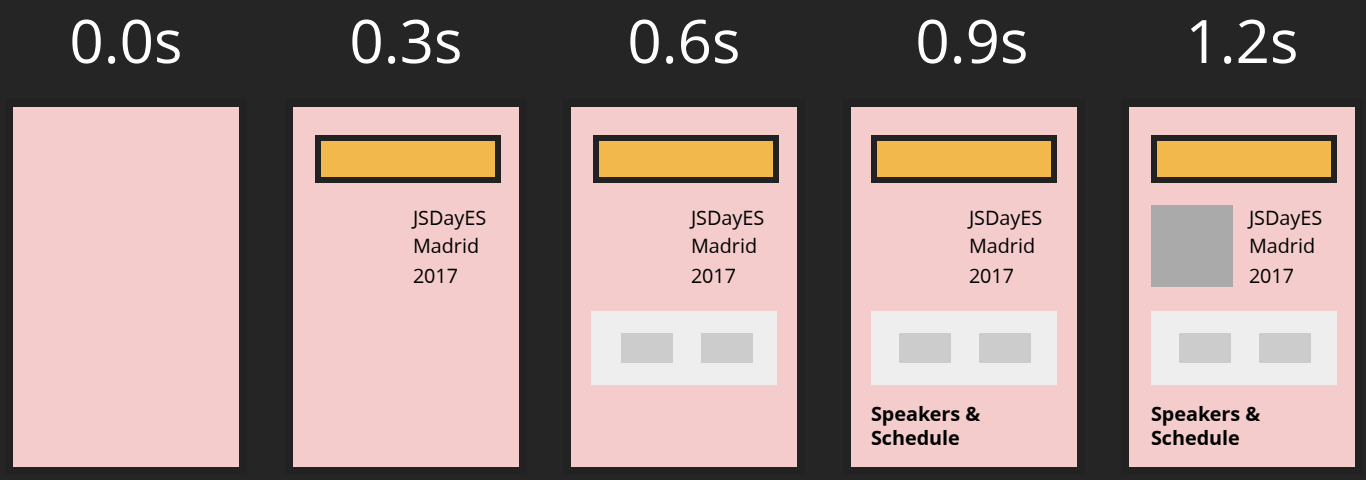

Browse
Your Music
SONGS
Stole the Show
Kygo
Charge It To The Rap Game
Ludacris
Baby Blue (feat. Chance the Rapper)
Action Bronson
The Never (feat. LV Baby)
Pell
Superfly
Raury
Believe
Mumford &
Believe
Mumford & Sons

Page Load Time

Version A



Version B



User Perceived Performance

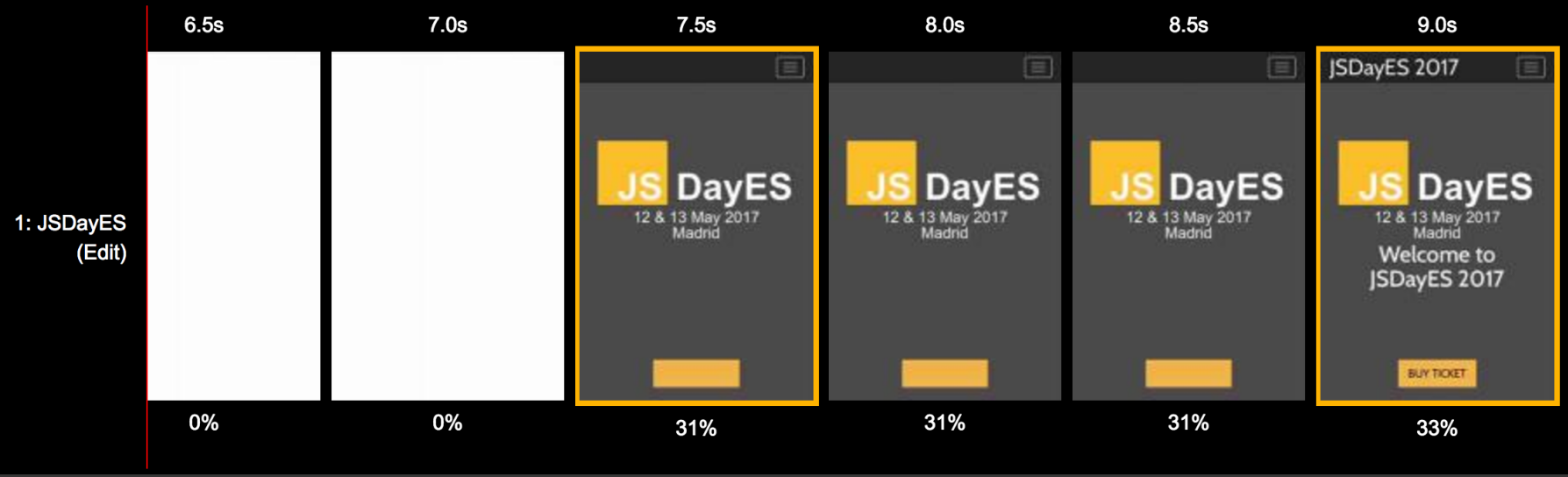
$$SpeedIndex = \int_0^{end} 1 - \frac{VC}{100}$$

