

11 September 2023

WPO Workshop

Web Performance Optimisation Workshop

www.iодigital.com

Let's

the boundaries
of page speed

WiFi

- Stayingvalencia
- Welcomem.b22

Get to know each other!

Hello my name is!



Sander van Surksum

WPO Consultant

- Born in Amersfoort
- Father of 4 daughters!
- Web Developer since 2003
- Part-time muralist
- Web Performance enthusiast

And you?

And you?

- Roles and responsibilities
- Experience so far
- Anything of interest



About the workshop!

About the workshop

- Please get comfortable
- Relax, walk around, help yourself to drinks, etc.
- Don't be polite or formal—let's just hang out and be productive
- Ask questions

Goals after 2 days



Erik Floor · 2nd
E-commerce consultant / Product owner / Projectmanger
10mo

Inmiddels een pagespeed score van 100 op desktop en 95 op mobiel 🎉

Pim de Koster 🚀

Pagespeed is van groot belang voor SEO en je conversie. Hoe hoog scoort jouw webshop?

#pagespeed

The screenshot shows a LinkedIn post from Erik Floor. At the top, there's a large green circle with the number '100' inside, labeled 'Prestaties'. Below it, a note says: 'Waarden worden geschat en kunnen variëren. De prestatiescore wordt rechtstreeks berekend op basis van deze statistieken. Rekenmachine bekijken'. A legend indicates: ▲ 0-49, ■ 50-89, ● 90-100. To the right, a thumbnail of a website page for 'LEGACY' is shown, featuring a person sitting at a desk with a computer. Below the main score, there's a table of 'STATISTIEKEN' with the following data:

		Weergave uitvoeren	
● First Contentful Paint	0,5 s	● Time to Interactive	0,5 s
● Speed Index	0,5 s	● Total Blocking Time	0 ms
● Largest Contentful Paint	0,6 s	● Cumulative Layout Shift	0,014

At the bottom of the post, there are three icons: a blue thumbs up, a green hand, and a red heart, followed by the number '35'. To the right, it says '8 Comments'. Below the post, there are three interaction buttons: 'Like', 'Comment', and 'Share'.



Workspace Environment

Useful links

Useful links

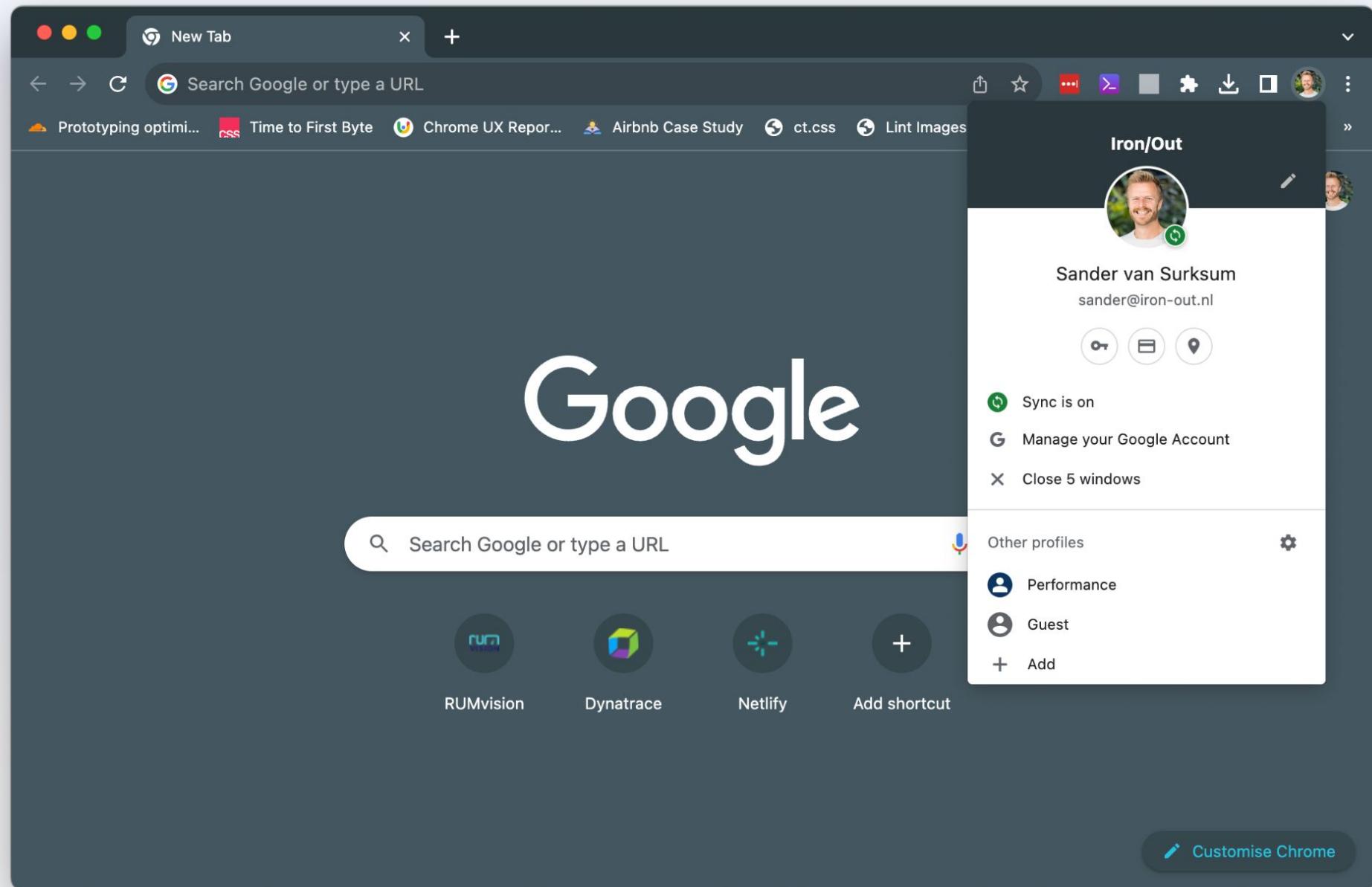
- Link to the chat
- <https://github.com/sandervsurksum/webperformance-workshop>

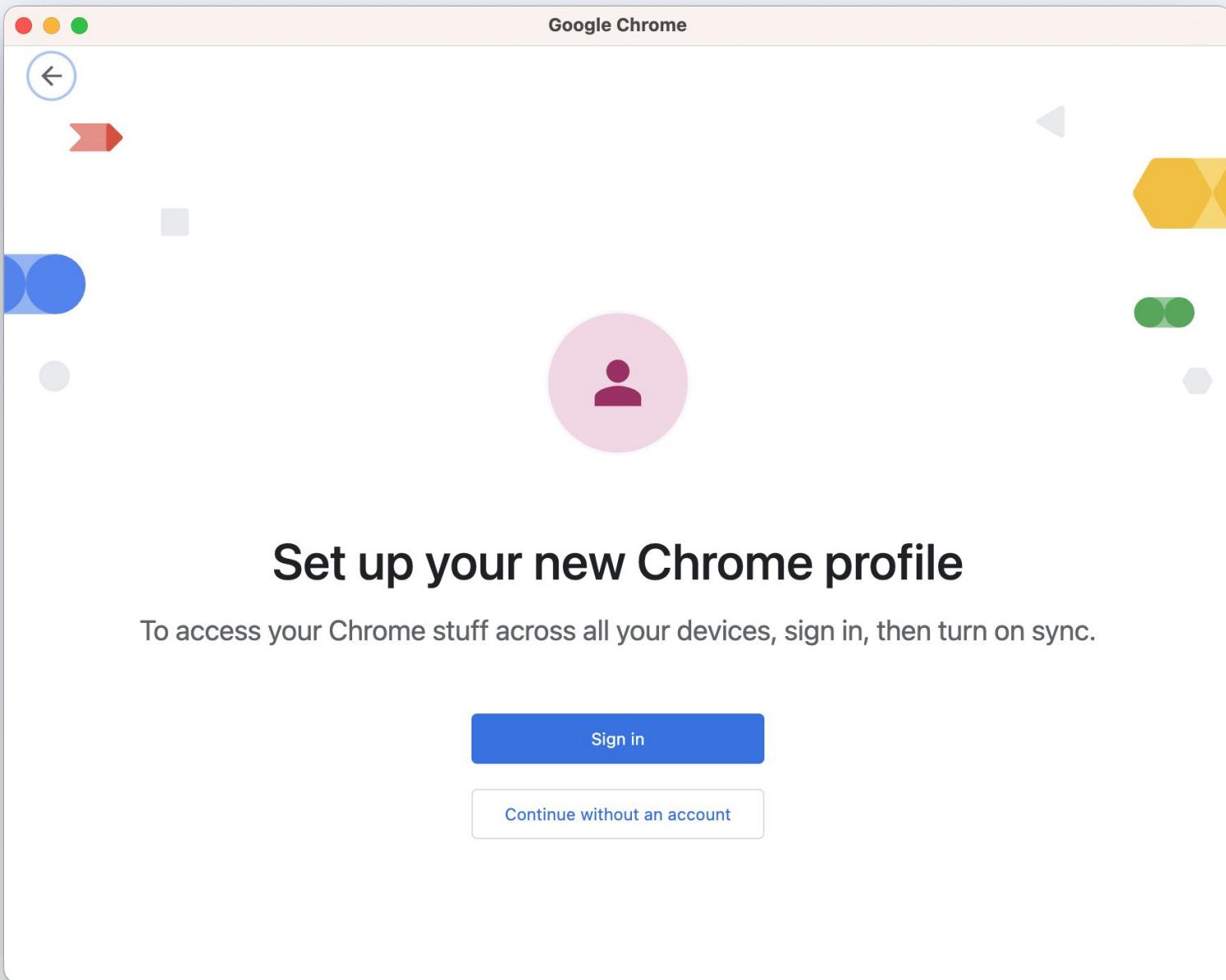
Devtools

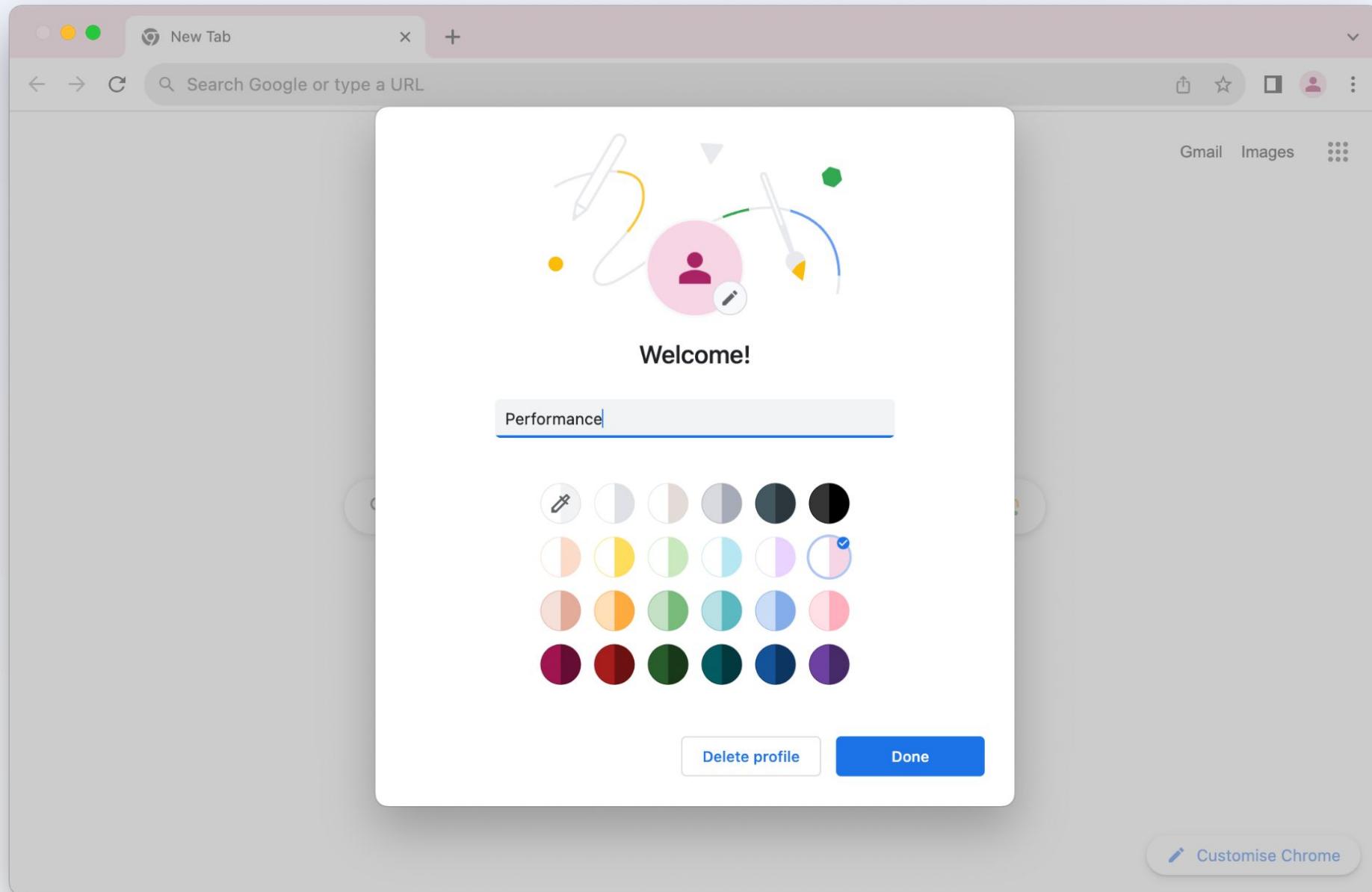
Setting up a new profile!

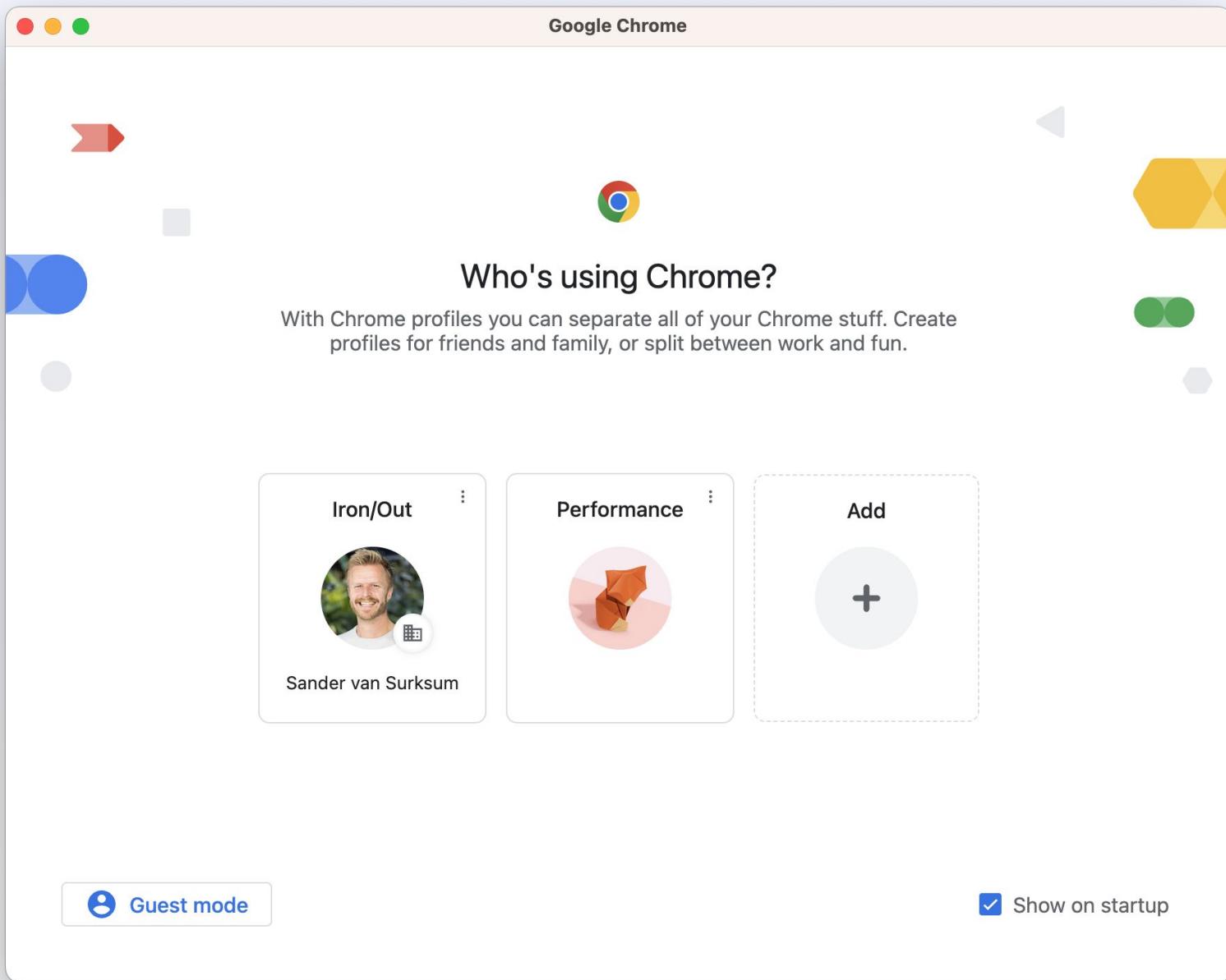
Setting Up a New Profile

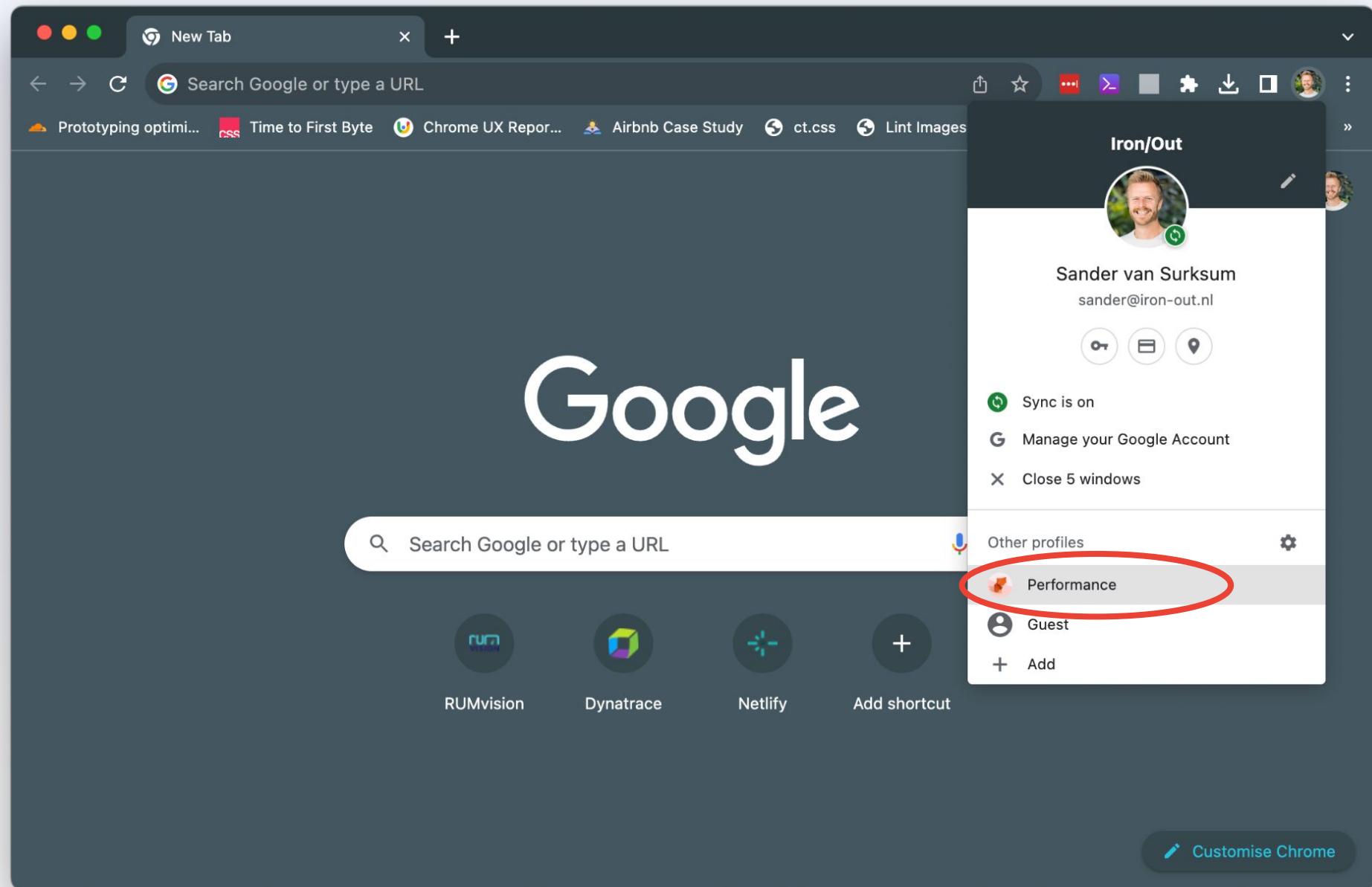
- Set up a new Chrome profile with no addons
- Addons can interfere with a page and give misleading results











Devtools

Get DevTools Ready

Get devtools ready

- Use expanded rows
- Add Priority column
- Disable cache
- Enable experiments

Speed up your website | Improv X +

iron-out.io Lint Images

iron/out What we do Who we help Services Cases About us Career Blog Contact us

Elements Console Sources Network Performance Recorder Memory Application Security Lighthouse Performance insights

Preserve log Disable cache No throttling Invert Hide data URLs All Fetch/XHR JS CSS Img Media Font Doc

Use large request rows Show overview

10000 ms 20000 ms 30000 ms 40000 ms 50000 ms 60000 ms

Name	Status	Type	Size	Priority	Cache-Co
page-data.json /page-data/blog	200	json	16.1 kB 0 B	Lowest	public,max-age=311
page-data.json /page-data/blog	200	xhr	16.0 kB 73.4 kB	High	public,max-age=311
component---src-p...	200	javascript	1.3 kB 0 B	Lowest	public,max-age=311
?v=311&id=43419...	200	webp	164 B 0 B	Low	Netlify
?v=311&id=43419...	200	webp	56 B 0 B	Low	Varnish
rum_collection ingesteer.services-...	204	preflight	0 B 0 B	High	Netlify
rum_collection ingesteer.services-...	202	fetch	166 B 0 B	High	Varnish

97 requests | 720 kB transferred | 2.0 MB resources | Finish: 2.0 min | DOMContentLoaded: 634 ms | Load: 6.0 s

✓ Name Path Url
Method
✓ Status Protocol Scheme Domain
Remote Address Remote Address Space
✓ Type Initiator Initiator Address Space Cookies Set Cookies
✓ Size Time
✓ Priority Connection ID
Sort By Reset Columns
Response Headers Waterfall

1



Why are we here?



Time To Interactive

MEDIAN DESKTOP

7.1 seconds

▲2.9%

MEDIAN MOBILE

13.6 seconds

▲2.3%

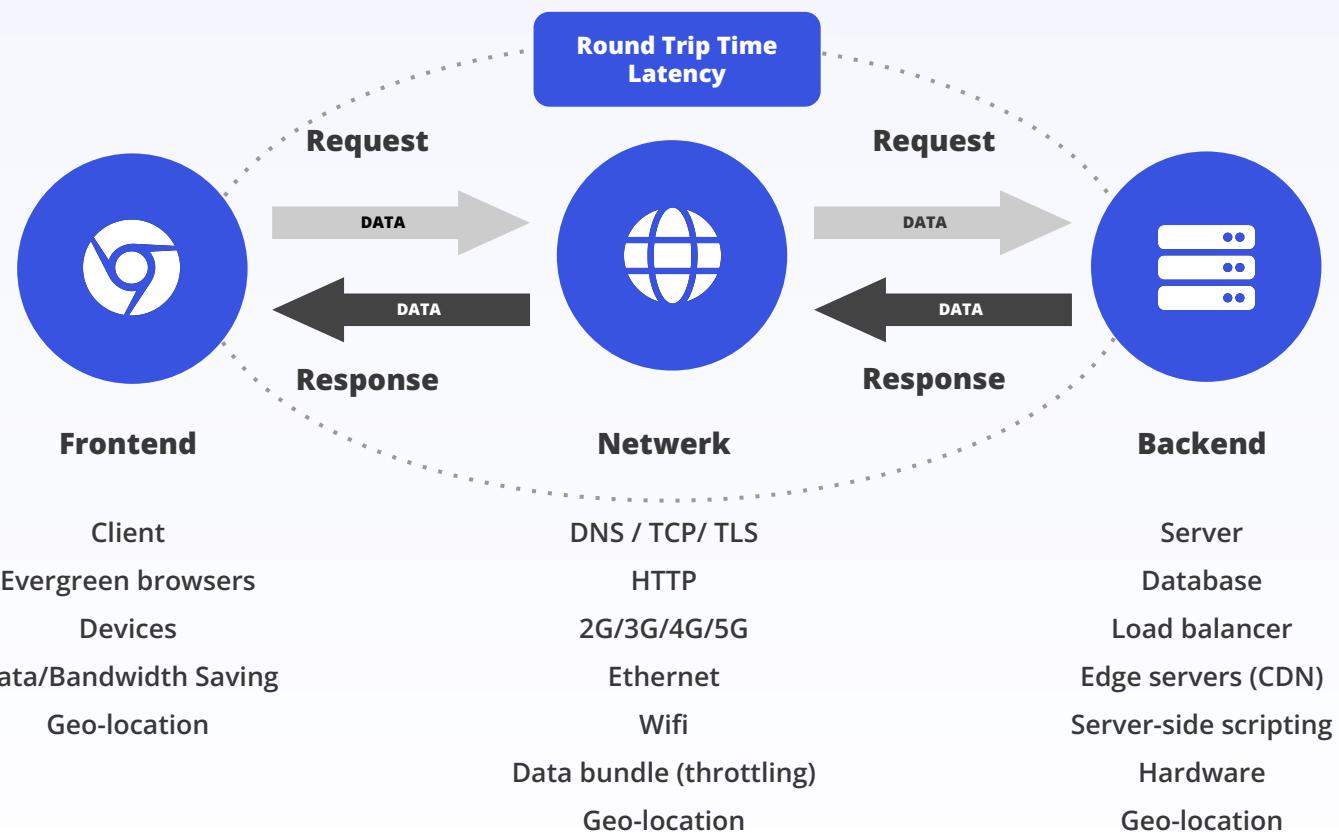
Source: httparchive.org

Advanced techniques

Understanding the web

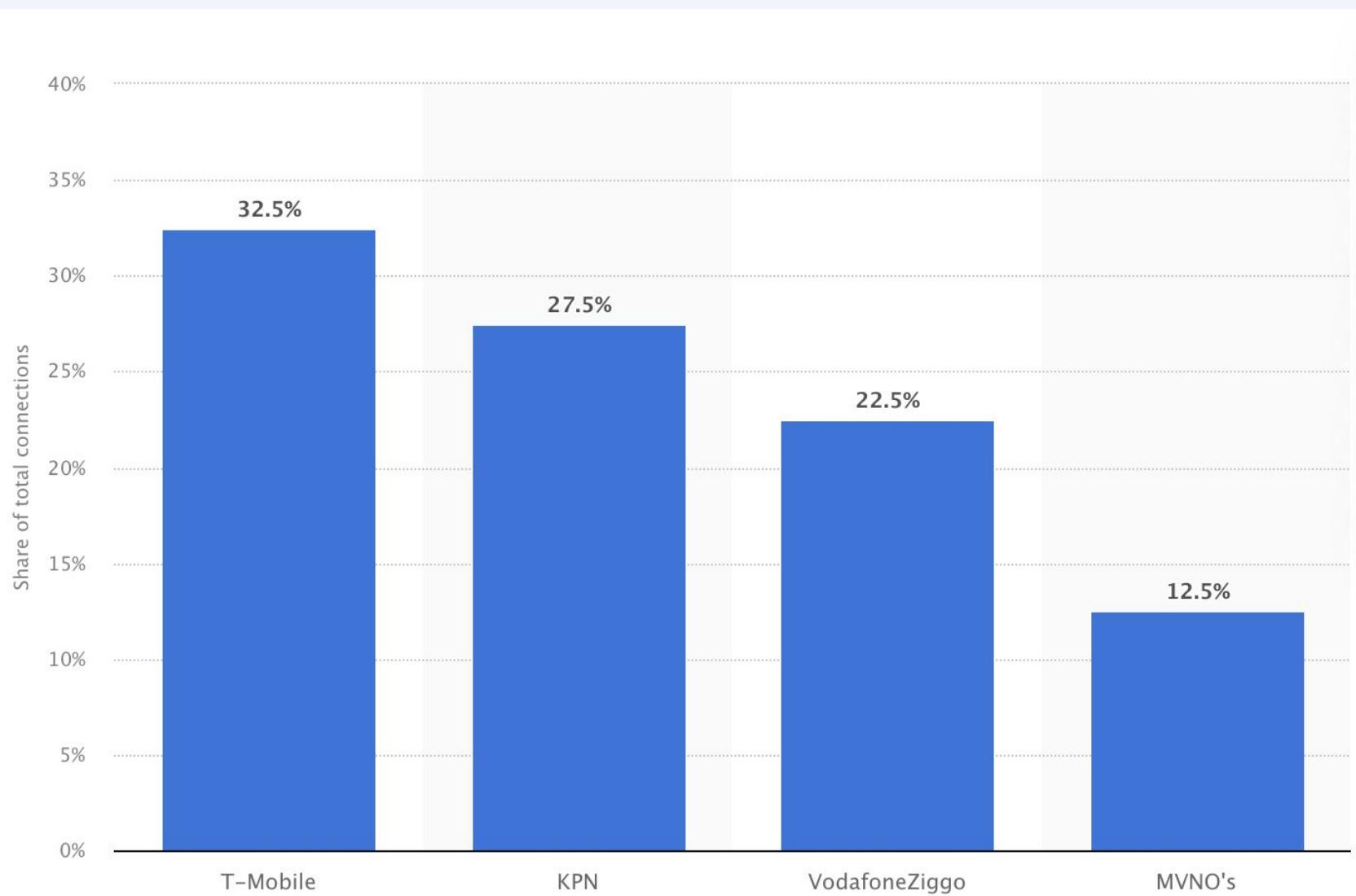
What is affecting load times?

