

BOOSTING FRONT-END PERFORMANCE



@DeclanRek

HTTP/1.1





<https://www.w3.org/History/19921103-hypertext/hypertext/WWW/TheProject.html>

World Wide Web

The WorldWideWeb (W3) is a wide-area [hypermedia](#) information retrieval initiative aiming to give universal access to a large universe of documents.

Everything there is online about W3 is linked directly or indirectly to this document, including an [executive summary](#) of the project, [Mailing lists](#), [Policy](#), November's [W3 news](#), [Frequently Asked Questions](#).

[What's out there?](#)
Pointers to the world's online information, [subjects](#), [W3 servers](#), etc.

[Help](#)
on the browser you are using

[Software Products](#)
A list of W3 project components and their current state. (e.g. [Line Mode](#), [X11 Viola](#), [NeXTStep](#), [Servers](#), [Tools](#), [Mail robot](#), [Library](#))

[Technical](#)
Details of protocols, formats, program internals etc

[Bibliography](#)
Paper documentation on W3 and references.

[People](#)
A list of some people involved in the project.

[History](#)
A summary of the history of the project.

[How can I help ?](#)
If you would like to support the web..

[Getting code](#)
Getting the code by [anonymous FTP](#), etc.

Network tab in developer tools showing a single request to "TheProject.html" taking 746ms. The request bar is mostly green, with a small orange segment between 300ms and 400ms. The response table shows the following data:

Name	Method	Status	Type	Initiator	Size
TheProject.html	GET	200	document	Other	2

OLX.PT OF BELGIUM

www.2dehands.be

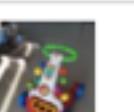
2dehands.be

Kies categorie ▾

Uw zoekopdracht

Zoek Geavanceerd

Nieuwste zoekertjes

-  muziek en activiteitenspel € 15,00
-  17" originele Mini originele 17" Mini € 350,00
-  mooie jurken goede staat € 8,00
-  speciaal kleedje "Blathine" € 40,00
-  Fisher Price loopwagentje € 13,00

Toon meer >

Populairste zoekertjes

-  spoon ek k20 240-260pk!!! € 15.000,00
-  golf 120vt Prijs o.t.k.
-  bmw e38 725tds 1998 € 3.500,00

Heeft u zelf spullen die u niet meer gebruikt? Zet ze op 2dehands.be, de grootste zoekertjessite van België!

Plaats gratis zoekertje

Keuk...
Kind...
Kledi...

yelloh! Onze campingdorpen voor een droomvakantie! [Ik wens meer te weten >](#)

Network Timeline Profiles Resources Security Audits Pa

View: Preset: Preserve log Disable cache No throttling

Filter Hide data URLs All XHR JS CSS Img Media Font Doc WS Other

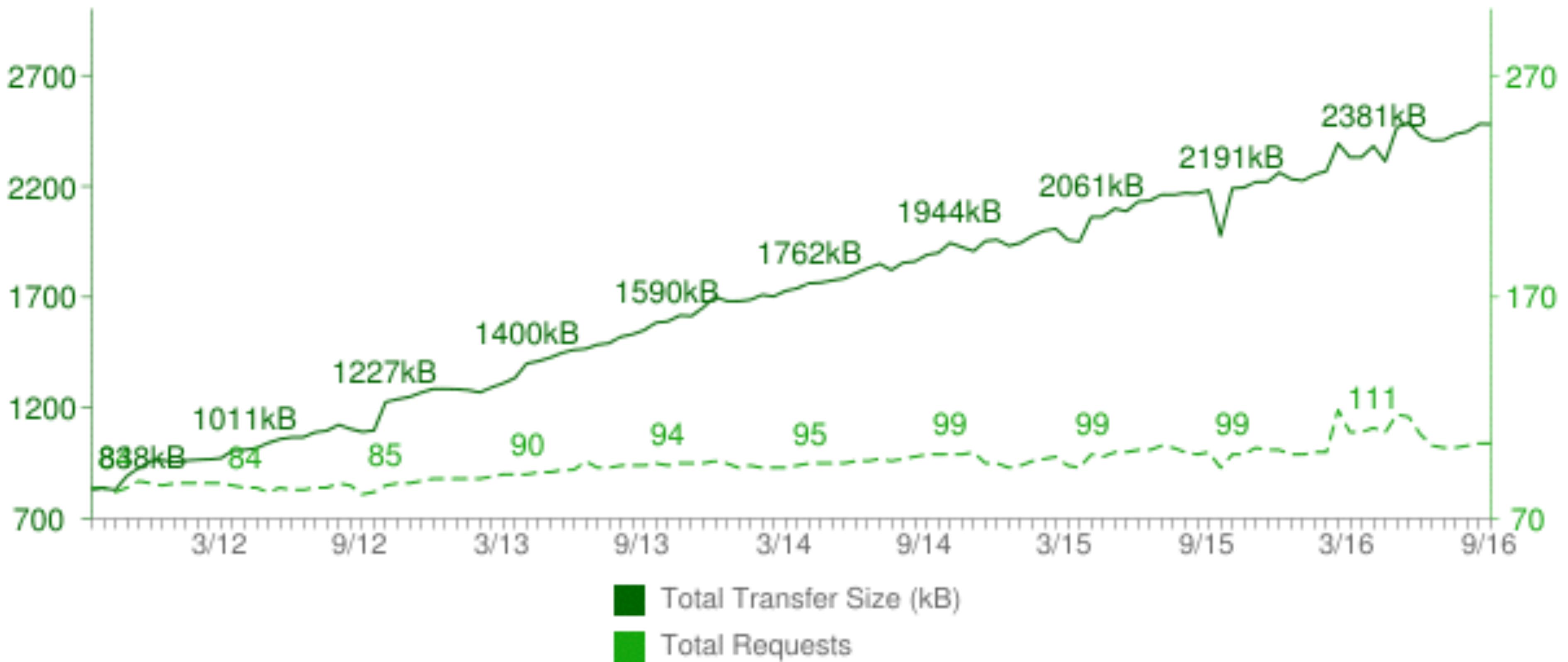
162 ms 482 ms 507 ms 524 ms 540 ms 547 ms 573 ms 590 ms 608 ms 614 ms 640 ms 658 ms 66