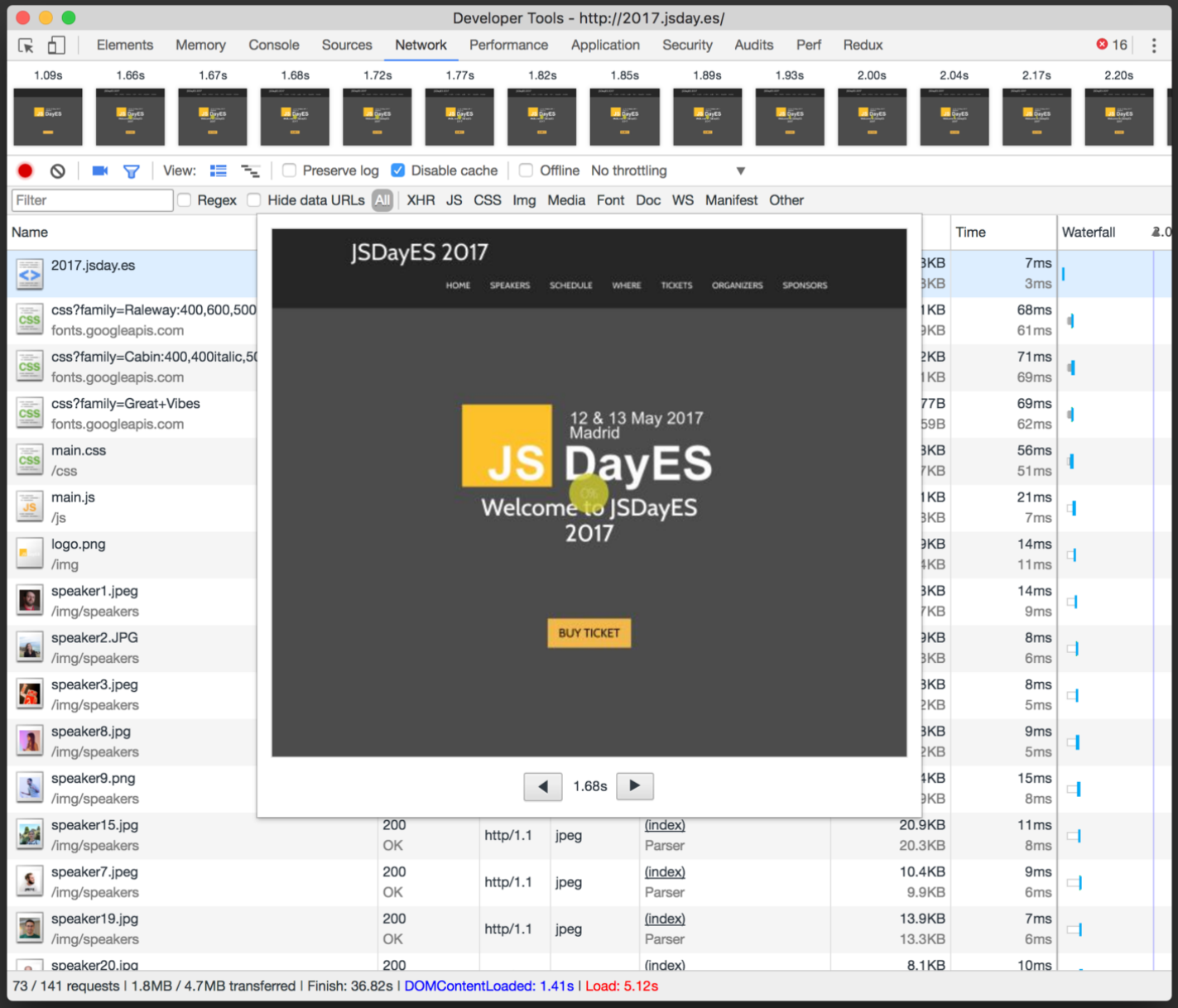
end = end time in milliseconds

VC = % visually complete

WebPageTest

Tested From: Dulles, VA - **iPhone 6 iOS 9 - 3G**



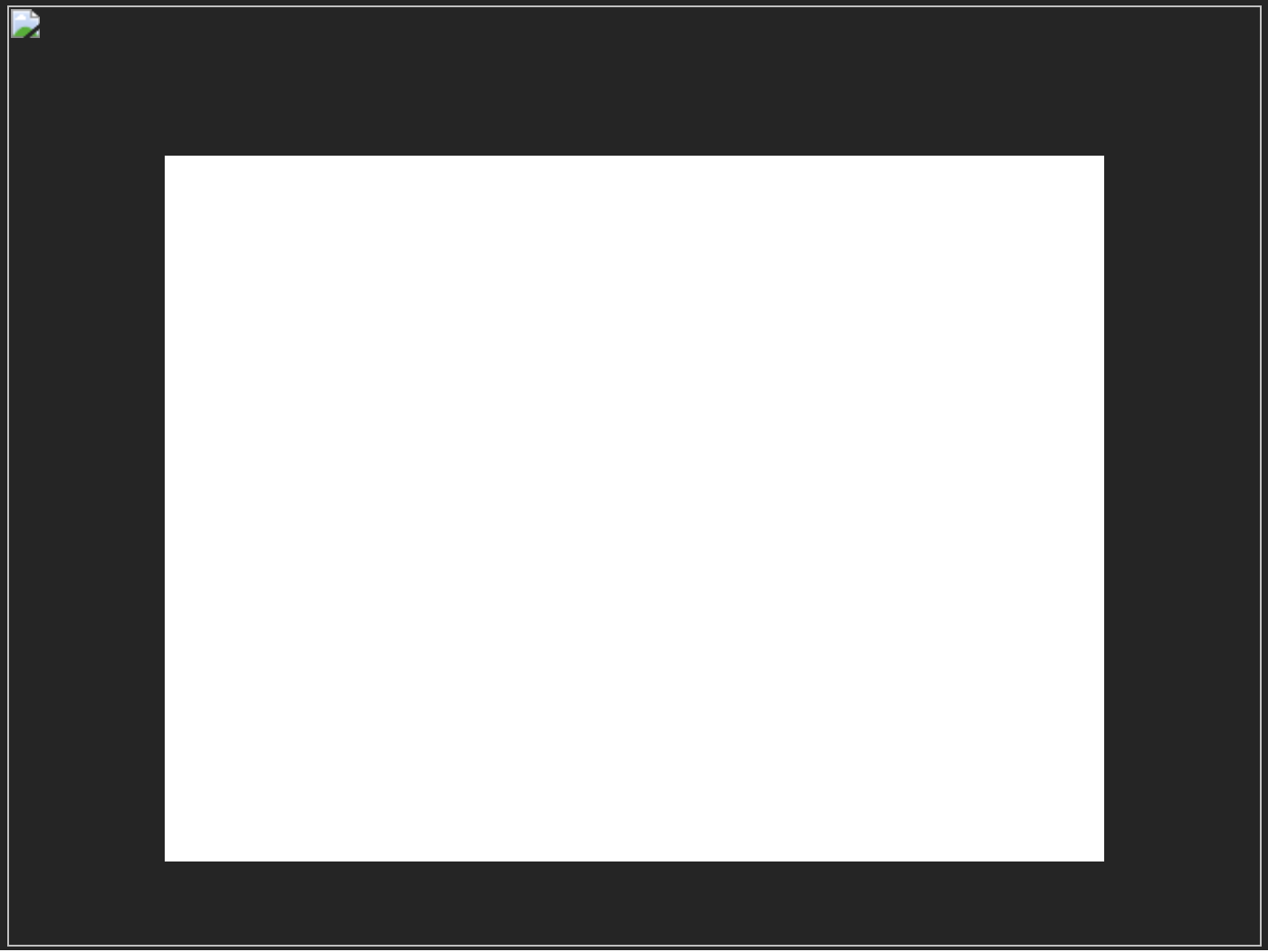

Developer Tools - http://2017.jsday.es/
Elements Memory Console Sources Network Performance Application Security Audits Perf Redux
1.09s 1.66s 1.67s 1.68s 1.72s 1.77s 1.82s 1.85s 1.89s 1.93s 2.00s 2.04s 2.17s 2.20s
View: Preserve log Disable cache Offline No throttling
Filter Regex Hide data URLs All XHR JS CSS Img Media Font Doc WS Manifest Other
Name Time Waterfall
2017.jsday.es
JSDayES 2017
HOME SPEAKERS SCHEDULE WHERE TICKETS ORGANIZERS SPONSORS
12 & 13 May 2017
Madrid
JS DayES
Welcome to JSDayES 2017
BUY TICKET
1.68s
73 / 141 requests | 1.8MB / 4.7MB transferred | Finish: 36.82s | DOMContentLoaded: 1.41s | Load: 5.12s

More kilobytes

can sometimes lead to

improved perceived performance

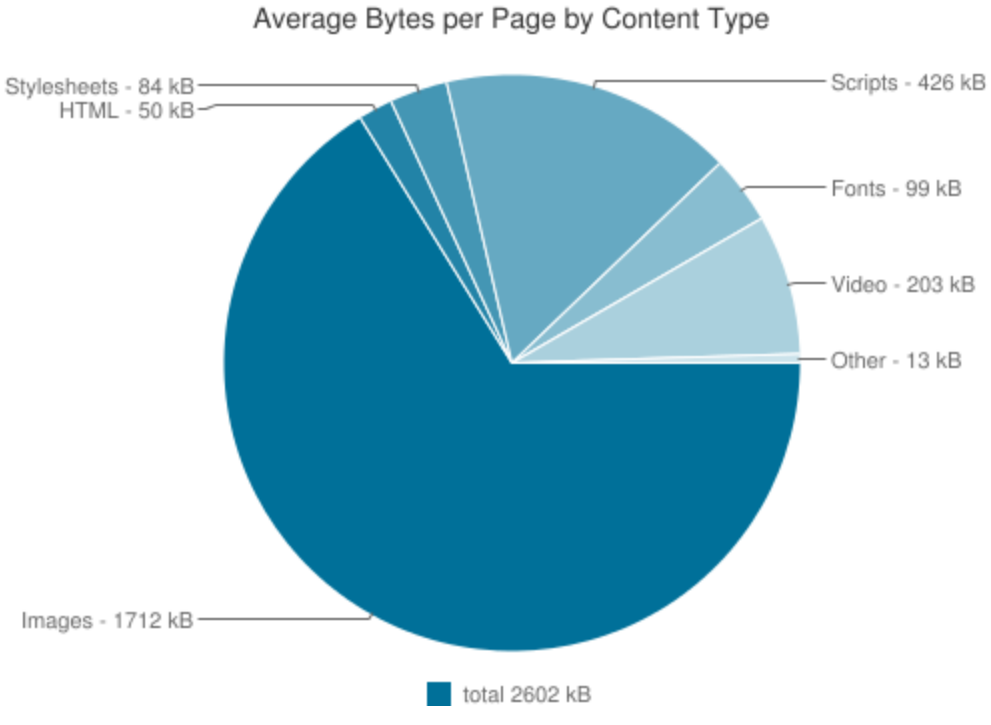
Avoiding this:



Techniques to improve perceived performance

- Server-side rendering
- Critical CSS
- Async JS
- Async fonts

What about images?



images
1712kB (66%)

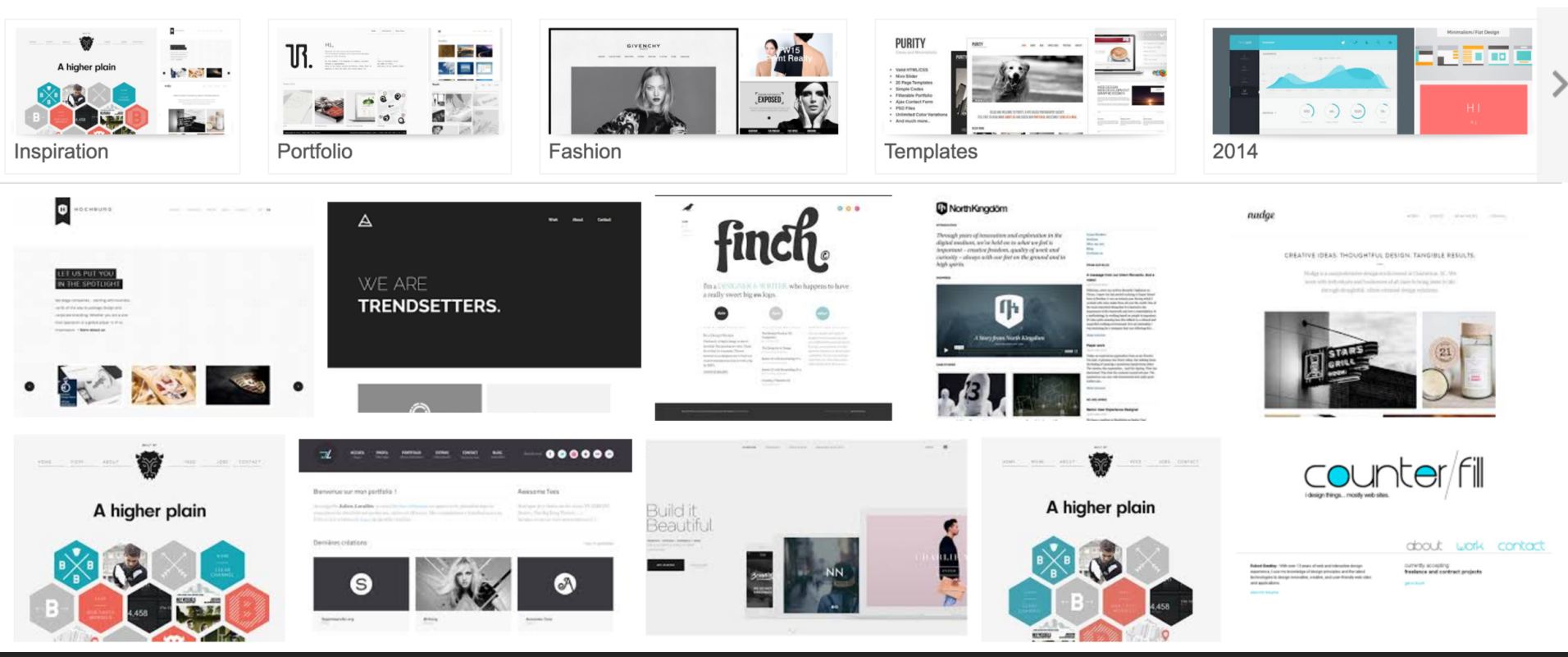
scripts
426kB (16%)

other
464kB (18%)