Transporting data takes time



Network

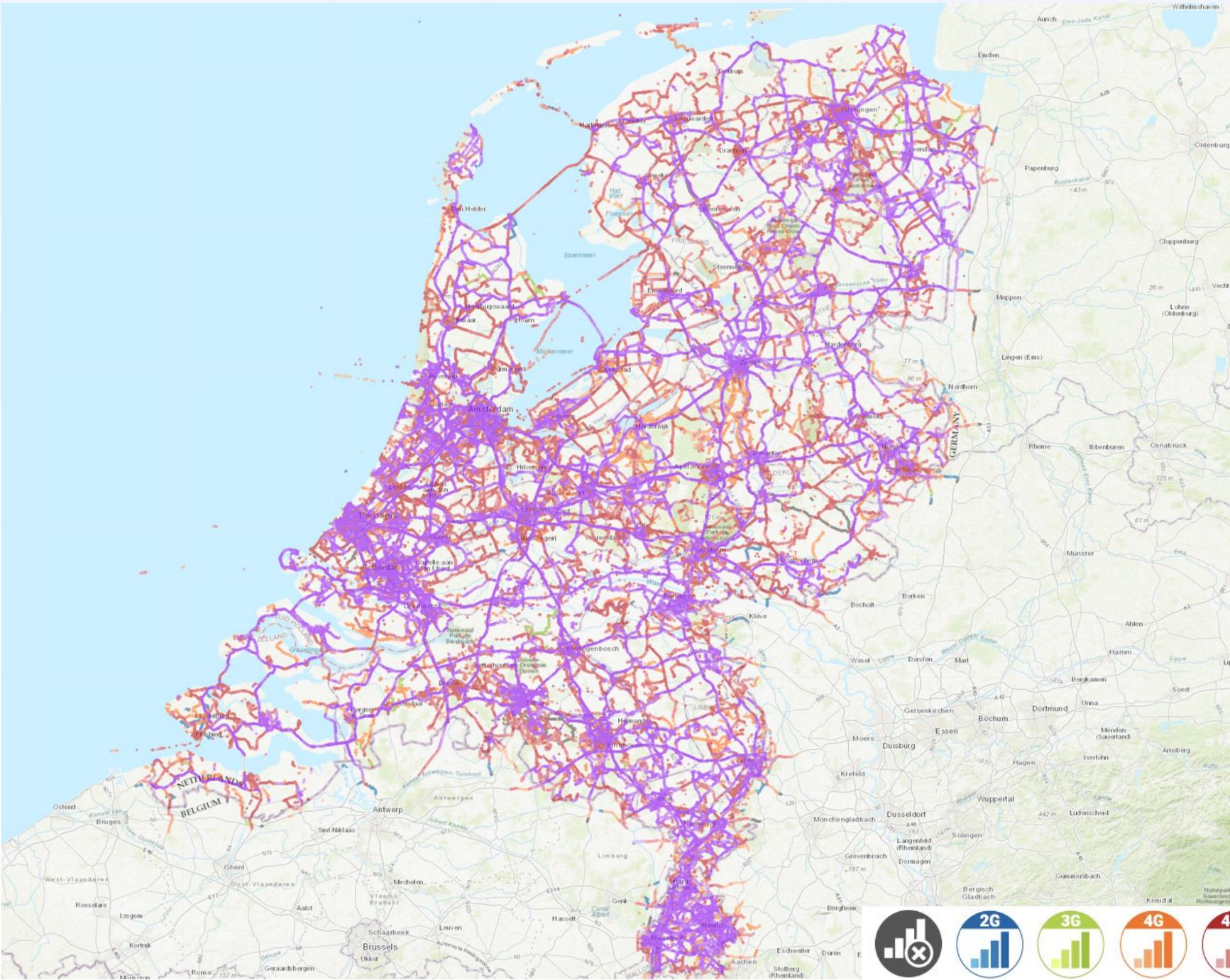
Bandwidth & Latency

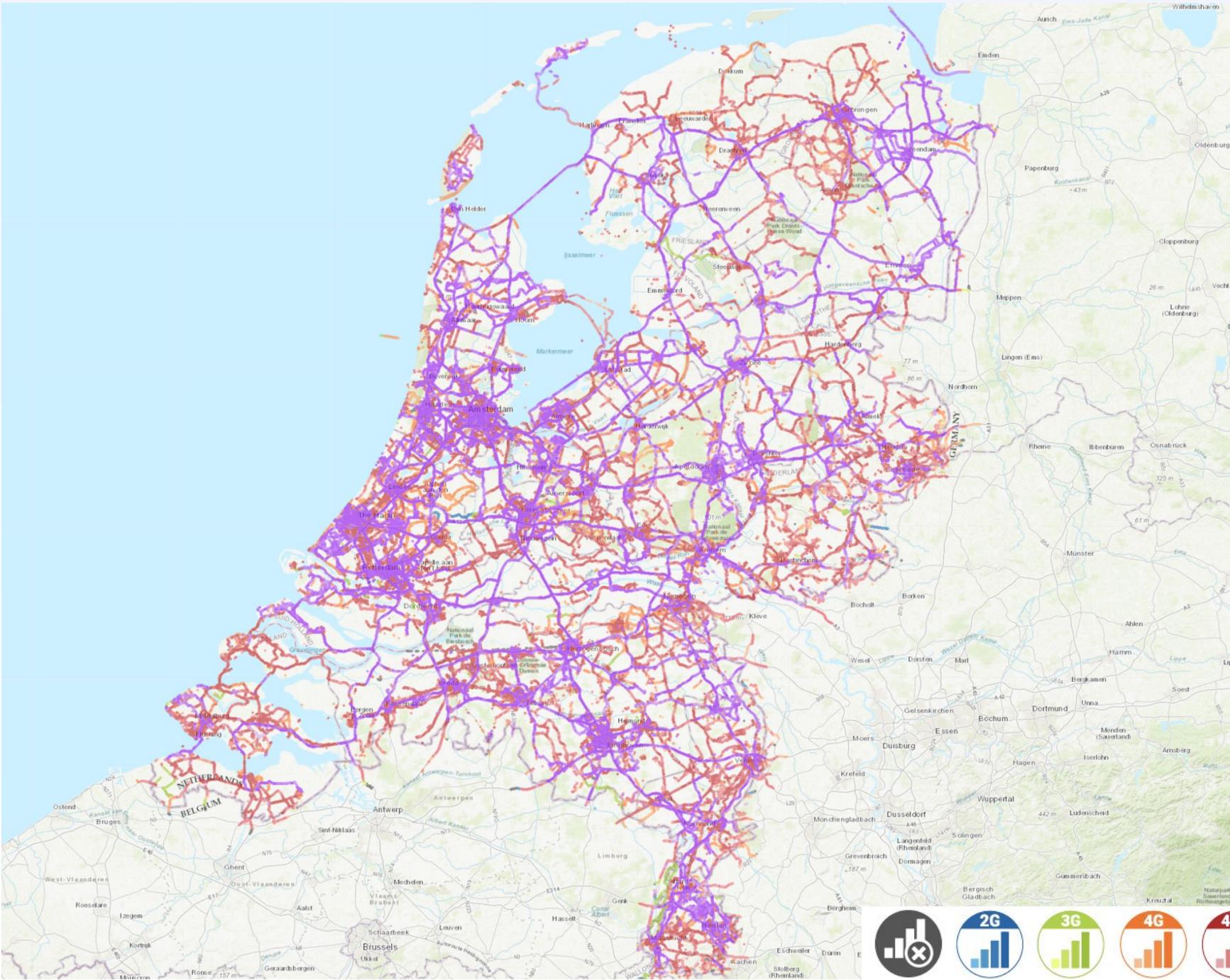


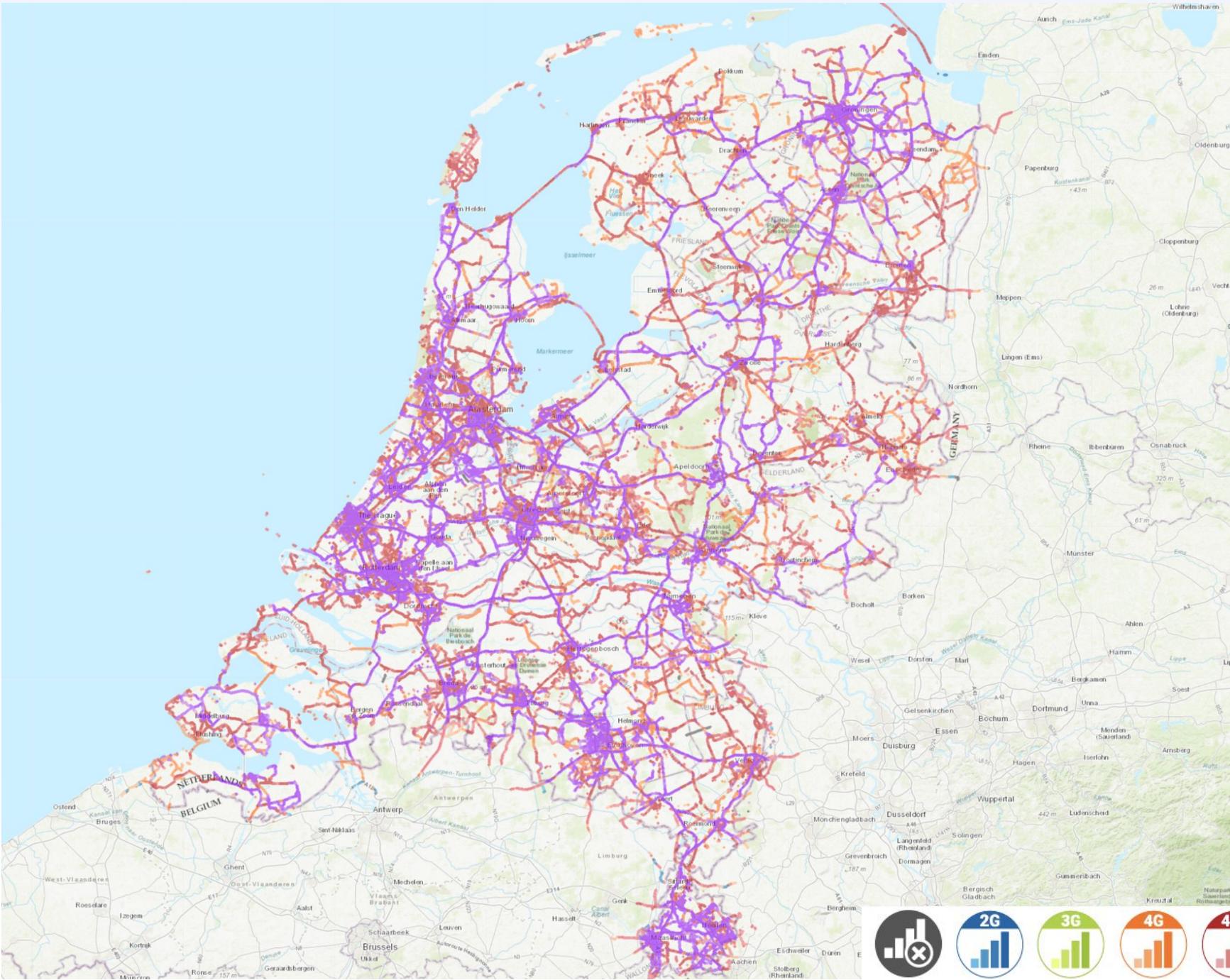
© Statista 2023 

Show source 

 Additional Information





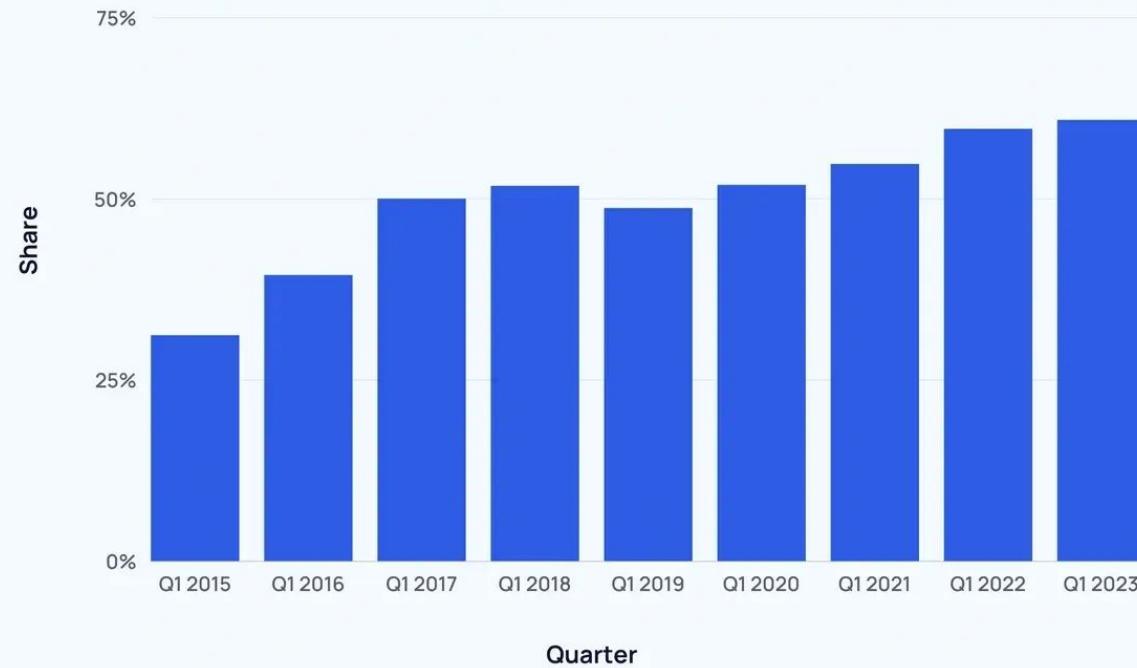


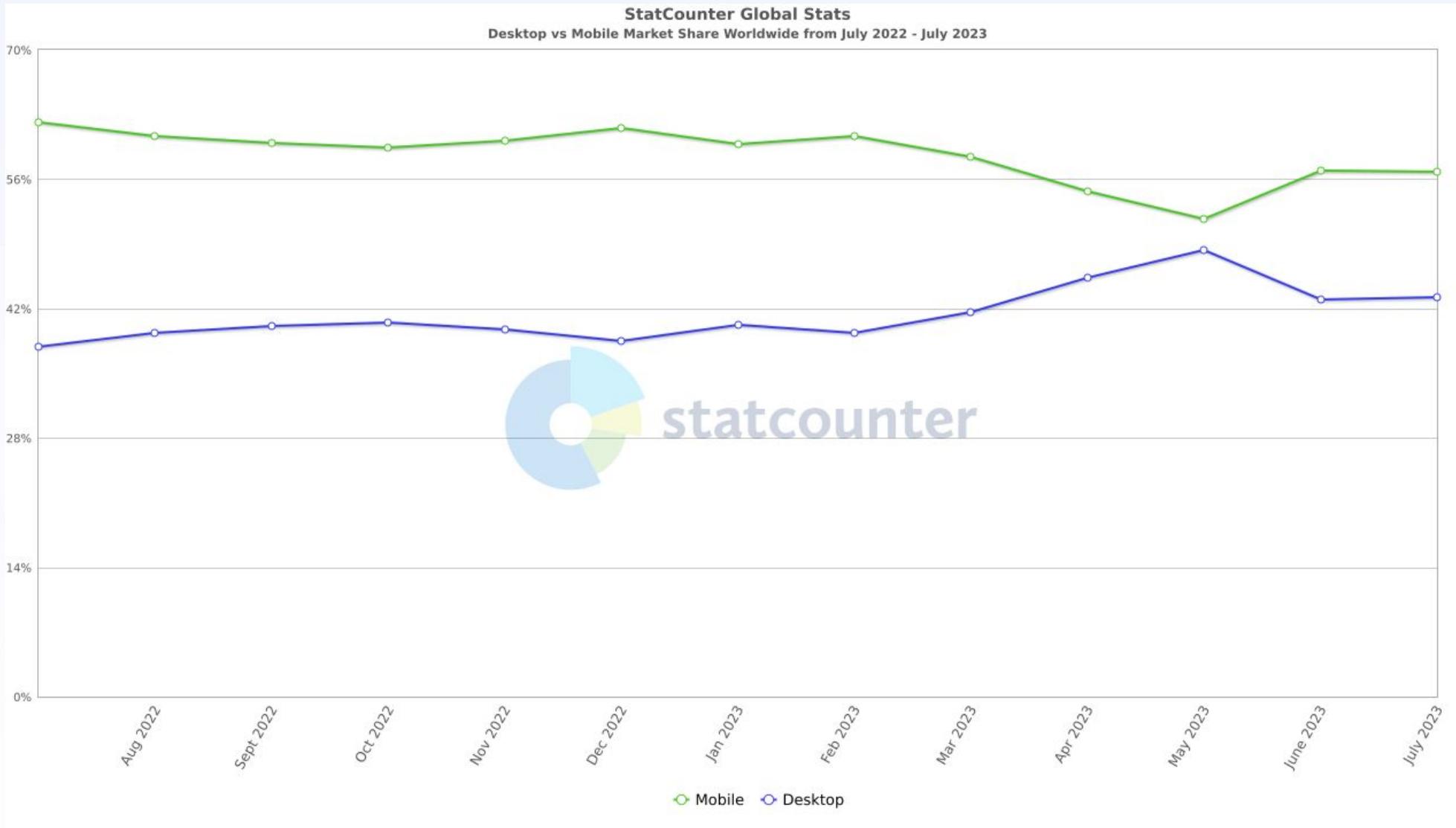
Landscape

Mobile space

Mobile traffic

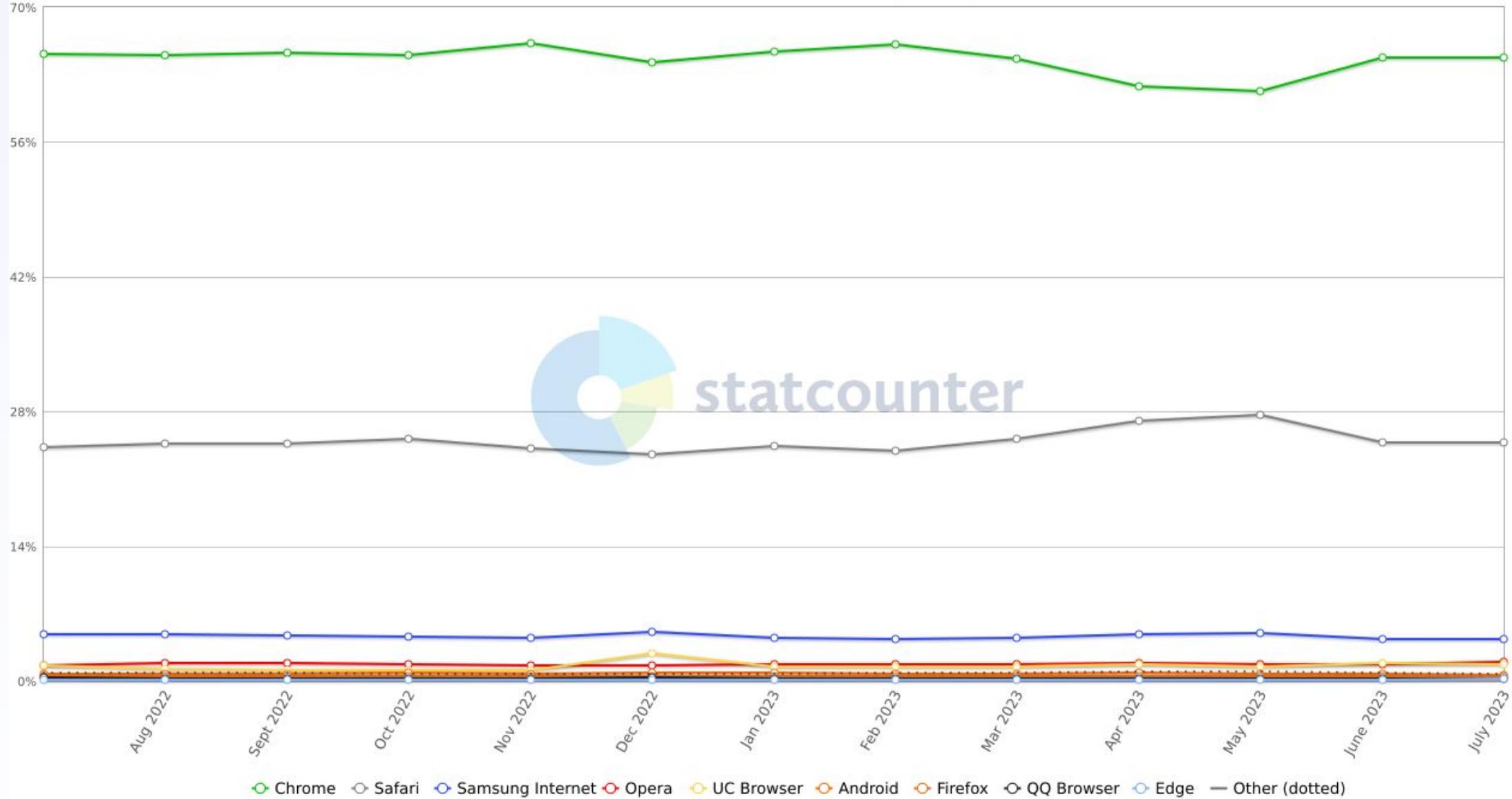
What percentage of internet traffic
comes from mobile devices?







StatCounter Global Stats
Mobile Browser Market Share Worldwide from July 2022 - July 2023



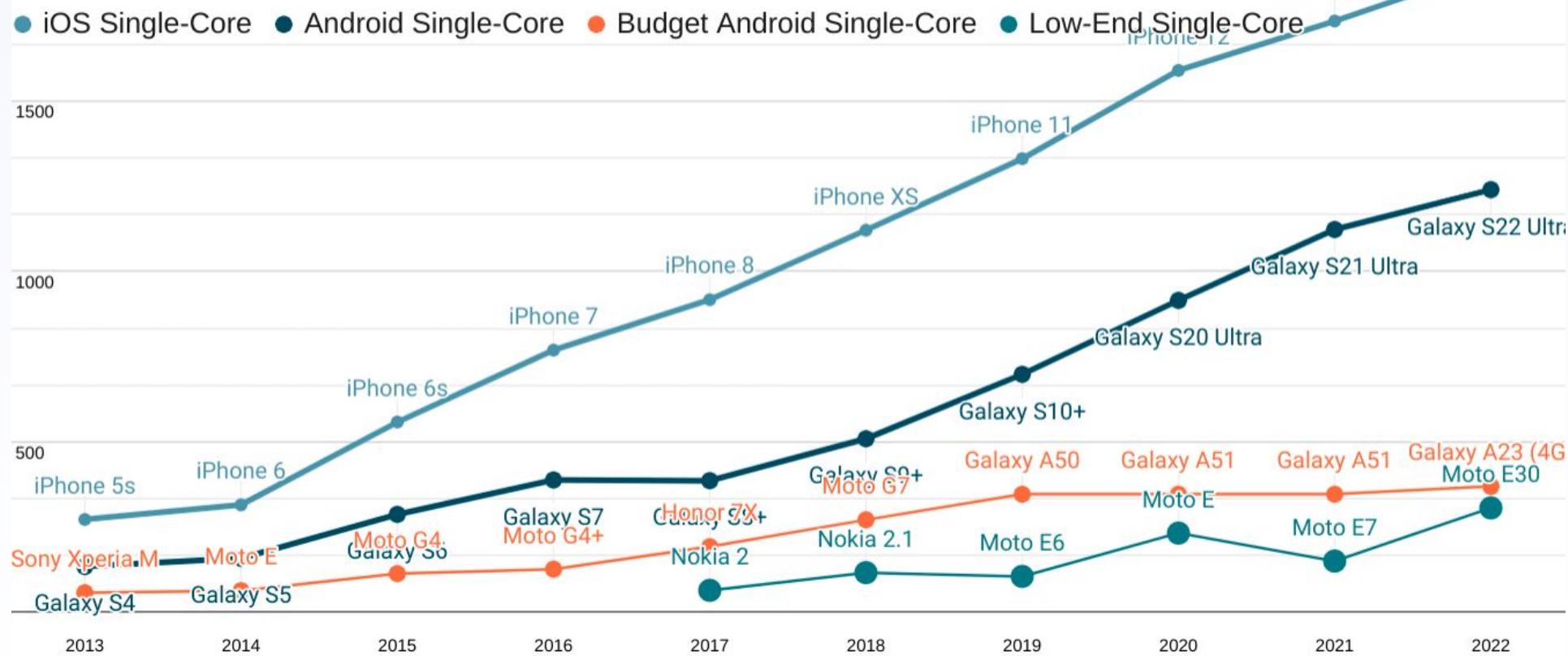
Device

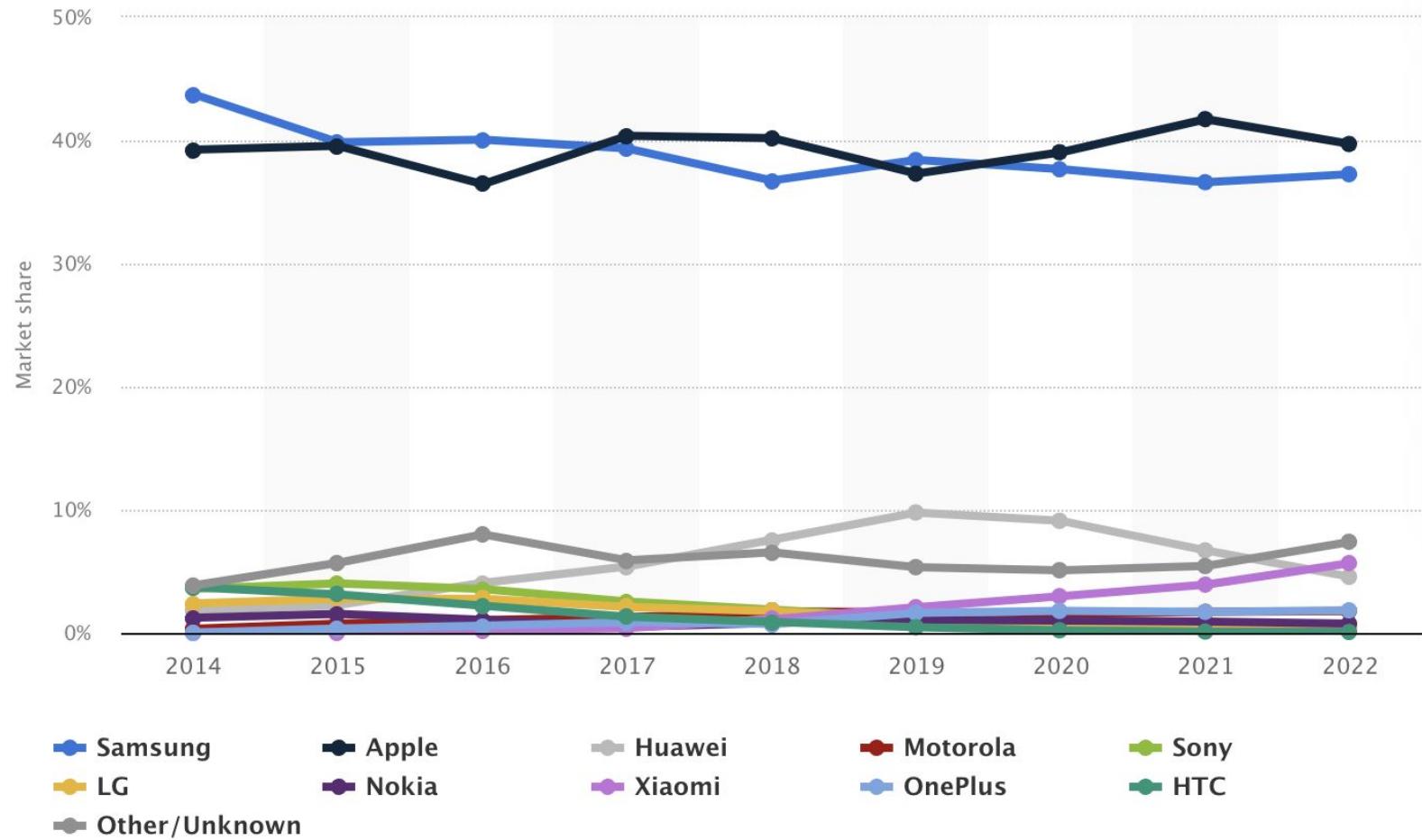
CPU (processor) power

What is affecting load times?

TL;DR: your iPhone isn't real life.

Geekbench 5 Single-Core Scores





© Statista 2023

Show source

Why you need a fast website

Google: 53% of mobile users abandon sites that take over 3 seconds to load

Vodafone improved their performance by 31%, resulting in an 8% increase in sales, a 15% increase in their lead to visit rate, and an 11% increase in their cart to visit rate.

Zalando saw a 0.7% increase in revenue when they shaved 100ms off their load time.

Furniture retailer Zitmaxx Wonen reduced their typical load time to 3 seconds and saw conversion jump 50.2%. Overall revenue from the mobile site also increased by 98.7%.

Key findings

Based on a 0.1s natural mobile site speed improvement, Deloitte observed the following key improvements to conversions and customer engagement:

- Mobile site speed improvements had a direct correlation to improved funnel progression.
- A positive change in the number of page views, conversion rates and average order value across all verticals.
- Retail conversions increased by 8.4% and average order value increased by 9.2%.
- Luxury brand page views per session increased by 8.6%.
- Bounce rates on product listing pages in retail and travel improved by 5.7% and 5.4% respectively.



Core Web Vitals (SEO)

Website experience for Google ranking

Google Core Web Vitals

Fast-loading, responsive, and visually stable websites are rewarded by Google. Google checks websites based on the following criteria.

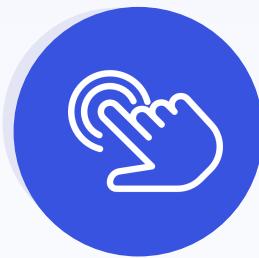


Loading

Time To First Byte

First Contentful Paint

Largest Contentful Paint

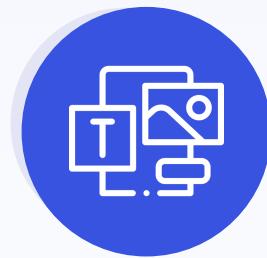


Interactivity

First Input Delay

Interaction to Next Paint

Total Blocking Time



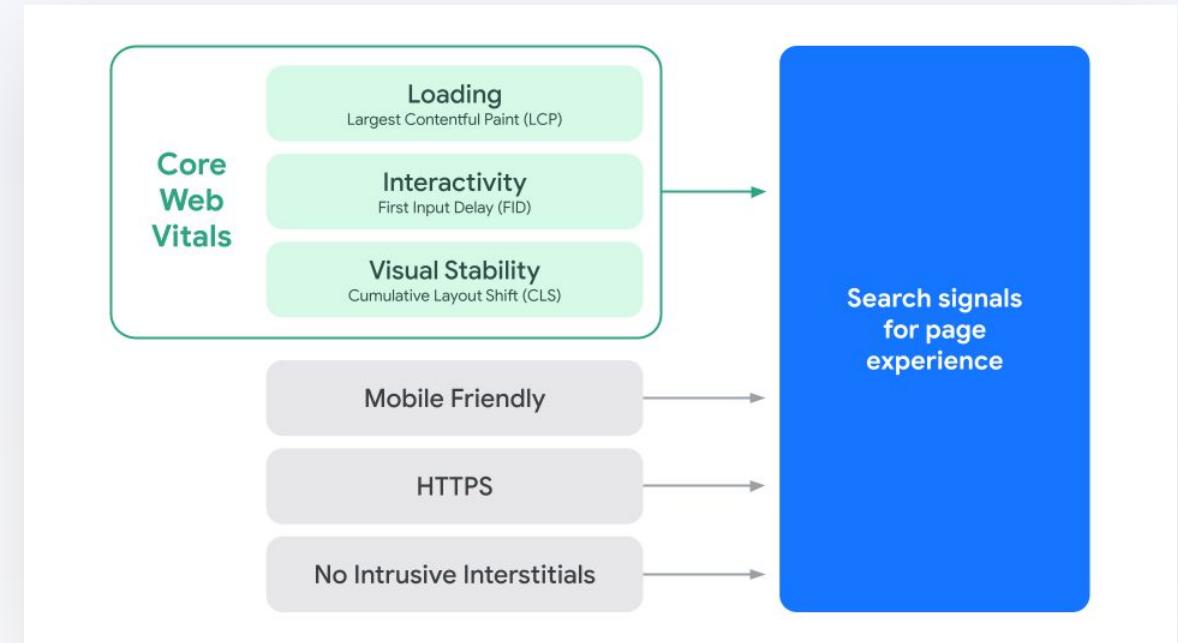
Visual stability

Cumulative Layout Shift

Core Web Vitals

Part of Page Experience

- 2010 Desktop pages get ranked by loading time.
- 2018 Mobile pages are ranked by loading time.
- 2021 In May 2021, Google combined Core Web Vitals for mobile pages with the existing signals in 'Page Experience'. As a result, Core Web Vitals are considered a ranking factor in (SEO).
- 2022 Since February 2022, this signal also applies to desktop pages.





COURTESY OF FOX NETWORK

WPO Case Studies

<https://wpostats.com/>

Impact of Poor Website Performance

Improving website performance will enhance user experience, boost conversion rates, improve SEO rankings, and strengthen the company's brand image.

