

# Need for speed 8

## performance tuning your front end application

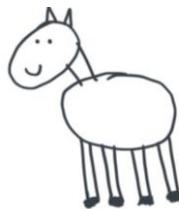




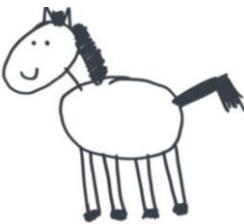
① DRAW 2 CIRCLE



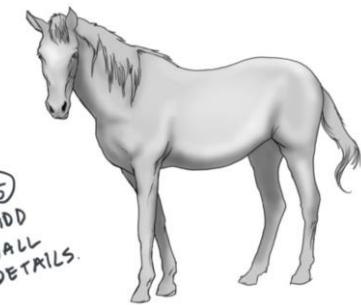
② DRAW THE LEGS



③ DRAW THE FACE



④ DRAW THE HAIR



⑤ ADD  
SMALL  
DETAILS.

# When I Grow up...



I want to be like mommy!



# Yaser Adel Mehraban

Software engineer, blogger, speaker, hiker

 @yashints

 yaser@mehraban.com.au

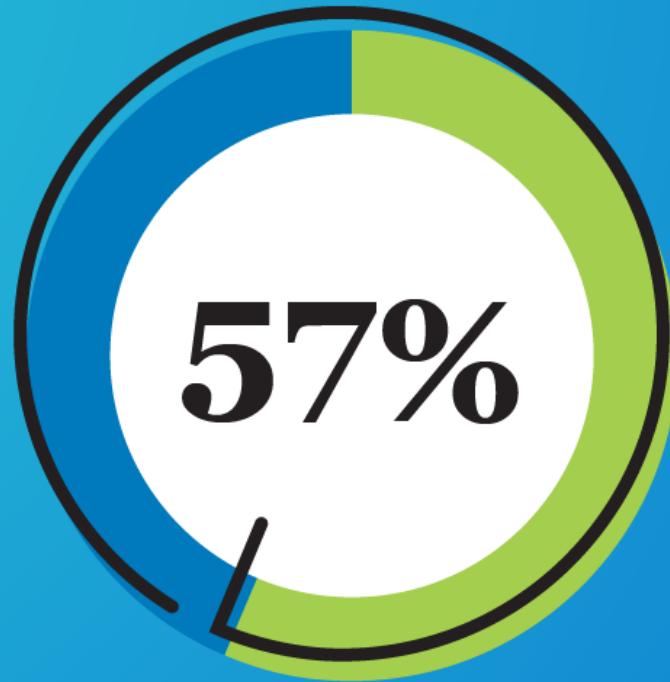
# Why should we care?

---

# 5,200,000,000

83%

76%

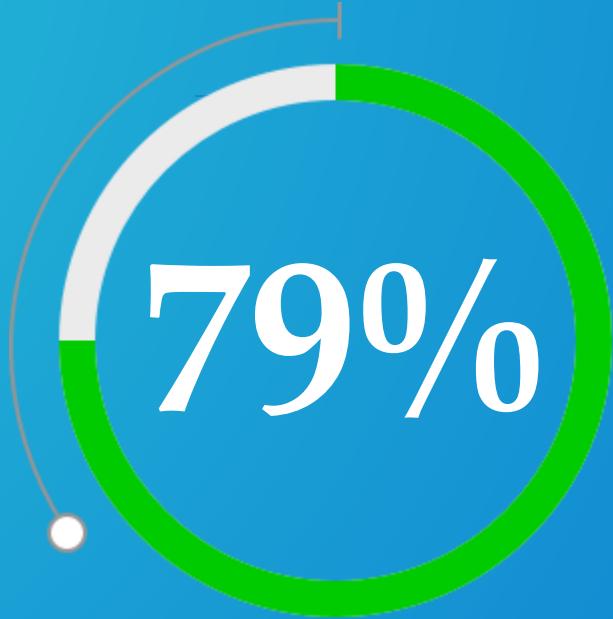


Lower bounce rate for mobile site visits that load < 5s

Source: DoubleClick

[bit.ly/2c0Dfcv](https://bit.ly/2c0Dfcv)

@yashints



Of shoppers who have trouble with site performance won't return

Source: Kissmetrics

[bit.ly/1Bt0Ojx](http://bit.ly/1Bt0Ojx)

@yashints

**90% DISCOUNT?**



**YOU'RE KIDDING RIGHT?**

1 second delay = 7% reduction in conversions

\$3,440,547



Source: Kissmetrics

[bit.ly/1Dj8Koy](http://bit.ly/1Dj8Koy)

@yashints

# Watch out

## Google Webmaster Central Blog

Official news on crawling and indexing sites for the Google index

### Mobile-first Indexing

Friday, November 04, 2016

Today, most people are searching on Google using a mobile device. However, our ranking systems still typically look at the desktop version of a page's content to evaluate its relevance to the user. This can cause issues when the mobile page has less content than the desktop page because our algorithms are not evaluating the actual page that is seen by a mobile searcher.