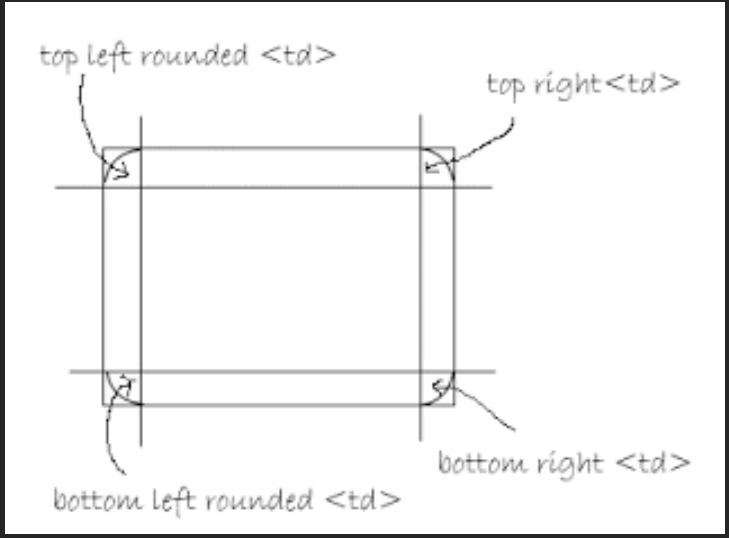
source: http archive 15 apr 2017

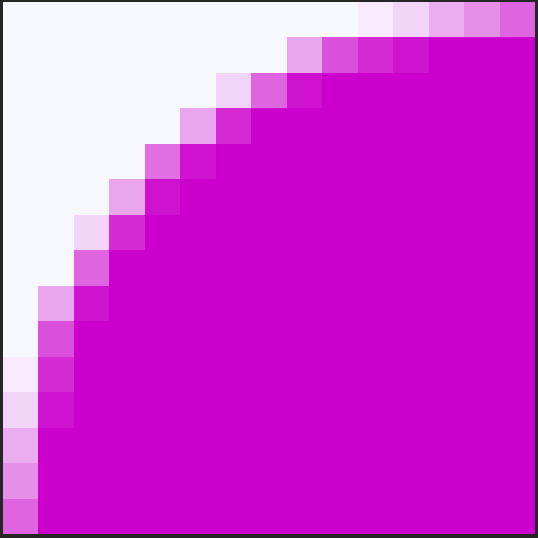
To use or not to use images

Minimalist | Flat Design



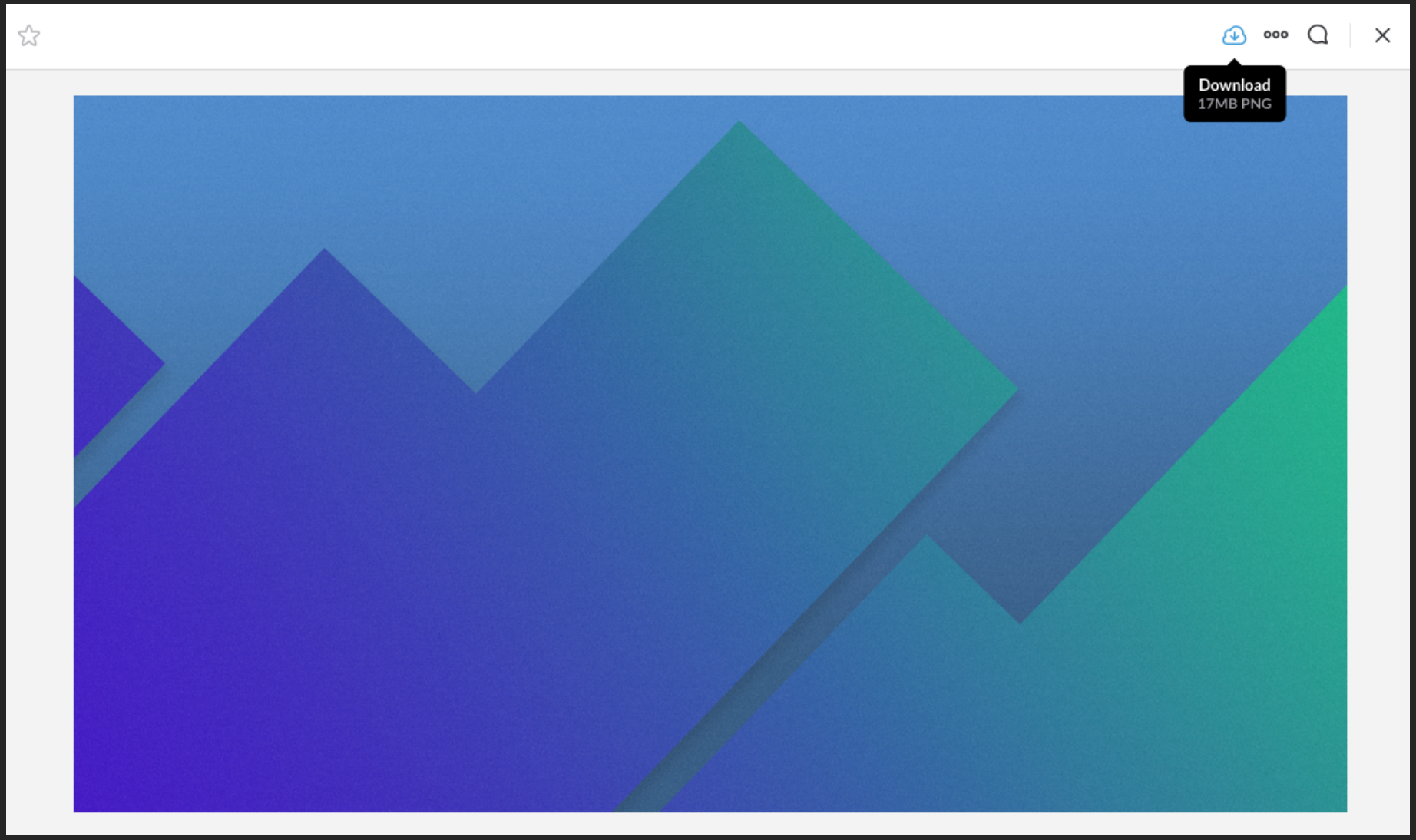
Not that long ago





TIP 1

Optimise your images


Download
17MB PNG

right format

gif | png | jpg | webp | <the_next_thing>

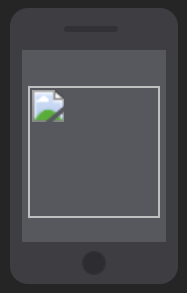
```
<picture>
    <source type="image/webp" srcset="2700x1209/my-image.webp 2700w,
                    1024x1024/my-image.webp 1024w,
                    600x600/my-image.webp 600w"
            sizes="100vw" />
    <source srcset="2700x1209/my-image.jpg 2700w,
                    1024x1024/my-image.jpg 1024w,
                    600x600/my-image.jpg 600w"
            sizes="100vw" />
    <img class="rsImg" src="600x600/my-image.jpg" alt="My beautiful image" />
</picture>
```

compression

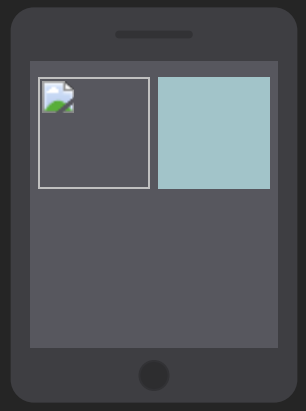
- lossless
- perceptual

TIP 2

Responsive



1 column



2 columns

3 columns

RESPONSIVE IMAGES

Example

```
<img sizes="(max-width: 30em) 100vw,
            (max-width: 50em) 50vw,
            calc(33vw - 100px)"
     srcset="profile-200.jpg 200w,
             profile-400.jpg 400w,
             profile-800.jpg 800w,
             profile-1600.jpg 1600w"
     src="profile-400.jpg" alt="Pinchito">
```

Challenge: Keeping in sync markup and CSS

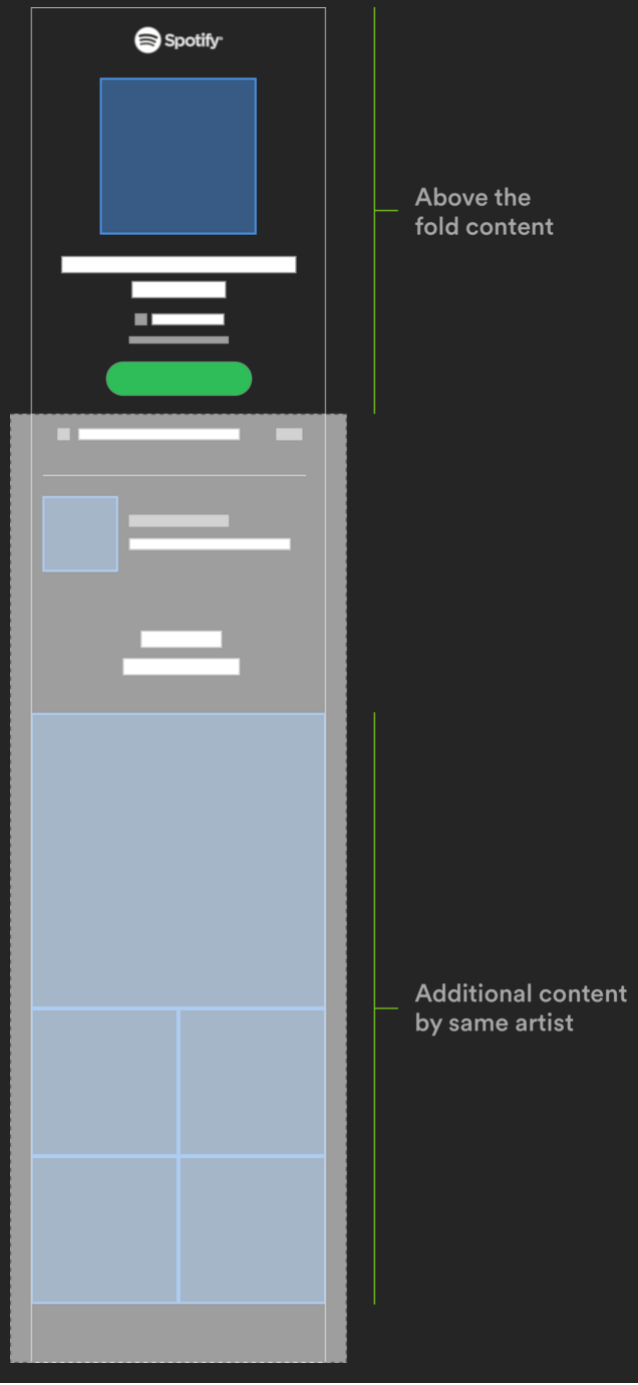
TIP 3

Lazy-load images

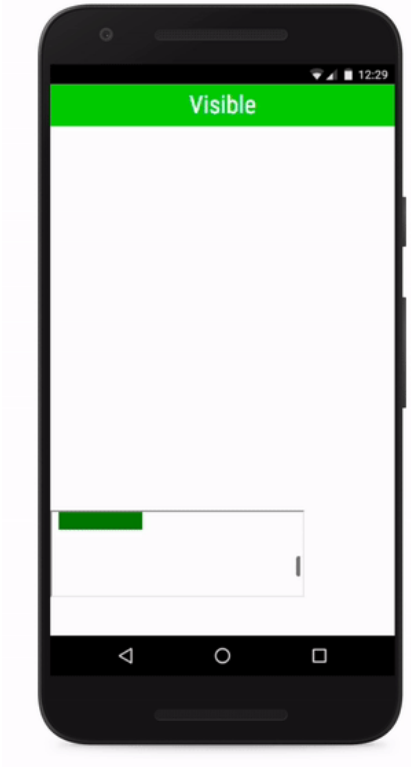
<img> above the fold

&

Lazy below the fold



Intersection Observer



INTERSECTION OBSERVER

Example

```
// load image when it's within 100px of the viewport

const options = {
  rootMargin: '100px'
}

const callback = entries => {
  entries.forEach(entry => {
    if (entry.intersectionRatio > 0) {
        // load image
    }
  });
};

const observer = new IntersectionObserver(callback, options);
observer.observe(document.querySelector('.lazy-img'));
```