User Experience

Slow loading times, delays, and glitches frustrate users, leading to high bounce rates and decreased engagement.

Conversion Rates

Poor performance negatively affects the ability to convert visitors into customers, resulting in lost sales opportunities.

SEO Rankings

Search engines consider website performance as a ranking factor. Slow websites may experience lower visibility and organic traffic.

Brand Reputation

Users associate a poorly performing website with a lack of professionalism and credibility, damaging the brand's reputation.



Introduction to WPO

Where should we start



Rafael Gonzaga @_rafaelgss

Disappointed to see that a majority of web performance discussions focus solely on front-end code, neglecting the critical role of server-side optimization

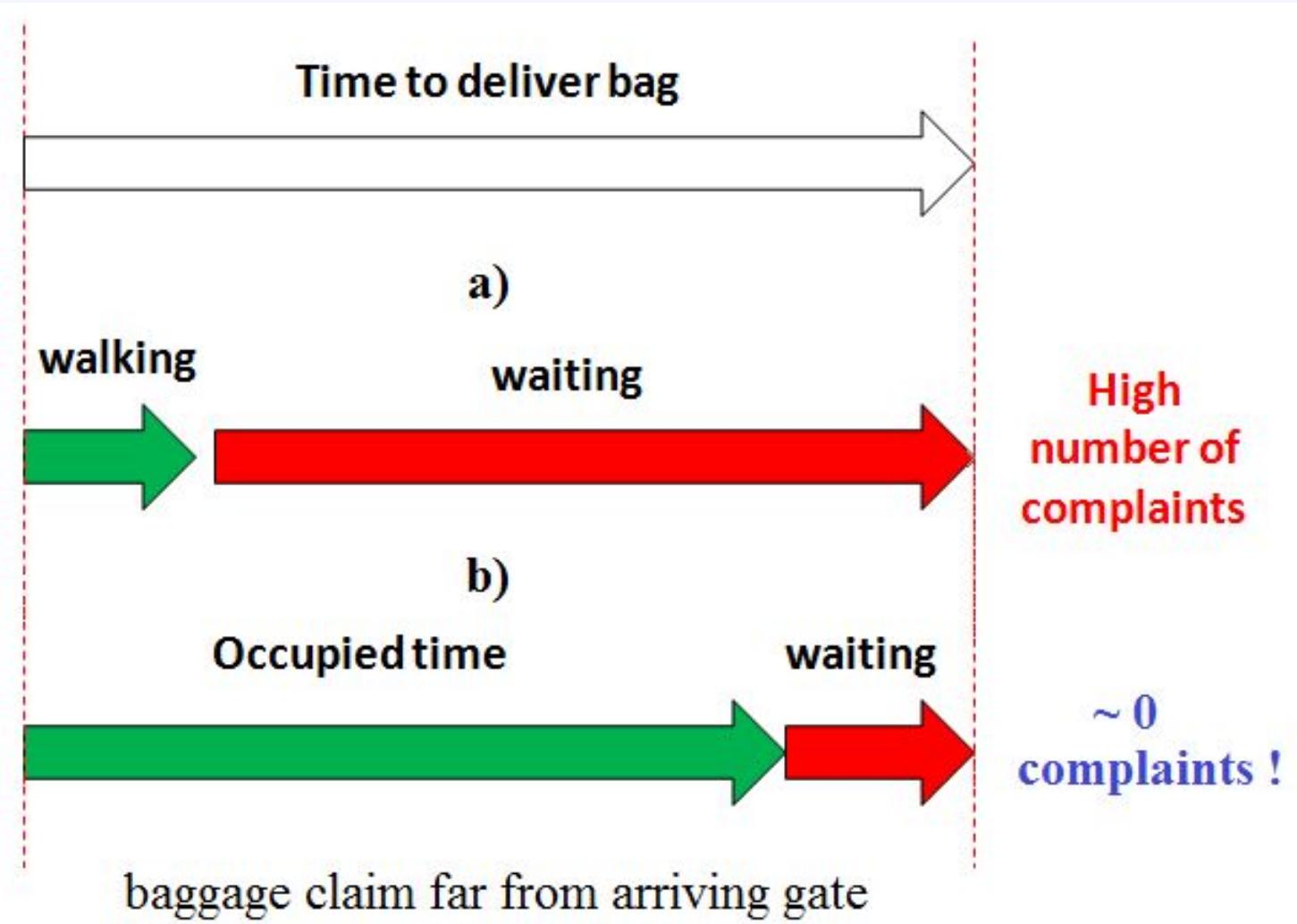
The Performance Golden Rule

SITE RANK	Backend	Front-end
Top 1,000	12.7%	87.3%
1,001 - 10,000	12.5%	87.5%
10,001 - 100,000	13.8%	86.2%
100,001 - 1,000,000	14.5%	85.5%

Source: <https://timkadlec.com/remembers/2023-04-10-the-golden-rule-revisited/>

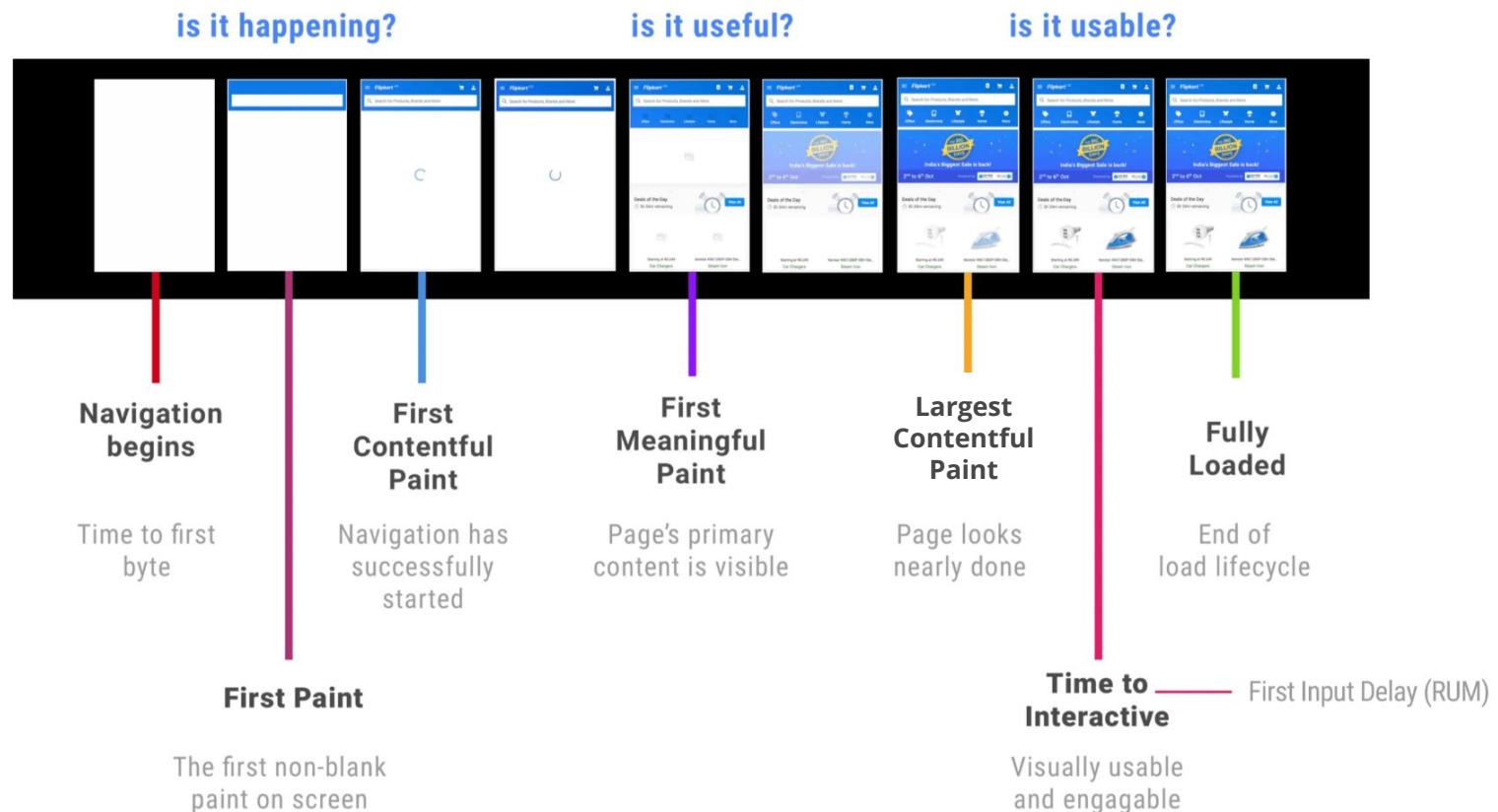
Advanced techniques

Perception of Time

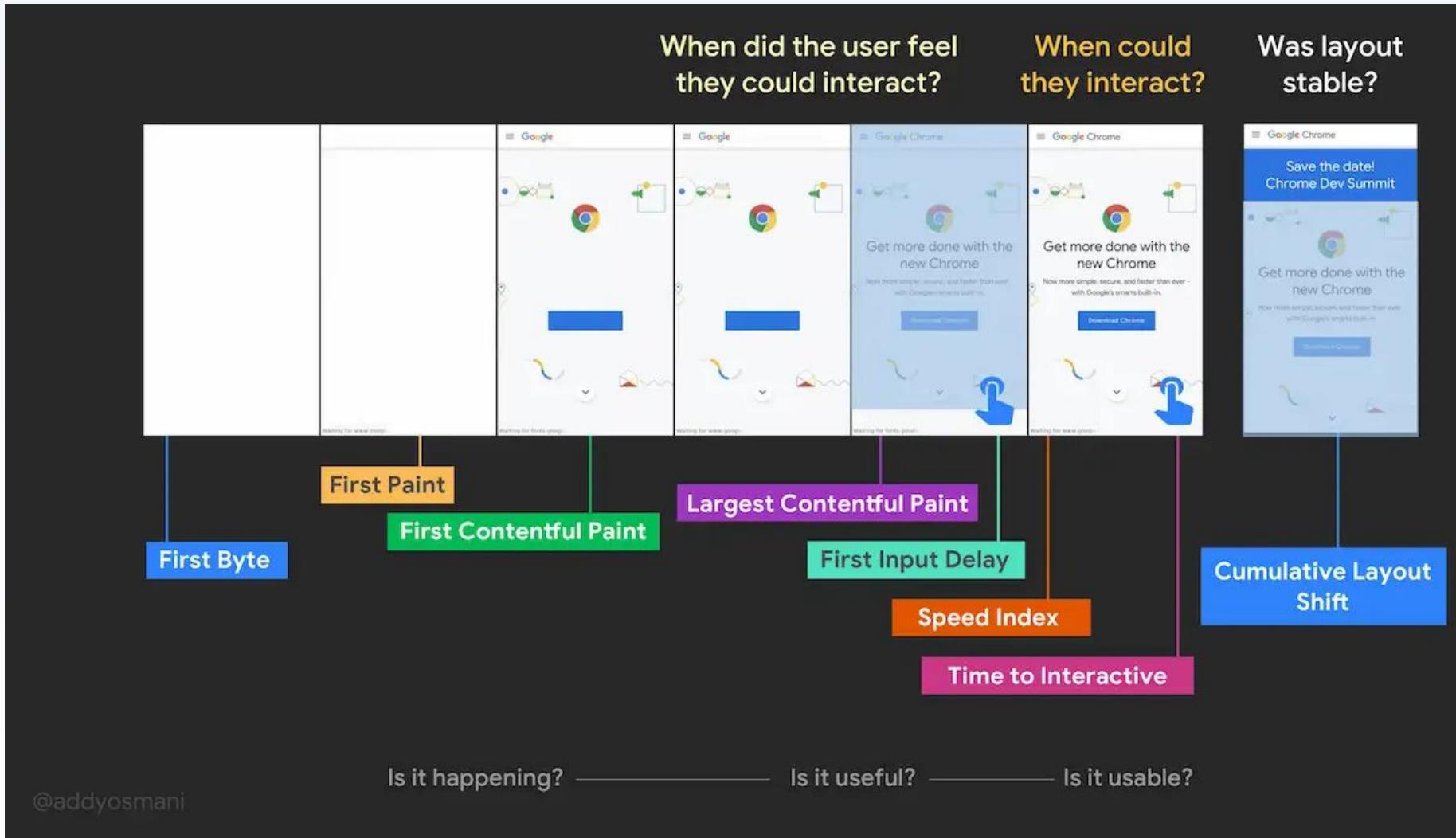


Loading progress

LOADING IS A JOURNEY



Loading progress



perception of time

Percieved performance exercise



Tools and practices for WPO

Measuring performance

Performance monitoring

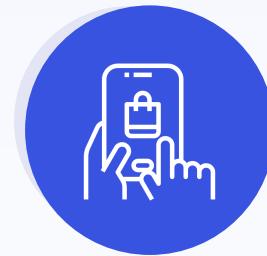
A combination of both lab and field measurements gives us the most complete insights



Lab data

Experiences from a potential visitor

Lab data is useful for debugging performance issues as it is collected in a controlled environment.



Field data

Experiences from real visitors

Field data is useful to capture the real user experience, but has a limited number of metrics.

Synthetic testing

- Consistent stable insight on various performance metrics.
- Insights on how your website performs over a period of time.
- Insights on how your website performs during the implementation of new features (code and design changes).
- Insights in first- and third-party resources

Real User Monitoring (RUM)

- Insights in the user experience of the website for real users, including key business templates and pages.
- Insights on how your website performs on different devices, connections, browsers and hardware.
- Insights how third-party business tooling affects performance.
- Enables correlation with business key performance indicators.

What tools can we use to measure

Synthetic monitoring

- WebPageTest
- Splunk
- SpeedCurve
- DebugBear
- NewRelic
- Datadog
- Raygun
- Treo.sh

Real user monitoring (RUM)

- Dynatrace
- Akamai MPulse
- Custom
- RumVision
- SpeedCurve
- NewRelic
- Raygun



Which metrics should you focus on?

Which metrics should you focus on?

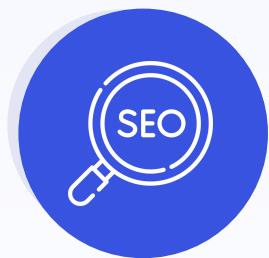
Several metrics can be tracked that are meaningful to the site:

- **Milestone timings:** e.g. Time To First Byte, Start Render, Largest Contentful Paint, Time to Add to Basket
- **Quantity based timings:** e.g. Page size, Image sizes, Long tasks, Blocking time, Total requests
- **Score based:** e.g. Cumulative Layout Shift, Lighthouse

There are dozens and dozens of performance metrics

No one-size-fits-all unicorn metric

There's no one-size-fits-all unicorn metric that will get everyone in your company excited about performance. Instead, your performance budgets may include the following.



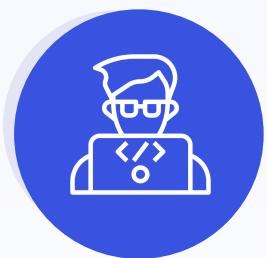
SEO

Wants to track Core Web Vitals.



Business

Wants to know how quickly the page delivers the most important content from a user's perspective.



Developers

Want to get a sense of how well the page is built – for instance, are there any blocking scripts or stylesheets.



Backend

Needs to know Time to First Byte so that they can investigate back-end issues

Identify what people care about

In order to get as many people involved on performance we need to find out what metric motivates them. It is therefore important to identify the business KPIs of all stakeholders. This allows us to map the correct business metrics to performance.

- In order to investigate back-end issues, the back-end needs to know the Time to First Byte.
- Start Render is useful for developers who want to check how well the page is built.
- The marketing team probably wants to track how fast the product page renders the hero image from the perspective of the user. Or what the time to 'add to basket' is.
- SEO want to track the Core Web Vitals.
- Advertising probably would like to know how fast the ads appear.

Performance targets

Thresholds Web Vitals - field data

Metrics			Good	Poor
Time to First Byte	TTFB	Other Web Vital	< 800 ms	≥ 1.8 sec
First Contentful Paint	FCP	Other Web Vital	< 1.8 sec	≥ 3.0 sec
Largest Contentful Paint	LCP	Core Web Vital	< 2.5 sec	≥ 4.0 sec
First Input Delay	FID	Core Web Vital	< 100 ms	≥ 300 ms
Interaction to Next Paint	INP	Experimental	< 200 ms	≥ 500 ms
Cumulative Layout Shift	CLS	Core Web Vital	≤ 0.1	> 0.25

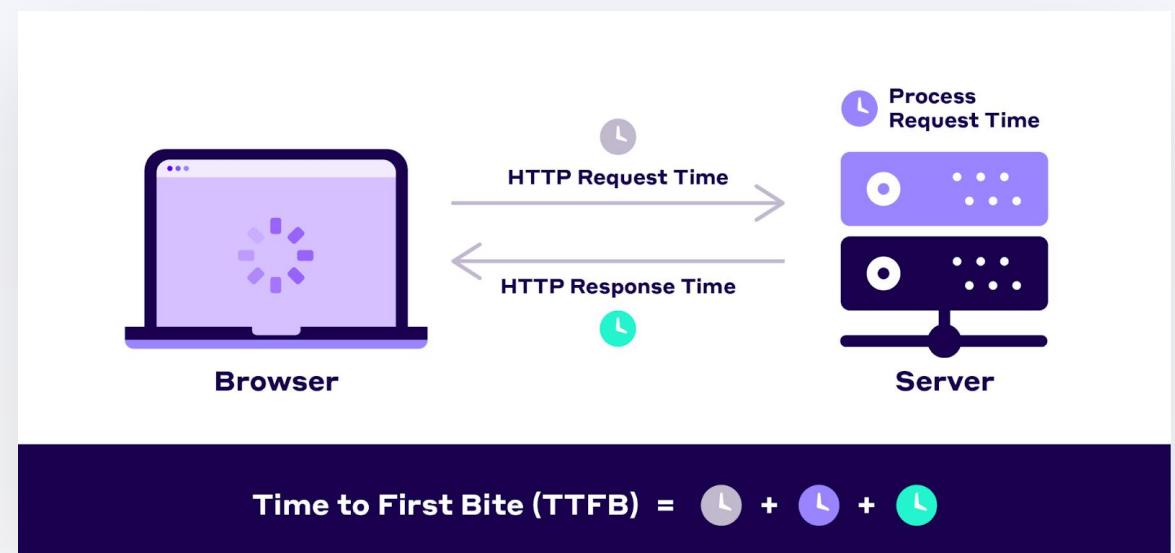


TTFB

Time to First Byte (TTFB)

"When does a browser receive the first byte of a response?"

- TTFB is a metric that measures the time between the request for a resource and when the first byte of a response begins to arrive (server response time)
- Important for every resource, but especially for the HTML (the first resource)
- TTFB precedes user-centric metrics such as First Contentful Paint (FCP) and Largest Contentful Paint (LCP)
- Must be faster than 0.8 sec



Time to First Byte

- Latency
- Server-Side Rendering
- Redirects
- Routing
- API calls
- File system reads
- Database queries
- Caching

Performance metrics

Server timing



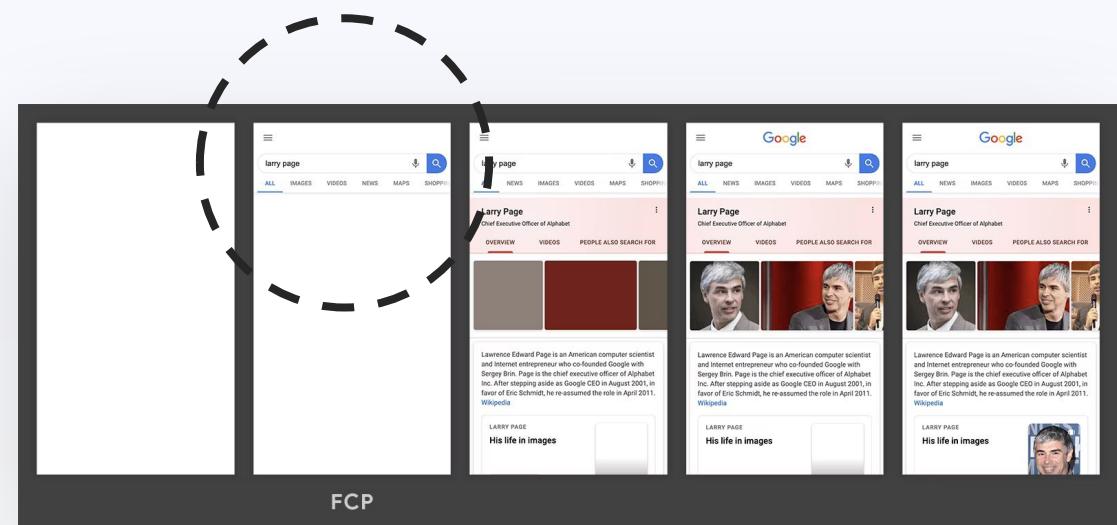


First Contentful Paint

First Contentful Paint (FCP)

"When can a visitor see anything on the screen or in the viewport?"

- A fast FCP helps reassure the user that something is happening
- Measures elements such as images and text
- In the load timeline (see image), FCP happens in the second frame, as that's when the first text and image elements are rendered to the screen
- Must be faster than 1.8 sec



First Contentful Paint

Do's

- HTTP/2, HTTP/3
- Eliminate render-blocking resources
- Optimise all your assets!!
- Add async or defer to non critical scripts
- Reorder your <head> tag
- Self host critical assets (Fonts, CSS, JS)
- Preconnect to required origins
- Reduce the HTML size
- Add font-display: swap for custom fonts

Self host critical assets



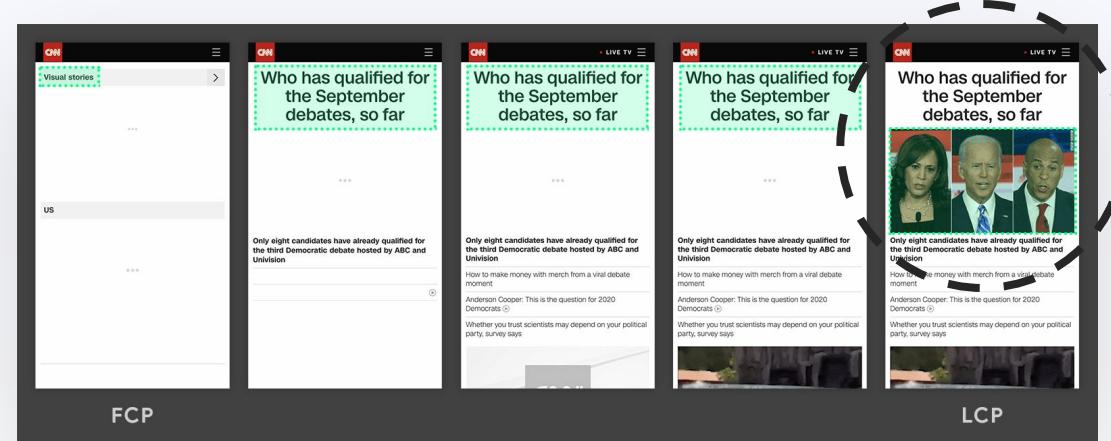


Largest Contentful Paint

Largest Contentful Paint (LCP)

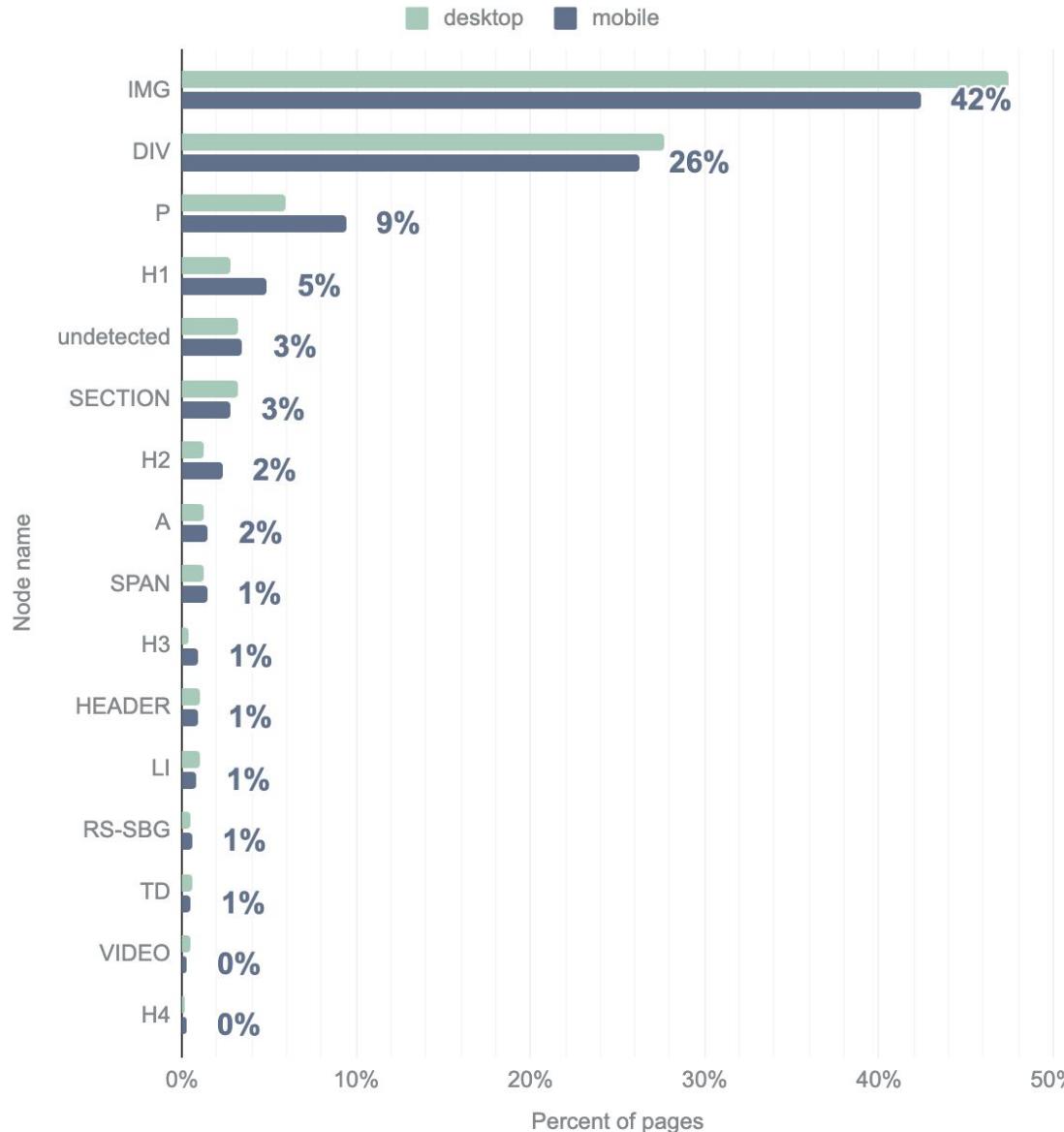
"When is the largest content element in the viewport visible to visitors?"

- LCP marks the point in the page load timeline (see images) when the page's main content has likely loaded—a fast LCP helps reassure the user that the page is useful
- Measures elements such as images, video and text
- The largest element may change over time as a larger element is loaded later (see images)
- Must be faster than 2.5 sec

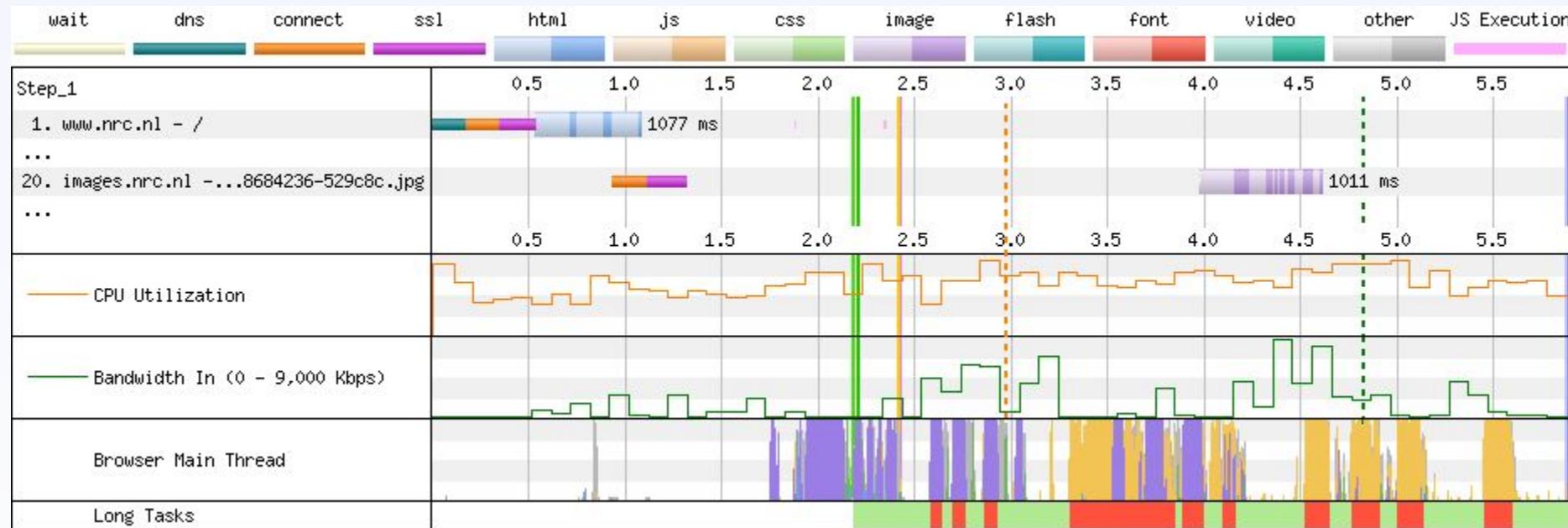


Top LCP element types

Web Almanac 2022: Performance



Lazy loaded LCP image



Largest Contentful Paint

Do's

- Make sure the LCP image is in the DOM
- Resource hints
- Preload the LCP image in the <head>
- Use fetchpriority=high attribute
- Lazyload all images below the fold
- Use modern image formats (Webp/AVIF)
- Use responsive images (srcset & sizes)

Don'ts

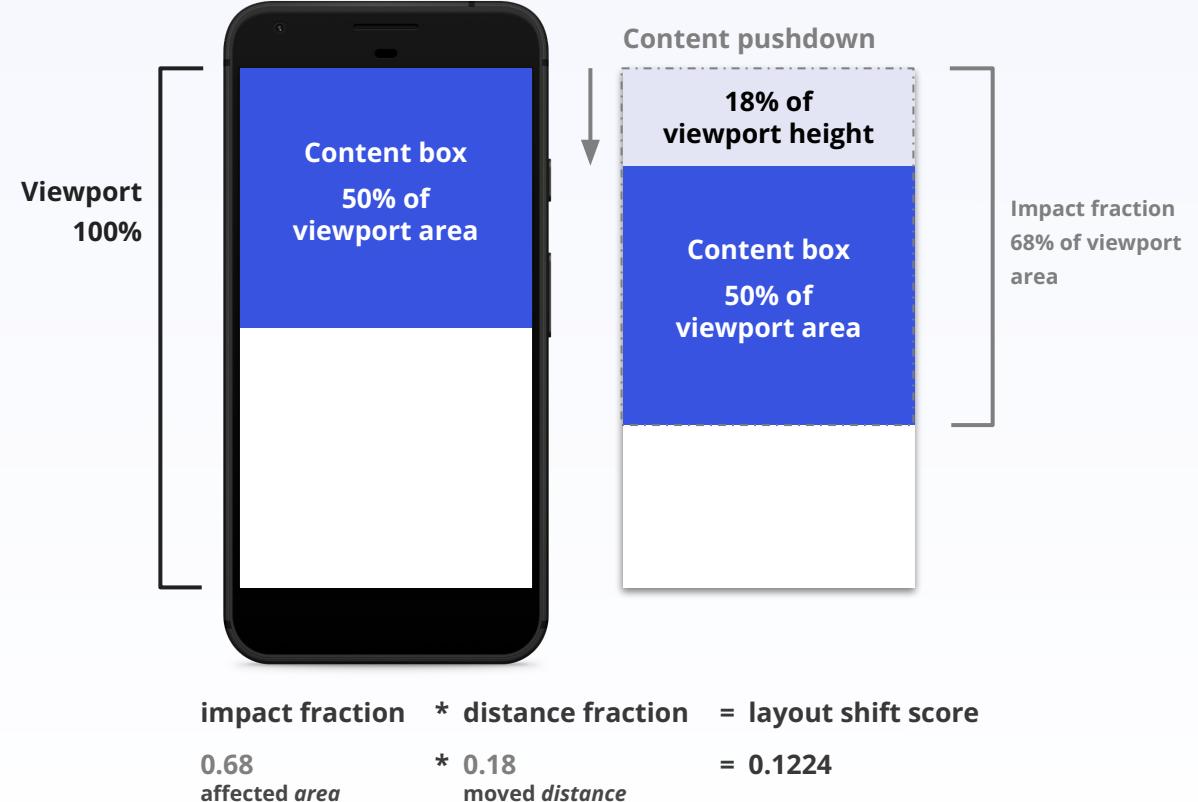
- Lazyload images above the fold
- Use CSS background images

Cumulative Layout Shift

Cumulative Layout Shift (CLS)

"How much of the content shifts while users interact with the page?"