To make our results more useful, we've begun experiments to make our index mobile-first. Although our search index will continue to be a single index of websites and apps, our algorithms will eventually primarily use the mobile version of a site's content to rank pages from that site, to understand structured data, and to show snippets from those pages in our results. Of course, while our index will be built from mobile documents, we're going to continue to build a great search experience for all users, whether they come from mobile or desktop devices.

# 2016



6:53 4G

Tweet

Addy Osmani @addyosmani

Speed is now a landing page factor for Google Search and Ads!

[bit.ly/search-ads-spe...](http://bit.ly/search-ads-spe...) "Both efforts are leveraging real-world user experience data to prioritize and highlight web pages that deliver fast user experiences" Evaluate perf with Lighthouse & PageSpeed Insights 👍

**MEASURE,  
OPTIMIZE,  
MONITOR,  
AND REPEAT.**

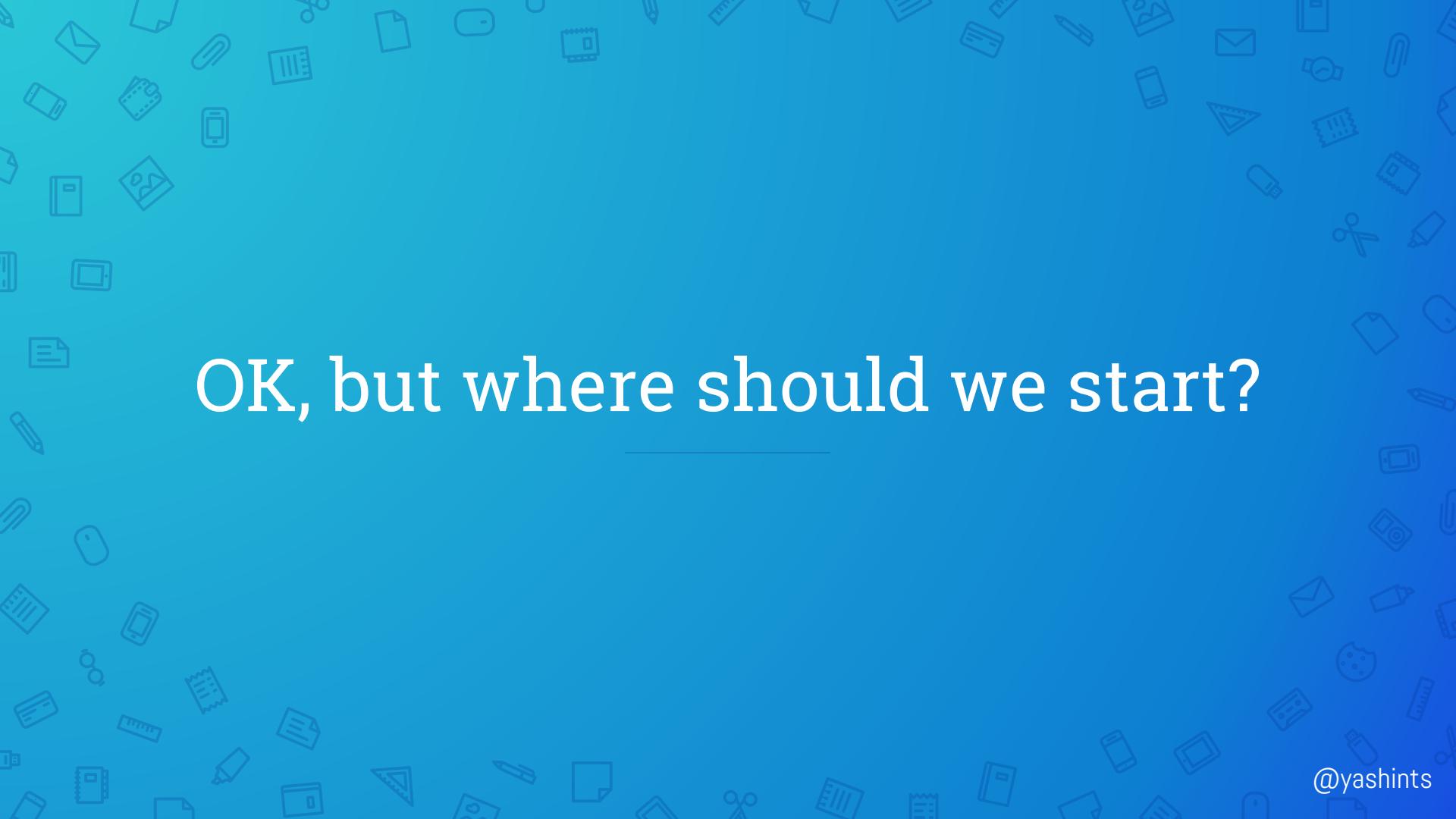
Spotted a slow landing page? Factor in Google Search and Ads. [developers.google.com](#)