INTERSECTION OBSERVER

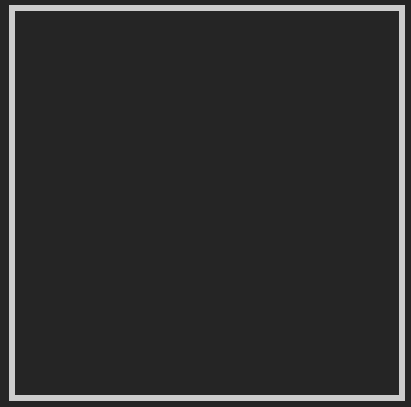
Encapsulating in React

```
class LazyImage extends React.Component {

    constructor() {
        this.observer = new IntersectionObserver(entries => {
            if (entries[0].intersectionRatio > 0) {
                // load!
            }
        });
        this.element = null;  /* render() will set it through a ref */
    }

    componentDidMount() {
        this.observer.observe(this.element);
    }

    componentWillUnmount() {
        this.observer.unobserve(this.element);
    }
    ...
}
```

What to show while the image is loading

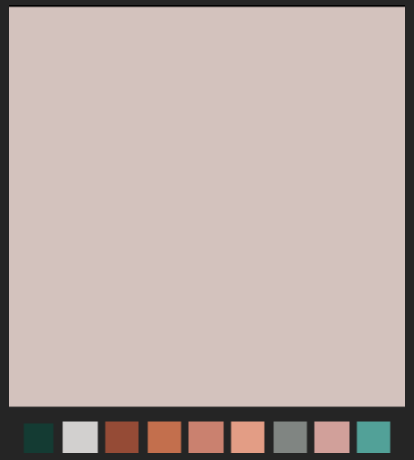
PLACEHOLDERS

Options



Nothing

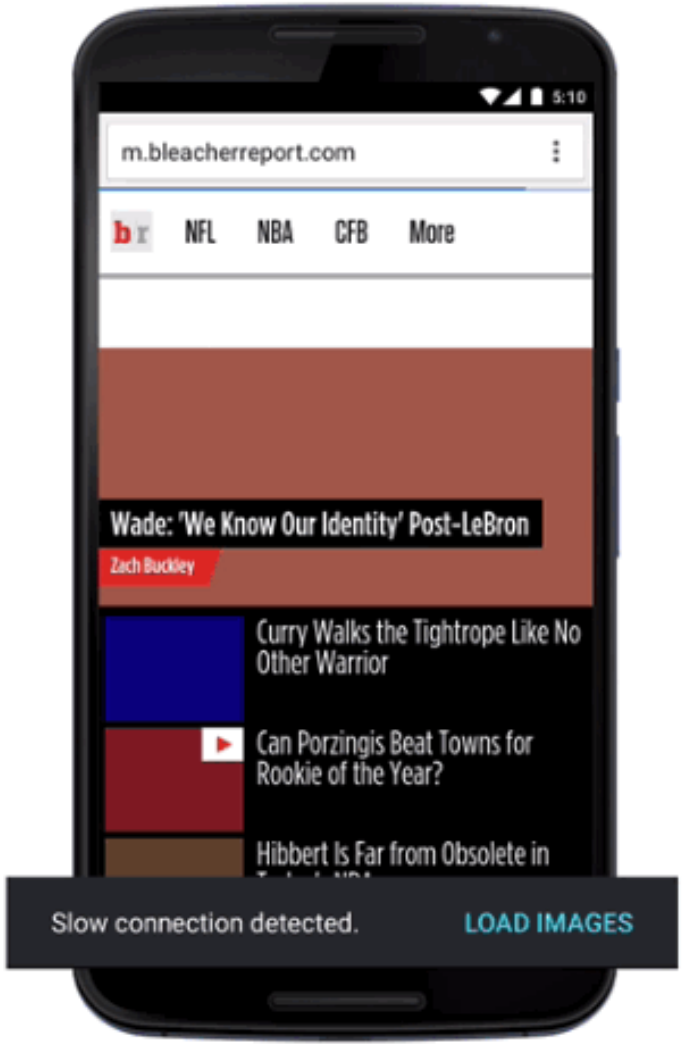
Placeholder

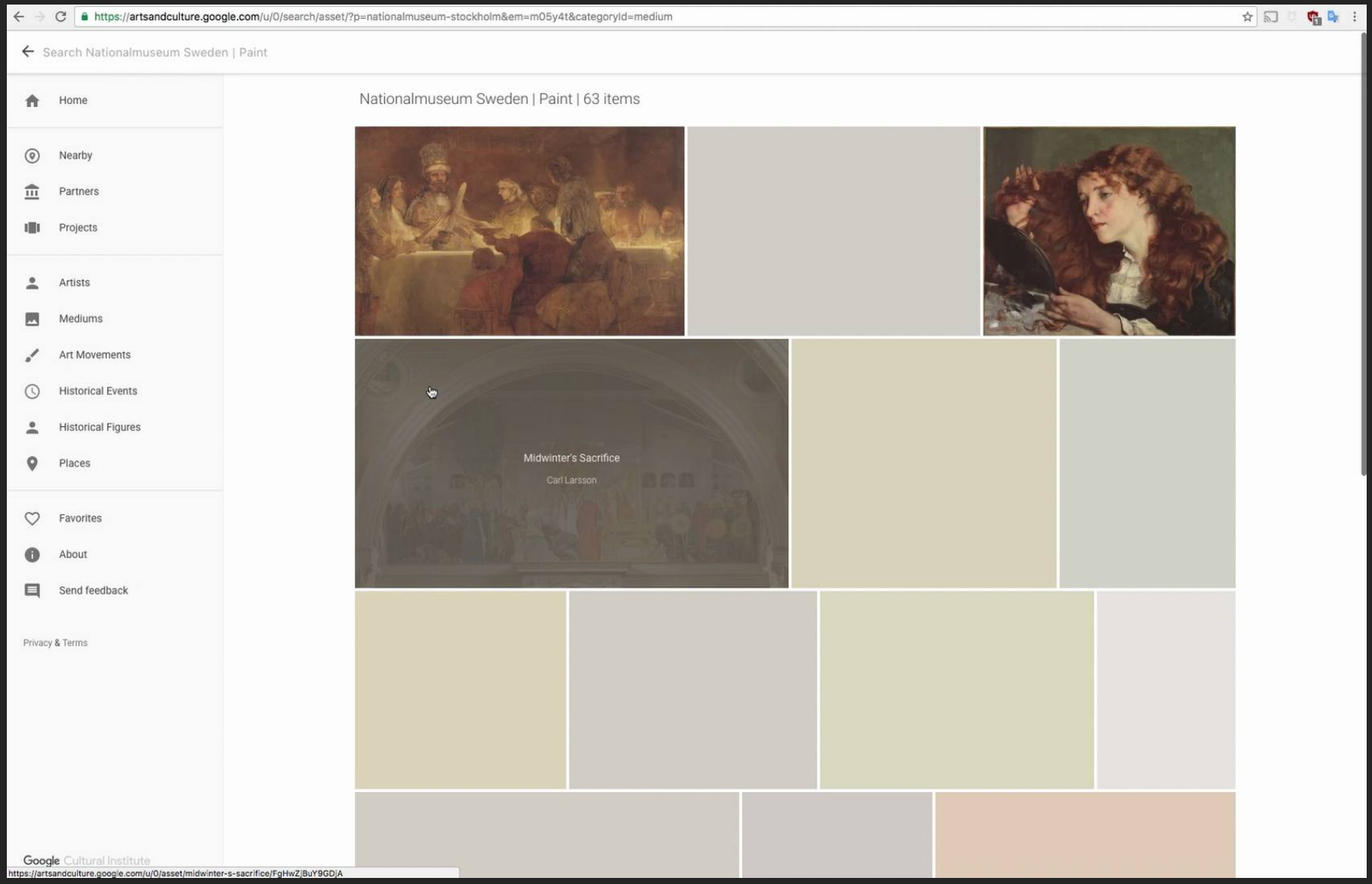


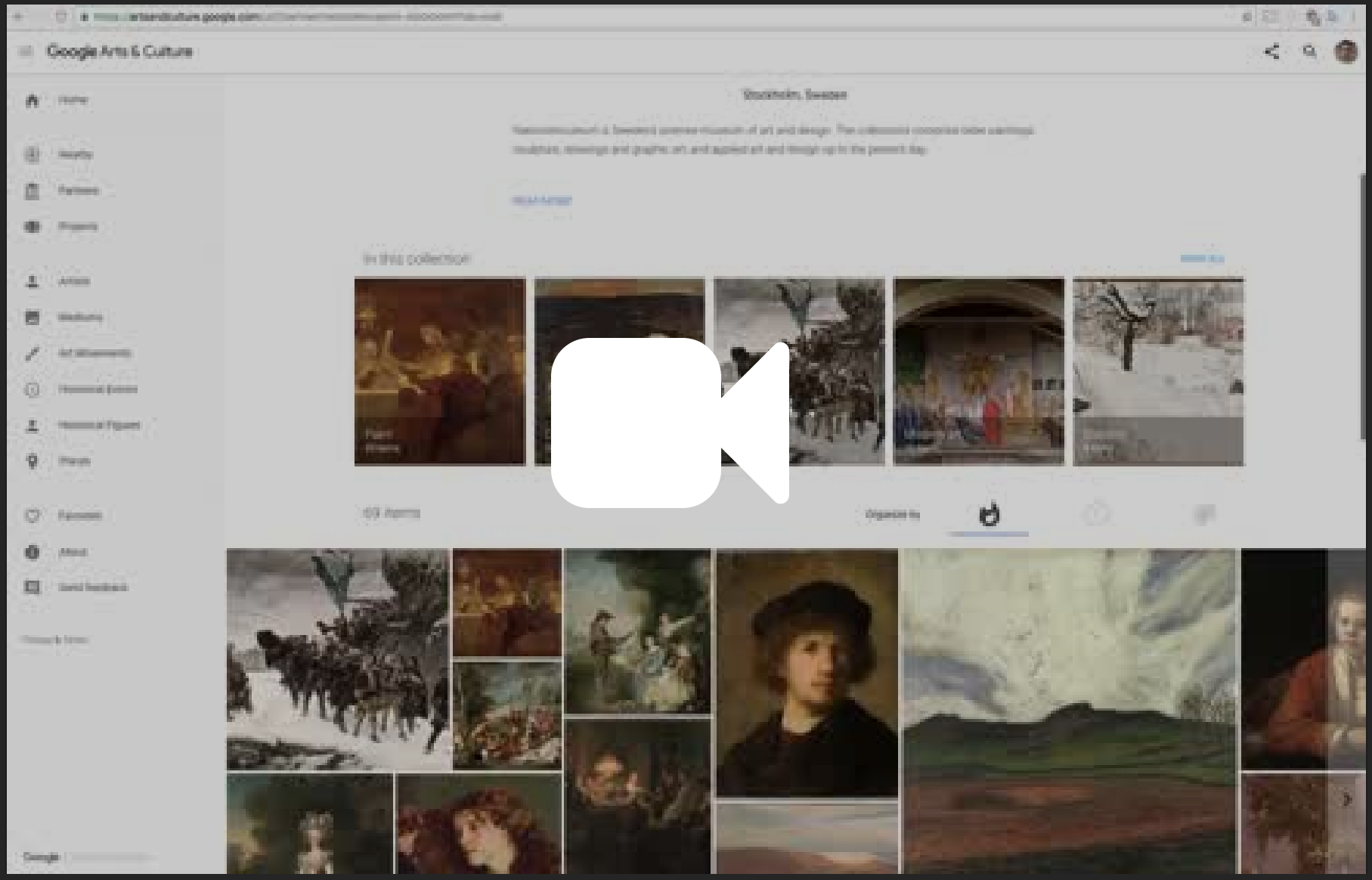
Solid colour

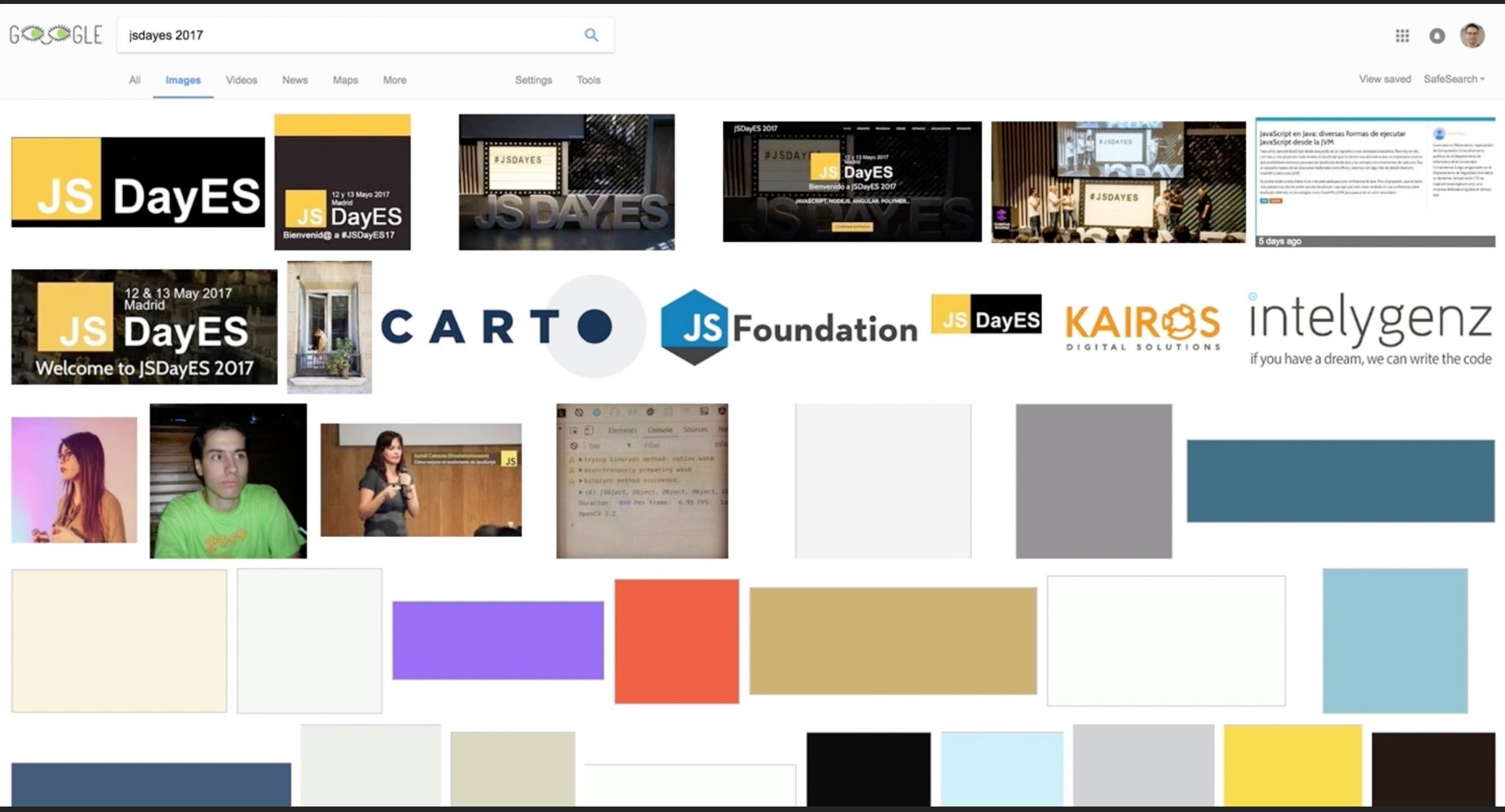