- CLS helps to quantify how often users experience unexpected layout shifts—a low CLS helps ensure that the page is delightful
- Measured while loading and while interacting with the page
- Must be lower than 0.10

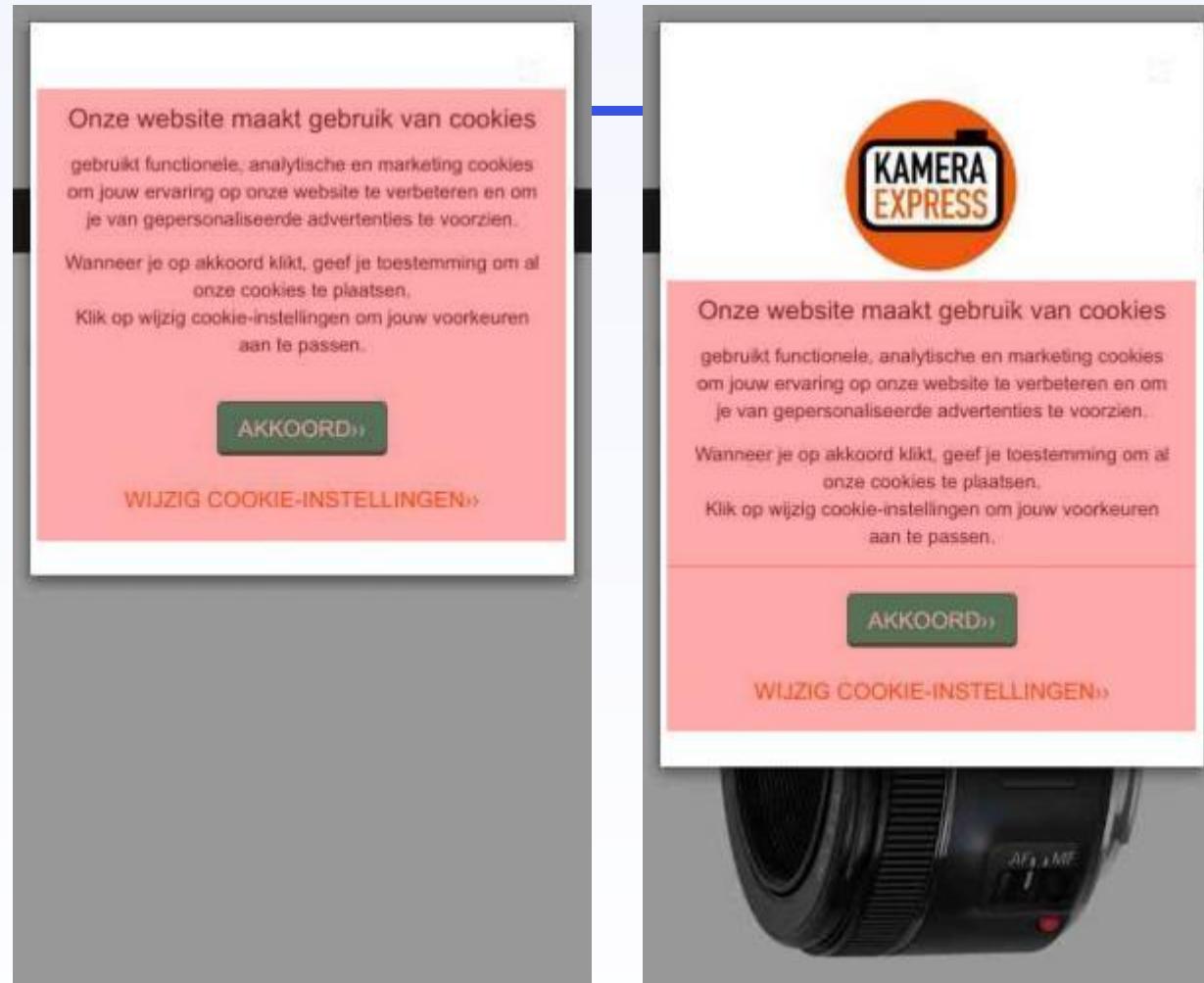


Cumulative Layout Shift (CLS)

Do's

- Include size attributes on **ALL** your images and video elements
- Reserve enough space for late loaded content
- Prefer transform animations instead of animations that trigger layout changes
- Use the <picture> element when images have different aspect ratio

Cumulative Layout Shift



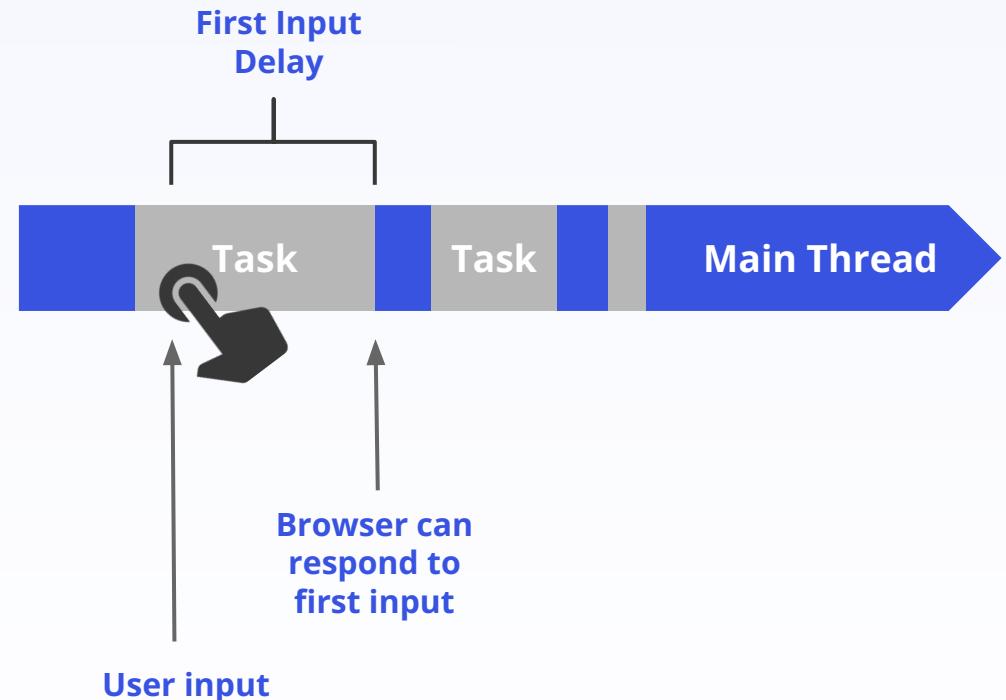


First Input Delay

First Input Delay (FID)

"How long is the response time of a page to the first interaction of users?"

- FID quantifies the experience users feel when trying to interact with unresponsive pages—a low FID helps ensure that the page is usable
- FID measures the time from when a user first interacts with a page (i.e. when they click a link, tap on a button, or use a custom, JavaScript-powered control) to the time when the browser is actually able to respond to that interaction.
- Must be faster than 100 ms



First Input Delay

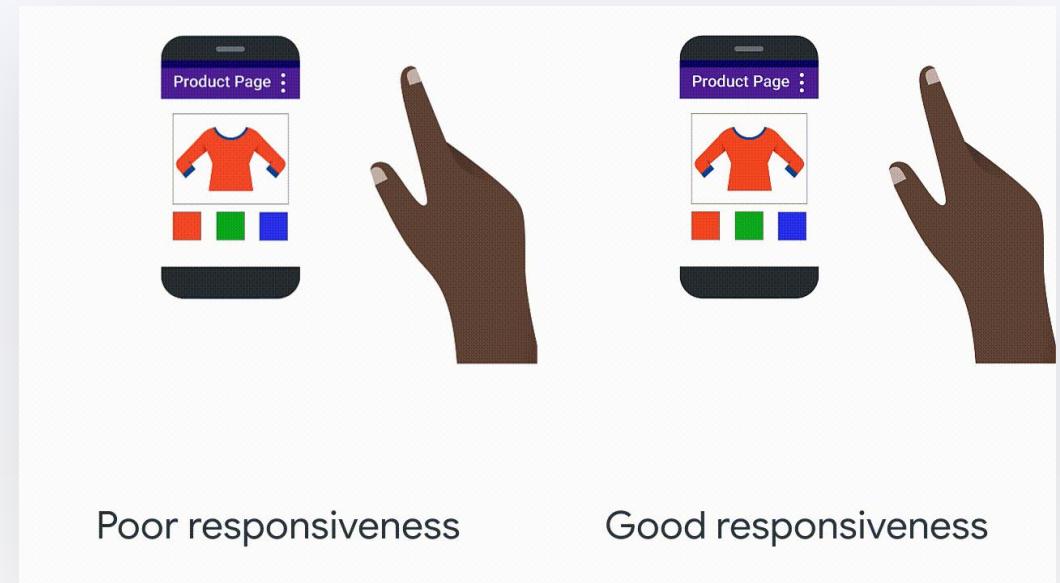
- Improve resource loading on page load
- Minimize main thread work
 - Code splitting
 - Use native browser elements instead of javascript libraries
 - Use facade's

Interaction to Next Paint

Interaction to Next Paint (INP)

"How responsive is a page to interactions of users?"

- INP logs the latency of all interactions throughout the entire page lifecycle.
- The highest value of those interactions—or close to the highest for pages with many interactions—is recorded as the page's INP. A low INP ensures that the page will be reliably responsive at all times.
- Must be faster than 200 ms



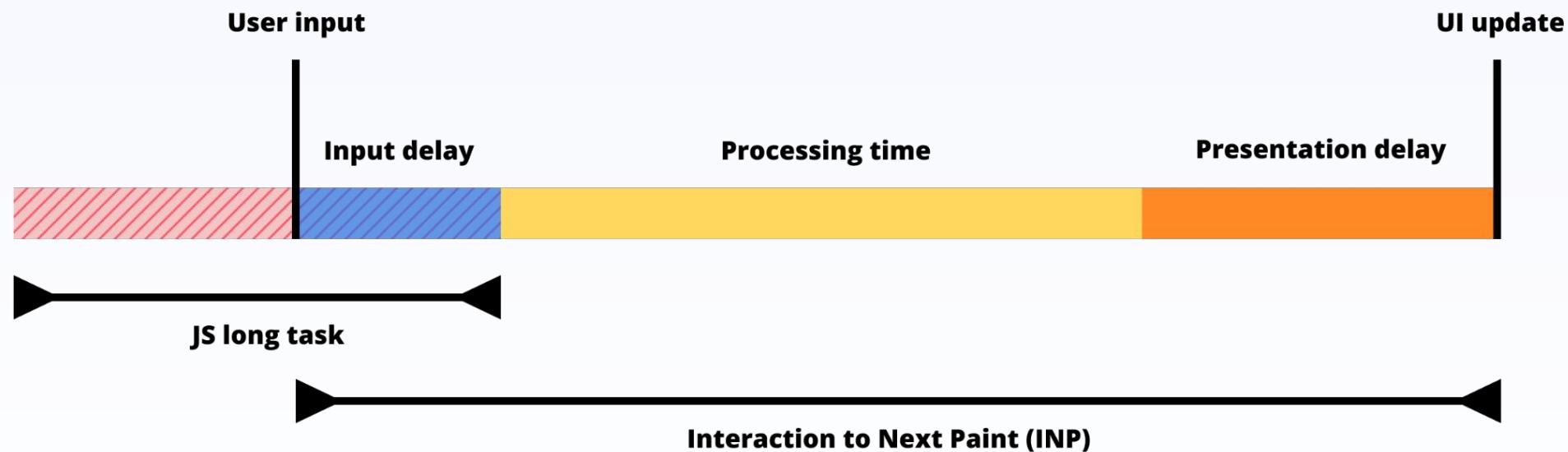
Poor responsiveness

Good responsiveness

Visual feedback underscores the importance of communicating a result of an interaction

Interaction to Next Paint (INP)

What can delay an interaction?





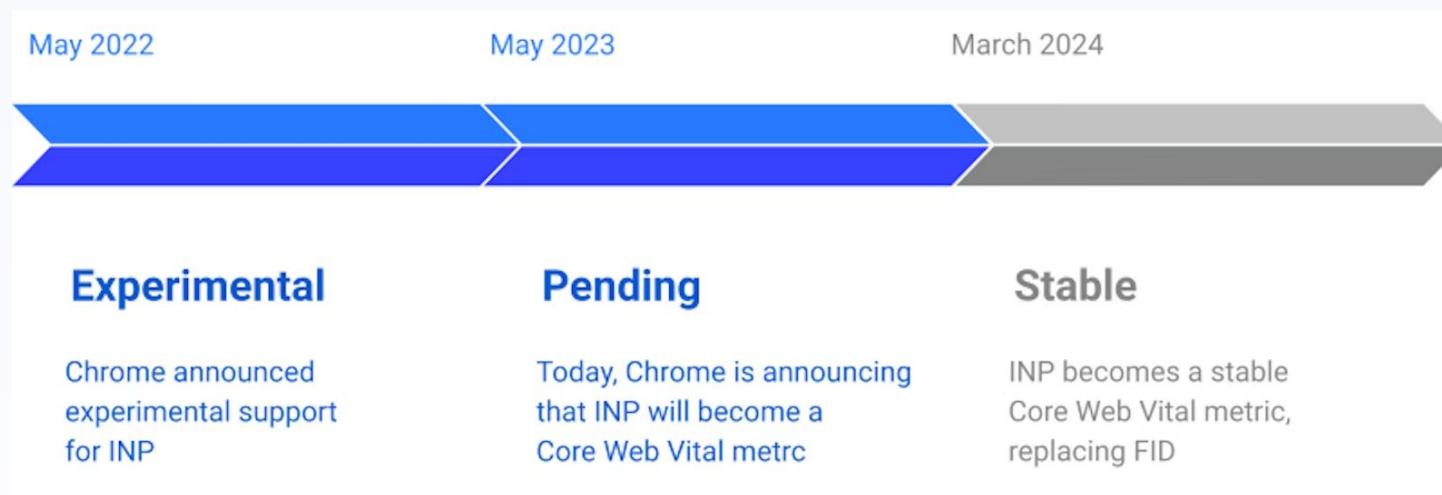
Responsiveness

*JavaScript is the fastest way
to slow down a site.*

Website experience for Google ranking

Evolving INP

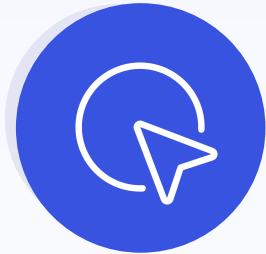
INP is no longer experimental and will instead be considered a pending Core Web Vital metric (March 2024).



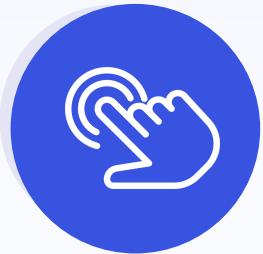
Prompt visual feedback is key for INP

What does INP measure?

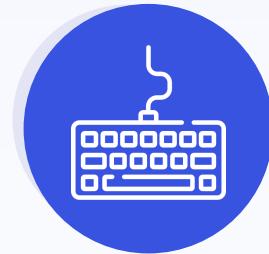
It starts with a user interaction.



Mouse click



Tap touchscreen



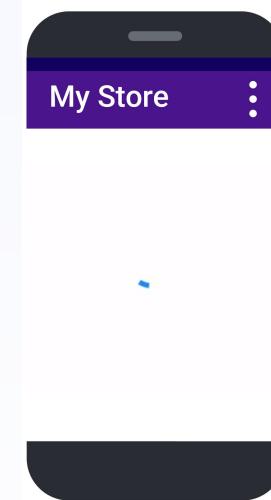
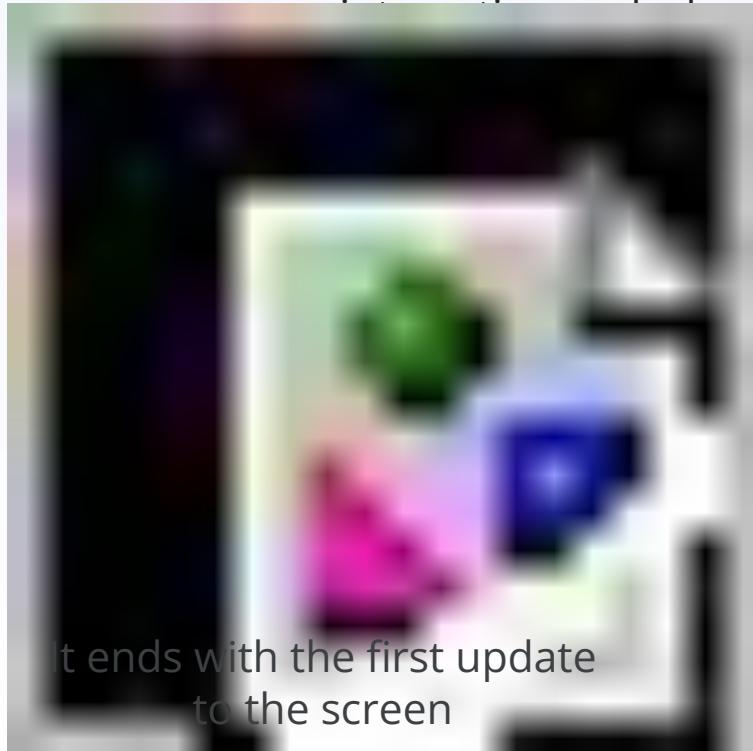
Type on keyboard

Users experience responsiveness in the form of visual feedback. For INP, it is vital that the time between a user interaction and when the next frame is painted is as short as possible.

Prompt visual feedback is key for INP

What does INP measure?

Users experience responsiveness in the form of visual feedback. For INP, it is vital that the time between a user action and the first update to the screen the next frame is painted is as short as possible.



Why a good INP matters

*"Over 90% of user time
spent on a page is after
the load."*



vodafone NL 4G | Wi-Fi | 46% 20:14

simyo

Menu

Maandelijks gratis aanpasbaar

Terug naar alle telefoons

Samsung Galaxy S22

128 GB - Zwart

• Direct leverbaar

Nu scherp geprijsd!



Kies je kleur



Kies je opslagruimte

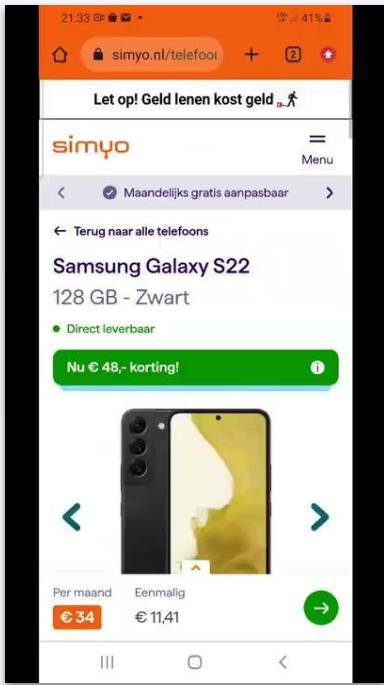
Per maand Eenmalig

€ 36 € 26,42

→

Poor responsiveness use case

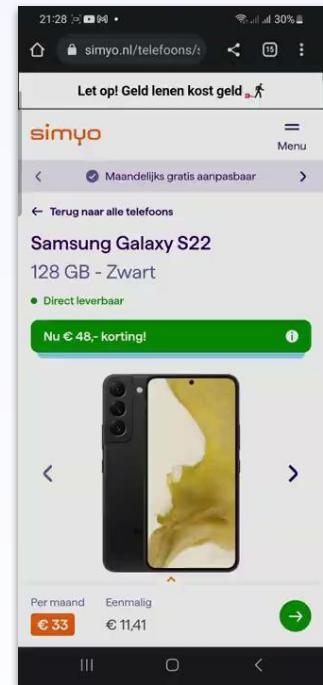
Handset PDP on different devices



Low-end Android



Mid-tier Android



High-end Android



iPhone 12 mini

Interaction to Next Paint

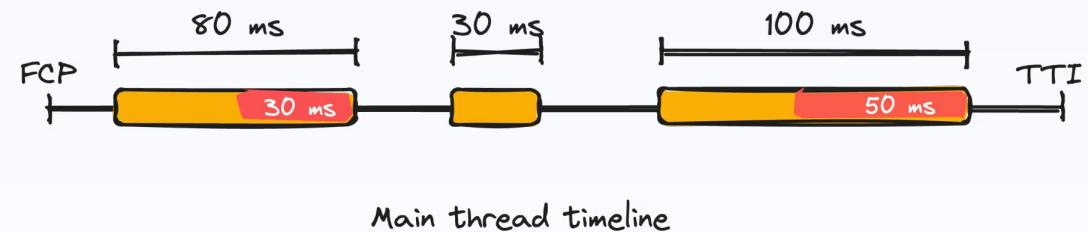
The most common causes that can lead to a high Interaction to Next Paint are:

- Third Party Scripts
- Unoptimised Javascript bundles
- Framework overhead
- Hydration
- Multiple event handlers
- Complexity in Styles & Layout
- Unused code
- Long javascript tasks
- Prefetching
- Large Images

Total Blocking Time (TBT)

"How responsive is a page to interactions of users?"

- Total Blocking Time (TBT) is a lab metric for responsiveness.
- TBT is a metric that might give you insight into whether you have excessive script evaluation occurring during page load.
- There is a relationship between TBT (a lab metric) and INP (a field metric), a high TBT measured in lab data is likely to result in elevated INP values in field data. When TBT issues in lab data are fully resolved it will also eliminate INP issues experienced by real users.
- Must be faster than 300 ms.





Tools and practices for WPO

Measuring performance

Performance monitoring

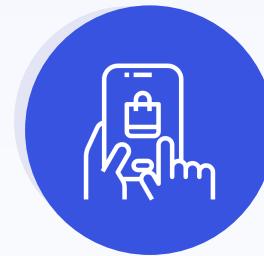
A combination of both lab and field measurements gives us the most complete insights



Lab data

Experiences from a potential visitor

Lab data is useful for debugging performance issues as it is collected in a controlled environment.



Field data

Experiences from real visitors

Field data is useful to capture the real user experience, but has a limited number of metrics.

Synthetic testing

- Consistent stable insight on various performance metrics.
- Insights on how your website performs over a period of time.
- Insights on how your website performs during the implementation of new features (code and design changes).
- Insights in first- and third-party resources

Real User Monitoring (RUM)

- Insights in the user experience of the website for real users, including key business templates and pages.
- Insights on how your website performs on different devices, connections, browsers and hardware.
- Insights how third-party business tooling affects performance.
- Enables correlation with business key performance indicators.

What tools can we use to measure

Synthetic monitoring

- WebPageTest
- Splunk
- SpeedCurve
- DebugBear
- NewRelic
- Datadog
- Raygun
- Treo.sh

Real user monitoring (RUM)

- Dynatrace
- Akamai MPulse
- Custom
- RumVision
- SpeedCurve
- NewRelic
- Raygun



Auditing Websites

CrUX - PageSpeed Insights

https://bol.com/ Analyze

Mobile Desktop

Showing results for URL: <https://www.bol.com/nl/nl/>
[Run with original URL](#)

Discover what your real users are experiencing This URL Origin

Core Web Vitals Assessment: Passed ⓘ Expand view

● Largest Contentful Paint (LCP)	1.1 s	● First Input Delay (FID)	16 ms	● Cumulative Layout Shift (CLS)	0
--	-------	---	-------	---	---

OTHER NOTABLE METRICS

● First Contentful Paint (FCP)	0.8 s	■ Interaction to Next Paint (INP) ⚡	211 ms	● Time to First Byte (TTFB) ⚡	0.4 s
--	-------	---	--------	---	-------

📅 Latest 28-day collection period 📍 Various mobile devices ✖ Many samples ([Chrome UX Report](#))
⌚ Full visit durations 📶 Various network connections ♾ All Chrome versions

- ▼ Performance
- G Search results
- * Discover
- ▼ Indexing
- 📄 Pages
- 🎥 Video pages
- 网站地图 Sitemaps
- 🔗 Removals
- ▼ Experience
- 🌐 **Page experience**
- ⌚ Core web vitals
- 📱 Mobile Usability
- 🔒 HTTPS
- ▼ Shopping
- 📦 Product snippets
- 📦 Merchant listings
- 📦 Shopping tab listings
- ▼ Enhancements
- 📦 Breadcrumbs
- 📦 Review snippets
- 📦 Sitelinks searchbox
- 📦 Unparsable structured ...

94.6% URLs with a good page experience on mobile

3.8% good URLs on desktop

Pages are evaluated separately for mobile and desktop

Mobile

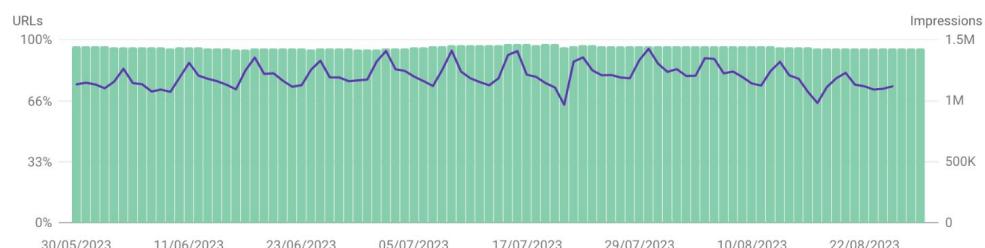
Good URLs ⓘ

94.6%

Total impressions of good URLs ⓘ

106M

ⓘ About chart



Page experience signals for mobile

Core web vitals ⓘ

1.66K

Failing URLs

Mobile Usability ⓘ

37

Failing URLs

HTTPS ⓘ

2

Non-HTTPS URLs

← → ⌛ 🔒 https://developer.chrome.com/docs/crux/

Chrome Developers  Search docs, blogs and more

Home  Documentation  Watch now. Dismiss

Docs  Blog  Articles 

Thanks for tuning in to Google I/O. Watch the Chrome content on-demand.



Chrome UX Report

The Chrome User Experience Report (CrUX) provides user experience metrics for how real-world Chrome users experience popular destinations on the web.

[About CrUX](#) Introduction to the CrUX dataset.

[CrUX methodology](#) Technical documentation on CrUX eligibility, metrics, dimensions and accessing the data.

[CrUX on BigQuery](#) Learn how the CrUX dataset on BigQuery is

Lab - Webpagetest

URL: <https://www.bol.com> DATE: 28/03/2023, 11:55:46

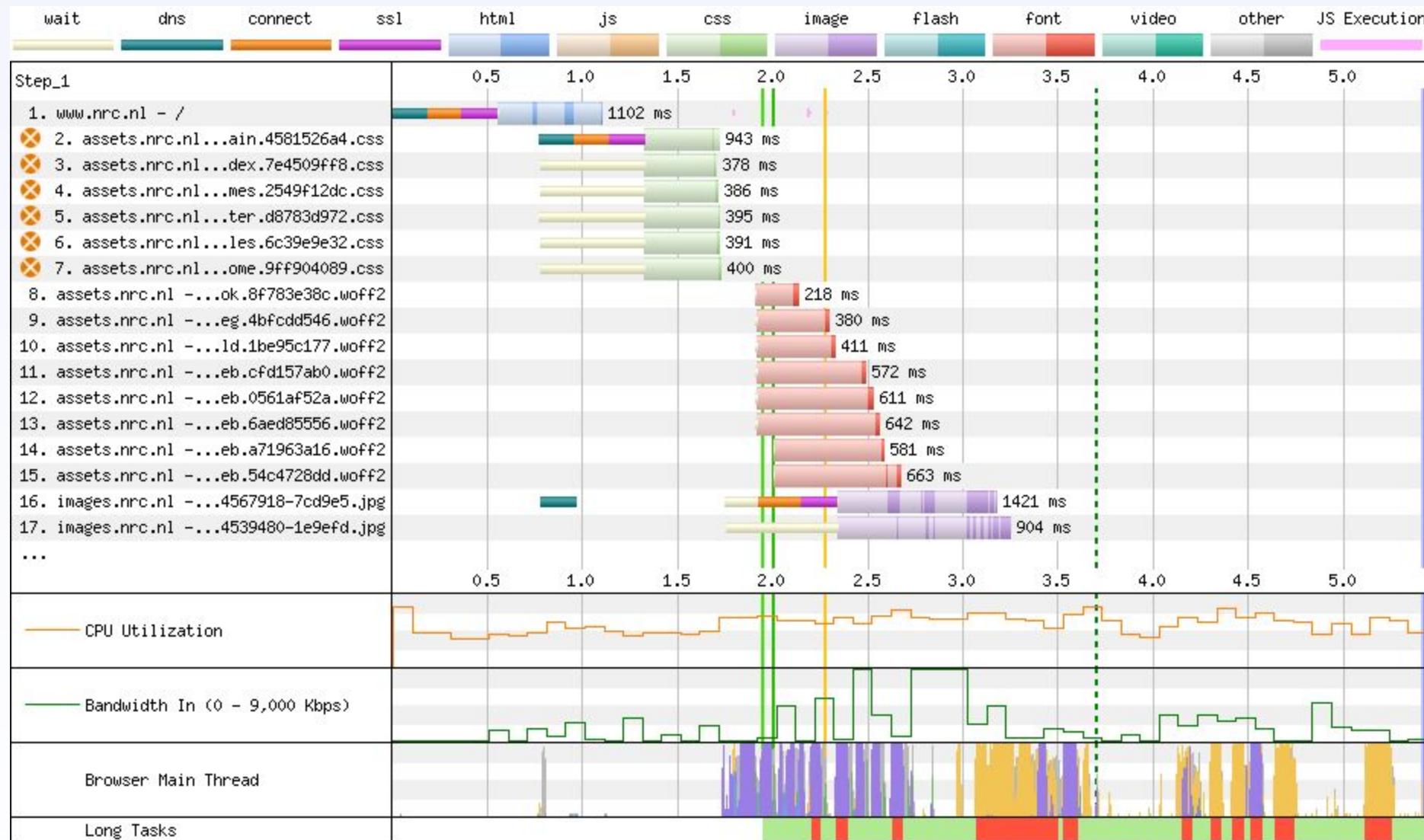
Webpage Performance Test Result

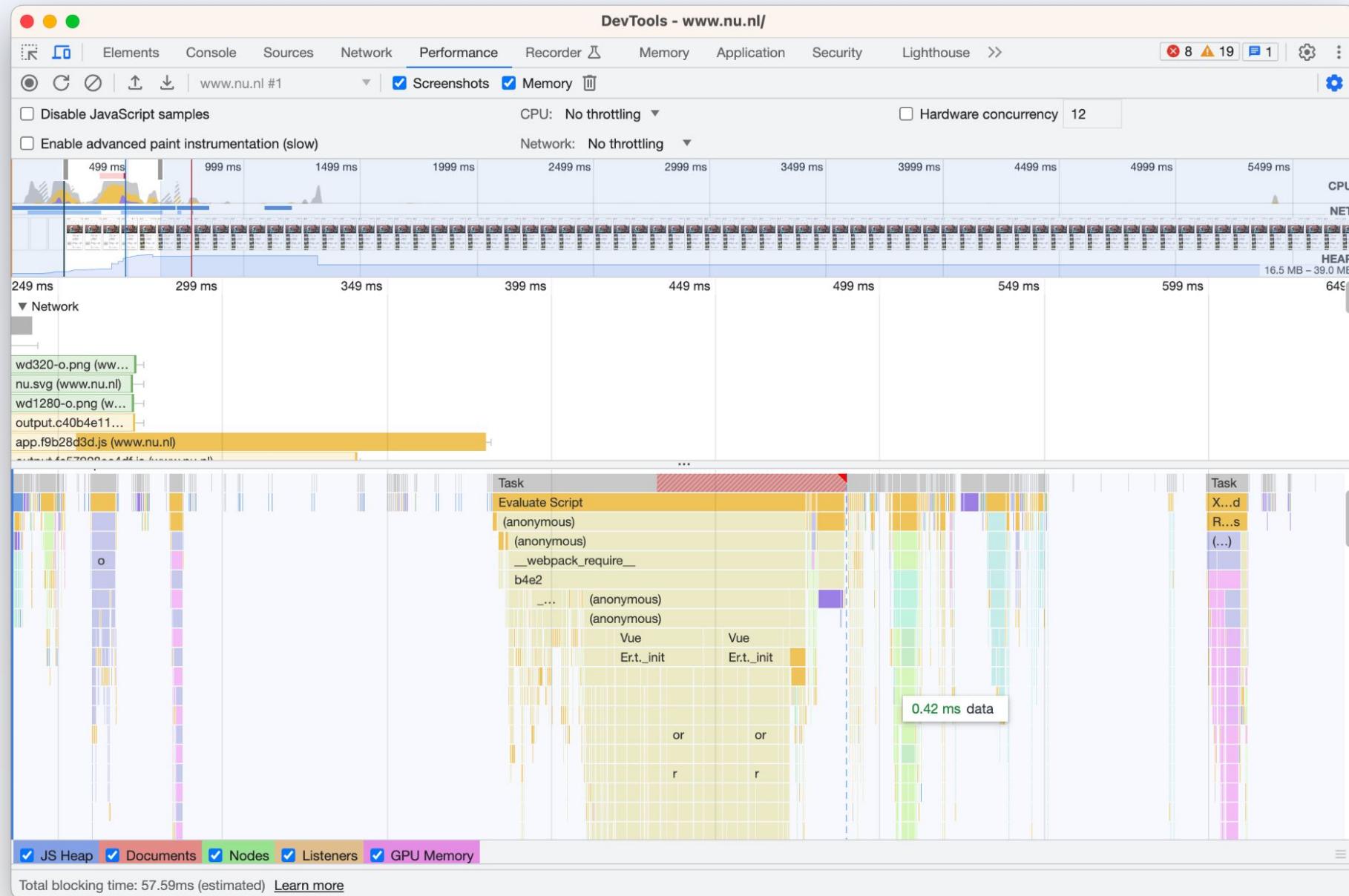
SETTINGS: DESKTOP v111 4G Amsterdam, NL More Share

View: Performance Summary Tools: Export Re-Run Test

First View (Run 2)	Time to First Byte **1.070 s**	Start Render **1.600 s**	First Contentful Paint **1.565 s**	Speed Index **2.153 s**	Largest Contentful Paint **2.509 s**	Cumulative Layout Shift **.002**	Total Blocking Time **.085 s**	Page Weight **922 KB**
When did the content start downloading?	When did pixels first start to appear?	How soon did text and images start to appear?	How soon did the page appear usable?	When did the largest visible content finish loading?	How much did the design shift while loading?	How long was content blocked from user input?	How many bytes were downloaded?	