500 ms 1000 ms 1500 ms 2000 ms 2500 ms 3000 ms

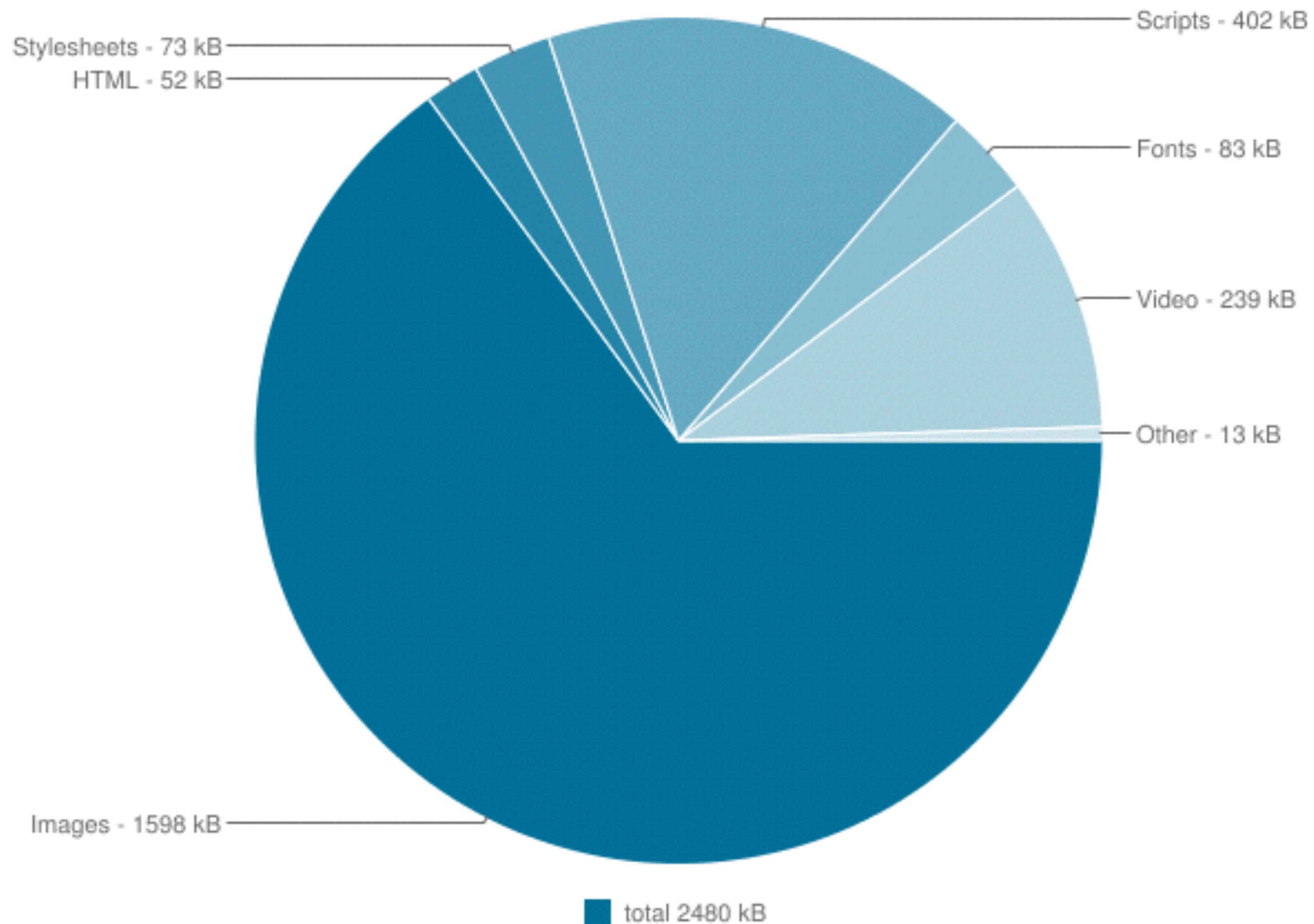
Name	Method	Status	Type	Initiator	Size	Time	Timeline
cm.ashx/au_id=331304590215445&...	GET	(failed)		https://x.bids...	0 B	1/b...	
Banniere_728x90_NL_edge.js	GET	200	text/javascript	Other	1.2 KB	11 ms	
pixel?google_ula=1293153&google_...	GET	200	png	https://pixel-...	201 B	19 ms	
Banniere_728x90_NL_edge.js	GET	200	script	edge.6.0.mi...	1.2 KB	11 ms	
visuel_728x90.jpg	GET	200	jpeg	Other	55.3 KB	19 ms	
logo_yelloh.png	GET	200	png	Other	9.7 KB	19 ms	
box_19_top-right.png	GET	200	png	Other	409 B	8 ms	
ci.png	GET	200	png	Other	881 B	9 ms	
pixel.gif?v=d803588_1&ttid=2&d=w...	GET	204	text/plain	Other	51 B	100...	
ping?client_id=117942688263049&...	GET	302	text/html	sdk.js:55	266 B	162...	
page.php?adapt_container_width=fal...	GET	307		sdk.js:80	0 B	18 ms	
page.php?adapt_container_width=fal...	GET	200	document	http://www.fa...	16.5 KB	218...	
hbe.swf?id=1~0	GET	200	x-shockwave-f...	Other	12.7 KB	11 ms	
xd_arbiter.php?version=42	GET	200	document	https://www.f...	34.5 KB	248...	
spKfcJYjaQ.css	GET	200	stylesheet	page.php?ada...	5.1 KB	126...	
Pa4LYC3smxF.js	GET	200	script	page.php?ada...	29.8 KB	130...	
YvxwM8R7o18.js	GET	200	script	page.php?ada...	44.4 KB	251...	
ihptErjAmMX.js	GET	200	script	page.php?ada...	16.3 KB	248...	
12592433_10153896116212179_79...	GET	200	jpeg	page.php?ada...	1.6 KB	134...	
189382_101519293340901_395547...	GET	200	jpeg	page.php?ada...	1.6 KB	135...	
10171691_1132110050147182_261...	GET	200	jpeg	page.php?ada...	1.8 KB	136...	
10421236_1297157350310920_219...	GET	200	jpeg	page.php?ada...	1.3 KB	136...	
10313345_867713813257275_3146...	GET	200	jpeg	page.php?ada...	1.7 KB	136...	
wL6VQj7Ab77.png	GET	200	png	page.php?ada...	1.3 KB	124...	
s7jcwEQH7Sx.png	GET	200	png	page.php?ada...	601 B	126...	
cUDgRFxaolk.js	GET	200	script	Pa4LYC3smxF...	643 B	122...	
OJBr1QHp8Gi.js	GET	200	script	Pa4LYC3smxF...	669 B	254...	
kDOzhTr2W91.js	GET	200	script	Pa4LYC3smxF...	421 B	121...	
activeview?avi=BuTZ4-93qVvhE5PY...	GET	200	gif	Other	470 B	21 ms	
activeview?avi=BSuQn_N3qVvbADY7...	GET	200	gif	Other	470 B	20 ms	

148 requests | 1.3 MB transferred | Finish: 3.90 s | DOMContentLoaded: 481 ms | Load: 2.92 s