Progressive image loading or "Blur-up"

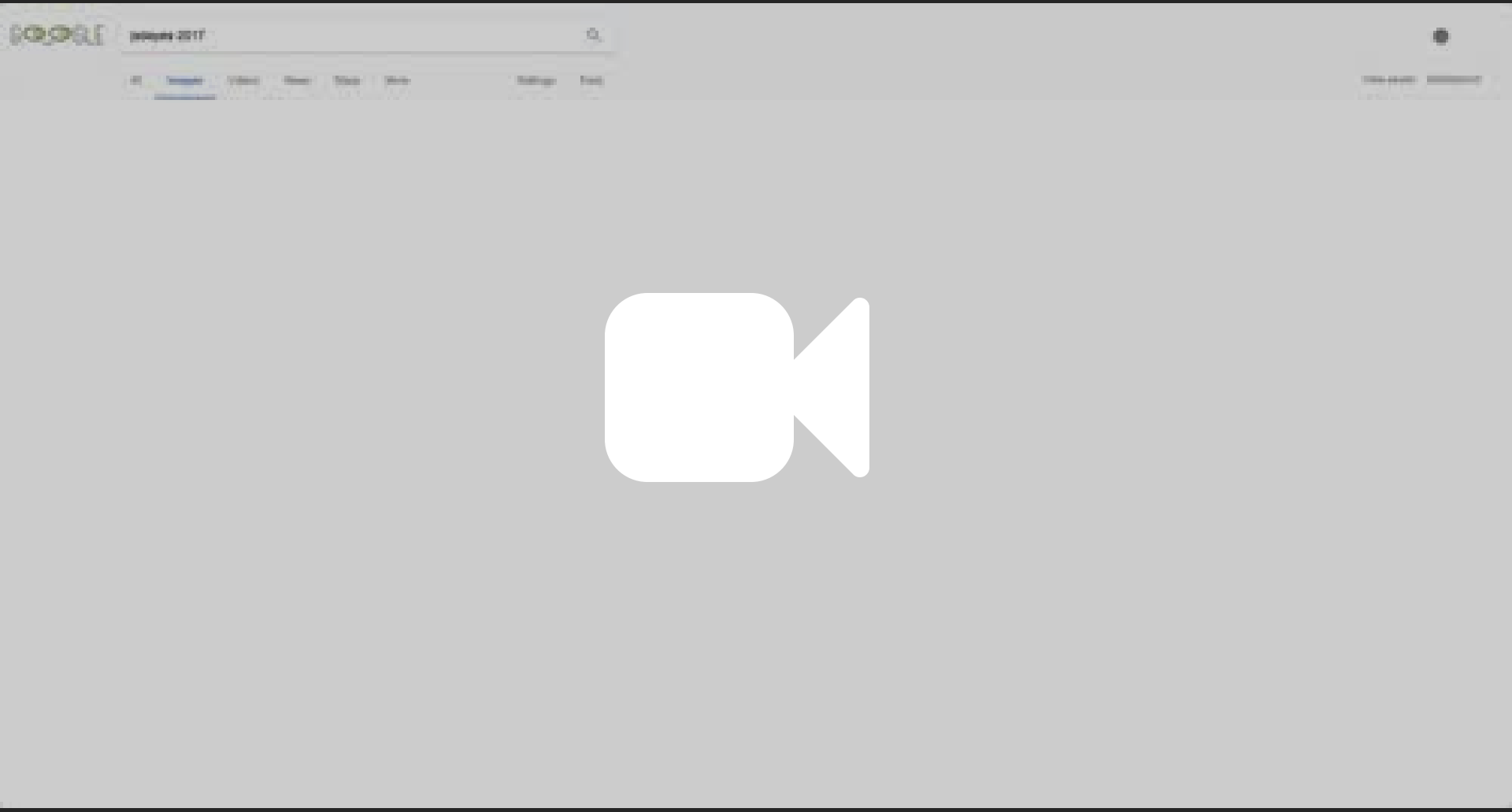
Examples of solid color


5:10
m.bleacherreport.com
NFL
NBA
CFB
More
Wade: 'We Know Our Identity' Post-LeBron
Zach Buckley
Curry Walks the Tightrope Like No Other Warrior
Can Porzingis Beat Towns for Rookie of the Year?
Hibbert Is Far from Obsolete in
Slow connection detected.
LOAD IMAGES


https://artsandculture.google.com/u/0/search/asset/?p=nationalmuseum-stockholm&em=m05y4t&categoryId=medium
Search Nationalmuseum Sweden | Paint
Home
Nearby
Partners
Projects
Artists
Mediums
Art Movements
Historical Events
Historical Figures
Places
Favorites
About
Send feedback
Privacy & Terms
Nationalmuseum Sweden | Paint | 63 items
Midwinter's Sacrifice
Carl Larsson
Google Cultural Institute
https://artsandculture.google.com/u/0/asset/midwinter-s-sacrifice/FgHwZjBuY9GDjA