Visual Page Loading Process (Explore)





What metrics should we measure

Project setup



Networking layer

How does a browser work

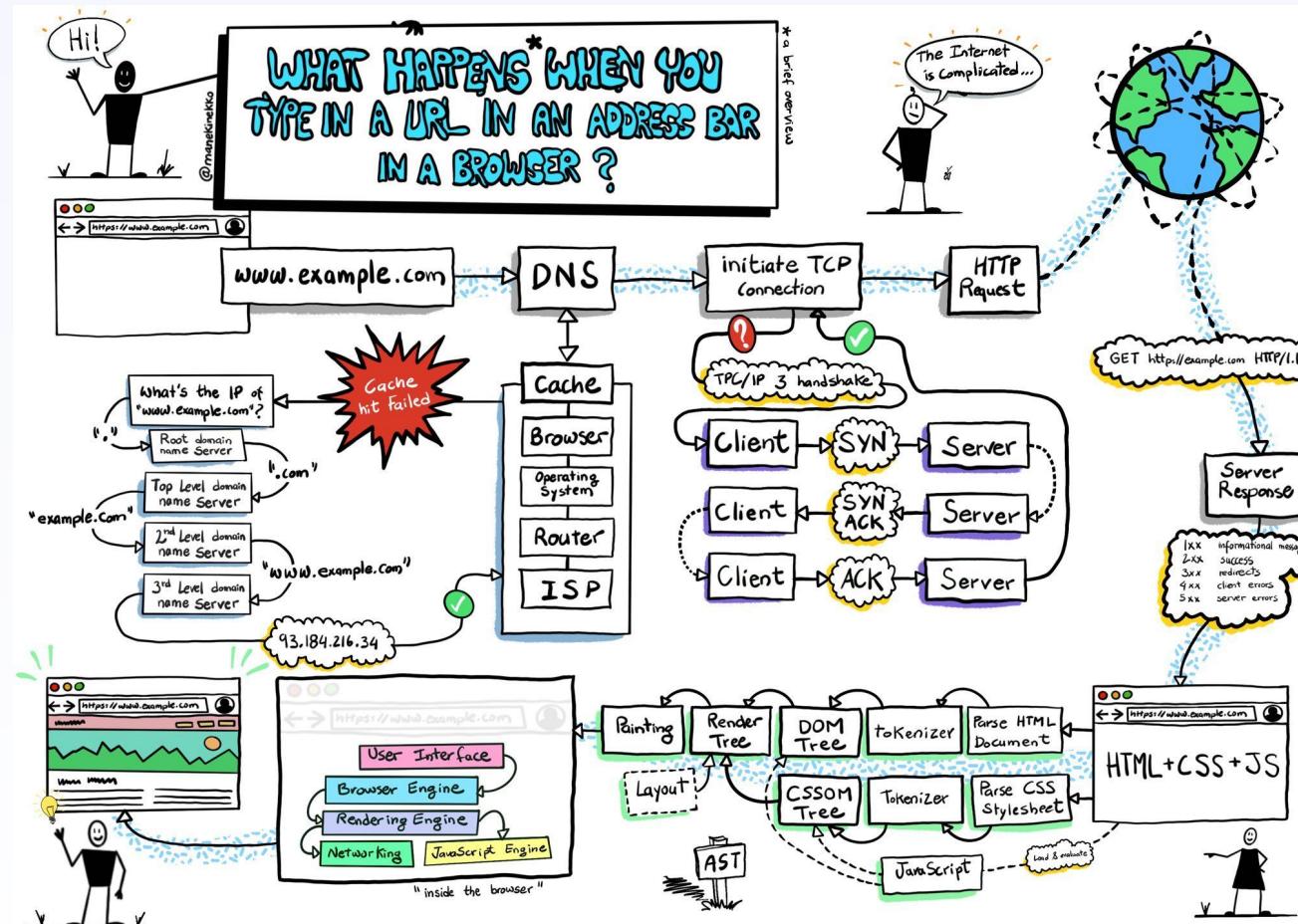
What happens when you request a page?

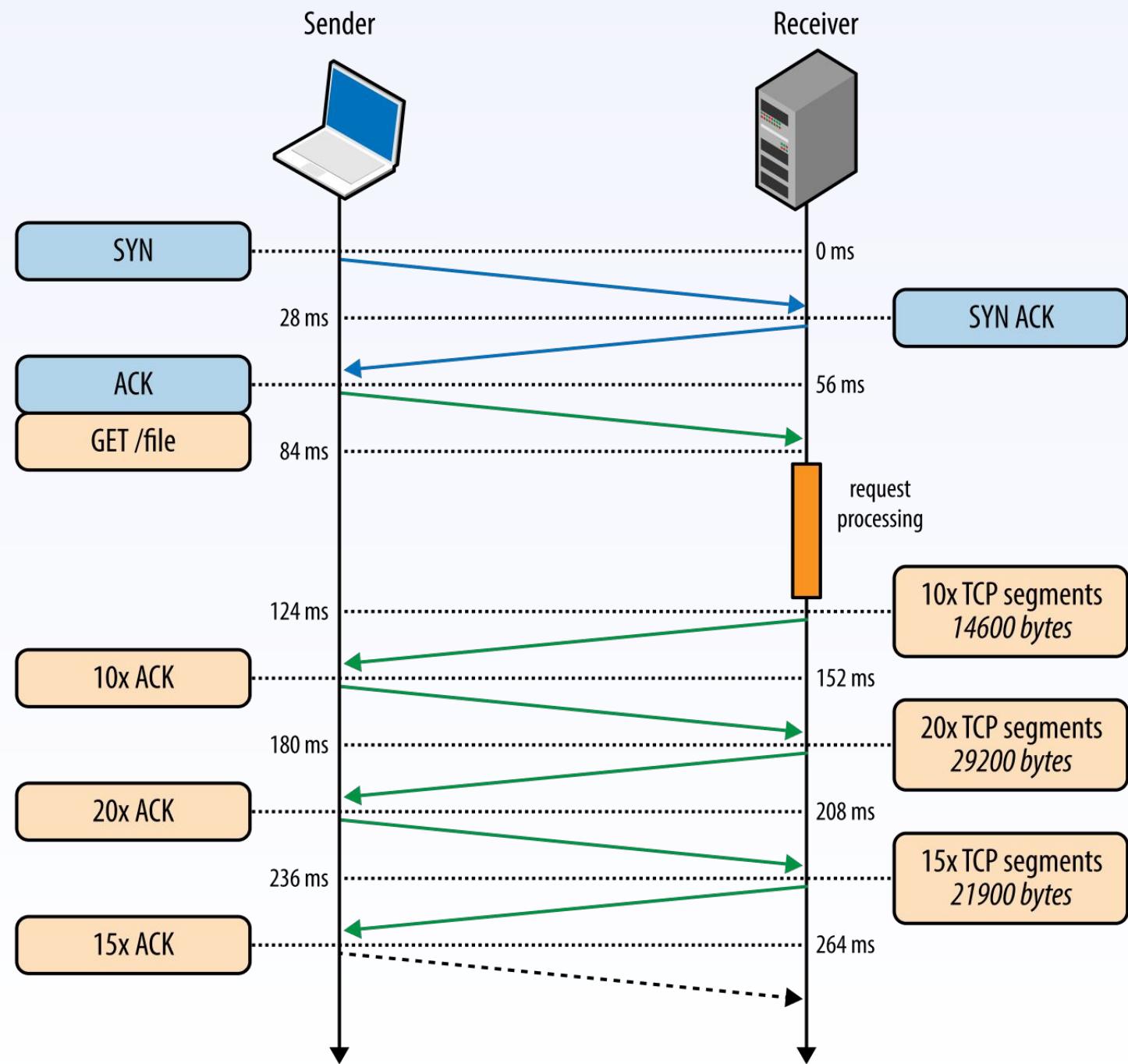
How does a browser work?

- Networking Layer
- Parsing
- Resource Discovery Phase
- Resource Prioritization
- Layout
- Paint

How does a browser work

What happens when you request a page?





HTTP/1.1

- Established Standard
- Single Connection
- Queue System
- Headers

HTTP/2

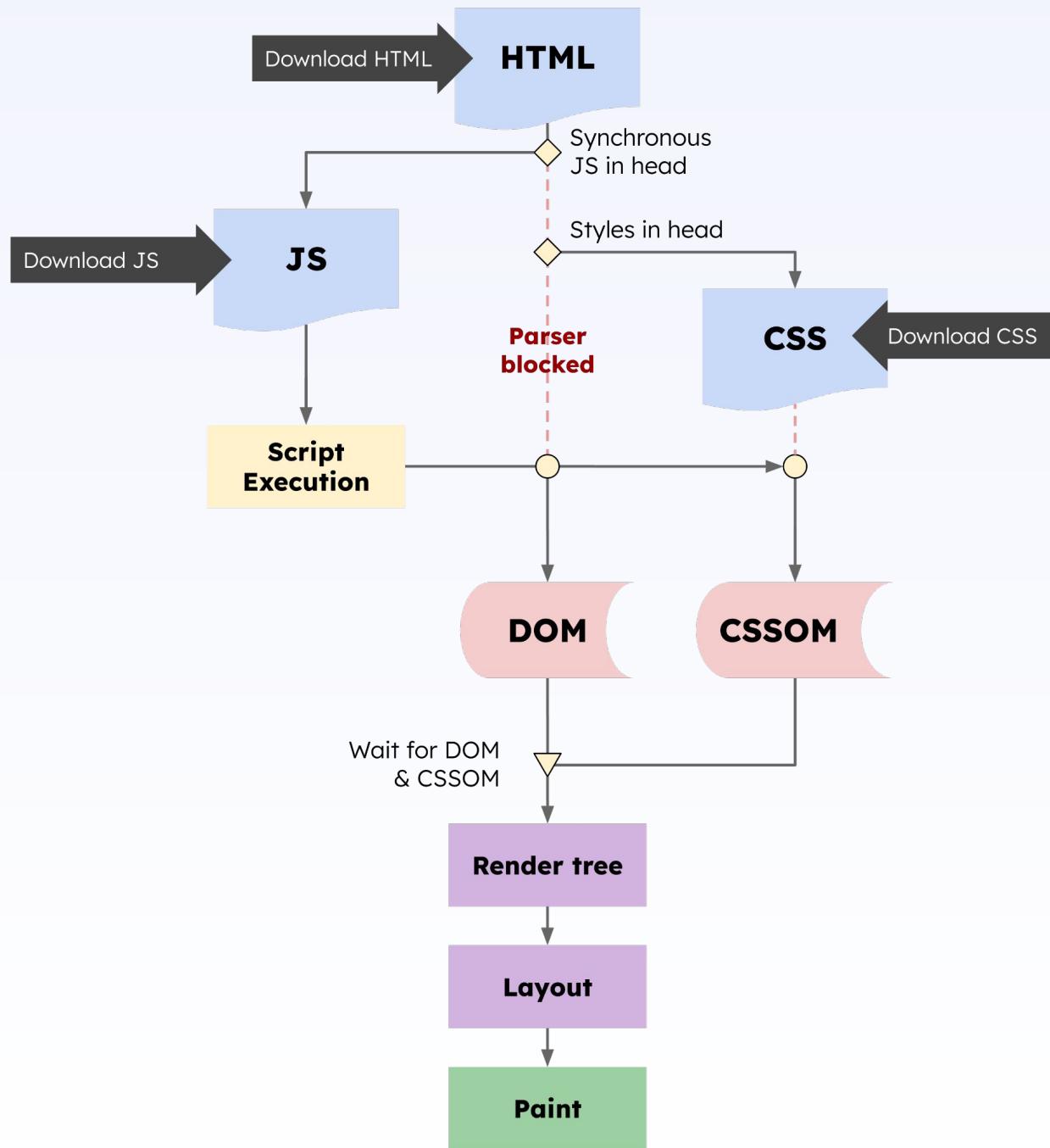
- Multiplexing
- Server Push (Deprecated)
- Binary Protocol
- Header Compression (HPACK)

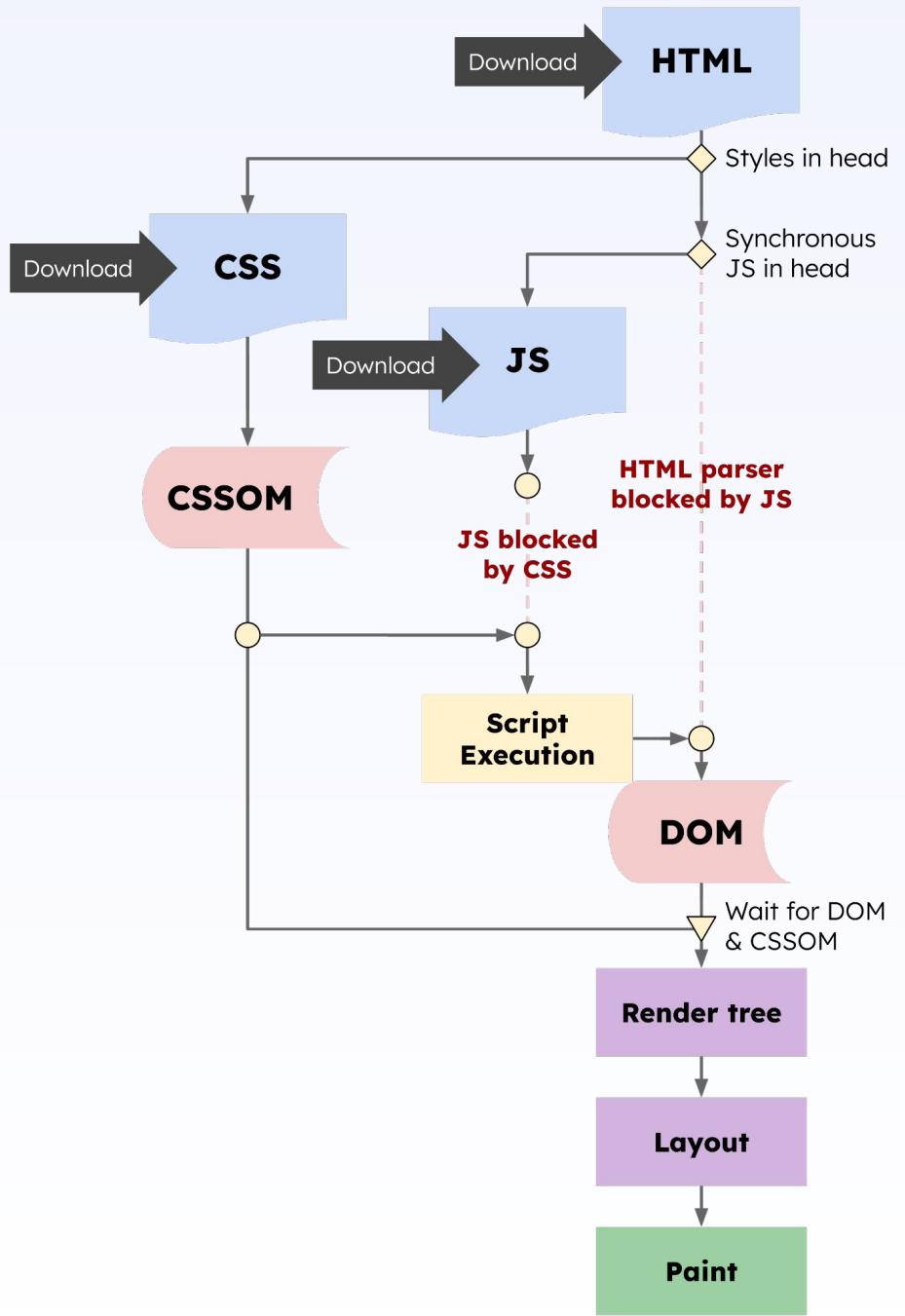
HTTP/3

- Faster Connection Establishment
- No Head-of-line Blocking
- UDP instead TCP
- Inherent Encryption with QUIC
- Improved Performance over Lossy Connections
- HPACK to QPACK Compression

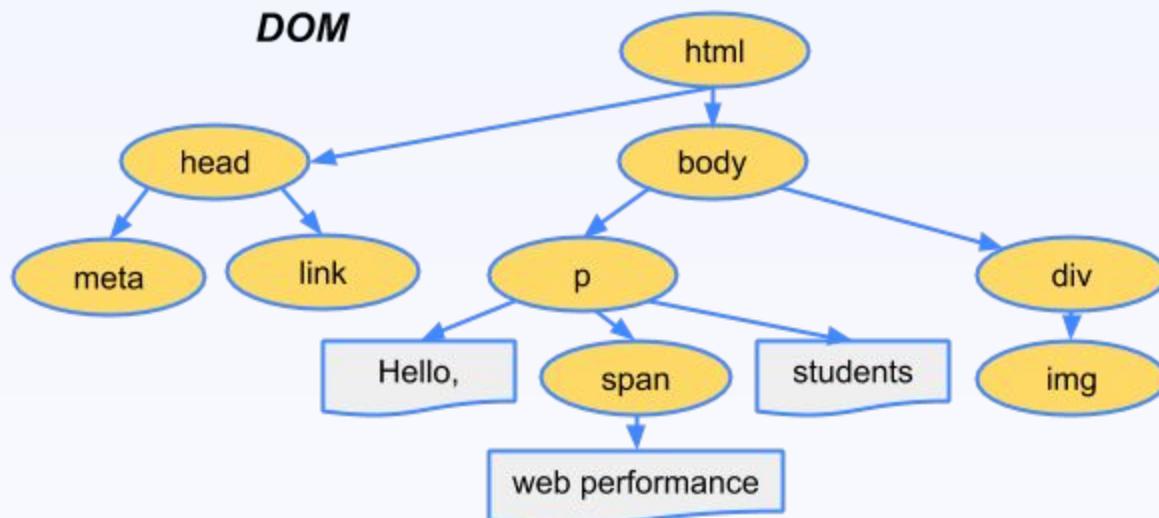
How does a browser work

Critical rendering path

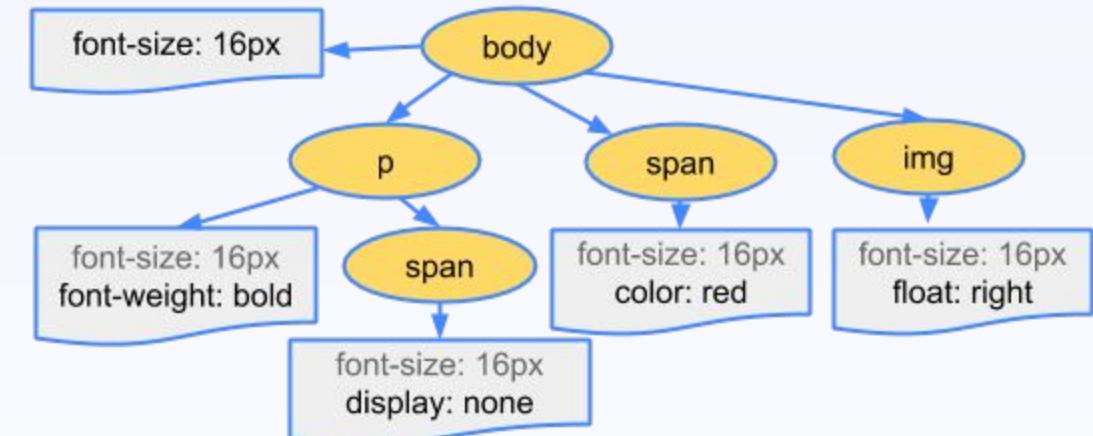




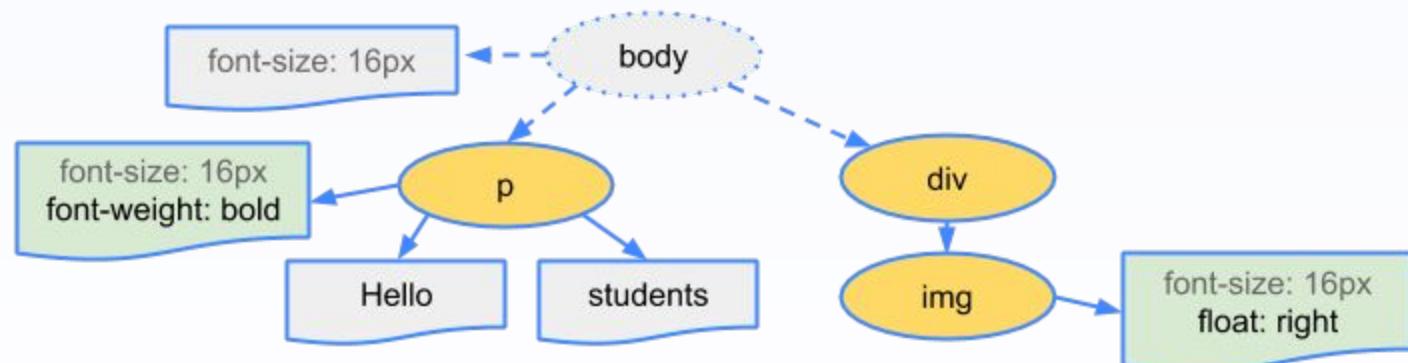
DOM



CSSOM



Render Tree

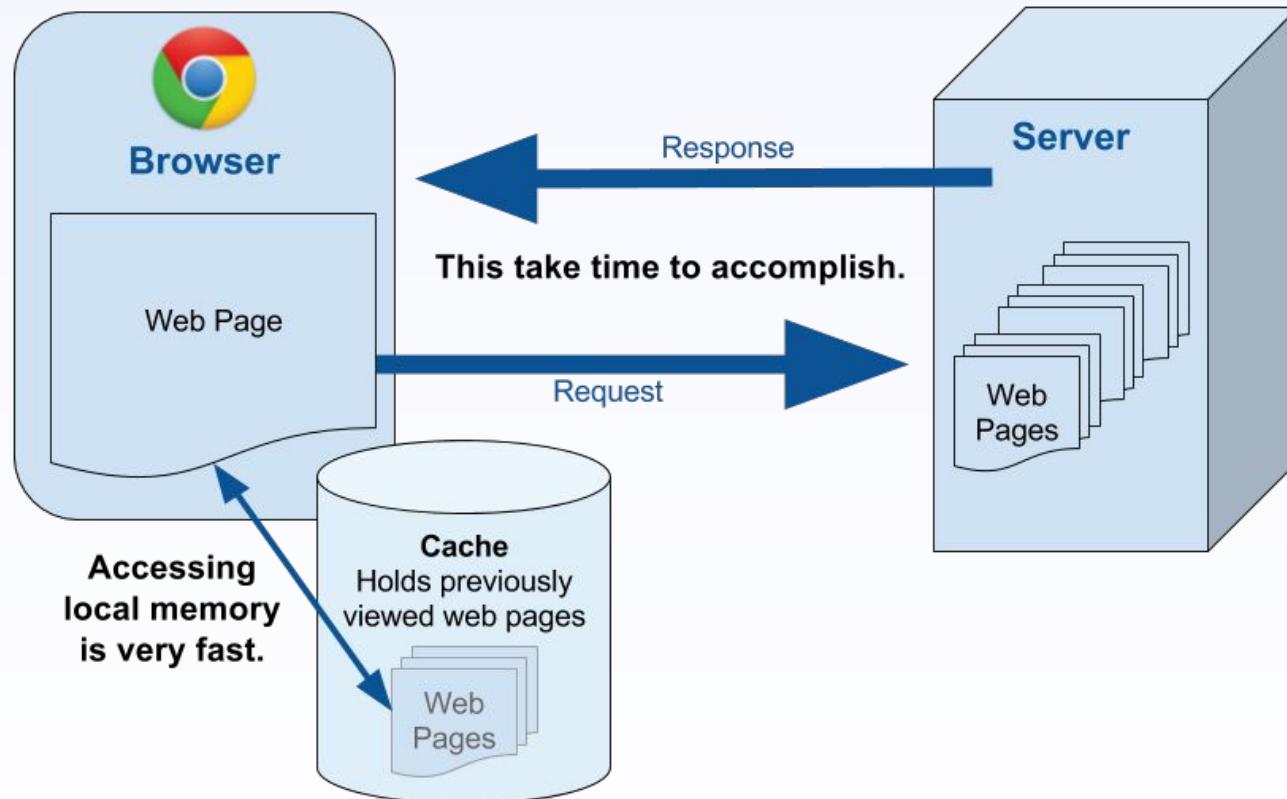


Advanced techniques

Browser Cache

Browser Caching

The Browser Cache



Static files

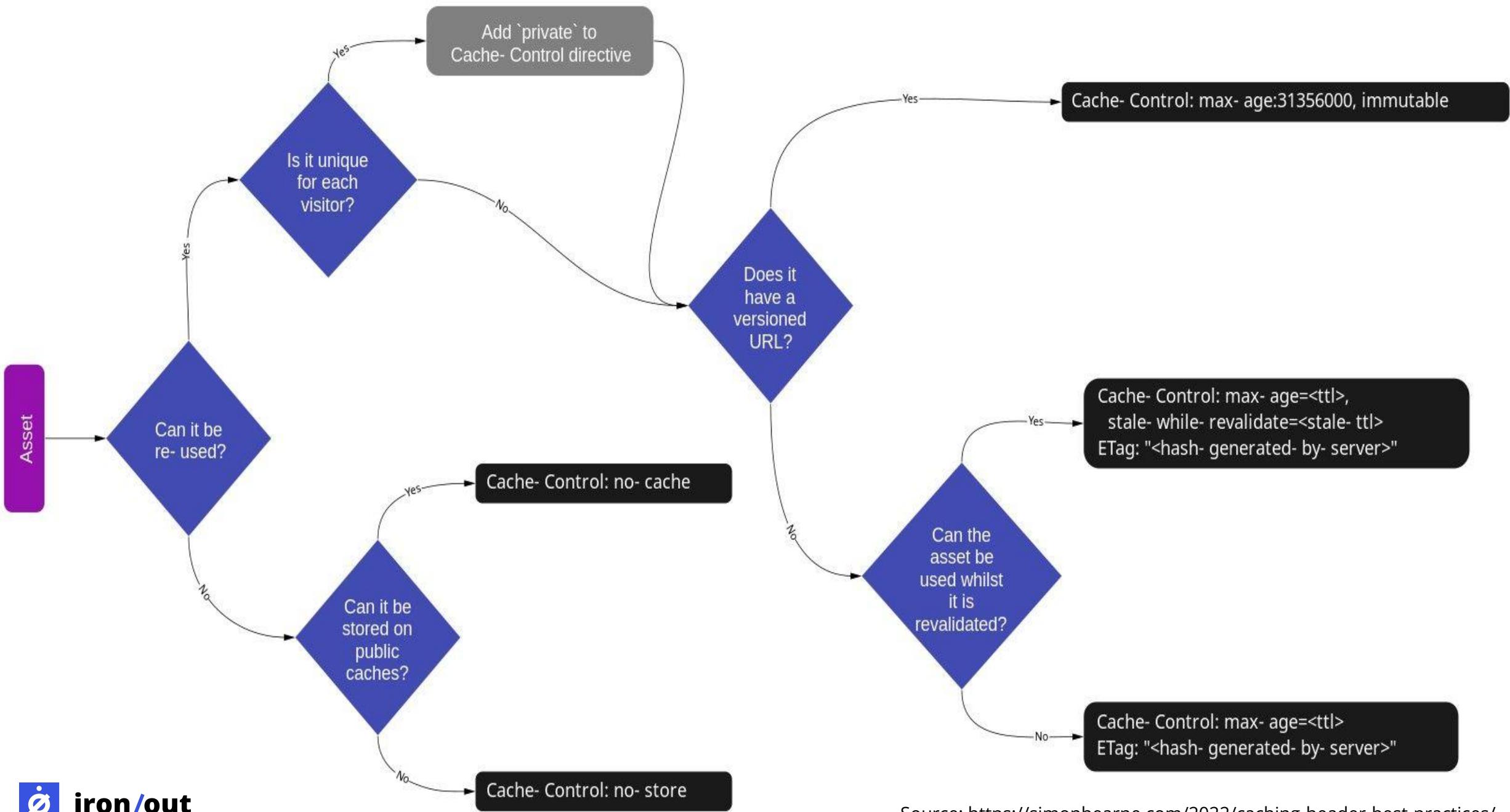
Caching should be enabled for static files like:

- images (JPG, PNG, WEBP, AVIF, GIF, SVG)
- JS
- CSS
- web fonts (WOFF, WOFF2)

Cache headers

Delving into Cache Headers:

- Absolute Expiration
- Relative Expiration
- Validation



Advanced techniques

Back/forward Cache (bfcache)

DevTools - www.iodigital.com/nl/wat-we-doen

Elements Console Sources Network Performance Memory Application Security Lighthouse Recorder ▾ Performance insights ▾ > 7 ⚙ :

Application

- Manifest
- Service Workers
- Storage

Storage

- Local Storage
- Session Storage
- IndexedDB
- Web SQL
- Cookies
 - https://www.iodigital.com
 - https://td.doubleclick.net
 - Private State Tokens
 - Interest Groups
- Shared Storage
- Cache Storage

Background Services

- Back/forward cache
- Background Fetch
- Background Sync
- Bounce Tracking Mitigations
- Notifications
- Payment Handler
- Periodic Background Sync
- Push Messaging
- Reporting API

Frames

- top

Back/forward cache

Not served from back/forward cache: to trigger back/forward cache, use Chrome's back/forward buttons, or use the test button below to automatically navigate away and back.