Total Transfer Size & Total Requests



Average Bytes per Page by Content Type



PERFORMANCE MATTERS



HIGH EXPECTATIONS

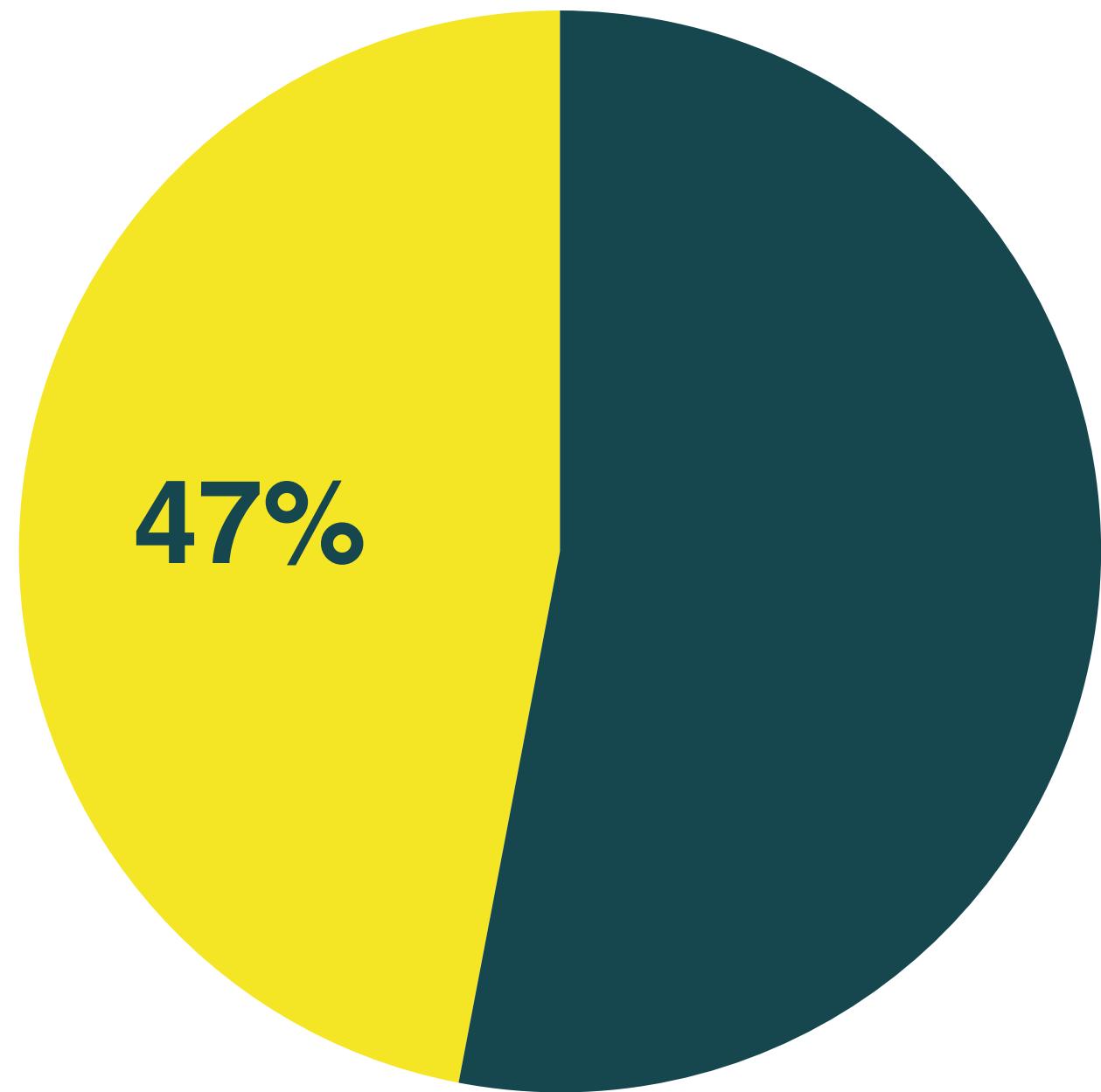
1 second delay in page load

↓ -7% conversion

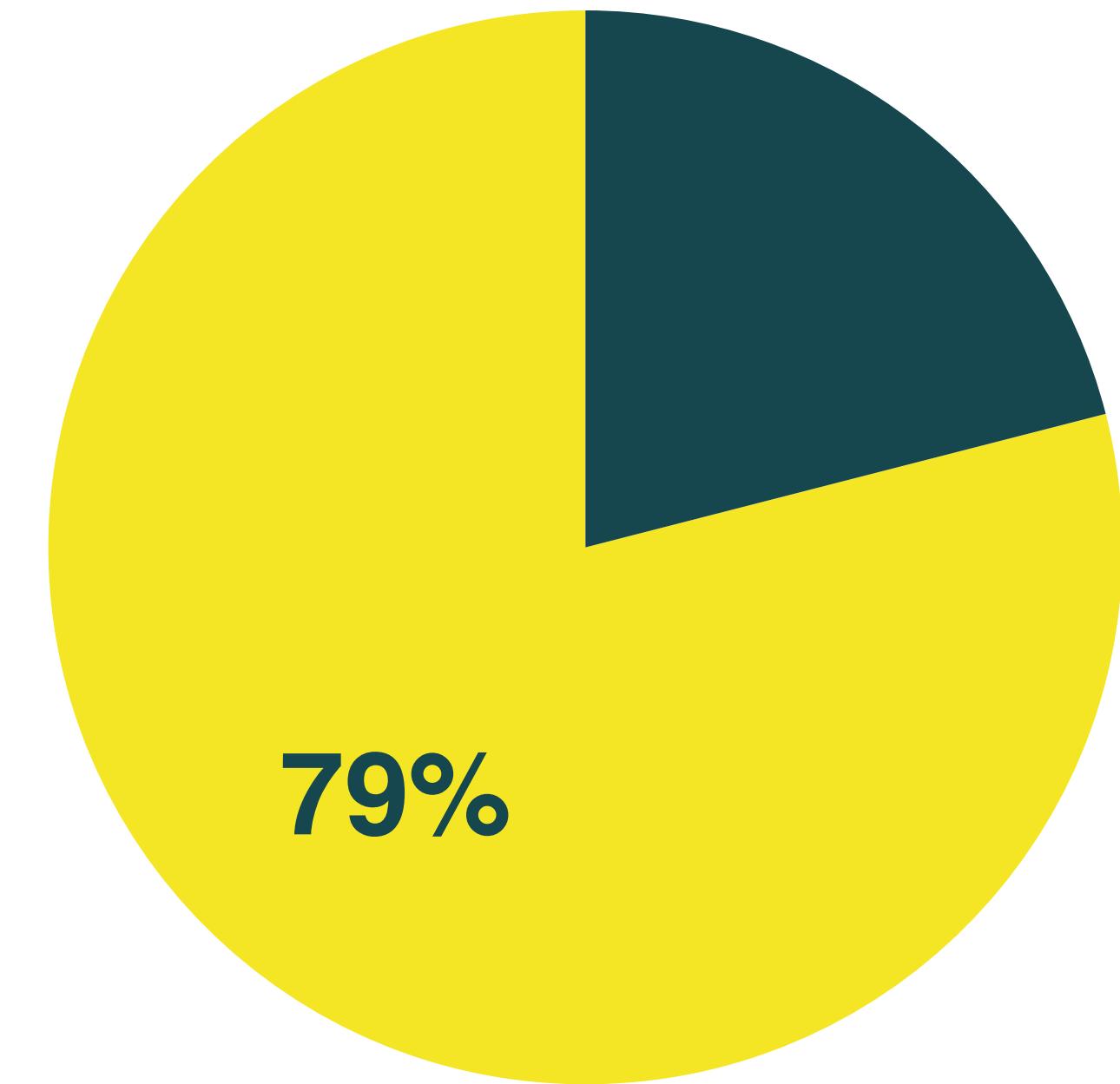
↓ -11% page views

↓ -16% satisfaction

HIGH EXPECTATIONS



47% of consumers expect a webpage to load within 2 seconds



79% of online shoppers will not return to a website after a disappointing experience due to poor performance

Fast websites have more visitors, who visit more pages, for longer period of times, who come back more often, and are more likely to buy

Perceived performance refers
to how fast a user thinks your
website is

Initial Content

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut tristique egestas ornare. Cras et quam sed risus fringilla tempus. Aenean in mauris enim. Cras et tempus est. Donec eros dui, commodo vel volutpat non, tempus et mi. Nam ac rutrum mi. Vestibulum luctus mauris eu pulvinar dapibus.