Google Arts & Culture
Stockholm, Sweden
In this collection

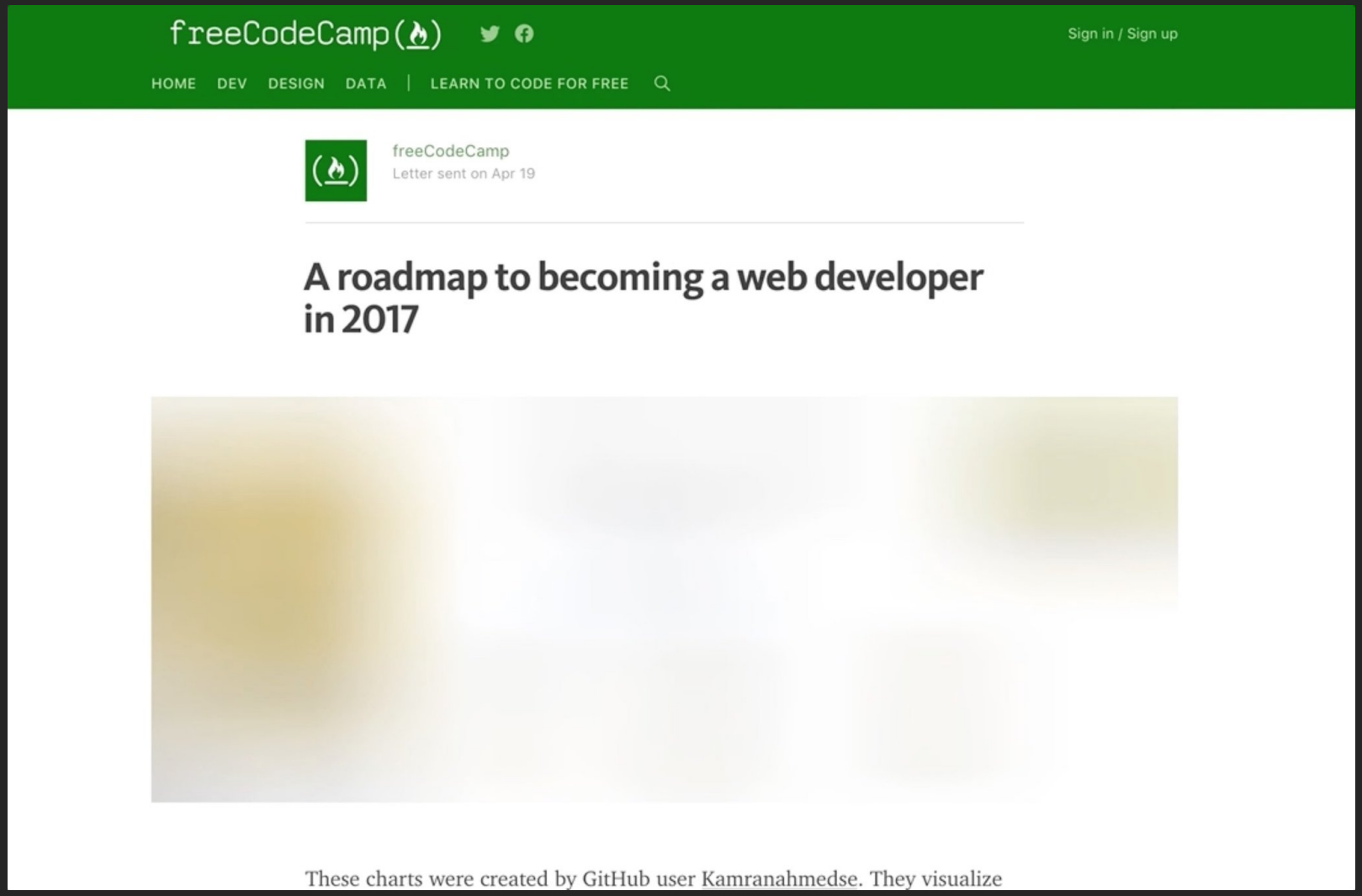

GOOGLE
jsdayes 2017
All
Images
Videos
News
Maps
More
Settings
Tools
View saved
SafeSearch
JS DayES
12 y 13 Mayo 2017
Madrid
JS DayES
Bienvenid@ a #JSDayES17
#JSDAYES
JS DAYES
JSDayES 2017
JS DayES
Bienvenido a JSDayES 2017
JAVASCRIPT, NODEJS, ANGULAR, POLYMER...
#JSDAYES
JavaScript en Java: diversas formas de ejecutar JavaScript desde la JVM
5 days ago
12 & 13 May 2017
Madrid
JS DayES
Welcome to JSDayES 2017
CARTO
JS Foundation
JS DayES
KAIROS
DIGITAL SOLUTIONS
intelygenz
if you have a dream, we can write the code