25/7/18, 4:26 pm

Tweet your reply

Home Search Notifications Mail

@yashints



# OK, but where should we start?

---

# Choose your metrics

## First Meaningful Paint

FMP, when primary content appears on the page

## Input responsiveness

how much time it takes for an interface to respond to user's action.

## Hero Rendering Times

When the page's important content has finished rendering.

Source: SpeedCurve

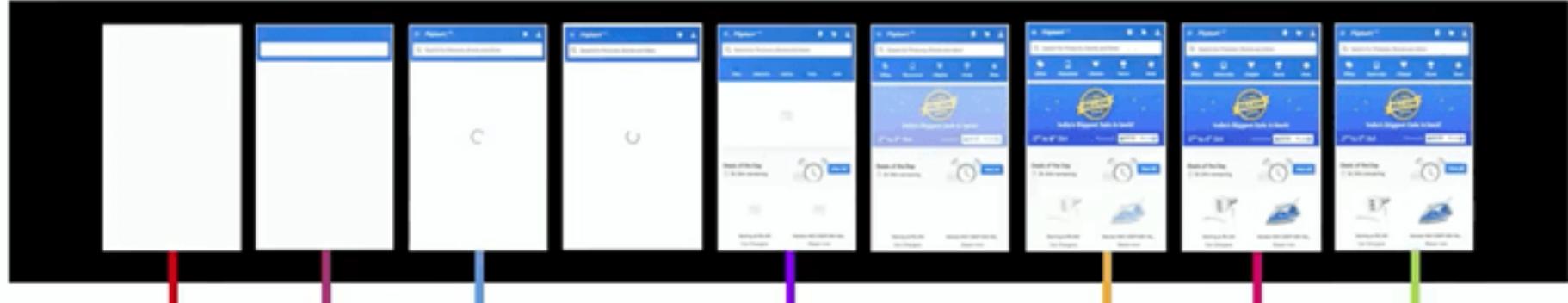
[yas.fyi/2trh1lh](https://yas.fyi/2trh1lh)

## Time to Interactive

When a user can tap on UI and interact with it.

## Perceptual Speed Index

measures how quickly the page contents are visually populated; the lower the score, the better.



Navigation begins

Time to first byte

First Contentful Paint

Navigation has successfully started

First Meaningful Paint

Page's primary content is visible

Visually ready

Page looks nearly done

Fully Loaded

End of load lifecycle

First Paint

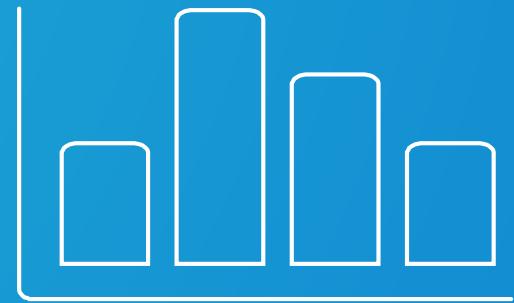
The first non-blank paint on screen

Speed Index

Time to Interactive

Visually usable and engagable

# PAGE LOAD



# Gather data

# Data sources

---



Field data



Lab data

# Process



# Know your tools

---

## Passive monitoring tools

- Lighthouse
- WebPageTest
- Yahoo YSlow

## Active monitoring tools

- SpeedCurve
- NewRelic

# Lighthouse

The screenshot shows the NDC Sydney website on the left and its Lighthouse audit results on the right.