Aliquam viverra nunc non augue cursus faucibus. Donec mollis, dui at imperdiet varius, tellus tellus ultricies leo, sed consectetur nisl eros non orci. Ut augue lacus, placerat eget posuere ut, tincidunt ut dui.

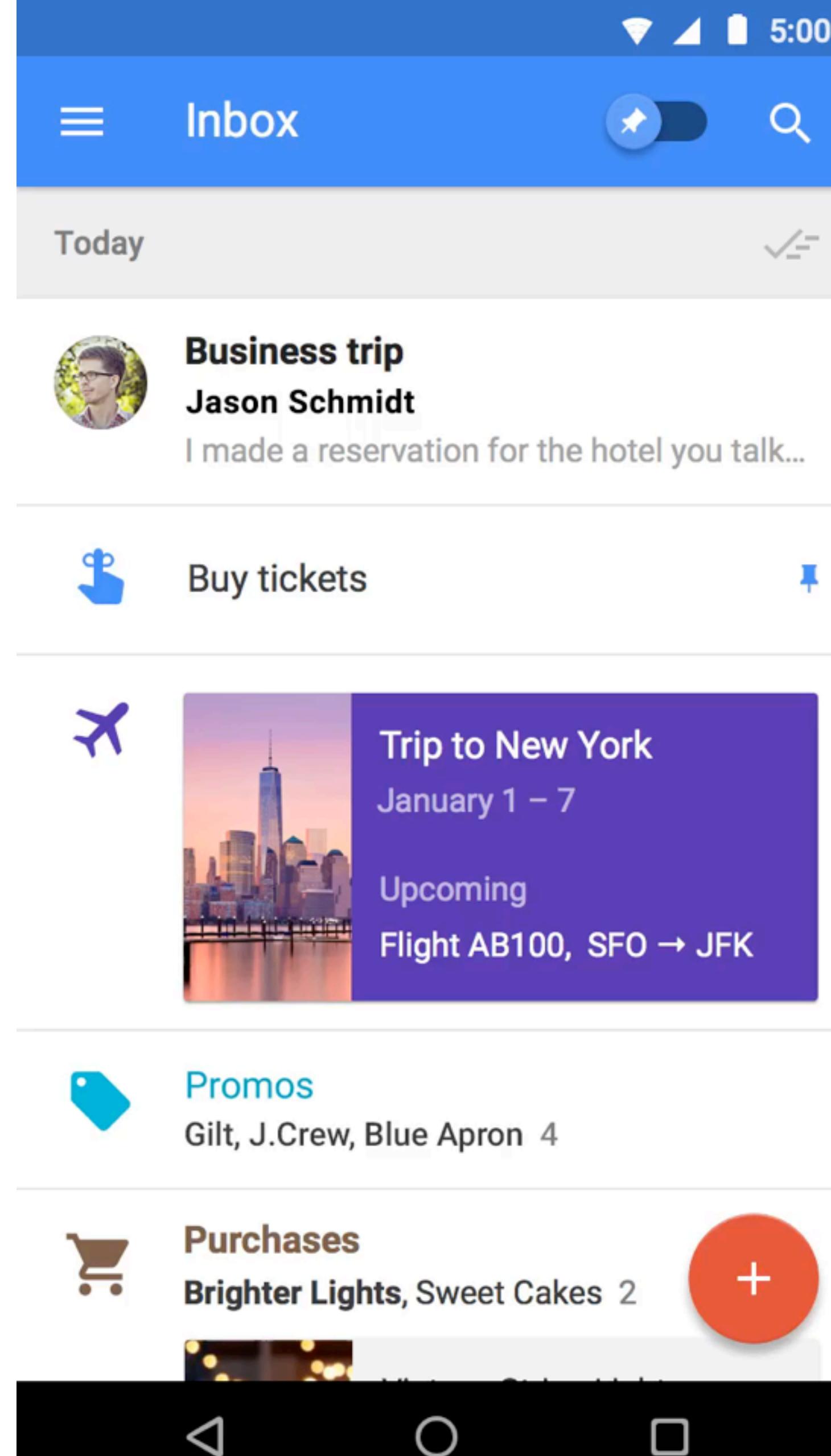
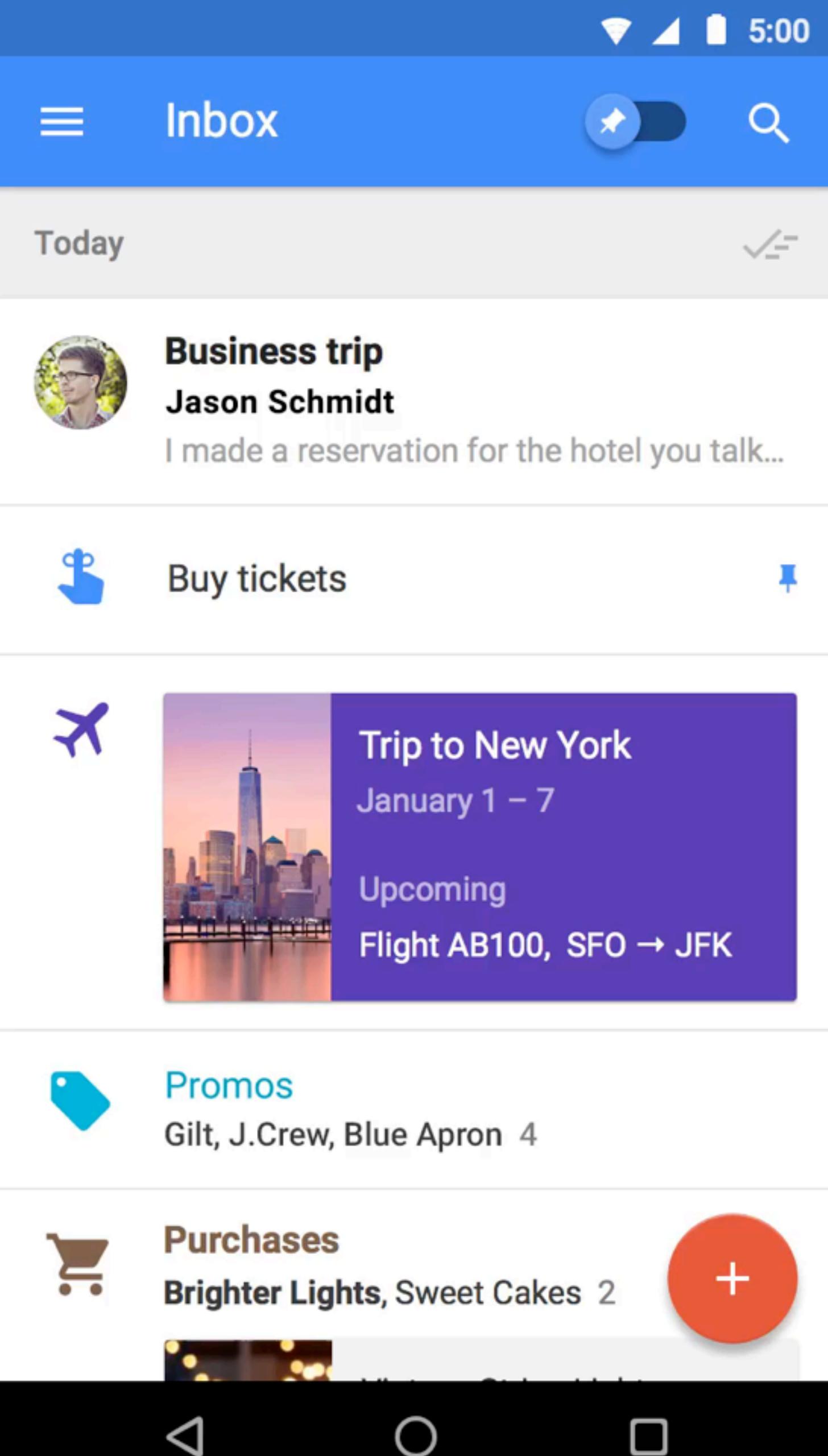
Aenean in mauris enim. Cras et tempus est. Donec eros dui.