URL: https://www.iodigital.com/nl/wat-we-doen

Frames ▾ 2 issues found in 2 frames.

- (2) https://www.iodigital.com/nl/wat-we-doen
 - UnloadHandlerExistsInMainFrame
- (1) https://td.doubleclick.net/td/rul/10820652145?random=1693818297155&cv=11&fst=1693818297155&fmt=3&bg=ffff&guid=ON&async=1...
 - UnloadHandlerExistsInSubFrame

Actionable ⓘ

- The page has an unload handler in the main frame. [Learn more: Never use unload handler](#)
 - UnloadHandlerExistsInMainFrame
 - 1 frame
- The page has an unload handler in a sub frame. [Learn more: Never use unload handler](#)
 - UnloadHandlerExistsInSubFrame
 - 1 frame

[Learn more: back/forward cache eligibility](#)

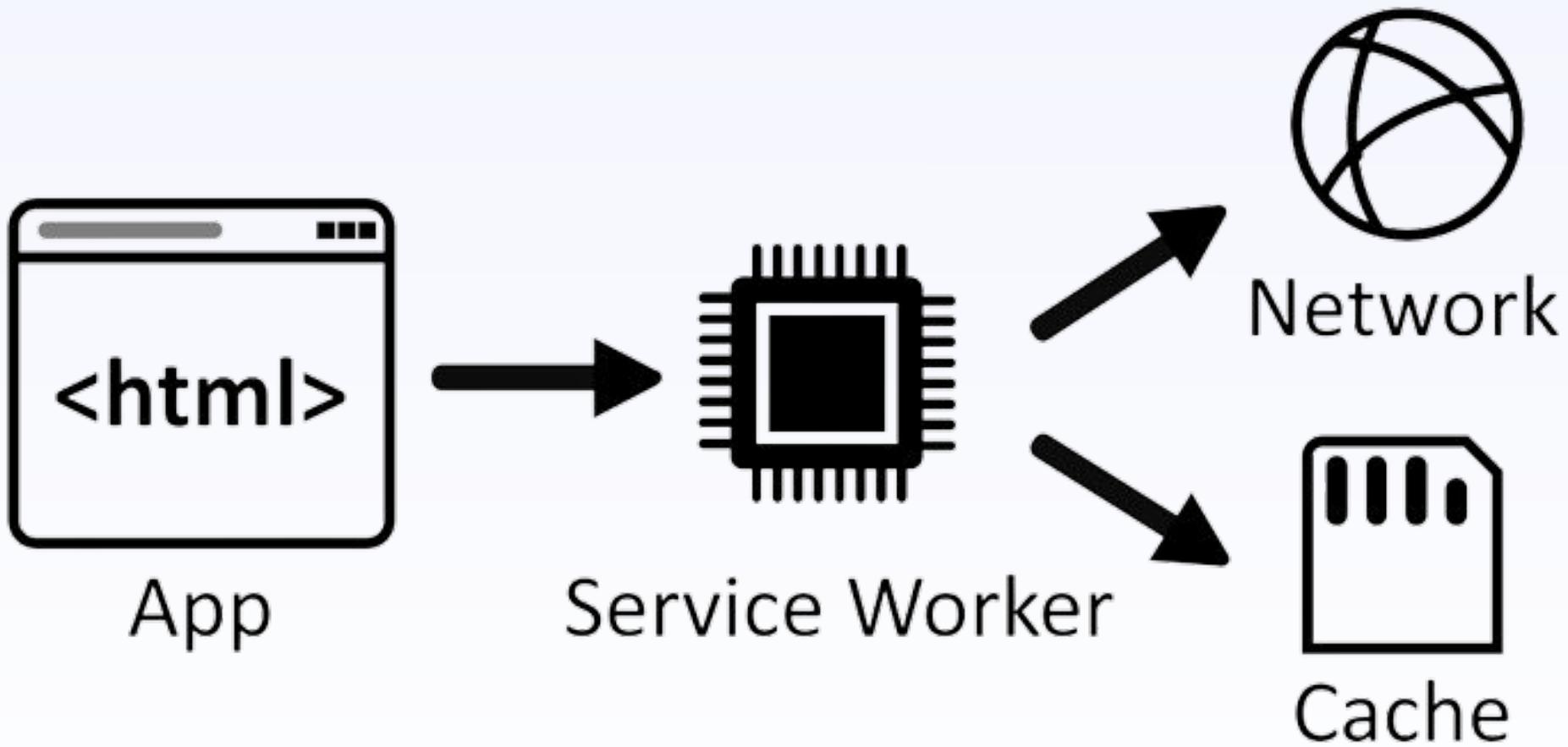
Bfcache

What makes pages eligible (and ineligible) for bfcache?

- Avoid using the unload event
- Be careful with adding beforeunload listeners
- Use Cache-Control: no-store only with information-sensitive pages
- Close open connections before navigating away

Advanced techniques

Service workers

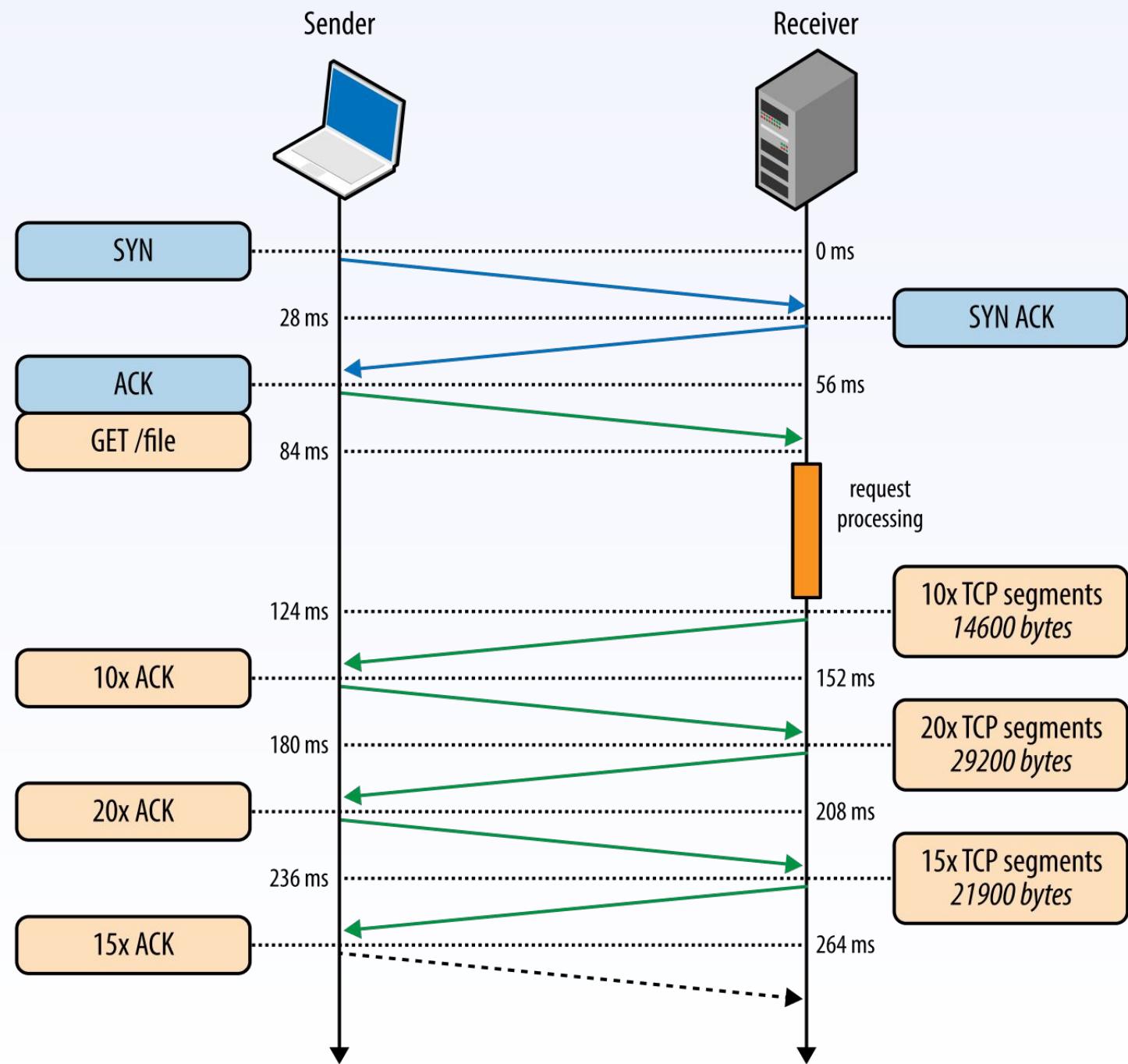




First load performance

First Load performance

Avoid multiple roundtrips



First Load performance

Avoid redirects



Strict-Transport-Security: max-age=63072000; includeSubDomains; preload

First Load performance

<https://hstspreload.org/>

First Load performance

Optimise <head>

First Load performance

Content Encoding

Data Compression for the Web

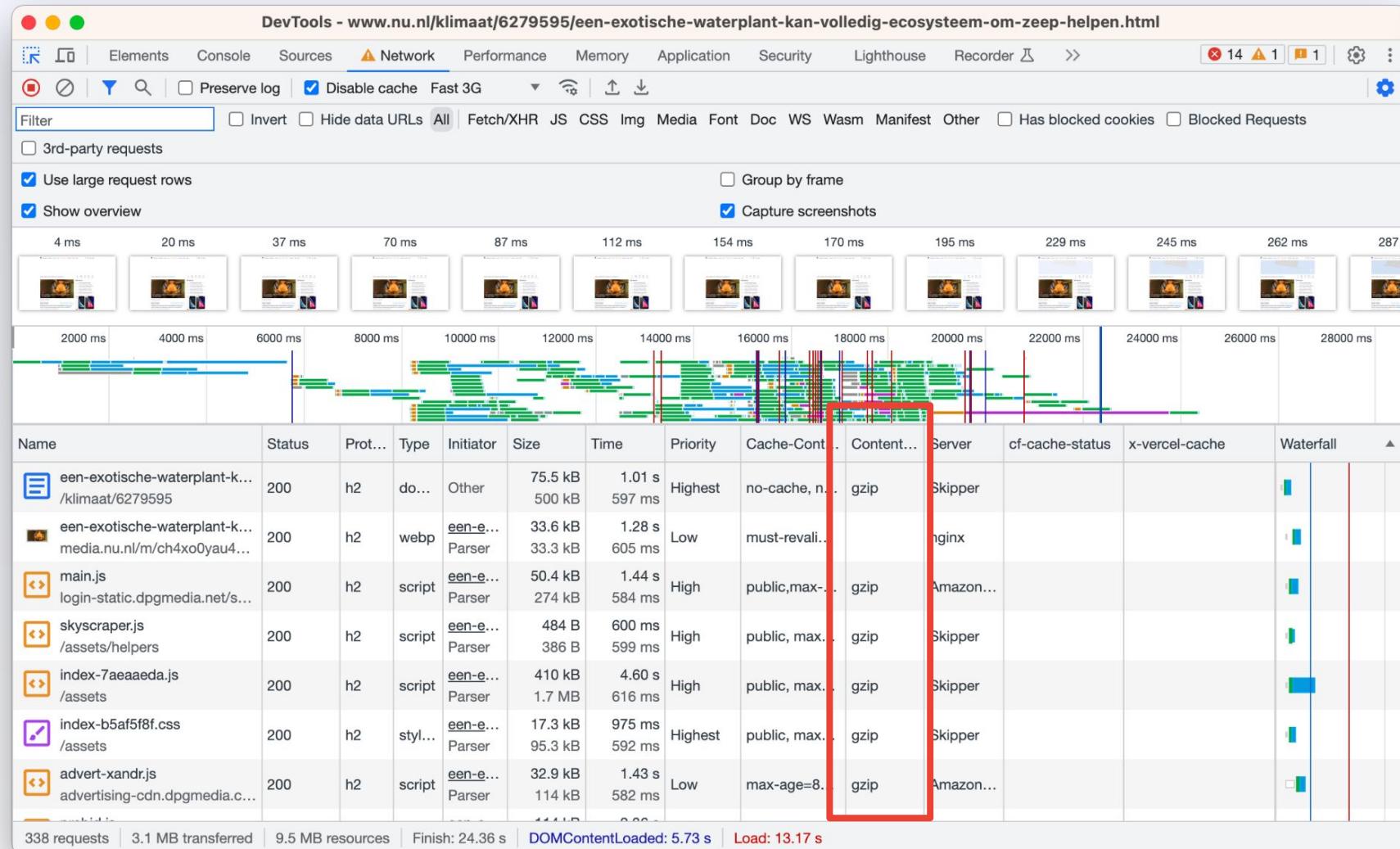
- Data compression is used for transferring data quickly over the network by reducing file size
- A compression technology gives lighter files to move around the web and reduces the time it takes to load and render a website
- Most used compression technologies:
 - Gzip
 - Brotli
- By using Brotli, smaller files can be sent over the network, which contributes to faster loading times.

Benchmark by Akamai

- Brotli offers better performance than GZIP.
- Median compression savings were:
 - GZIP: 78%
 - Brotli: 82%

Note: Higher percentages indicate better compression performance.

- Brotli outperformed GZIP in specific areas:
 - Brotli achieved 14% better compression for JavaScript files
 - Brotli achieved 17% better compression for CSS files
 - Brotli achieved 21% better compression for HTML files





Images

Median page weight by content type

Web Almanac 2022: Page Weight

desktop mobile

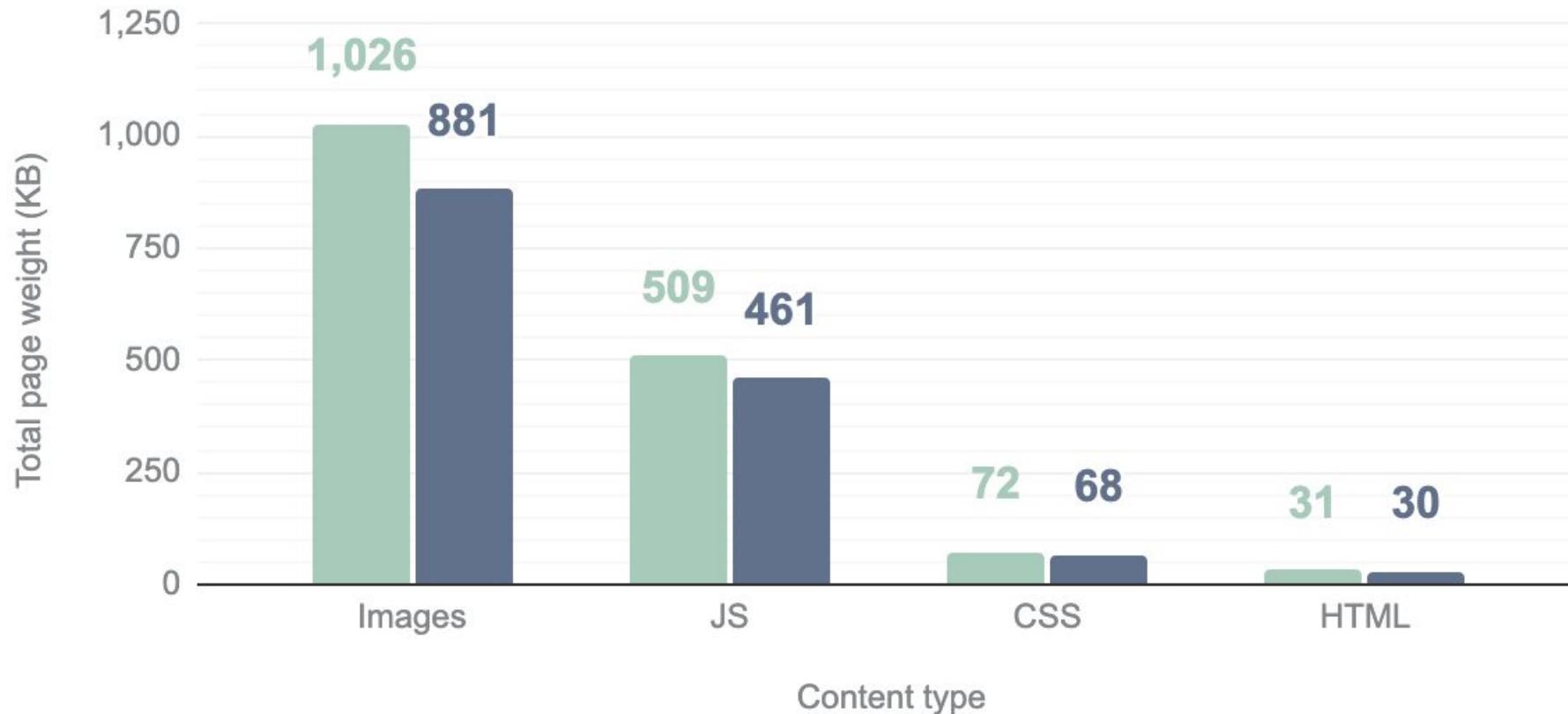


Image strategies

- **File formats:** using the optimal file format.
- **Responsive:** applying responsive images techniques to transfer only the pixels that will be shown on screen.
- **Lazy loading:** to transfer content only when a human will see it.
- **Accessibility:** ensuring a consistent experience for all people.



```

```

Devtools

Difference between eager and lazy loading

Lazy attribute

- **Auto:** Default lazy-loading behavior of the browser, effectively the same as not including the attribute.
- **Lazy:** Defer loading of the resource until it reaches a calculated distance from the viewport.
- **Eager:** Load the resource immediately, regardless of where it's located on the page.



```

```

Custom Fonts

Quality

- <https://squoosh.app>
- <https://imageoptim.com>
- <https://smashed.by/optimsketch>

Images

Elements

- Picture
- IMG



```
<picture>
  <source srcset="puppy.webp" type="image/webp">
  <source srcset="puppy.jpg" type="image/jpeg">
  
</picture>
```



Custom Fonts

Browse Fonts - Google Fonts +

fonts.google.com Lint Images

This site uses cookies from Google to deliver its services and to analyze traffic. Learn more Got it

Google Fonts Fonts Icons Knowledge FAQ ⋮ ⚙️ 📁

Your Privacy and Google Fonts

Learn how building websites with Google Fonts is safe for you and your users.

Learn more Dismiss

Search fonts Sentence Type something 40px

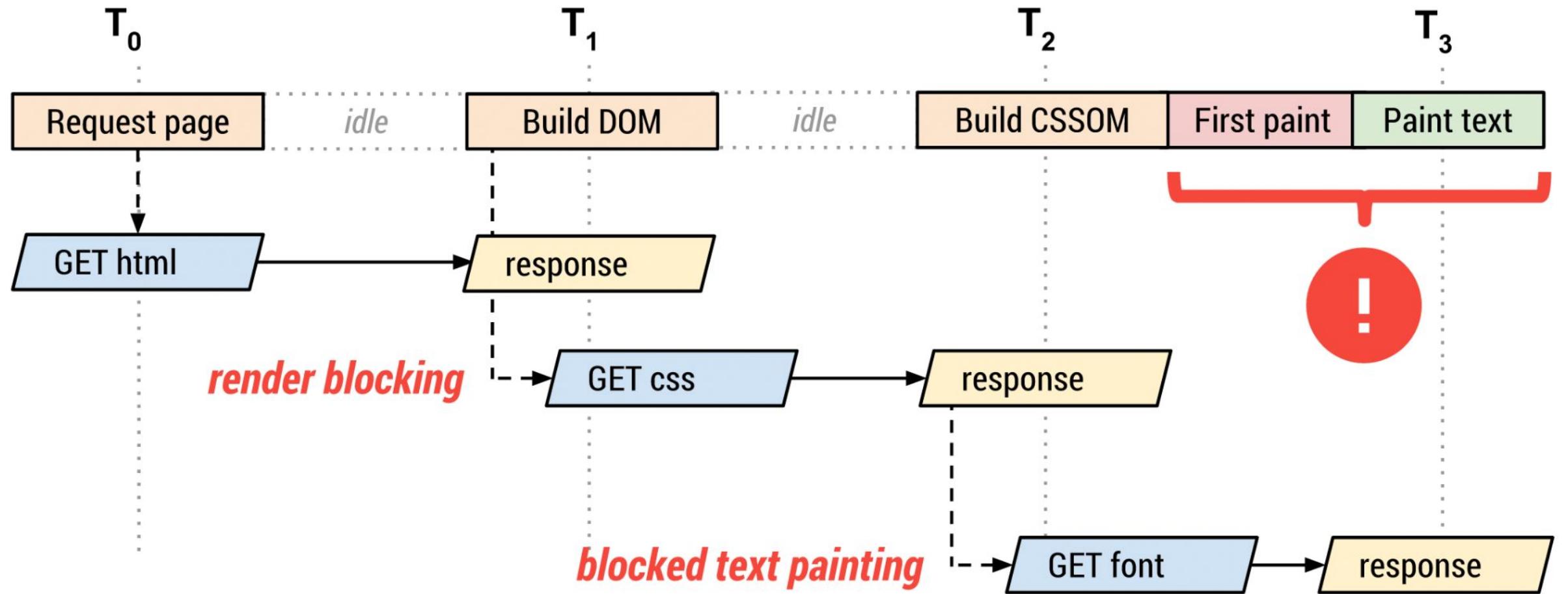
Categories Language Number of styles Show only variable fonts Show only color fonts

1562 of 1562 families About these results Sort by: Trending

Roboto Christian Robertson 12 styles Noto Sans Mahajani Google 1 style

Whereas recognition of the inherent dignity

ଅତେବେଳେ ହାବୁଳ୍କା ଯେ
ଯେବେଳେ ହାବୁଳ୍କା ଯେବେଳେ
ଯେବେଳେ ହାବୁଳ୍କା ଯେବେଳେ



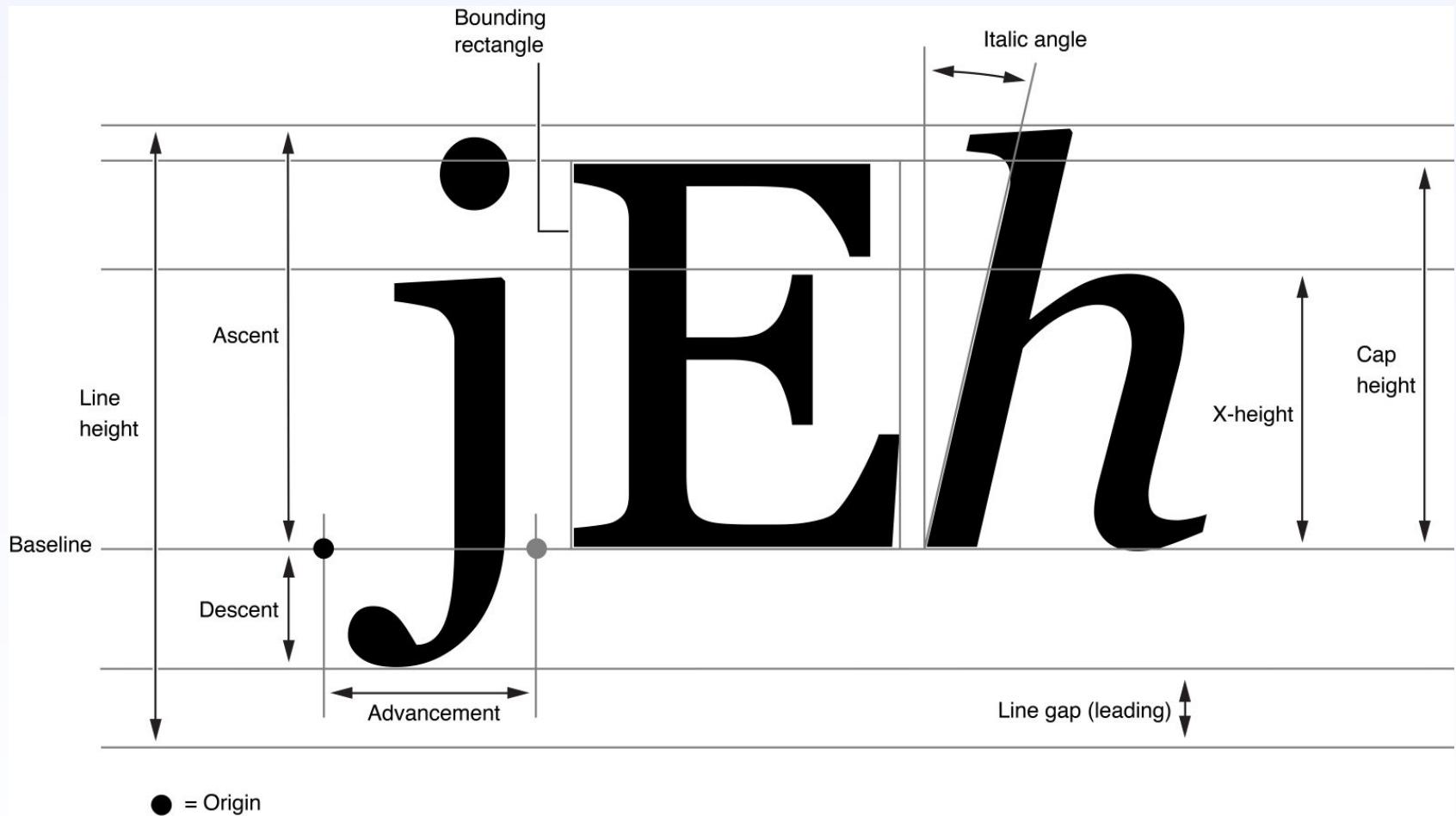
Optimise font loading

How to optimise custom font loading

- Host your own fonts
- Preload your WebFont resources
- Customize the text rendering delay (font-display)
- Use modern formats
- Subset your fonts
- Caching

```
● ● ●

@font-face {
    font-family: custom-font;
    src: url("https://example.com/font.woff2");
}
@font-face {
    font-family: fallback-font;
    src: local(Arial); /* required! */
    advance-override: xx;
    ascent-override: xx;
    descent-override: xx;
    line-gap-override: xx;
}
body {
    font-family: custom-font, fallback-font;
}
```



The screenshot shows a web browser window titled "Fallback Font Generator" at screenspan.net/fallback/. The interface is dark-themed.

Brand Font: A dark gray box containing a "Drop font here" button and an "Upload" button.

Fallback Font: A dropdown menu set to "Arial". Next to it is a checked checkbox labeled "Adjust Fallback".

Adjust Size: Two horizontal sliders. The left one is labeled "Ascent Override" and the right one is labeled "Descent Override".

Override Options: Two checkboxes: "Descent Override" and "Line-Gap Override".

Preview Area: Displays the text "The Lion and the Unicorn" in a green font. It includes labels "Fallback Font (adjusted)" and "Brand Font".

Buttons: "Preview" (disabled), "Toggle Brand Font" (highlighted in green), and a "Copy" button.

Your CSS rules:

```
@font-face {  
    font-family: 'Adjusted Arial Fallback';  
    src: local(Arial);  
    size-adjust: 100%;  
    ascent-override: normal;  
    descent-override: normal;  
    line-gap-override: normal;  
}  
  
h1 {  
    font-family: 'FredokaOne-Regular', 'Adjusted Arial Fallback';  
}
```



CWV Extension

Bundle size

JavaScript

<https://bundlephobia.com/>

JavaScript

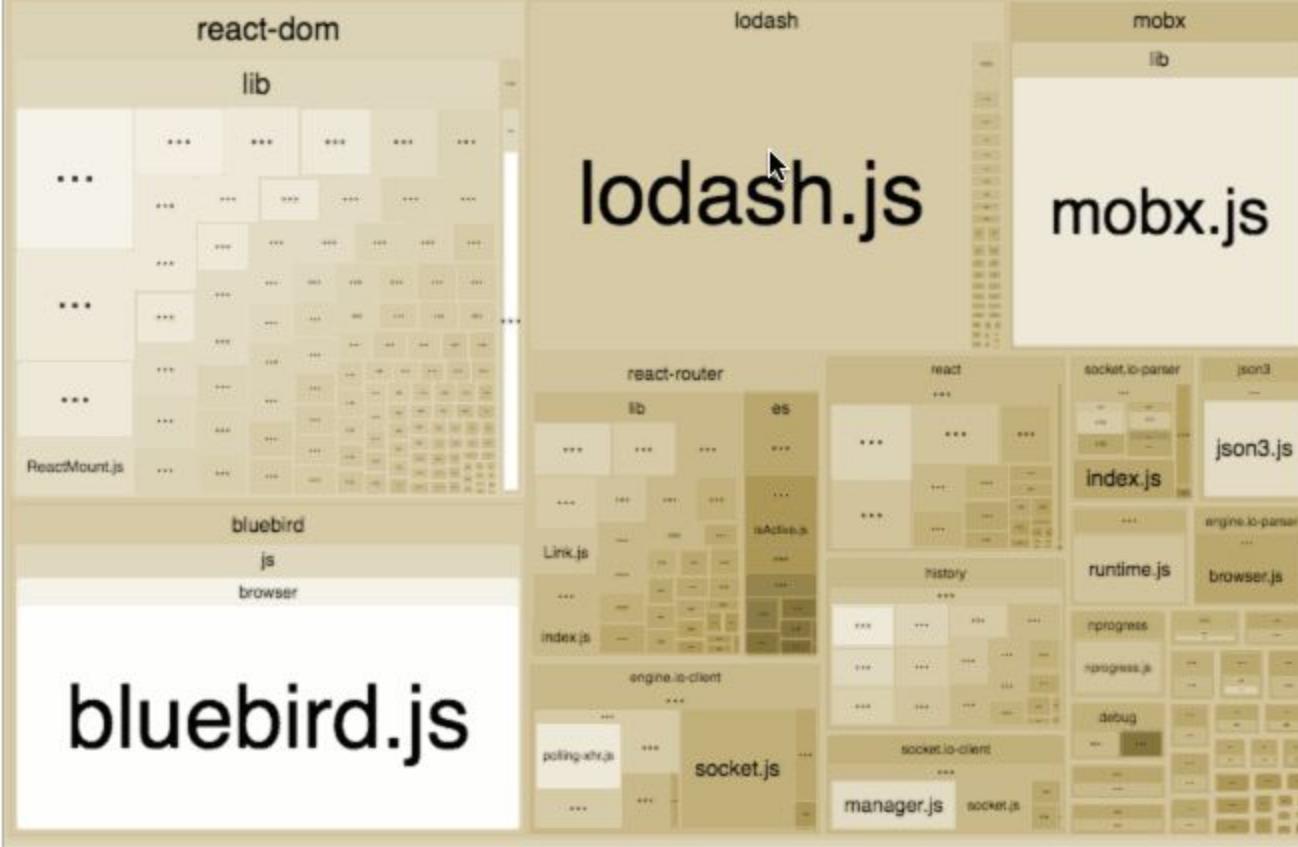
bundle analyzer



```
"scripts": {  
  ...  
  "analyze": "cross-env ANALYZE=true next build"  
},
```

vendor.f72c2e816850a7014aaa.js

node_modules



common.c1fb8e4d1e77e36538e7.js

node_modules



0.7eb2a80449bbd3ee5178.js



app.e03fbac0ea8a85246e45.js





Devtools

Devtools

Let's setup snippets!!