**NDC { Sydney }** | 17-21 September 2018, Hilton Sydney, Australia | Get Your Tickets

## NDC Sydney

17-21 September 2018

Inspiring Software Developers since 2008

2 Days of Workshops // 3 Days of Conference

Topics: .NET, Agile, AI, Architecture, Big Data, Blockchain, Cloud, Continuous Delivery, Cross-Platform, Database, Design, DevOps, Embedded, Fun, Functional Programming, IoT, JavaScript, Languages, Level: Advanced

Level: All levels, Beginner, Intermediate, Machine Learning, Microservices

Technologies: Microsoft, Mobile, People, Security, Serverless, Soft skills, Testing, Tools, UI, UX, Web, Work Skills

**Lighthouse Audit Results:**

- Performance: 15
- Progressive Web App: 45
- Accessibility: 0
- Best Practices: 81
- SEO: 78

**Performance**  
These encapsulate your web app's current performance and opportunities to improve it.

**Metrics**  
These metrics encapsulate your web app's performance across a number of dimensions.

1.9 s	3.9 s	5.8 s	7.8 s	9.7 s	11.6 s	13.6 s	15.5 s	17.5 s	19.4 s
[Screenshot]									

First meaningful paint: 5,930 ms

First Interactive (beta): 19,400 ms

Consistently Interactive (beta):  
Your page took too long to load. Please follow the opportunities in the report to reduce your page load time, and then try re-running Lighthouse. (NO\_TTI\_NETWORK\_IDLE\_PERIOD)

Perceptual Speed Index: 6.320

Estimated Input Latency: 283 ms

**Opportunities**  
These are opportunities to speed up your application by optimizing the following resources.

Opportunity	Value
Serve images in next-gen formats	6,980 ms 1,002 KB
Offscreen images	4,700 ms 674 KB
Properly size images	3,460 ms 497 KB
Reduce render-blocking stylesheets	3,040 ms

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# WebPageTest

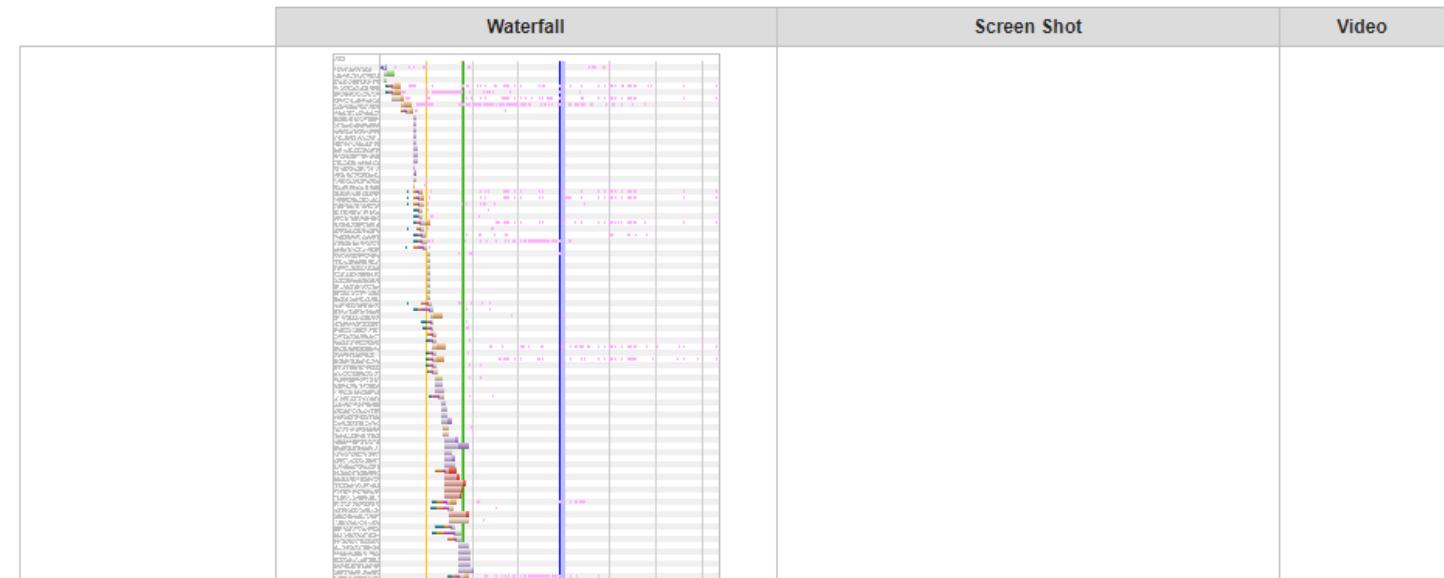
## Performance Results (Median Run)