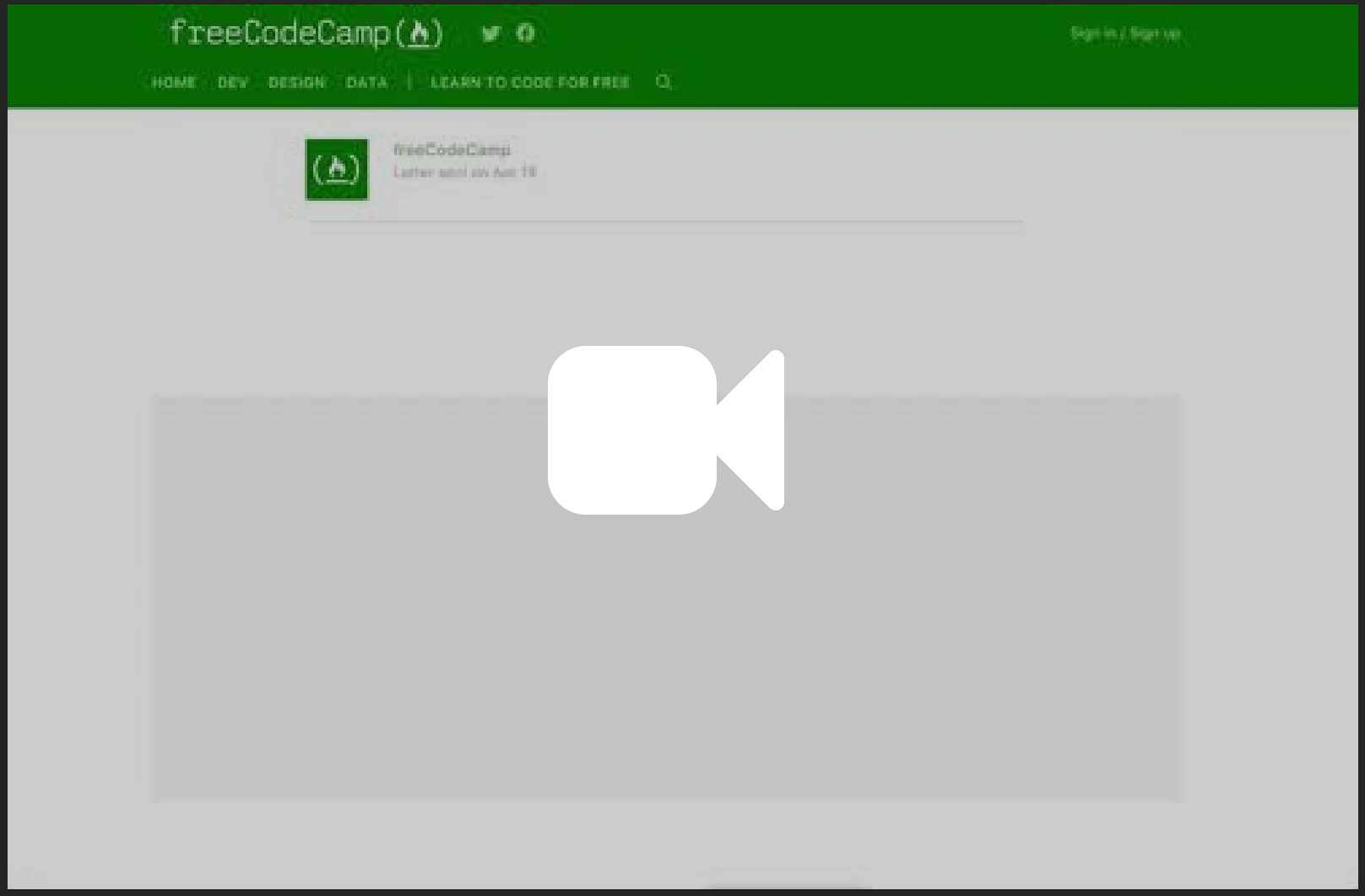
Examples of

Progressive Image Loading

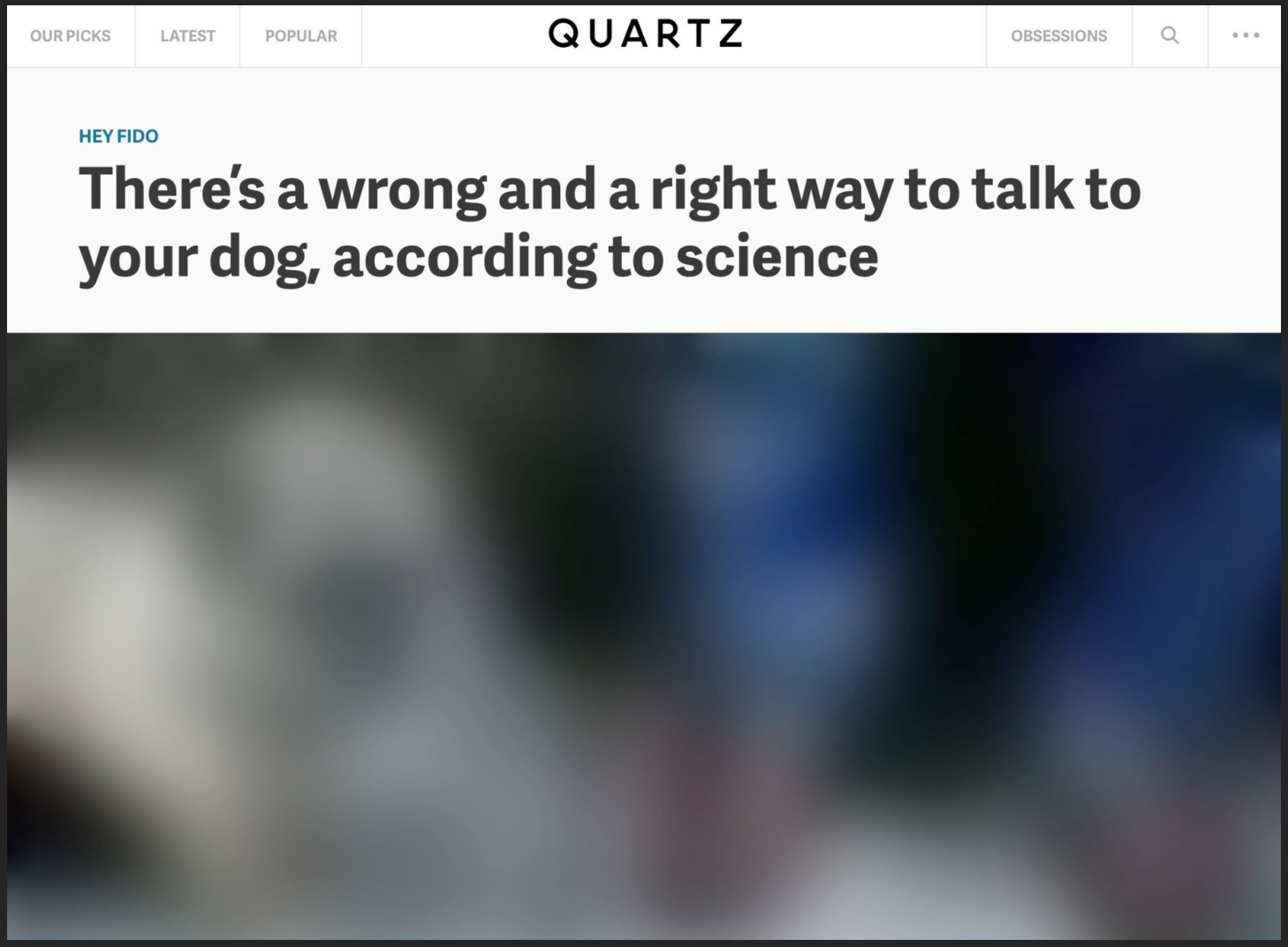
Medium


freeCodeCamp
Sign in / Sign up
HOME DEV DESIGN DATA | LEARN TO CODE FOR FREE
freeCodeCamp
Letter sent on Apr 19
A roadmap to becoming a web developer in 2017
These charts were created by GitHub user Kamranahmedse. They visualize

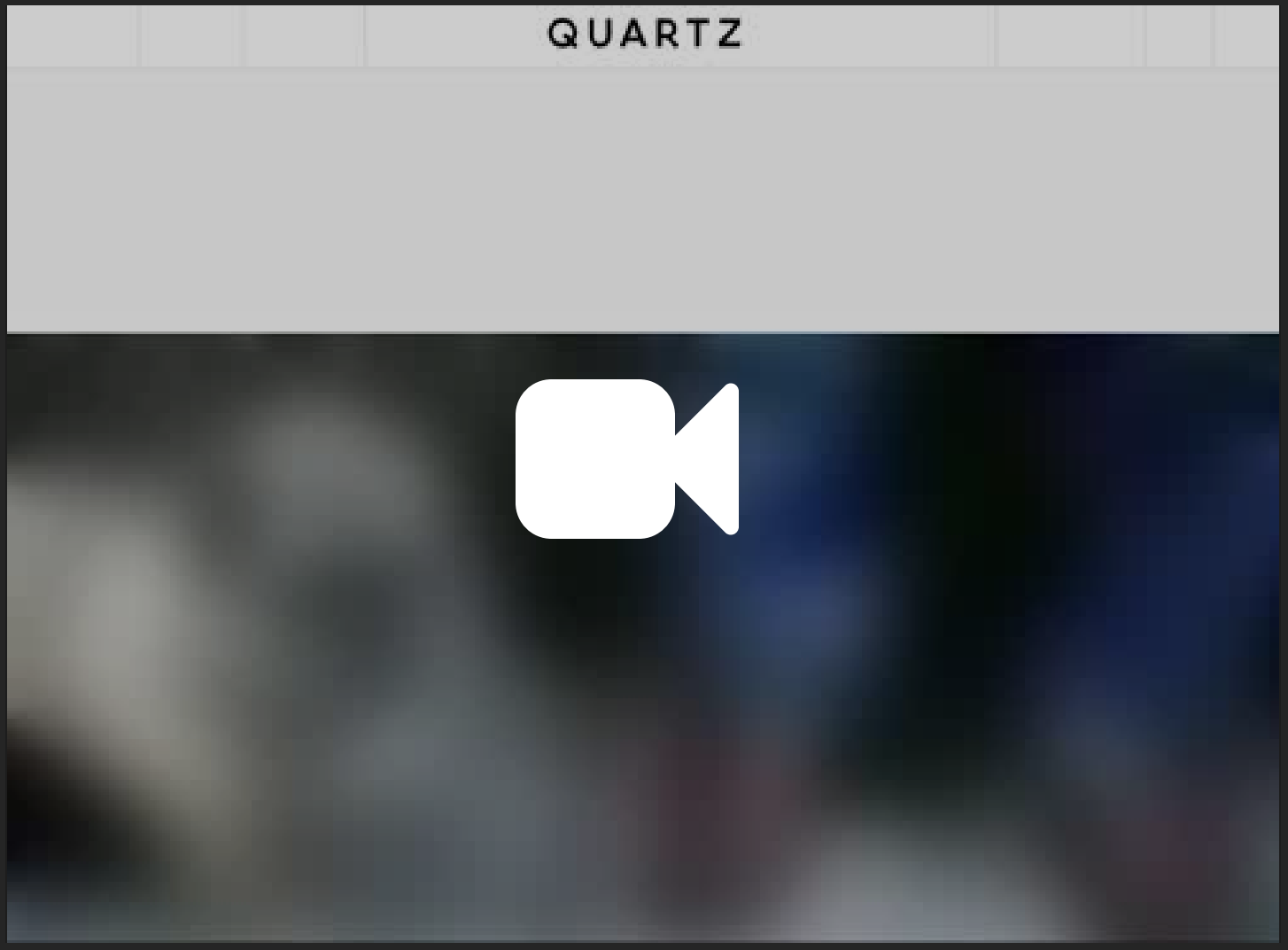
Medium


freeCodeCamp
HOME
DEV
DESIGN
DATA
LEARN TO CODE FOR FREE
freeCodeCamp

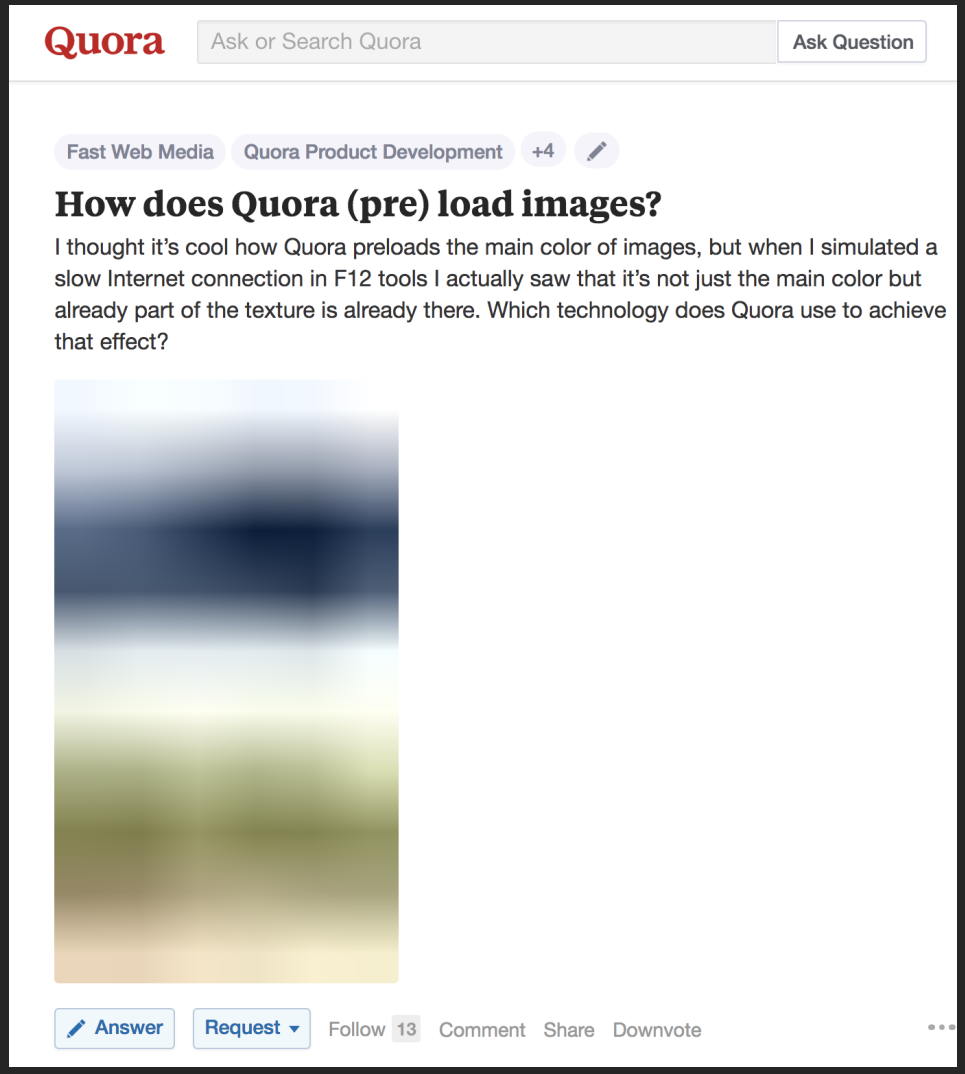
Quartz (qz.com)



Quartz (qz.com)