Elements Console Sources Network Performance Recorder ▾ Memory Application Security Lighthouse Performance insights ▾

Page Snippets > Loaf LCP X TTFB TTFB Resources Scripts loading Resource hints ATF Lazy Render blocking Image info

+ New snippet
 ATF Lazy
 CLS
 Image info
LCP
 Loaf
 Render blocking
 Resource hints
 Scripts loading
 TTFB
 TTFB Resources

```

11 const lcpResEntry = performance
12   .getEntriesByType('resource')
13   .filter((e) => e.name === lcpEntry.url)[0];
14
15 const ttfb = navEntry.responseStart;
16 const lcpRequestStart = Math.max(
17   ttfb,
18   lcpResEntry ? lcpResEntry.requestStart || lcpResEntry.startTime : 0
19 );
20 const lcpResponseEnd = Math.max(
21   lcpRequestStart,
22   lcpResEntry ? lcpResEntry.responseEnd : 0
23 );
24 const lcpRenderTime = Math.max(
25   lcpResponseEnd,
26   lcpEntry ? lcpEntry.startTime : 0
27 );
28
29 LCP_SUB_PARTS.forEach((part) => performance.clearMeasures(part));
30
31 const lcpSubPartMeasures = [
32   performance.measure(LCP_SUB_PARTS[0], {
33     start: 0,
34     end: ttfb,
35   }),
36   performance.measure(LCP_SUB_PARTS[1], {
37     start: ttfb,
38     end: lcpRequestStart,
39   }),
40   performance.measure(LCP_SUB_PARTS[2], {
41     start: lcpRequestStart,
42     end: lcpResponseEnd,
43   }),
44   performance.measure(LCP_SUB_PARTS[3], {
45     start: lcpResponseEnd,
46     end: lcpRenderTime,
47   }),
48 ];
49
50 // Log helpful debug information to the console.
51 console.log('LCP value: ', lcpRenderTime);
52 console.log('LCP element: ', lcpEntry.element, lcpEntry?.url);
53 console.table(
54   lcpSubPartMeasures.map((measure) => ({
55     'LCP sub-part': measure.name,
56     'Time (ms)': measure.duration,
57     '% of LCP': `${58       Math.round((1000 * measure.duration) / lcpRenderTime) / 10
59       }%`,
60     })),
61   );
62 }).observe({type: 'largest-contentful-paint', buffered: true});
    
```

Threads
 Watch
 Breakpoints
 Pause on uncaught exceptions
 Pause on caught exceptions
 Scope
 Not paused
 Call Stack
 Not paused
 XHR/fetch Breakpoints
 DOM Breakpoints
 Global Listeners
 Event Listener Breakpoints
 CSP Violation Breakpoints

iron/out

{ } Line 62, Column 64 ▶ %+Enter Coverage: n/a

Add snippets

You can use the webperf-snippets as a Snippet in the Chrome DevTools Sources tab.

1. Copy any of the WebPerf Snippets
2. Open Chrome DevTools
3. Select the Sources tab
4. Select the Snippets sub tab
5. Click New snippet button, e.g. LCP
6. Write the snippet name, LCP
7. Paste the copied code at the right area
8. Run the snippet

Devtools

local overrides

Devtools

Network tab



Settings

Network Throttling Profiles

Preferences

Workspace

Experiments

Ignore List

Devices

Throttling

Locations

Shortcuts

[Add custom profile...](#)

Normal 4G	8.0 Mbit/s	6.0 Mbit/s	70 ms
-----------	------------	------------	-------

Queued at 0

Started at 1.07 ms

Resource Scheduling

Queueing



DURATION

1.07 ms

Connection Start

Stalled



DURATION

21.11 ms

DNS Lookup



DURATION

77.52 ms

Initial connection



DURATION

11.58 ms

SSL



DURATION

5.85 ms

Request/Response

Request sent



DURATION

0.11 ms

Waiting for server response



DURATION

235.10 ms

Content Download



DURATION

63.34 ms

[Explanation](#)

409.91 ms

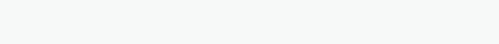
Server Timing

TIME

1693473822120_17521...

1.00 ms

MISS



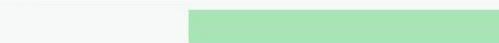
101.00 ms

edge



101.00 ms

origin



67.00 ms



iron/out

Elements Console Sources **Network** Performance Recorder  Memory Application Security Lighthouse Performance insights 

Preserve log Disable cache Normal 4G   

Filter Invert Hide data URLs All Fetch/XHR JS CSS Img Media Font Doc WS Wasm Manifest Other Has blocked cookies Blocked Requests 3rd-party requests

	500000 ms	1000000 ms	1500000 ms	2000000 ms	2500000 ms	3000000 ms	3500000 ms	4000000 ms	4500000 ms	5000000 ms	5500000 ms	6000000 ms	6500000 ms	7000000 ms	7500000 ms
Name	Status	Type	Size	Priority	Cache-Control	Content-Encod...	Server	Cf-Cache-Status	x-vercel-c...	Waterfall					
 www....	200	document	64.5 kB	Highest	public, max-age=0, must-r...	gzip	Vercel		HIT						
 sdm...y...	200	webp	(memory cache)	Low	s-maxage=86400, max-ag...		cloudflare	MISS							
 OtAut...	200	script	(memory cache)	Low	public, max-age=86400	gzip	cloudflare	HIT							
 otSDK...	200	script	(memory cache)	Low	public, max-age=86400	gzip	cloudflare	HIT							
 produ...	200	png	(memory cache)	Medium	private, no-transform, max-...		Akamai Ima...								
 produ...	200	png	(memory cache)	Medium	private, no-transform, max-...		Akamai Ima...								
 0ac6a...	200	font	34.2 kB	High	public, max-age=0		Vercel		HIT						
 03374...	200	font	37.1 kB	High	public, max-age=0		Vercel		HIT						
 0dad7...	200	font	26.6 kB	High	public, max-age=0		Vercel		HIT						
 a9179...	200	font	36.7 kB	High	public, max-age=0		Vercel		HIT						
 4eb88...	304	stylesheet	350 B	Highest	public, max-age=900										
 ad319...	304	stylesheet	350 B	Highest	public, max-age=900										
 produ...	200	png	(memory cache)	Medium	private, no-transform, max-...		Akamai Ima...								
 produ...	200	webp	(memory cache)	Low	private, no-transform, max-...		Akamai Ima...								
 produ...	200	webp	(memory cache)	Low	private, no-transform, max-...		Akamai Ima...								
 produ...	200	webp	(memory cache)	Low	private, no-transform, max-...		Akamai Ima...								
 produ...	200	webp	(memory cache)	Low	private, no-transform, max-...		Akamai Ima...								
 produ...	200	avif	(memory cache)	Low	private, no-transform, max-...		Akamai Ima...								
 nike?f...	200	webp	(memory cache)	High	s-maxage=86400, max-ag...		cloudflare	HIT							
 adida...	200	webp	(memory cache)	High	s-maxage=86400, max-ag...		cloudflare	HIT							
 puma...	200	webp	(memory cache)	High	s-maxage=86400, max-ag...		cloudflare	HIT							
 under-...	200	webp	(memory cache)	High	s-maxage=86400, max-ag...		cloudflare	HIT							
 asics?...	200	webp	(memory cache)	High	s-maxage=86400, max-ag...		cloudflare	HIT							
 new-b...	200	webp	(memory cache)	High	s-maxage=86400, max-ag...		cloudflare	HIT							
 sketc...	200	webp	(memory cache)	High	s-maxage=86400, max-ag...		cloudflare	HIT							
 Ree...	200	webp	(memory cache)	High	s-maxage=86400, max-ag...		cloudflare	HIT							

Devtools

Coverage tab

Elements Console Sources Network **Performance** Memory Application Security Lighthouse Recorder Performance insights

Preserve log Disable cache No throttling

Filter Invert Hide data URLs All Fetch/XHR JS CSS Img Media Font Doc WS Wasm Manifest Other Has blocked cookies Blocked Requests 3rd-party requests

Use large request rows Group by frame
 Show overview Capture screenshots

Name	Status	Protocol	Type	Initiator	Size	Time	Priority	Cache-Control	Server	cf-cache-status	x..	Waterfall
region1.google-anal...	200		ping	Script	0 B	40 ms	Lowest	no-cache, no-store, must-revalidate	Google			
NRJS-602b4a620b0...	200	http/1.1	xhr	anwb...	333 B	89 ms	High					
bam.eu01.nr-data.n...	OK			Script	24 B	88 ms						

112 requests | 4.2 MB transferred | 14.7 MB resources | Finish: 12.05 s | DOMContentLoaded: 960 ms | Load: 1.90 s

⋮ Console Network request blocking Animations What's New Coverage Rendering Network conditions Issues Performance monitor

Per function URL filter All

URL	Type	Total Bytes	Unused Bytes	Usage Visualization
https://1152.static.anwb.nl/release-1.11.6/_next/static/chunks/115-47fdd5554163c46d.js	JS (per fu...)	1 772 202	874 599 49.4%	
https://992.static.anwb.nl/index.js	JS (per fu...)	3 690 256	860 985 23.3%	
https://static.anwb.nl/packages/core-ui/style.css	CSS	536 942	534 210 99.5%	
https://t066.anwb.nl/plugin/library/3eedc5a91f5ef6acea2292fbb7d6b3bf	JS (per fu...)	576 620	454 376 78.8%	
https://anwb1.cdn-expoints.nl/m/Scripts/dist/expoints-external.min.js?lv=1	JS (per fu...)	542 473	199 886 36.8%	
https://t.contentsquare.net/uxa/be42086a51ccf.js	JS (per fu...)	330 881	162 413 49.1%	
https://cdn.optimizely.com/js/711893837.js	JS (per fu...)	494 494	161 833 32.7%	
https://t066.anwb.nl/plugin/plugin/ab4c55a2d690f3253fe8c122936bcf9d	JS (per fu...)	175 624	126 010 71.7%	
https://www.googletagmanager.com/gtm.js?id=GTM-MD994Z4&l=dataLayer	JS (per fu...)	301 821	125 225 41.5%	
https://connect.facebook.net/signals/config/260370994592108?v=2.9.125&r=stable&domain=www.anwb.nl	JS (per fu...)	140 106	99 998 71.4%	
https://www.googletagmanager.com/gtag/js?id=G-0BPRJ6YQQG&l=dataLayer&cx=c	JS (per fu...)	250 230	87 664 35%	
https://www.googletagmanager.com/gtag/js?id=G-9ZJ9JFZNEG&l=dataLayer&cx=c	JS (per fu...)	251 638	87 585 34.8%	
https://www.googletagmanager.com/gtm.js?id=GTM-P9Q4QS	JS (per fu...)	577 096	84 496 14.6%	
https://www.googletagmanager.com/gtag/js?id=G-123454552234999&l=dataLayer&cx=c	JS (per fu...)	194 402	80 476 41.4%	
https://600.static.anwb.nl/index.js	JS (per fu...)	196 099	76 989 39.3%	
https://connect.facebook.net/en_US/fbevents.js	JS (per fu...)	197 928	76 720 38.8%	
https://992.static.anwb.nl/assets/lpChat.min.js	JS (per fu...)	135 903	72 932 53.7%	
https://www.anwb.nl/auto/private-lease/anwb-private-lease?icp=home_etalage_private-lease-peugeot	CSS+JS (...)	113 310	61 038 53.9%	
https://1152.static.anwb.nl/release-1.11.6/_next/static/chunks/... %5B%5B...page%5D%5D-9b1ce0c729aaaf0e6.js	JS (per fu...)	115 477	60 965 52.8%	
https://1152.static.anwb.nl/release-1.11.6/_next/static/chunks/main-63745a98e7190059.js	JS (per fu...)	109 324	58 544 53.6%	
https://t066.anwb.nl/script.js	JS (per fu...)	139 247	44 965 32.3%	
https://1152.static.anwb.nl/release-1.11.6/_next/static/chunks/framework-205c01b50ab52072.js	JS (per fu...)	100 000	11 110 24.0%	

Filtered: 6.6 MB of 11.1 MB (60%) used so far, 4.5 MB unused. Total: 7.1 MB of 12.5 MB (57%) used so far, 5.4 MB unused.



iron/out

Devtools

Performance tab

```
function yieldToMain() {
    return new Promise(resolve => {
        setTimeout(resolve, 0);
    });
}

function doWork() {
    let loopLength = input.value * 100000;
    let gottenclassList = toggled.classList;
    for (let i = 0; i < loopLength; i++) {
        if (toggled.classList !== gottenclassList) {
            toggled.classList = gottenclassList;
        }
    }
}

toggle.addEventListener('click', async () => {
    toggled.classList.toggle('hidden');
    await yieldToMain();
    doWork();
});
```



Order

head order

<https://github.com/rviscomi/capo.js>



Advanced topics

Advanced techniques

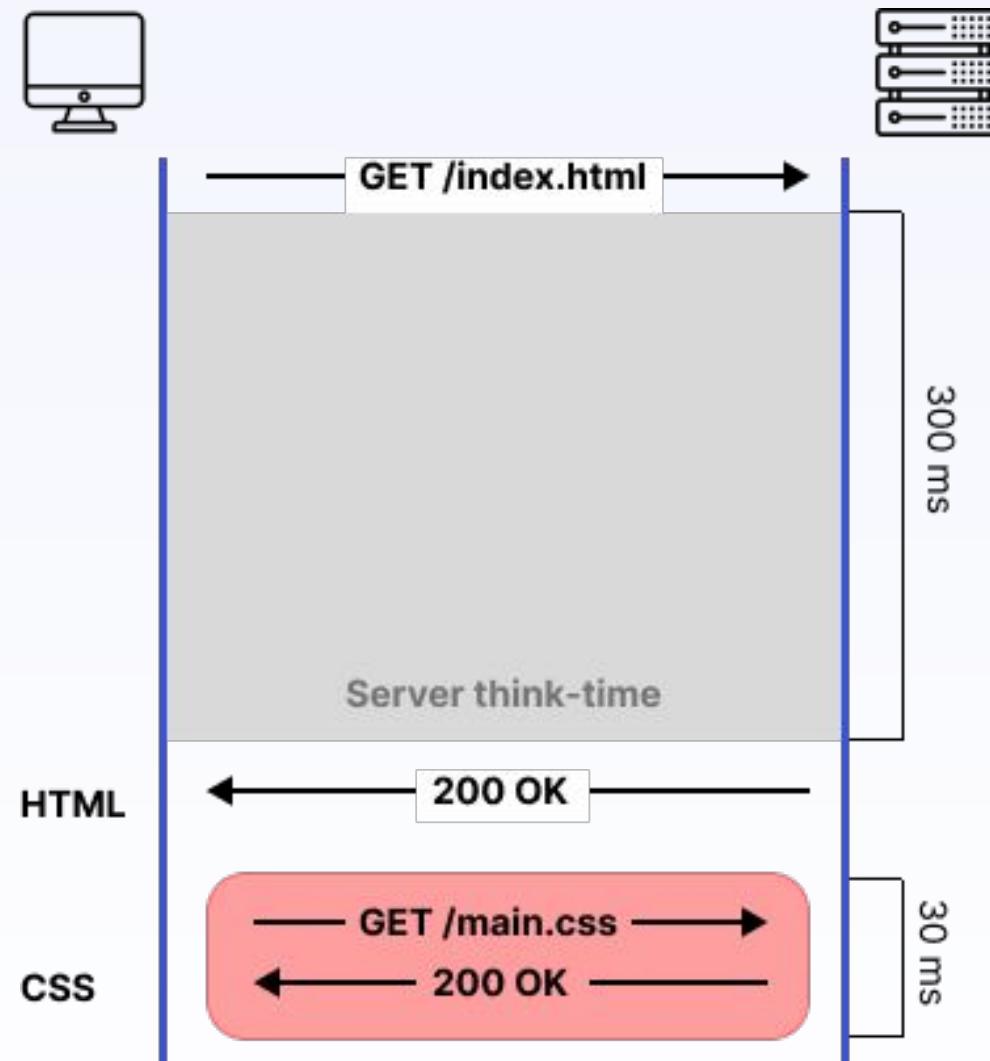
Cookie size

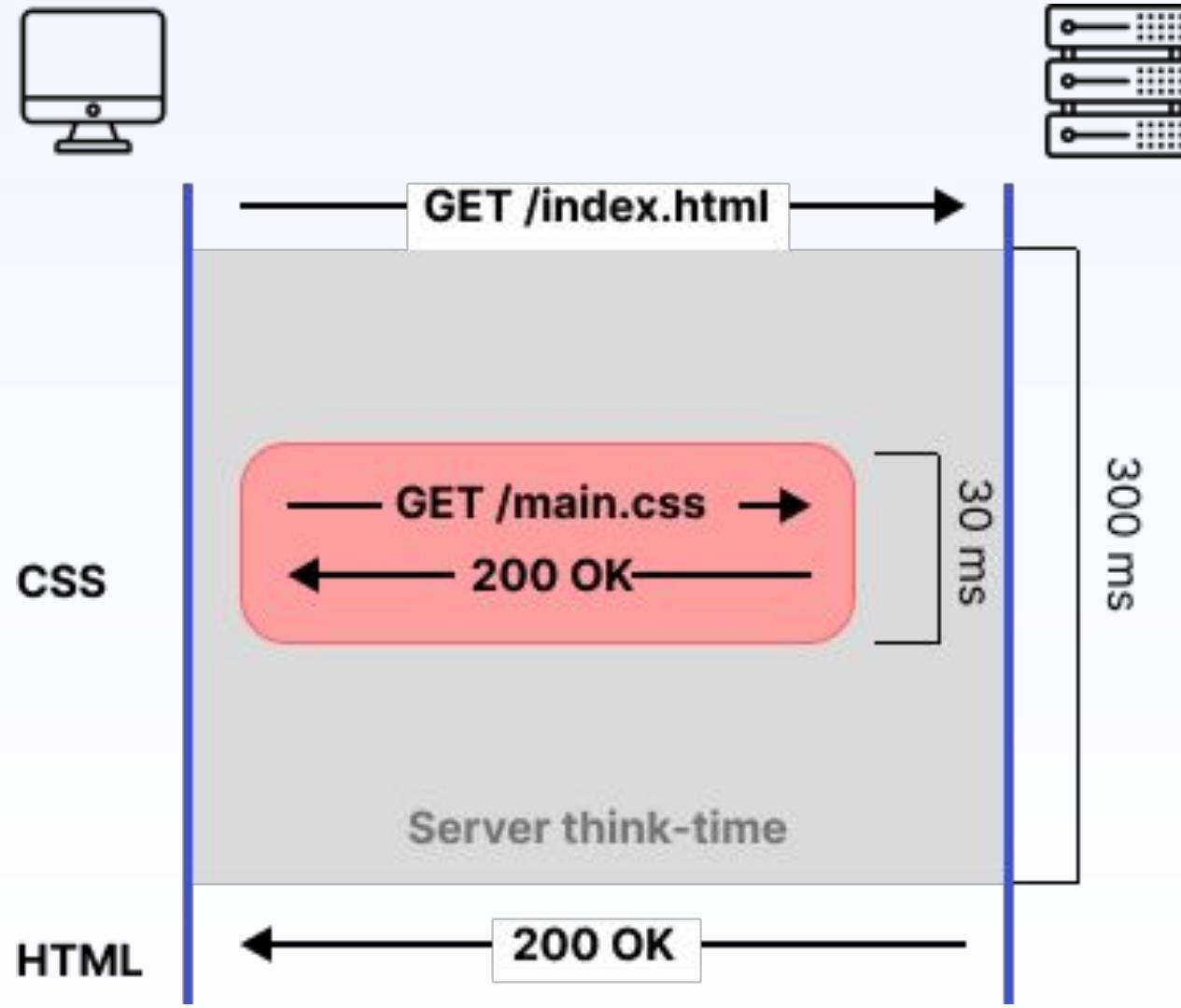


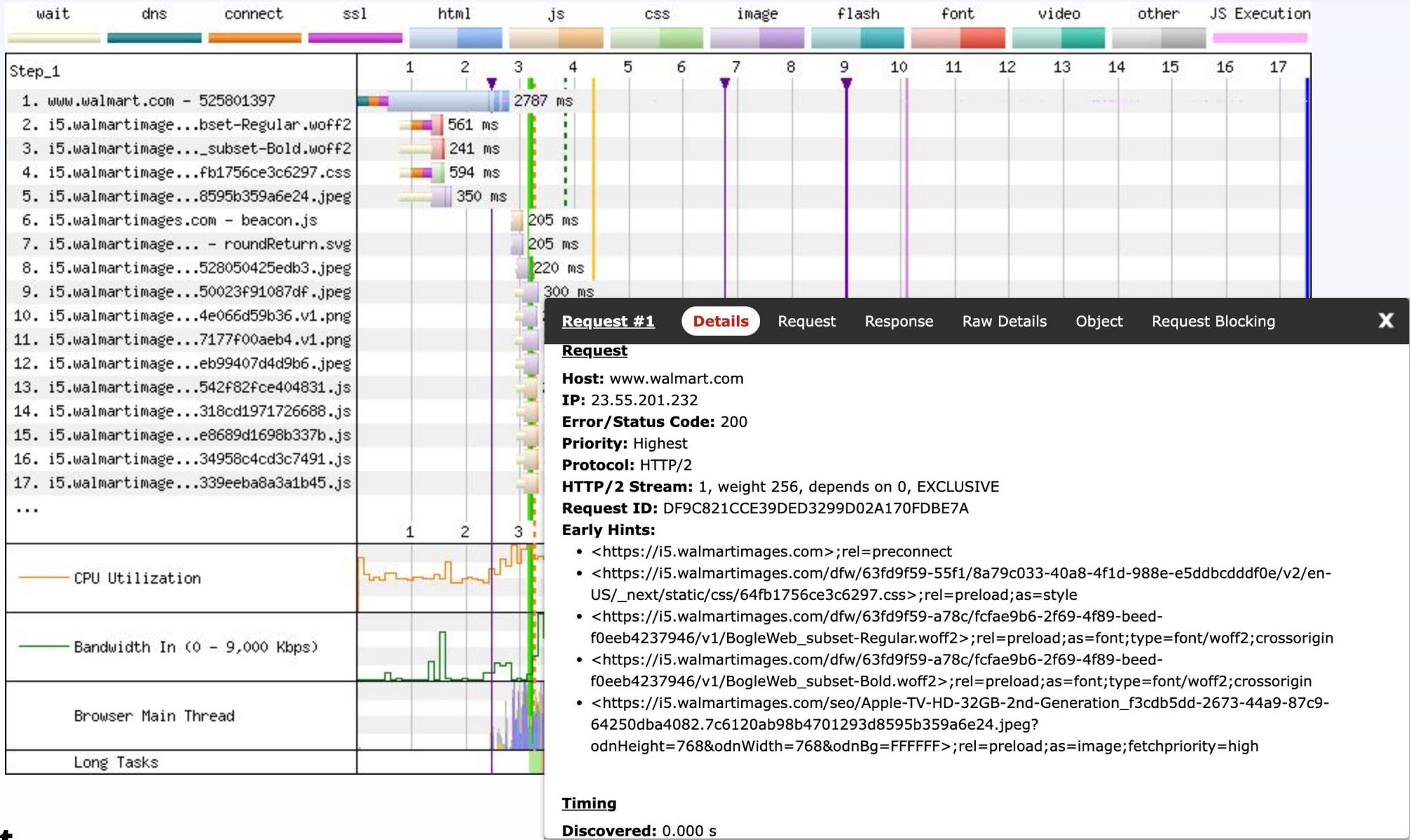
iron/out

Advanced techniques

103 Early hints









Gary Illyes • Following
Analyst at Google
3mo •

• • •

HTTP 103 should be handled gracefully by Googlebot. If the response from the server is formatted as described in the experimental standard, Googlebot will ignore the 103 and wait for the subsequent response (which is hopefully a 200)



Gary Illyes • Following
Analyst at Google
3mo •

It's one of those weeks, another PSA from my inbox: Googlebot does NOT support experimental HTTP features, including Early Hints.

Early Hints specifically may cause issues, because the initial response from the server is empty, and Googlebot will treat that as a bad response. If your provider opts you in, you might wanna figure out a way to opt out.

Once the experimental label is dropped, Googlebot will likely also support it.

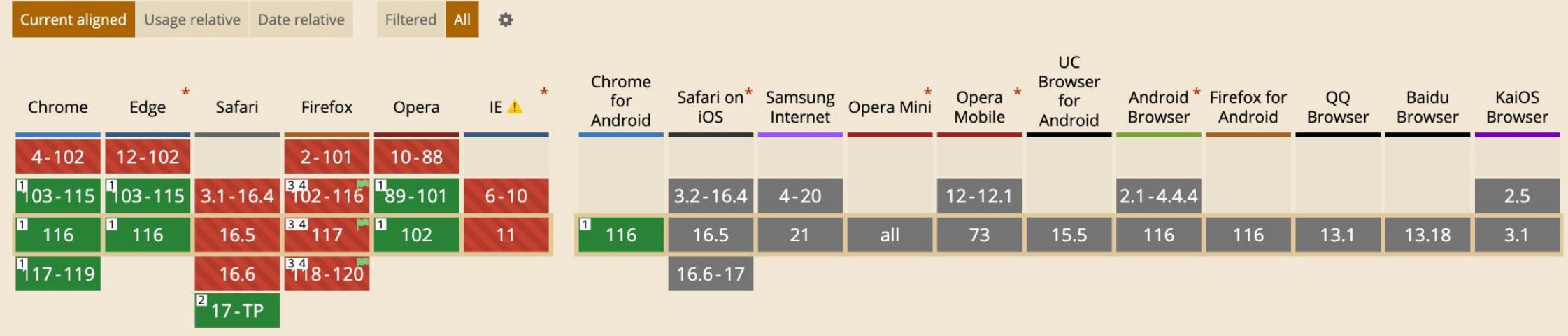


[103 Early Hints - HTTP | MDN](#)

developer.mozilla.org • 1 min read

HTTP status code: 103

Usage % of all users ?
Global 67.84%



Notes Test on a real browser Feedback

This feature is **experimental**. Use caution before using in production.

See full reference on [MDN Web Docs](#).

¹ Supported in [HTTP/2 and later for preconnect and preload](#).

² Supported in HTTP/2 and later for preconnect.

³ • Can be enabled by setting `network.early-hints.enabled` to true
 • Can be enabled by setting `network.early-hints.preconnect.enabled` to true

⁴ Supported in HTTP1.0 and later for preconnect.

Advanced techniques

Preloading



```
<link rel="preload" href="/fonts/Inter-Semibold.woff2" as="font" type="font/woff2"  
crossorigin>  
<link rel="preload" href="critical.js" as="script" />  
  
<link rel="preload" as="fetch" href="/api/items.json" crossorigin>
```

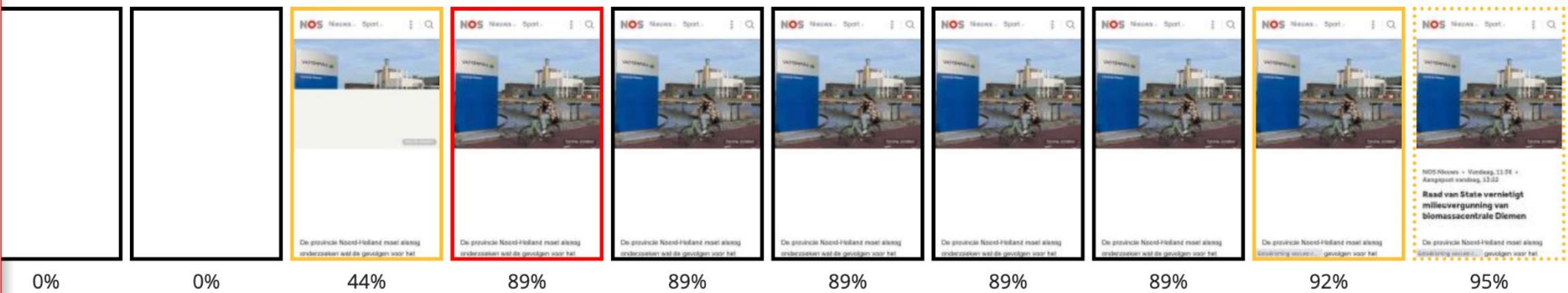
Preloading

As an HTML link element in the head section of the HTML document, the preload tag has a number of mandatory and optional attributes.

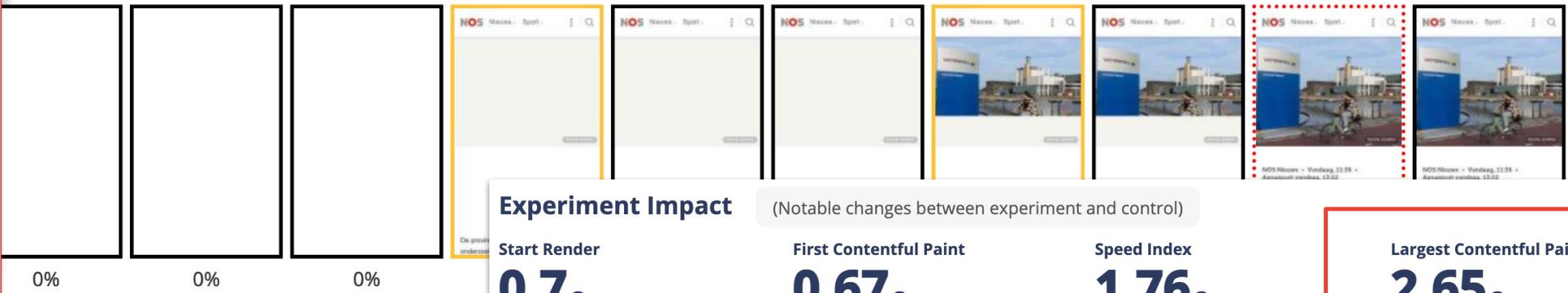
- href
- AS
- Media
- Crossorigin
- Type
- imagesrcset & imagesizes

0.5s 1.0s 1.5s 2.0s 2.5s 3.0s 3.5s 4.0s 4.5s 5.0s

1: Experiment Test Run Details



2: Original (Control Run) Test Run Details



Experiment Impact

(Notable changes between experiment and control)

Start Render

0.7 s

FASTER

Experiment: **1.3s**

Control: **2s**

First Contentful Paint

0.67 s

FASTER

Experiment: **1.28s**

Control: **1.95s**

Speed Index

1.76 s

FASTER

Experiment: **2.07s**

Control: **3.83s**

Largest Contentful Paint

2.65 s

FASTER

Experiment: **1.71s**

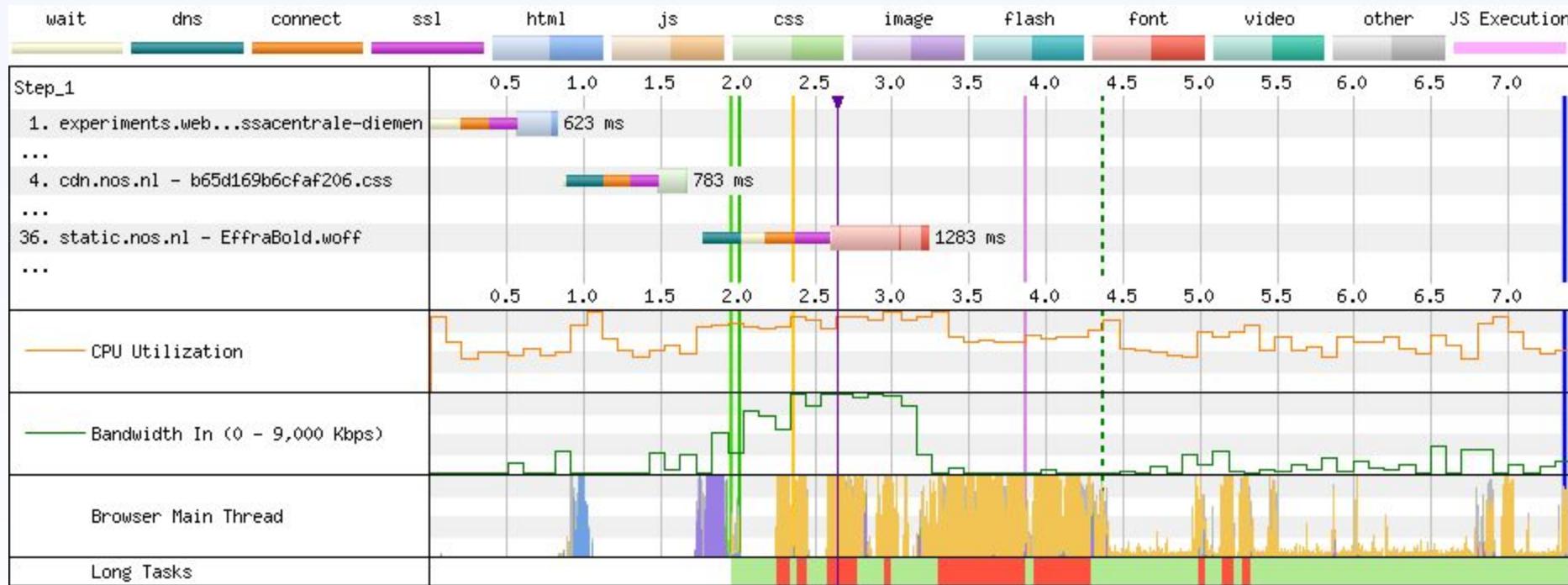
Control: **4.36s**



iron/out

Advanced techniques

Preconnecting



Advanced techniques

Priority Hints

Advanced techniques

Prefetching: The Web's Crystal Ball



```
<link rel="prefetch" href="/main.css" />
```

advanced techniques

Speculation Rules API



```
<link rel="prerender" href="/next-page.html" />
```

How is a page prerendered?