Initial Content

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut tristique egestas ornare. Cras et quam sed risus fringilla tempus. Aenean in mauris enim. Cras et tempus est. Donec eros dui, commodo vel volutpat non, tempus et mi. Nam ac rutrum mi. Vestibulum luctus mauris eu pulvinar dapibus.

Aliquam viverra nunc non augue cursus faucibus. Donec mollis, dui at imperdiet varius, tellus tellus ultricies leo, sed consectetur nisl eros non orci. Ut augue lacus, placerat eget posuere ut, tincidunt ut dui.

Aenean in mauris enim. Cras et tempus est. Donec eros dui.



Motion material

HOW FAST IS FAST ENOUGH?

100ms = Instantaneous

1 second = Uninterrupted flow

DESIGN FOR PERFORMANCE



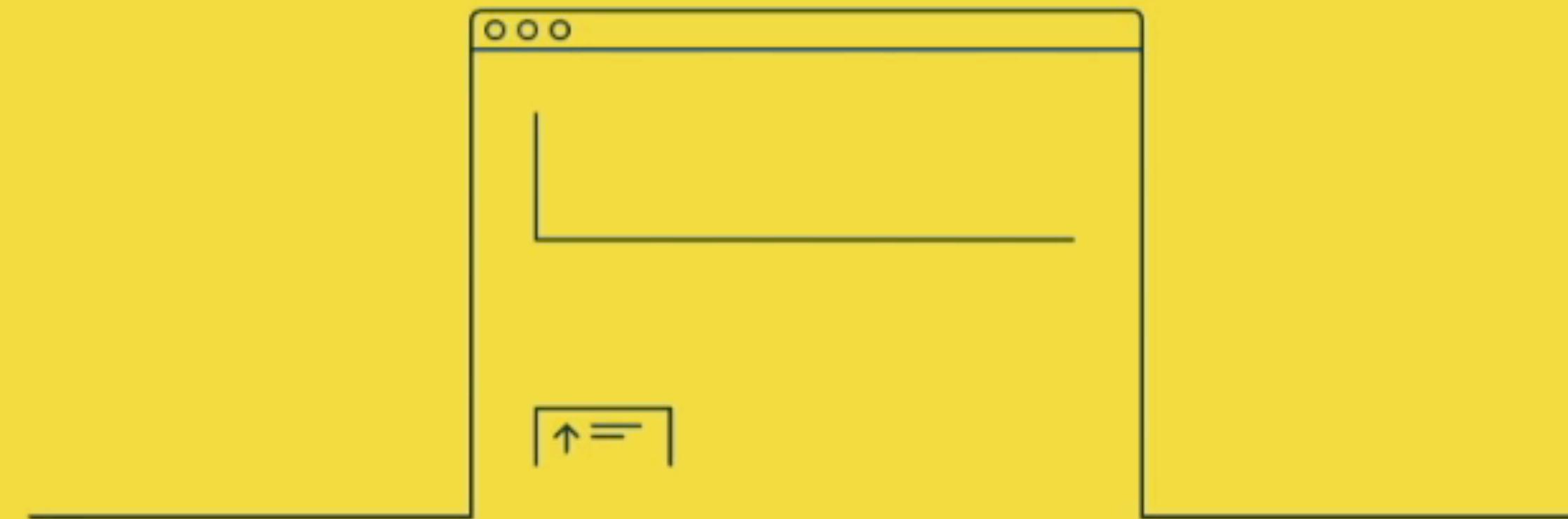
PERFORMANCE STARTS WITH DESIGN

- The message: Do you use text or images
- Colors & gradients: image format choice, transparency needs, number of sprites, how much CSS3
- Layout: impacts HTML hierarchy, number of classes, amount of CSS
- Typography: weight and number of font files

Make performance part of your
design workflow

Performance > Aesthetics

Content first



NPO Dashboard

Clear-cut insights in realtime visitor statistics



Within the Dutch Public Broadcasting (NPO) a project was started in 2015 to develop a number of pilots based on 'big data'. One of those pilots was the development of a dashboard for editorial staff to get **direct insight**



Portfolio

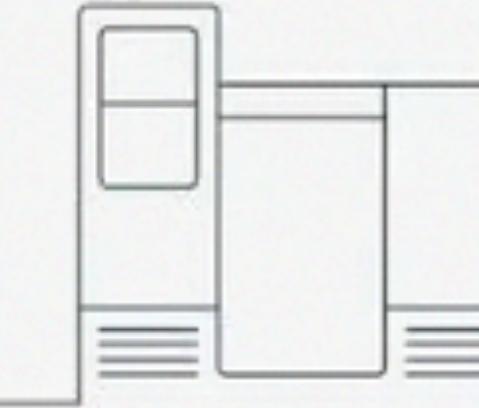
At De Voorhoeede we built web sites and apps for innovative start-ups, small businesses and large enterprises. These are the stories behind our projects.



A brand new Funda

The biggest, most responsive and modular website for real estate in the Netherlands

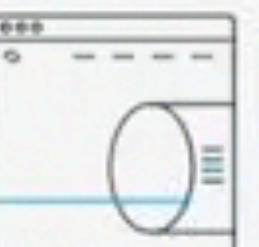
[Read more](#)



Drop & Fly

Self-service baggage drop-off with a web UI

[Read more](#)



Delft Hyperloop

The Tesla Roadster of websites

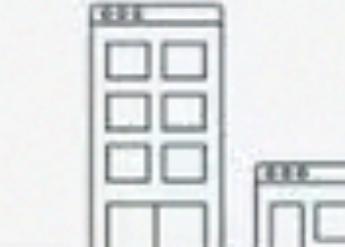
[Read more](#)



RTL Weekend Magazine

From app to web

[Read more](#)



Hotel- and Bungalow-Specials

One new front-end for 10 European websites

[Read more](#)

"That yellow color makes me think of soviet-era low-income housing. It's the color you puke in if you eat a jar of mustard. It's sad and ugly all at once. I didn't realize you could pack that much sadness into a background-color"

—

snalin(reddit user)

LOW HANGING FRUIT



MINIMIZE HTTP REQUESTS

- Concatenate
- Inline images
- Image sprites
- Caching

MINIFY

- HTML
- CSS
- JS
- Images

IMAGE DELIVERY



WEBP

```
<picture>
  <source type="image/webp" srcset="l.webp" media="(min-width: 640px)">
  <source type="image/webp" srcset="m.webp" media="(min-width: 320px)">
  <source type="image/webp" srcset="s.webp">
  <source srcset="l.jpg" media="(min-width: 640px)">
  <source srcset="m.jpg" media="(min-width: 320px)">
  <source srcset="s.jpg">
  
</picture>
```