	Load Time	First Byte	Start Render	User Time	Speed Index	First Interactive (beta)	Document Complete			Fully Loaded			
							Time	Requests	Bytes In	Time	Requests	Bytes In	Cost
First View (Run 3)	7.322s	0.192s	3.400s	3.421s	4515	> 14.941s	7.322s	186	2,489 KB	13.949s	401	3,416 KB	\$\$\$\$\$

[Plot Full Results](#)

## Test Results

Run 1:



@yashints

# Demo

[yas.fyi/ndc](https://yas.fyi/ndc)

# What next?

---

# Goals

---

- 100 ms response
- 60 fps for animations
  - Only 16.6 ms for your code
- SpeedIndex < 1250
- TTI < 5s on 3G

# Size

---

Max 170Kb gzipped

0.8-1MB decompressed



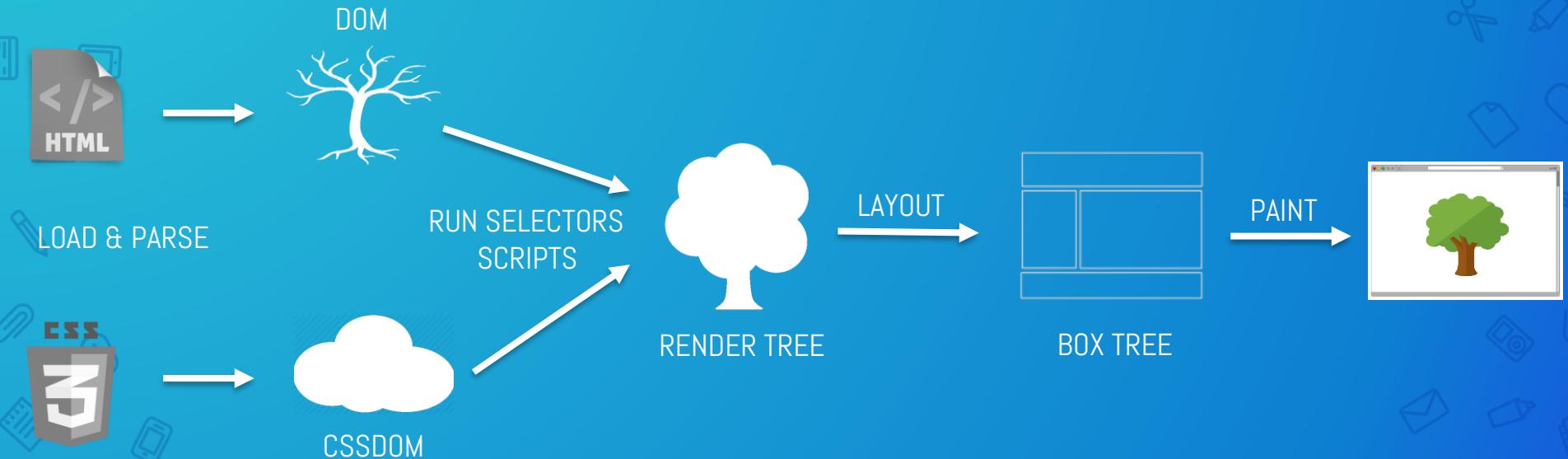


Average page size is 3Mb in 2018

Source: SpeedCurve [yas.fyi/2MnCdXm](https://yas.fyi/2MnCdXm)



# How browsers build the DOM



# Critical Rendering Path



Source: google developers

[yas.fyi/2zhGH0d](https://yas.fyi/2zhGH0d)

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# Rules to keep in mind

---

Stream HTML to the client

Get CSS to client fast

# Did we miss something?

---

- Our friend JavaScript
- Images
- Web Fonts
- External Resources

# JavaScript

---

- External
  - Requires separate network request
- Internal
  - Too much can delay initial load
- Inline
  - Don't even