- When you type a URL into the address bar
- When you type a search term in the omnibox
- Use of the Speculation Rules API

Speculation Rules

- When you type a URL into the address bar
- When you type a search term in the omnibox
- Use of the Speculation Rules API

Chrome | chrome://predictors

Lint Images

Autocomplete Action Predictor Resource Prefetch Predictor

Filter zero confidences

Entries: 57

User Text	URL	Hit Count	Miss Count	Confidence
b	https://www.flannels.com/balenciaga-track-runners-116334#colcode=11633403	0	1	0
bol.com	https://bol.com/	0	1	0
c	https://www.sportsdirect.com.my/	0	1	0
chrome://predictors	chrome://predictors/	1	0	0
chrome://predictors	https://www.google.com/search?q=chrome%3A%2F%2Fpredictors&sourceid=chrome&ie=UTF-8	0	1	0
co	https://www.sportsdirect.com.my/	0	1	0
d	https://www.flannels.com/	0	1	0
d	https://www.sportsdirect.com.my/	0	1	0
de	https://www.flannels.com/	0	1	0
f	https://www.flannels.com/	6	2	0.75
f	https://www.flannels.com/balenciaga-track-runners-116334#colcode=11633403	0	1	0
fl	https://www.flannels.com/	6	0	1
fl	https://www.flannels.com/balenciaga-track-runners-116334#colcode=11633403	0	1	0
fla	https://www.flannels.com/	2	0	0
flan	https://www.flannels.com/	1	0	0
fo	https://www.flannels.com/	0	2	0
h	https://www.flannels.com/	0	1	0
ht	https://www.flannels.com/	0	1	0
ht	https://www.sportsdirect.com.my/	0	1	0
htt	https://www.flannels.com/	0	1	0
htt	https://www.sportsdirect.com.my/	0	1	0
http	https://www.flannels.com/	0	1	0

[Advanced techniques](#)

HTTP Client hints

Performance monitoring with API's

Advanced techniques

User timing API



```
function addToCartClickHandler() {
  // add marker for start of add to cart
  performance.mark('add-to-cart-start');

  // code to process click event...
}
```



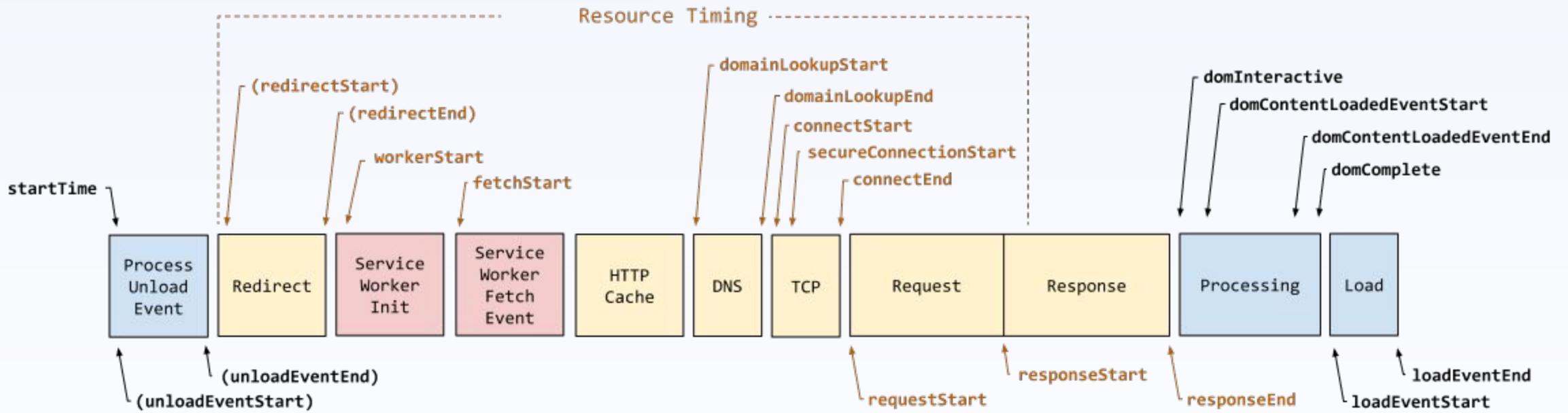
```
function CartTotal() {  
  
  if (isFinishedUpdating) {  
    //add marker for end of add to cart  
    performance.mark('add-to-cart-finish');  
  }  
  
  return (  
    // render updated component  
  )  
}
```



```
const measurementObj = performance.measure(  
  'add-to-cart-measurement',  
  'add-to-cart-start',  
  'add-to-cart-end'  
);  
  
const addToCartDuration = measurementObj.duration;  
  
// report to monitoring tool  
monitoringTool.reportCustomMetric({  
  name: 'addToBasketTiming',  
  timing: addToCartDuration  
})
```

Advanced techniques

Navigation timing





```
const observer = new PerformanceObserver((list) => {
  list.getEntries().forEach((entry) => {
    const domContentLoadedTime =
      entry.domContentLoadedEventEnd - entry.domContentLoadedEventStart;
    console.log(
      `${entry.name}: DOMContentLoaded processing time: ${domContentLoadedTime}ms`,
    );
  });
});

observer.observe({ type: "navigation", buffered: true });
```

Performance Anti Patterns

Performance Anti Patterns

Base64

Performance Anti Patterns

Asset Domains

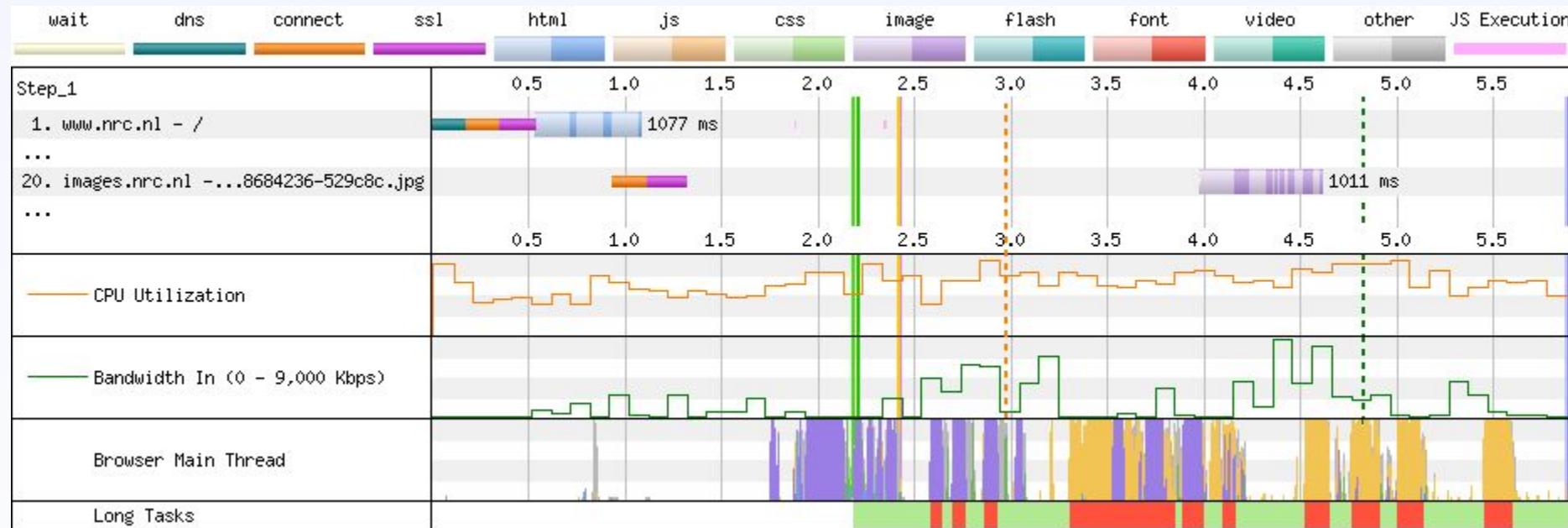
Performance Anti Patterns

Script before </body>

Performance Anti Patterns

Lazy ATF

Lazy loaded LCP image



Performance Anti Patterns

Async Snippets



```
<script>
  var script = document.createElement('script');
  script.src = 'https://third-party.com/analytics.min.js';
  document.head.appendChild(script);
</script>
```



```
<script src="https://third-party.com/analytics.min.js" async></script>
```

Performance Anti Patterns

Bitmap in SVG

Performance Anti Patterns

Release directory

Performance Anti Patterns

Loading polyfills for all browsers

Performance Anti Patterns

Carousel Autoplay

Performance Anti Patterns

Display hidden on images

3rd party scripts

Advanced techniques

3rd party Scripts



You might not need js

Advanced techniques

Modal

Advanced techniques

Slider

Advanced techniques

FAQ



```
<details>
  <summary>Epcot Center</summary>
  <p>Epcot is a theme park at Walt Disney World Resort featuring exciting
attractions, international pavilions, award-winning fireworks and seasonal special
events.</p>
</details>
```

Advanced techniques

lightbox

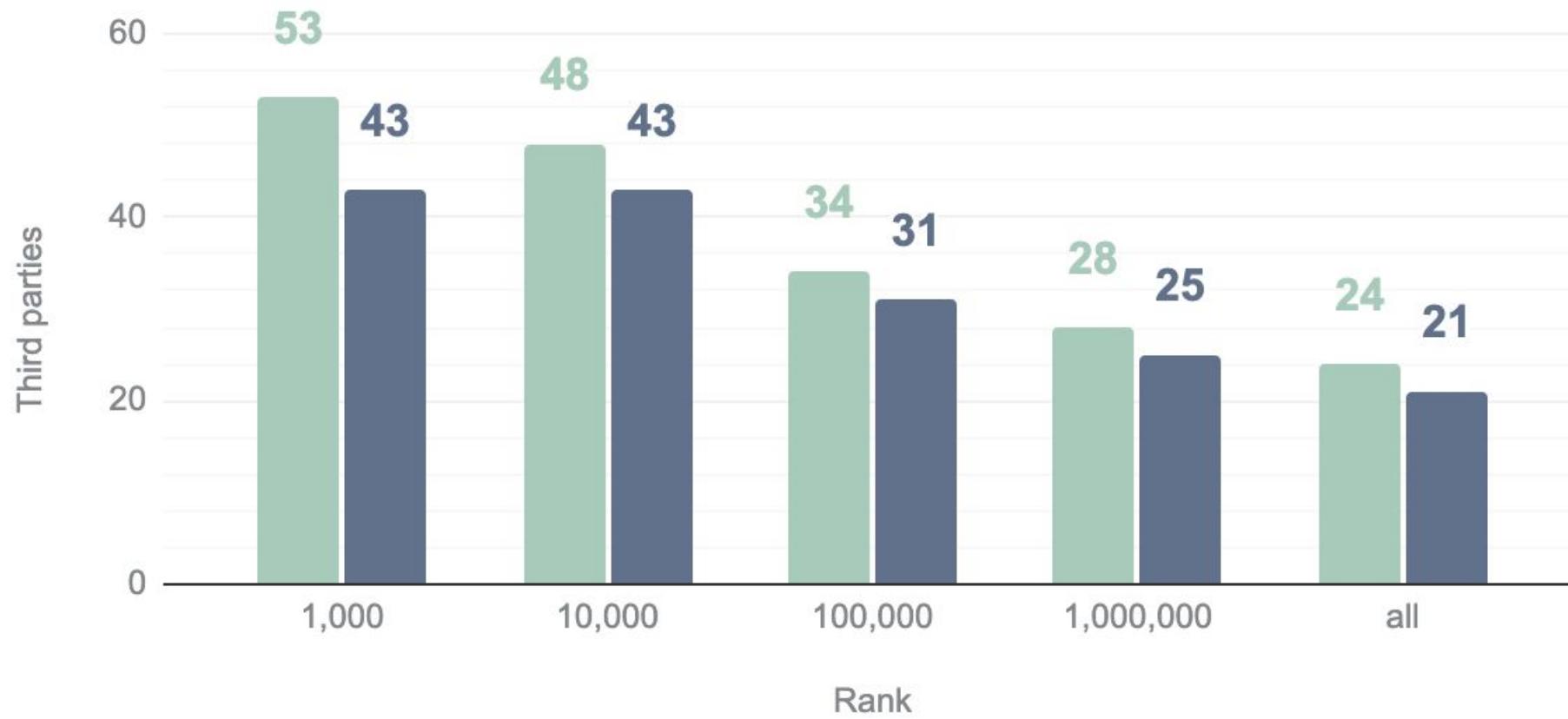
3rd party scripts

***More than 94% of the pages on the web use
third-parties***

Median number of third-party domains by rank

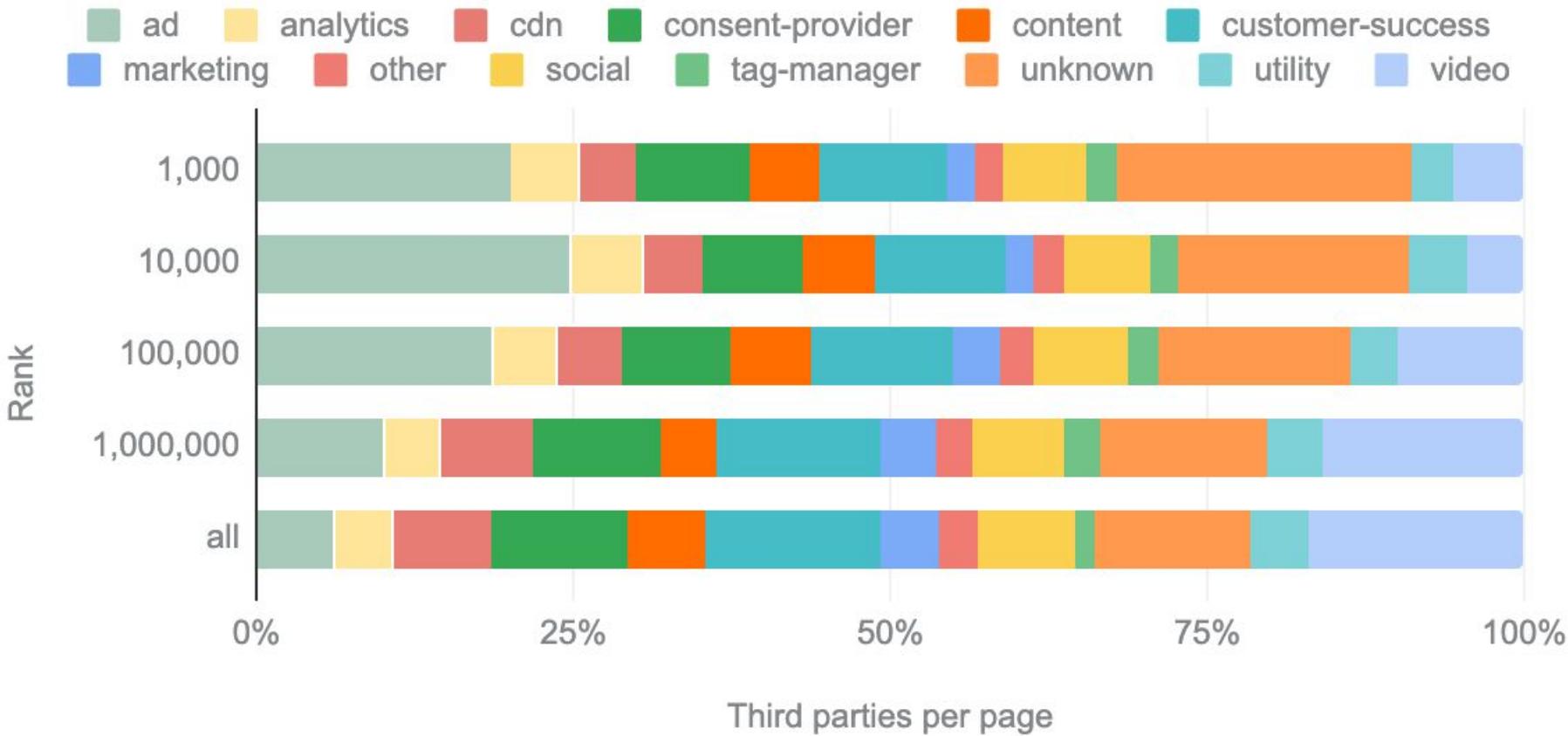
Web Almanac 2022: Third Parties

desktop mobile



Third-party domains per page by rank and category

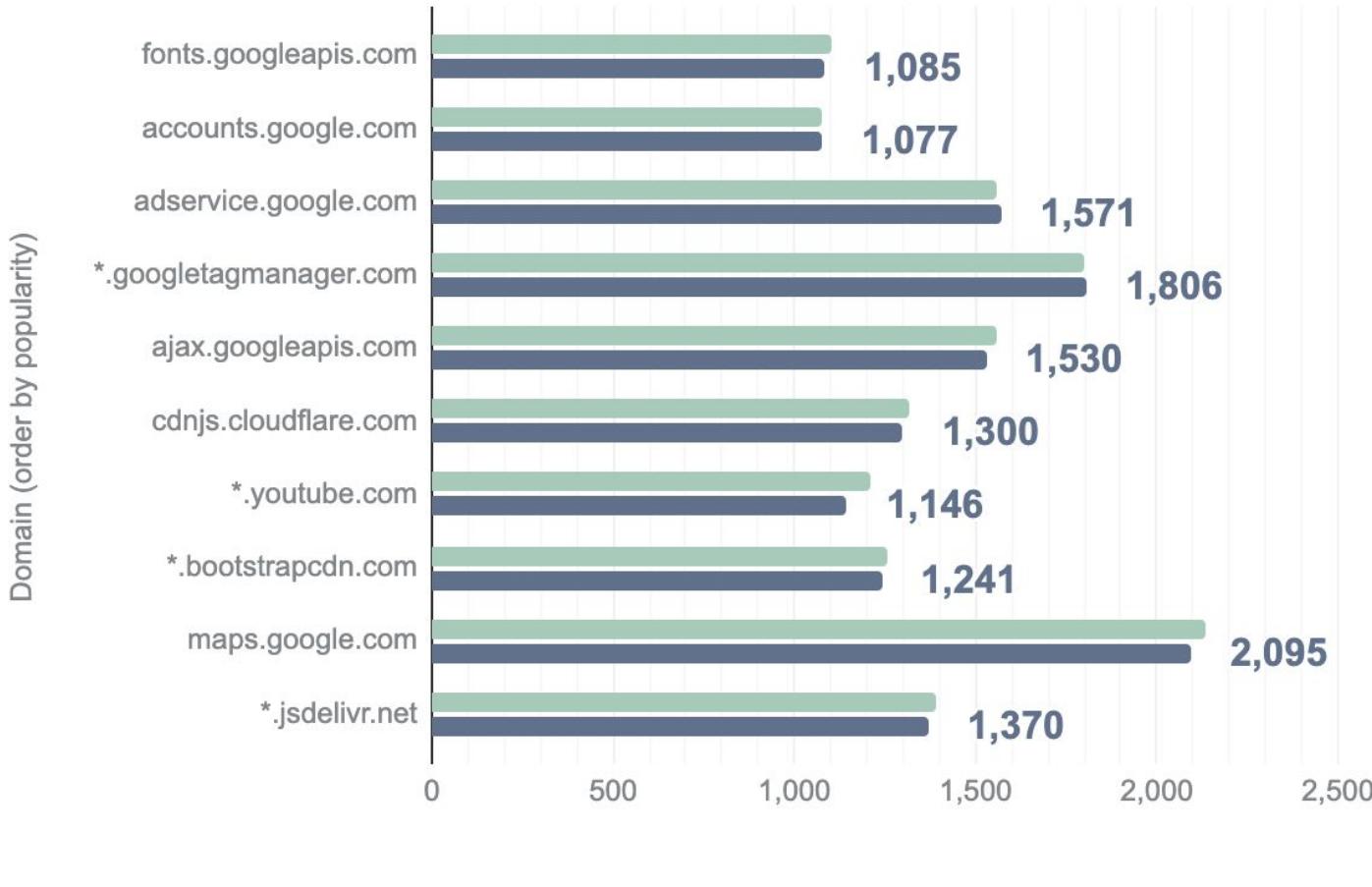
Web Almanac 2022: Third Parties (mobile)



Render-blocking time by most popular third parties

Web Almanac 2022: Third Parties

desktop mobile



3rd Party Optimization strategies

- Replace or remove
- Optimize the loading sequence
- Use pixels

Load 3P scripts efficiently

- Use async or defer (NO EXCEPTION)
- Establish early connections to required origins using resource hints
- Lazy load below-the-fold 3P resources
- Self-host 3P scripts to prevent round trips
- Use service workers to cache scripts where possible

3rd party scripts

Tagmanagers



```
window.dataLayer = [{}  
  'gtm.allowlist': ['<id>', '<id>', ...],  
  'gtm.blocklist': ['customScripts']  
};
```

3rd party scripts

Facâdes

3rd party scripts

Partytown

Partytown

- Freeing up main thread resources to be used only for the primary web app execution;
- Sandboxing third-party scripts and allowing or denying their access to main-thread APIs;
- Isolating long-running tasks within the web worker thread;
- Reducing layout thrashing coming from third-party scripts by batching DOM setters/getters into group updates;
- Throttling third-party scripts' access to the main thread;
- Allowing third-party scripts to run exactly how they're coded and without any alterations;
- Reading and writing main-thread DOM operations synchronously from within a web worker, allowing scripts running from the web worker to execute as expected.

3rd party scripts

Next.js Script component

Next JS script

- **beforeInteractive**: Use this for critical scripts that the browser should execute before the page becomes interactive. (e.g., bot detection)
- **afterInteractive**: Use this for scripts that the browser can run after the page is interactive. (e.g., tag managers) This is the default strategy applied and is equivalent to loading the script with defer
- **lazyOnload**: Use this for scripts that can be lazily loaded when the browser is idle.



Audit clients!



How to create a performance culture

Deliver a great UX

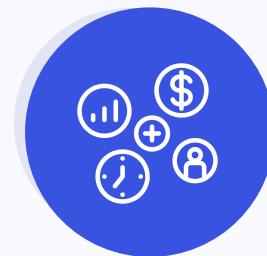
A great user experience is achieved and maintained through a combination of performance targets and budgets



Performance goals

How fast do I want to be eventually?

Long-term targets to achieve a desired user experience



Performance budgets

How can I keep my site from getting slower?

Limits to ensure current user experience does not get worse



Performance goals

[Collaborate on performance budgets](#)

Performance budgets

Are an important tool for ensuring your site is delivering a great user experience



Metrics

[Which metrics should you focus on?](#)

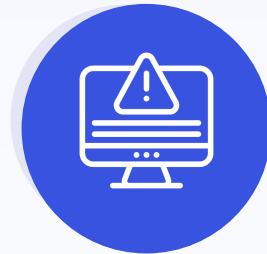
Identify your most important metrics



Thresholds

[What should your budget thresholds be?](#)

Set thresholds for those most important metrics



Alerts

[How do you stay on top of your budgets?](#)

Get alerts when those budget thresholds are crossed

What should your budget thresholds be?

Setting a brand new budget

A good practice is to look at your last 2-4 weeks of data for a given metric, identify the worst number, and then set your performance budget for that number.

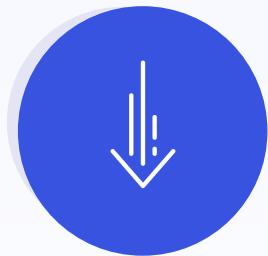


In this example, the worst Start Render time over the past month was 3.5 seconds, so that's the performance budget (represented by the red line)

What should your budget thresholds be?

Revisiting and redefining budgets

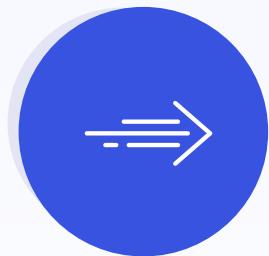
By constantly revisiting and redefining budgets in two-weekly snapshots, we're able to make slow, steady, and incremental improvements.



Improvement

[Adjust budget](#)

New worst point is better
than previous one



No change

[Budget stays unchanged](#)

New worst point is the
same as the previous one



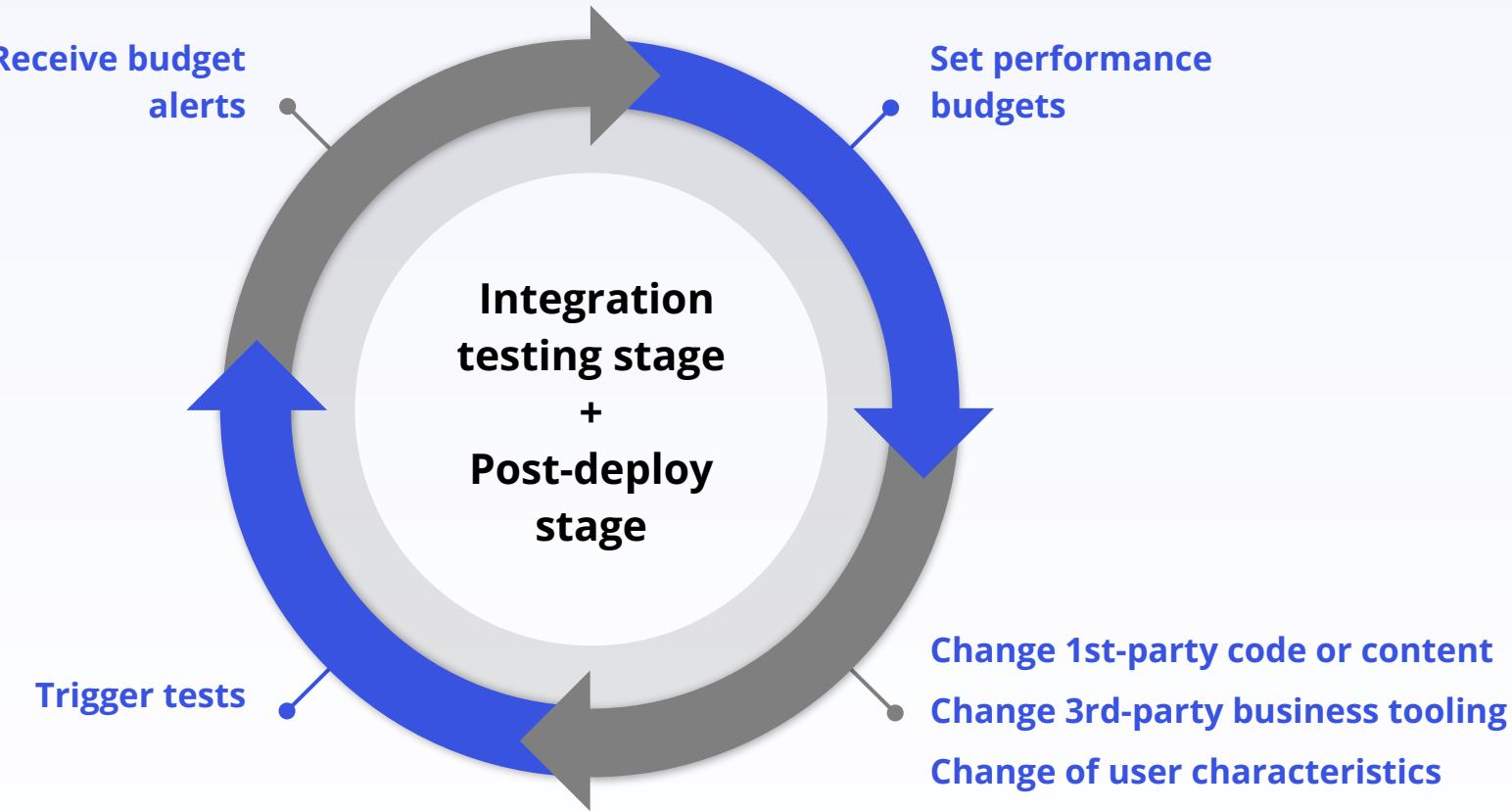
Regression

[Solve problem by optimising](#)

New worst point is worse
than previous one

Collaborate on performance budgets

Performance workflow



Recap & Open Session

Reach us at

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Thanks!

Smooth site, Strong performance!

Let's

the boundaries
of page speed

2-Day Workshop

Workshop Objectives

Our 2-day intensive workshop is designed to achieve the following objectives:

- **Comprehensive Understanding:** Enable participants to gain a deep understanding of key web performance metrics and their impact on user experience, business and SEO.
- **Skill Acquisition:** Equip participants with practical skills in applying basic to advanced web performance optimization techniques.
- **Hands-on Experience:** Provide a practical, real-world experience through an interactive session, allowing participants to directly apply the learned techniques on a given website.
- **Performance Analysis:** Teach participants to use industry-standard tools to assess and monitor web performance effectively.
- **Performance Improvement:** Empower participants to implement immediate improvements on your clients' websites, leading to a better user experience, boost conversion rates, improve SEO rankings, and strengthen the company's brand image.

By the end of this workshop, our goal is for all participants to leave with a robust understanding of web performance.



Day 1: Overview

- Morning Session: Understanding Web Performance Metrics
 - Introduction to web performance optimization
 - Installing workspace environment
 - Which metrics should you focus on?
- Afternoon Session: Introduction to Performance Optimization Techniques
 - Exploration of tools and practices for assessing web performance
 - Networking Layer
 - First load performance

Day 2: Overview

- Morning Session: Hands-on Performance Optimization
 - Image optimization techniques
 - Javascript & Library's
 - Performance Monitoring with APIs
- Afternoon Session: Advanced Optimization Strategies and Tools
 - Devtools performance panel
 - Deep-dive into advanced topics like critical rendering path, async loading, etc
 - Performance Budgets
 - Recap the key takeaways from the workshop. Open up for questions and provide further resources for self-study.