GENERATION

```
gulp.task('images:generate', function () {
  return gulp.src(['**/*.{jpg,png}'])
    .pipe(responsive({
      '**/*.{jpg,png}': [
        // JPG, PNG
        {width: '990px'},
        {width: '990px', rename: {suffix: '-l'}},
        {width: '680px', rename: {suffix: '-m'}},
        {width: '480px', rename: {suffix: '-s'}},
        // WEBP
        {width: '990px', rename: {suffix: '-l', extname: '.webp'}},
        {width: '680px', rename: {suffix: '-m', extname: '.webp'}},
        {width: '480px', rename: {suffix: '-s', extname: '.webp'}}]
    }),
    {
      quality: 80,
      progressive: true
    })
  )
  .pipe(gulp.dest('/dist/images/')));
});
```

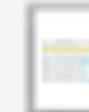
Gulp responsive

WRITE

![Description of the image](image.jpg)

```
<picture>
  <source type="image/webp" srcset="l.webp" media="(min-width: 640px)">
  <source type="image/webp" srcset="m.webp" media="(min-width: 320px)">
  <source type="image/webp" srcset="s.webp">
    <source srcset="l.jpg" media="(min-width: 640px)">
    <source srcset="m.jpg" media="(min-width: 320px)">
    <source srcset="s.jpg">
      
</picture>
```

WEBP

 voorhoede-network-analysis-l.webp	65.8KB
 voorhoede-fold-l.webp	51.8KB
 webpagetest-voorhoede-l.webp	34.7KB
 pagespeed-insights-voorhoede-l.webp	19.4KB
 voorhoede-cookies-l.webp	14.8KB
 average-bytes-per-page-chart-l.webp	10.6KB
 declan-l.webp	2.6KB

Total: 199.7KB

-111.56KB

36% reduction

 voorhoede-network-analysis-l.jpg	109,35 KB
 voorhoede-fold-l.jpg	76,82 KB
 webpagetest-voorhoede-l.jpg	52,02 KB
 pagespeed-insights-voorhoede-l.jpg	31,49 KB
 voorhoede-cookies-l.jpg	21,46 KB
 average-bytes-per-page-chart-l.jpg	16,59 KB
 declan-l.jpg	3,53 KB

Total: 311.26KB

CLIENT HINTS

```
<head>
...
<meta http-equiv="Accept-CH"
      content="DPR, Viewport-Width, Width">
</head>

```

Request headers will hold:

- width: 360
- dpr: 2
- viewport-width: 720

WEB FONTS



We saved ~87% in custom web
font file size using
font subsetting

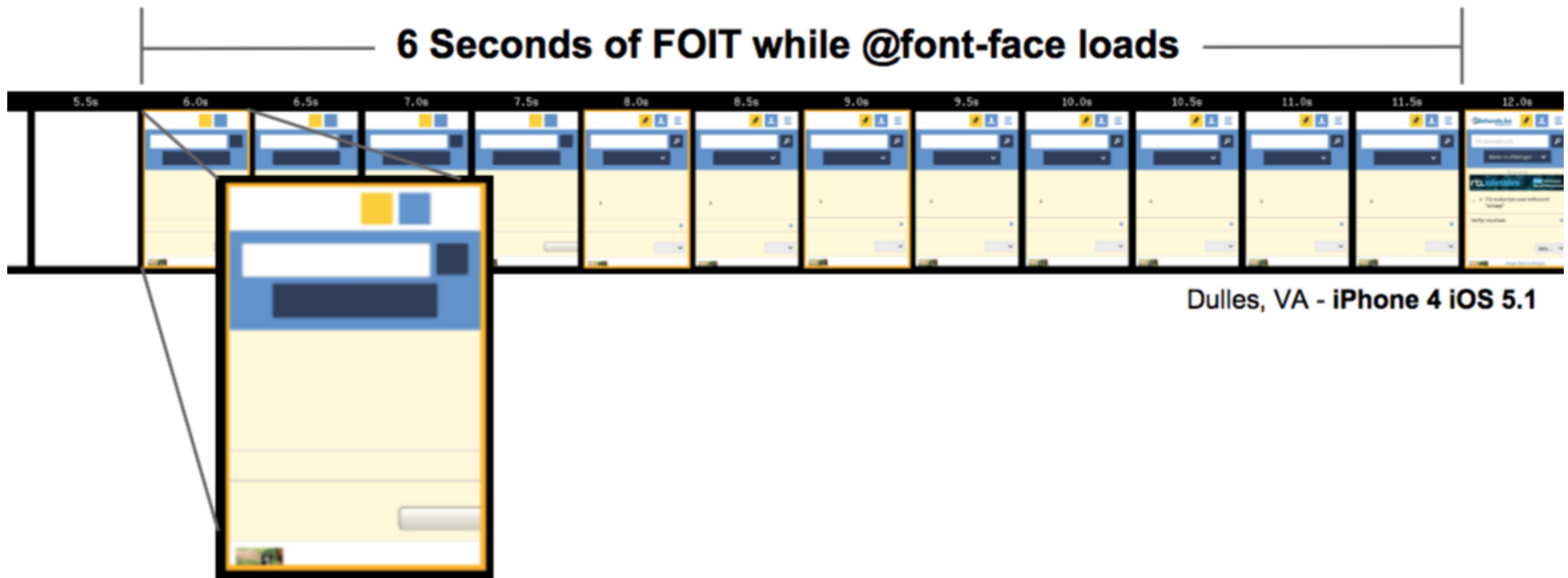
[font squirrel font subsetting](#)

BLOCKING FONT LOADING

```
@font-face {  
    font-family: 'Noto';  
    src: url('noto.woff2') format('woff2'),  
        url('noto.woff') format('woff');  
}  
  
html {  
    font-family: Noto, Georgia, serif;  
}
```

FOIT





From FilamentGroup 2dehands review

START WITH SYSTEM FONT

```
html {  
    font-family: Georgia, serif;  
}
```

```
html.fonts-loaded {  
    font-family: Noto, Georgia, serif;  
}
```

ENHANCE AFTER ASYNC LOADING

```
// (include FontFaceObserver here)
var font = new FontFaceObserver('Noto');
var html = document.documentElement;

// load font async, then enhance HTML:
font.load().then(function () {
  html.className += ' fonts-loaded';
});
```

FOUT

.NET can has wow front-end too

Building a modular front-end in .NET Core



by Joao
September 16, 2016

Table of contents

- [Why we need a .NET front-end stack](#)
- [Running .NET on Mac OS](#)
- [Picking best practices](#)
- [A back-end agnostic module viewer](#)
- [Embracing .NET and its standards](#)
- [File structure](#)
- [Conclusion](#)

Share on

Recently we successfully integrated our front-end approach into a .NET setup. We created a demo viewer, defined a suitable project structure, and shared our code for it on Github:

[.NET Core front-end development guide →](#)

In this blog post, we explain why and how we set it up.

Why we need a .NET front-end stack

Node.js on the back-end is still a fairly small affair, moreso in corporate environments where .NET and Java still reign supreme. However, as front-enders we prefer to work with Node.js — or, to be honest, we *need* to, as many of the tools we use are written with Node.