Quora

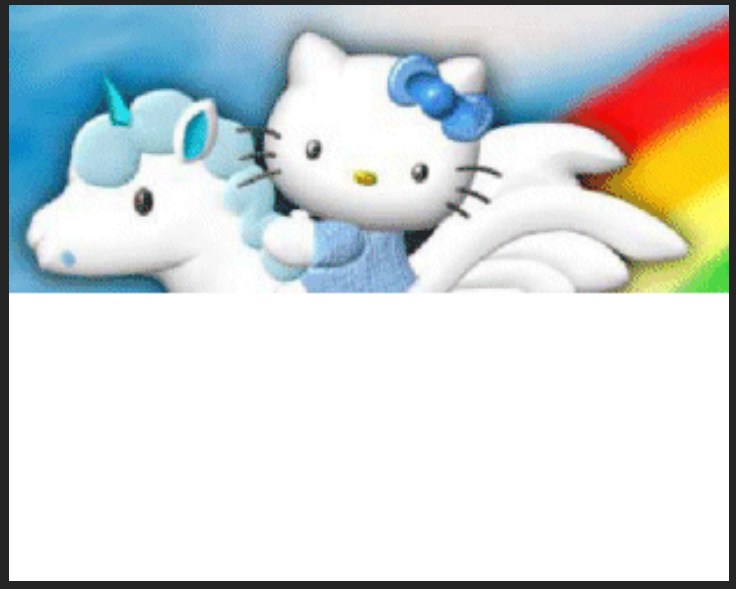

Quora
Ask or Search Quora
Ask Question
Fast Web Media
Quora Product Development
+4
How does Quora (pre) load images?
I thought it's cool how Quora preloads the main color of images, but when I simulated a slow Internet connection in F12 tools I actually saw that it's not just the main color but already part of the texture is already there. Which technology does Quora use to achieve that effect?
Answer
Request
Follow 13
Comment
Share
Downvote

How it is done

Markup - Eg Medium

```
<figure>
  <div>

    <div/> <!-- this div keeps the aspect ratio so
                the placeholder doesn't collapse -->

    <img/> <!-- this is a tiny image with a small
                resolution (e.g. ~27x17) and low quality -->

    <canvas/> <!-- takes the above image and applies a blur filter -->

    <img/> <!-- the large image to be displayed -->

    <noscript/> <!-- fallback for no JS -->

  </div>
</figure>
```

Progressive JPEGs



Baseline

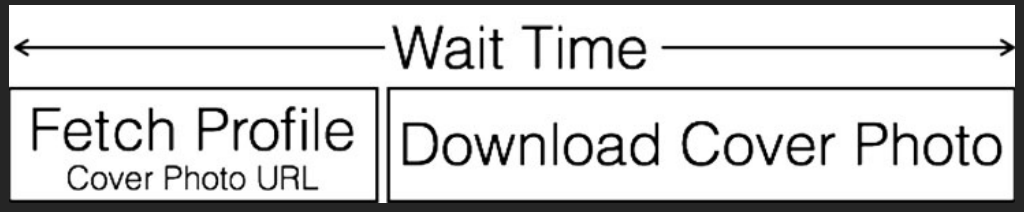
Progressive

Source: https://blog.codinghorror.com/progressive-image-rendering/

> *“ With the Progressive JPEG method [...]* ***cognitive fluency is inhibited and the brain has to work slightly harder to make sense of what is being displayed****.*
>
> *— From Progressive image rendering: Good or evil?*

Facebook

Inlining thumbnail image in payload



Source: https://code.facebook.com/posts/991252547593574/the-technology-behind-preview-photos/

Facebook

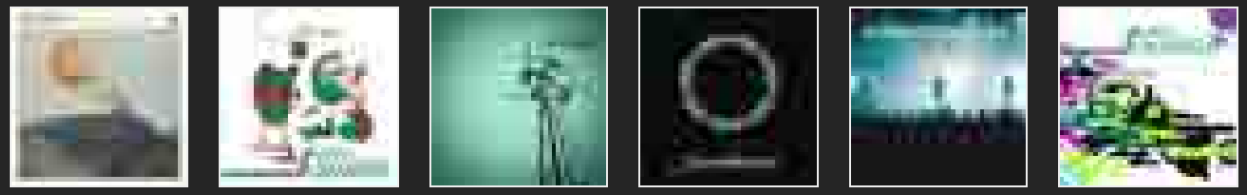
" Unfortunately, the standard JPEG header is hundreds of bytes in size. In fact, ***the JPEG header alone is several times bigger than our entire 200-byte budget****. However, excluding the JPEG header, the encoded data payload itself was approaching our 200 bytes.*

Facebook

Header (Quantization Table and Huffman Table)	Compressed Data
Client (mobile app)	GraphQL

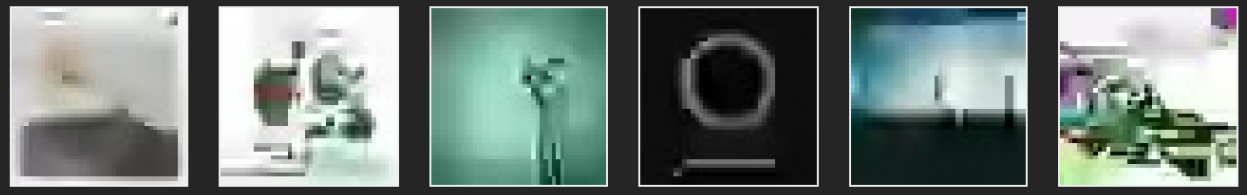
Thumbnails

JPG



464 B 532 B 428 B 409 B 456 B 692 B

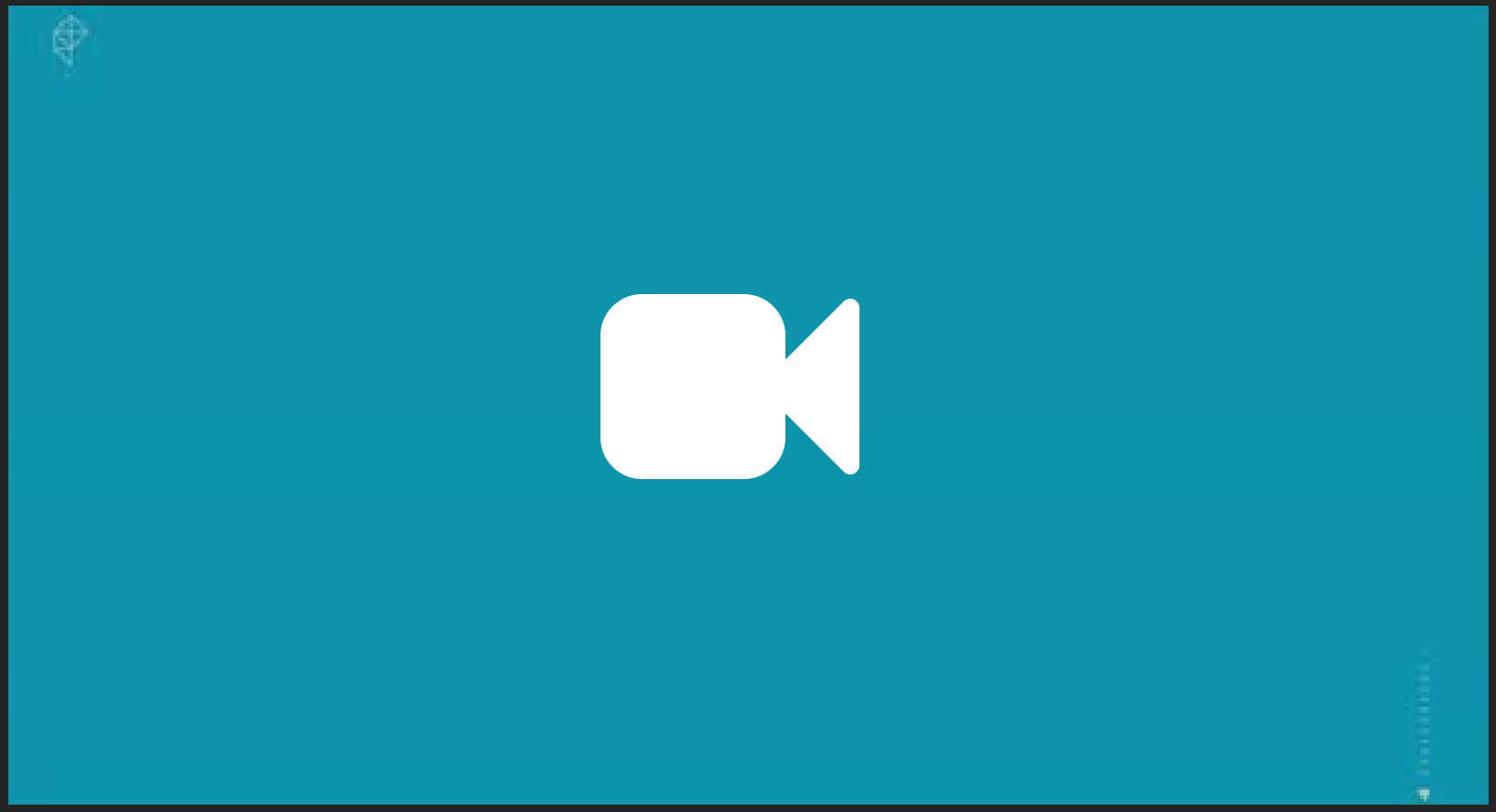
WebP



112 B 154 B 106 B 96 B 116 B 202 B

Getting creative with SVGs

SVG



Source: https://www.polygon.com/a/ps4-review

SVG

Source: https://www.polygon.com/a/xbox-one-review

Drawing with SVG

">//codepen.io/jmperez/embed/rxxRRg/?height=525&theme-id=0&default-tab=js,result&embed-version=2">

Source: https://codepen.io/jmperez/pen/rxxRRg

Drawing bitmap images

Canny Edge Detector

https://jmperezperez.com/renderconf17/ext-slides/contour2/index.html

Source: https://jmperezperez.com/contour/

https://jmperezperez.com/contour/

Source: https://jmperezperez.com/contour/

How to draw bitmaps

1. Find edges with canny edge detector
2. Create lines
3. Use JS and SVG to animate

```
<svg>
  <polyline points="51,1 61,1 61,2 56,4 56,3"/>
  <polyline points="52,1 50,2 51,3 50,4 50,9 46,10 46,8 48,8 48,9"/>
  <polyline points="61,4 61,5 58,6"/>
  ...
  <polyline points="62,58 61,59 61,60 50,62 50,61 51,61"/>
</svg>
```

Should we do this?

Just because you can it doesn't mean you should

Summary

- Reduce requests
- Choose the right format and optimise
- Embrace responsive images
- Try to lazy load
- Innovate!

The Web is fun.

spotify.com/jobs

talk with me for more info

Thanks!

@jmperezperez