# DOM

```
15  
16 var para = document.createElement("p");  
17 var node = document.createTextNode("This is new.");  
18 para.appendChild(node);  
19  
20 var element = document.getElementById("div1");  
21 element.appendChild(para);  
22
```

# CSSDOM

```
15  
16  document.getElementById('#id').style.fontSize = '20px';  
17
```

# Let's optimise

# PRPL

---

- P USH
- R ENDER
- P RE-CACHE
- L AZY-LOAD



**DUDE, JUST LAZY LOAD IT!**

<https://developers.google.com/web/fundamentals/performance/prpl-pattern/>

# Styles

---

- <link rel="preload">
- Inline the critical CSS
- Example
- Use noscript

```
1 <link rel="preload" href="style.css" as="style" onload="this.rel='stylesheet'>
```

# Using webpack?

## preload-webpack-plugin

npm package 2.3.0 downloads 61k/month dependencies up to date

```
34 plugins: [
35   new HtmlWebpackPlugin(),
36   new PreloadWebpackPlugin({
37     rel: 'preload',
38     as: 'style'
39   })
40 ]
```

# JavaScript

- <script defer src=...>
- <script async src=...>
- Right before </body>



# JavaScript

---

- Code splitting
  - CommonChunkPlugin
- Dynamic import/require
- Analyse your bundle (unused code/tree shaking)
  - webpack-bundle-analyzer

# Web Fonts

---

- Can be cached
- Prefetch/Preload
- Do you even need it?
  - eBay's font loading strategy



# Images

---

- > 50% of page weight
- Right dimensions
- Next-gen formats
- Compression => into build process
- Lazy load'em
- Less of'em





# DDD PERTH



DDD Perth is an inclusive non-profit conference for the Perth software community.

Our goal is to create an approachable event that appeals to the whole community, especially people that don't normally get to attend or speak at conferences. See our [Code of Conduct](#).

## Previous event

### VENUE

Perth Convention and Exhibition Centre

### DATE

Saturday 4th August 2018

### COST

**SOLD OUT**

[2018 agenda](#) >

[Important Dates](#)



Performance



Progressive Web App



Accessibility



Best Practices



SEO

Score scale: 0-44 45-74 75-100

33

## Performance

### Metrics

First Contentful Paint	4,070 ms ⓘ	First Meaningful Paint	4,220 ms ⓘ
Speed Index	15.130 ms ⚠️	First CPU Idle	7,600 ms ⚠️
Time to Interactive	7,600 ms ⓘ	Estimated Input Latency	130 ms ⚠️

[View Trace](#)

Values are estimated and may vary.



### Opportunities

These are opportunities to speed up your application by optimizing the following resources.

Resource to optimize	Estimated Savings
1 Properly size images	13.27 s ⓘ

Console What's New ✕

Highlights from the Chrome 68 update

Eager evaluation

Preview return values in the Console without explicitly executing expressions.

Argument hints

Minimize the need to type arguments in the Console



# Progressive images



# srcset

```
<picture>
  <source
    type="image/webp"
    srcSet="images/worlds-300.webp 300w,
            images/worlds-600.webp 600w,
            images/worlds-800.webp 800w,
            images/worlds.webp 1000w"
  />
  <source
    srcSet="images/worlds-300.jpg 300w,
            images/worlds-600.jpg 600w,
            images/worlds-800.jpg 800w,
            images/worlds.jpg 1000w"
  />
  
</picture>
```



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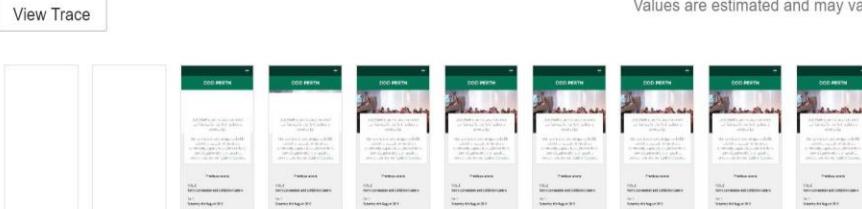
**SOLD OUT**

2018 agenda ➔

## Performance

### Metrics

First Contentful Paint	3,600 ms ⓘ	First Meaningful Paint	3,780 ms ⓘ
Speed Index	3,600 ms ✓	First CPU Idle	7,770 ms ⚡
Time to Interactive	7,770 ms ⓘ	Estimated Input Latency	566 ms ⚡
<a href="#">View Trace</a>		Values are estimated and may vary.	