We often try to **combine the front-end and back-end into a single project environment**. If for some reason we can't, we deliver a static, modular front-end using Nunjucks templates and stub data. Back-end developers then build the actual application out of prerendered templates and precompiled assets.

This conversion however is time-consuming and prone to errors. So, to smoothen this process, we built a **front-end development stack for .NET**.

Running .NET on Mac OS

ASP.NET is available for Windows only, whereas all of De Voorhoede (and many

.NET can has wow front-end too

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ASP.NET is available for Windows only, whereas all of De Voorhoede (and

CONDITIONAL FONT LOADER

```
font.load().then(function () {  
  html.className += ' fonts-loaded';  
  setCookie('fonts-loaded');  
});
```

On server, if 'fonts-loaded' cookie:

```
<html class="fonts-loaded">
```



Name	Value	Domain	Path	Expires / Max-Age
fonts-loaded	true	www.voorhoede.nl	/	2016-10-21T13:01:32.000Z
full-css-loaded	/assets/css/main-0d82fe89fd.css	www.voorhoede.nl	/	2016-10-21T13:01:32.000Z

FUTURE

```
@font-face {  
    font-family: ExampleFont;  
    src: url(/examplefont.woff) format('woff');  
    font-weight: 400;  
    font-style: normal;  
    font-display: swap;  
}
```

LAZY LOAD JS



BLOCKING SCRIPT LOADING

```
<head>
  <!-- Loading early means blocking page: -->
  <script src="index-6a14b2.js"></script>
</head>

<body>
  <!-- Loading late means wasting time: -->
  <script src="index-6a14b2.js"></script>
</body>
```

OPTIMISE SCRIPT LOADING

```
<head>
  <!-- Load early, execute after DOM ready -->
  <script src="index-6a14b2.js" defer></script>
</head>
```

CONDITIONAL SCRIPT LOADING

```
<script>
  if (!querySelector in document) {
    return;
};

loadJS('index-6a14b2.js', function() {
  var html = document.documentElement;
  html.className += ' enhanced';
});
</script>
```

LAZY LOAD CSS



BLOCKING STYLE LOADING

```
<head>
  <!-- Loading early means blocking page: -->
  <link rel="stylesheet" href="index-f3c2b4.css">
</head>

<body>
  <!-- Loading late means flash of unstyled content: -->
  <link rel="stylesheet" href="index-f3c2b4.css">
</body>
```

LOAD STYLES ASYNC

```
<script>
    // (include loadCSS here)
    var stylesheet = loadCSS('index-f3c2b4.css');
</script>

<noscript>
    <link rel="stylesheet" href="index-f3c2b4.css">
</noscript>
```

Critical CSS is the minimum set of
above the fold blocking CSS that we
need to make the page recognisable
to the user

GENERATE CRITICAL CSS



Critical

CRITICAL CSS

```
<html>
<head>
  <style> /* inlined critical CSS */ </style>
  <script> loadCSS('non-critical.css'); </script>
  <noscript>
    <link rel="stylesheet" href="non-critical.css">
  </noscript>
</head>
<body>
  ...
</body>
</html>
```

APPLY CRITICAL CSS

The image shows two side-by-side screenshots of the De Voorhoede website. Both screenshots have a yellow header bar at the top containing the logo, navigation links (WERK, BLOG, TEAM, CONTACT, NL | EN), and a smartphone icon.

Left Screenshot: The main content area has a white background. It features a large text block: "Wij zijn DE VOORHOEDE" followed by "We bouwen front-end oplossingen waarmee je jaren vooruit kunt". Below this is a dark circular button with a white downward arrow. Underneath is a table with three rows:

100% web	We bouwen websites, mobiele apps en user interfaces voor ieder apparaat en platform.
Robuust	We bouwen schaalbare en onderhoudbare front-end oplossingen, die je naadloos kunt integreren met je back-end systemen.
Gespecialiseerd	Voorhoede developers zijn experts in webtechnologie - JavaScript, HTML, CSS. Met onze uniforme werkwijze zorgen we voor continuïteit.

At the bottom, there is a red horizontal bar with the text: "We geloven in universele oplossingen die door iedereen te gebruiken zijn. Dit bereiken we door webtoepassingen te maken die altijd en overal werken op elk apparaat." Below this is a section titled "Dit kunnen we voor je doen" with icons for responsive websites and complex webapplications.

Right Screenshot: The main content area has a white background. It features the same text block and button as the left screenshot. Below is a table with three rows:

100% web	We bouwen websites, mobiele apps en user interfaces voor ieder apparaat en platform.
Robuust	We bouwen schaalbare en onderhoudbare front-end oplossingen, die je naadloos kunt integreren met je back-end systemen.
Gespecialiseerd	Voorhoede developers zijn experts in webtechnologie - JavaScript, HTML, CSS. Met onze uniforme werkwijze zorgen we voor continuïteit.

At the bottom, there is a teal-colored section with the quote: "We geloven in universele oplossingen die door iedereen te gebruiken zijn. Dit bereiken we door webtoepassingen te maken die altijd en overal werken op elk apparaat." Below this is a section titled "Dit kunnen we voor je doen" with icons for responsive websites and complex webapplications.

Critical CSS on voorhoede.nl

CONDITIONAL STYLE LOADER

```
<html><head><style>/ *critical CSS* /</style><script>
// (include loadCSS & onloadCSS here)
var stylesheet = loadCSS('index-f3c2b4.css');
onloadCSS(stylesheet, function() {
  setCookie('full-css-loaded', 'f3c2b4');
});
```

On server, if 'full-css-loaded' cookie and version is equal:

```
<link rel="stylesheet" href="index-f3c2b4.css">
```

Console	Sources	⚠ Network	Timeline	Profiles	Resources	Security	Audits	PageSpeed
Name	Value				Domain	Path	Expires / Max-Age	
fonts-loaded	true				www.voorhoede.nl	/	2016-10-21T13:01:32.000Z	
full-css-loaded	/assets/css/main-0d82fe89fd.css				www.voorhoede.nl	/	2016-10-21T13:01:32.000Z	

[cookies on voorhoede.nl](#)

FILE LEVEL CACHING



REVISIONING

```
gulp.task('revision:hash', function() {
  return gulp.src([
    paths.dist + '**/css/main.css',
    paths.dist + '**/js/index.js'
  ])
    .pipe(rev())
    .pipe(gulp.dest(paths.dist))
    .pipe(rev.manifest(manifestPath))
    .pipe(gulp.dest(''));
});
```

REVISIONING

```
{  
  "assets/css/main.css": "assets/css/main-e946c959b4.css",  
  "assets/js/index.js": "assets/js/index-30d938a361.js"  
}
```

REV REPLACE

```
gulp.task('revision:replace', function() {
  return gulp.src([
    paths.dist + '**/*.html'
  ])
  .pipe(revReplace({
    manifest: gulp.src(manifestPath)
  }))
  .pipe(gulp.dest(paths.dist));
});
```

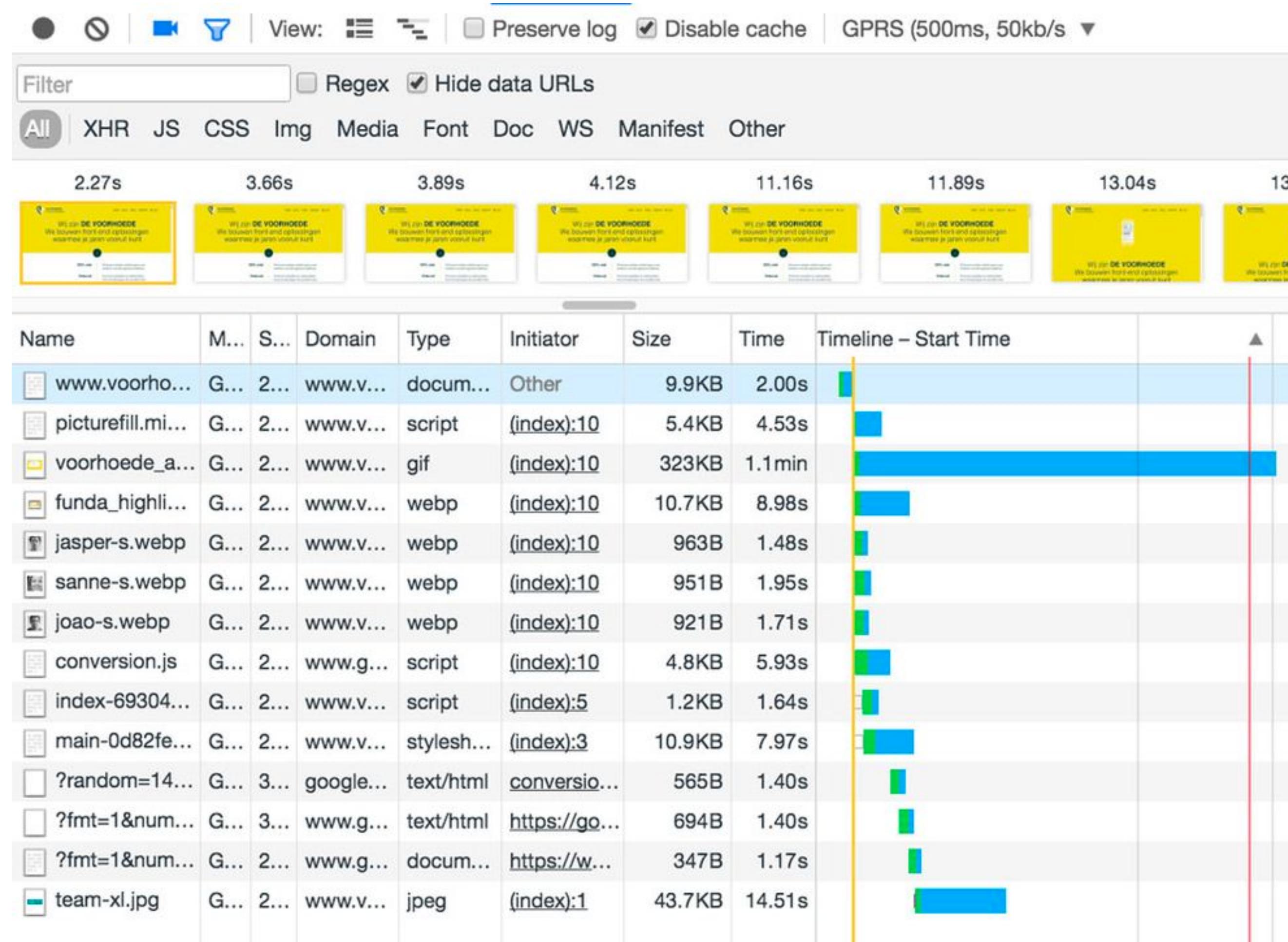
CACHING

cache (Cache-Control: max-age=31536000)

RESULT



THE RESULT



[result on voorhoede.nl](http://result.on.voorhoede.nl)

THE RESULT

PageSpeed Insights [G+](#)

<https://www.voorhoede.nl/> [ANALYZE](#)

Mobile Desktop

100 / 100 Speed

Congratulations! No issues found.

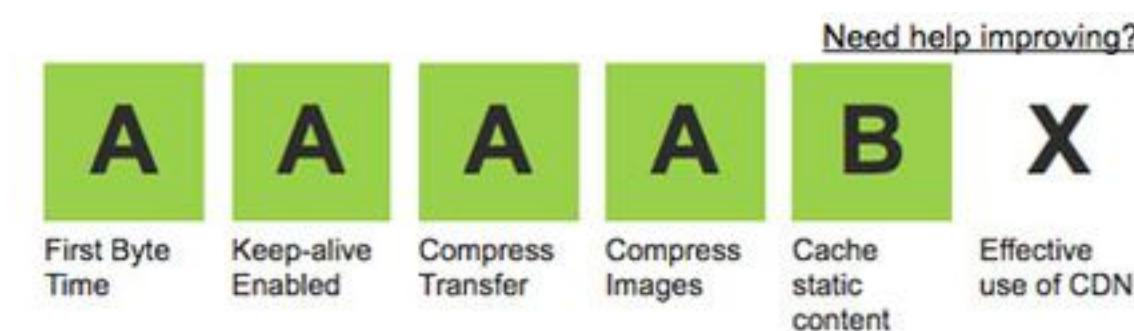
Avoid landing page redirects
Your page has no redirects. Learn more about [avoiding landing page redirects](#).

Eliminate render-blocking JavaScript and CSS in above-the-fold content
You have no render-blocking resources. Learn more about [removing render-blocking resources](#).



Web Page Performance Test for <https://www.voorhoede.nl>

From: Amsterdam, NL - IISpeed - Chrome - Cable
7/13/2016, 6:02:33 PM



[Summary](#) [Details](#) [Performance Review](#) [Content Breakdown](#) [Domains](#) [Screen Shot](#)

Tester: VPS16230-93.191.133.233 [Raw page data](#) - [Raw object data](#)
[Re-run the test](#) [Export HTTP Archive \(.har\)](#) [View Test Log](#)

	Load Time	First Byte	Start Render	Speed Index	DOM Elements	Document Complete			Fully Loaded			
						Time	Requests	Bytes In	Time	Requests	Bytes In	Cost
First View	1.452s	0.279s	0.609s	693	197	1.452s	21	592 KB	1.503s	22	597 KB	\$---
Repeat View	1.028s	0.186s	0.609s	733	191	1.028s	4	38 KB	1.028s	4	38 KB	

[**result on voorhoede.nl**](#)

Latest SRP

PAINT
1.6 Sec.

USABLE PAGE
2.2 Seconds



Min + gzip

PAINT
1.6 Sec.

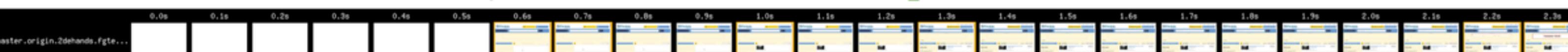
USABLE PAGE
2.0 Seconds



CriticalCSS + min + gzip

PAINT
0.6 Sec.

USABLE PAGE
1.3 Seconds



Critical + FOIT + min + gzip

PAINT and USABLE PAGE
0.7 Sec.



ROADMAP

Service Worker
HTTP/2
Streams
CDN

It doesn't have to be perfect

Treat performance as a feature

Questions?

@DeclanRek



DE VOORHOEDE

front-end developers