### Opportunities

These are opportunities to speed up your application by optimizing the following resources.

Resource to optimize	Estimated Savings
1 Serve images in next-gen formats	0.9 s ⓘ
2 Eliminate render-blocking resources	0.45 s ⓘ
3 Properly size images	0.3 s ⓘ
4 Defer unused CSS	0.15 s ⓘ

Console What's New X

Highlights from the Chrome 68 update

# Recap

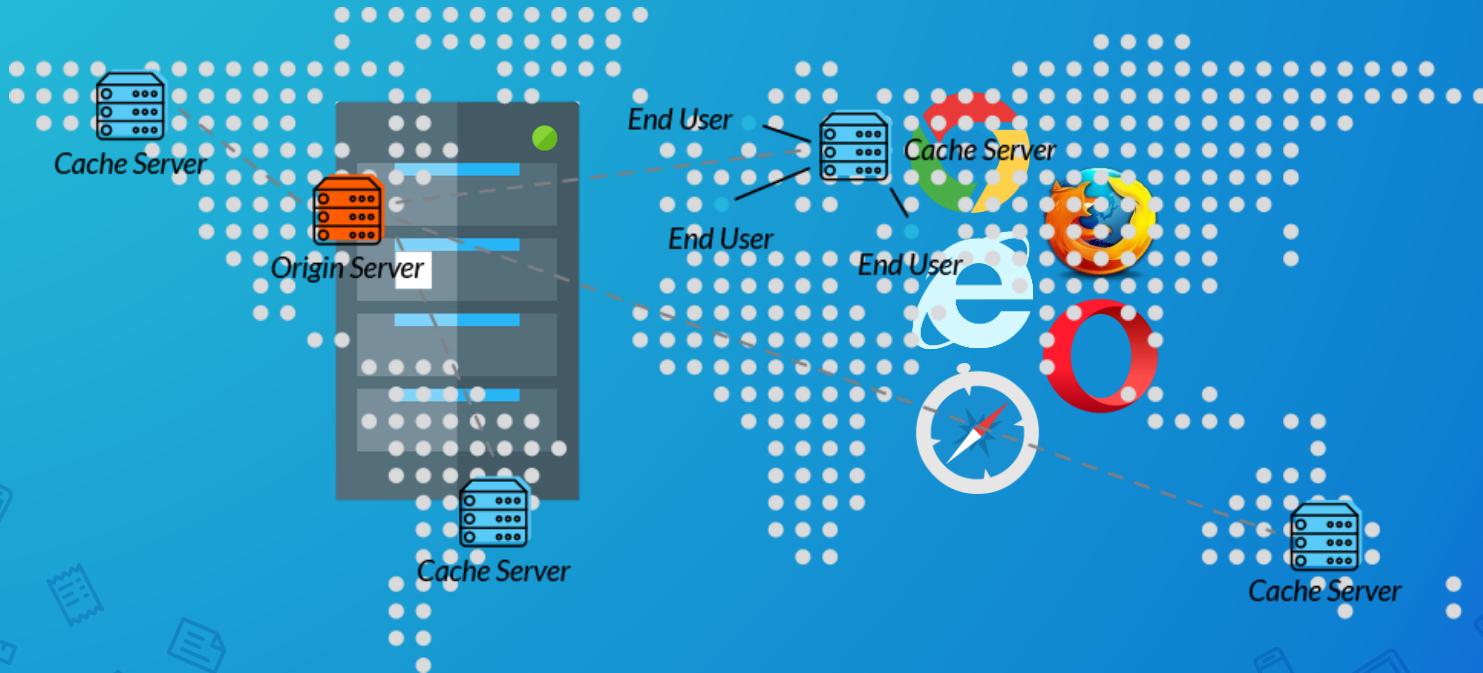
Field Data



Deploy –  
Field Data

Improve –  
Lab Data

# Caching



# References

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- Front-end performance checklist
- Google developers – Perf Matters
- High Performance Web Fonts
- Google developers – Image Optimisation

[yas.fyi/2uOOAoh](https://yas.fyi/2uOOAoh)

[yas.fyi/2JGQfS1](https://yas.fyi/2JGQfS1)

[yas.fyi/2LBWnNI](https://yas.fyi/2LBWnNI)

[yas.fyi/2LCyipJ](https://yas.fyi/2LCyipJ)



# Thanks!

Any questions?

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