

# Website Performance

Thomas Puppe auf der NConf Rostock 2023



# Hi, ich bin Thomas 🖐️

Senior Frontend Developer bei ZEIT Online

#a11y, #leanweb, #webperf

# MacBook Pro



## Mover. Maker. Boundary breaker.

Supercharged by M2 Pro or M2 Max, MacBook Pro takes its power and efficiency further than ever. It delivers exceptional performance whether it's plugged in or not, and now has even longer battery life. Combined with a stunning Liquid Retina XDR display and all the ports you need — this is a pro laptop without equal.

From \$1999

[Watch the announcement](#)

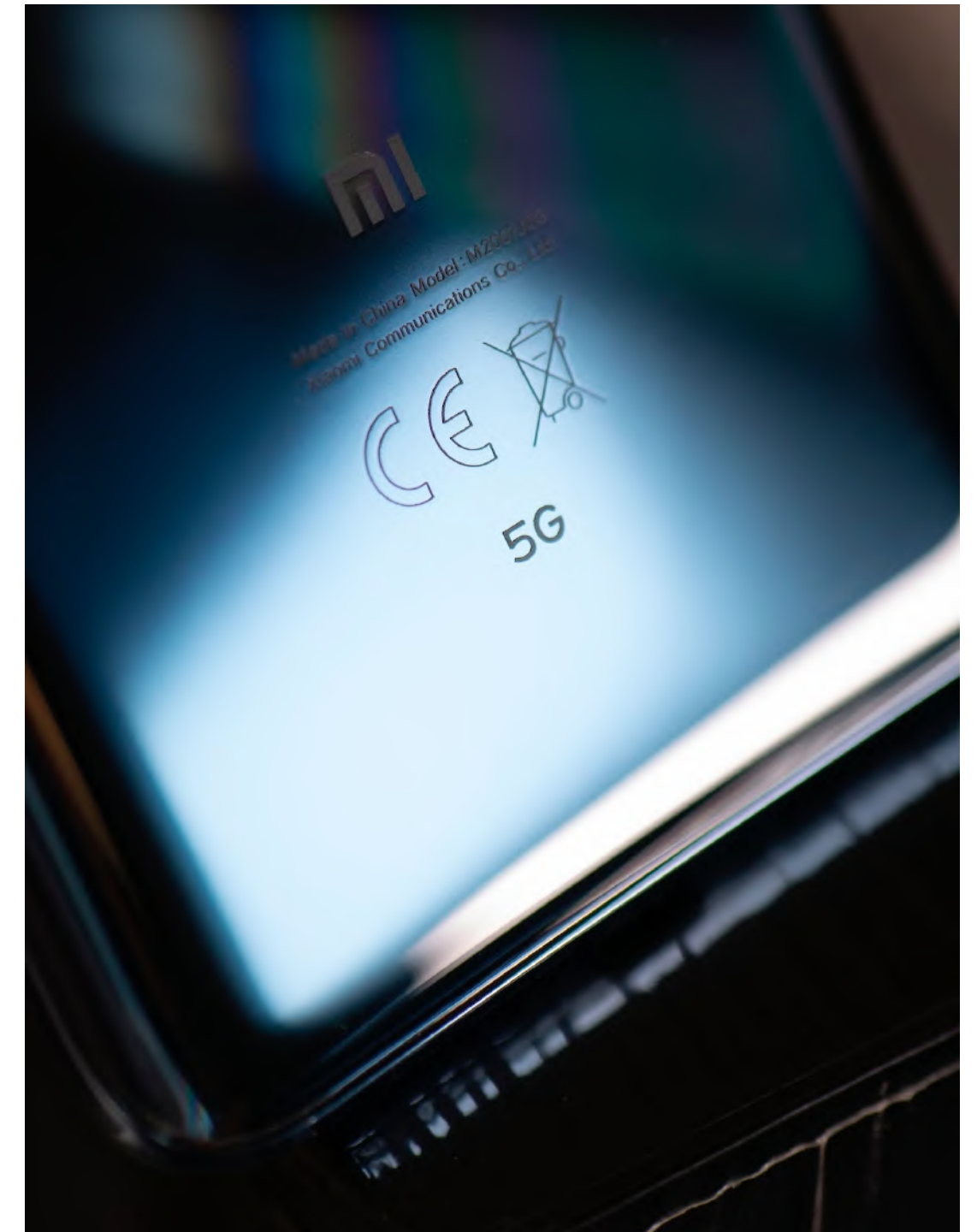
## Supercharged by



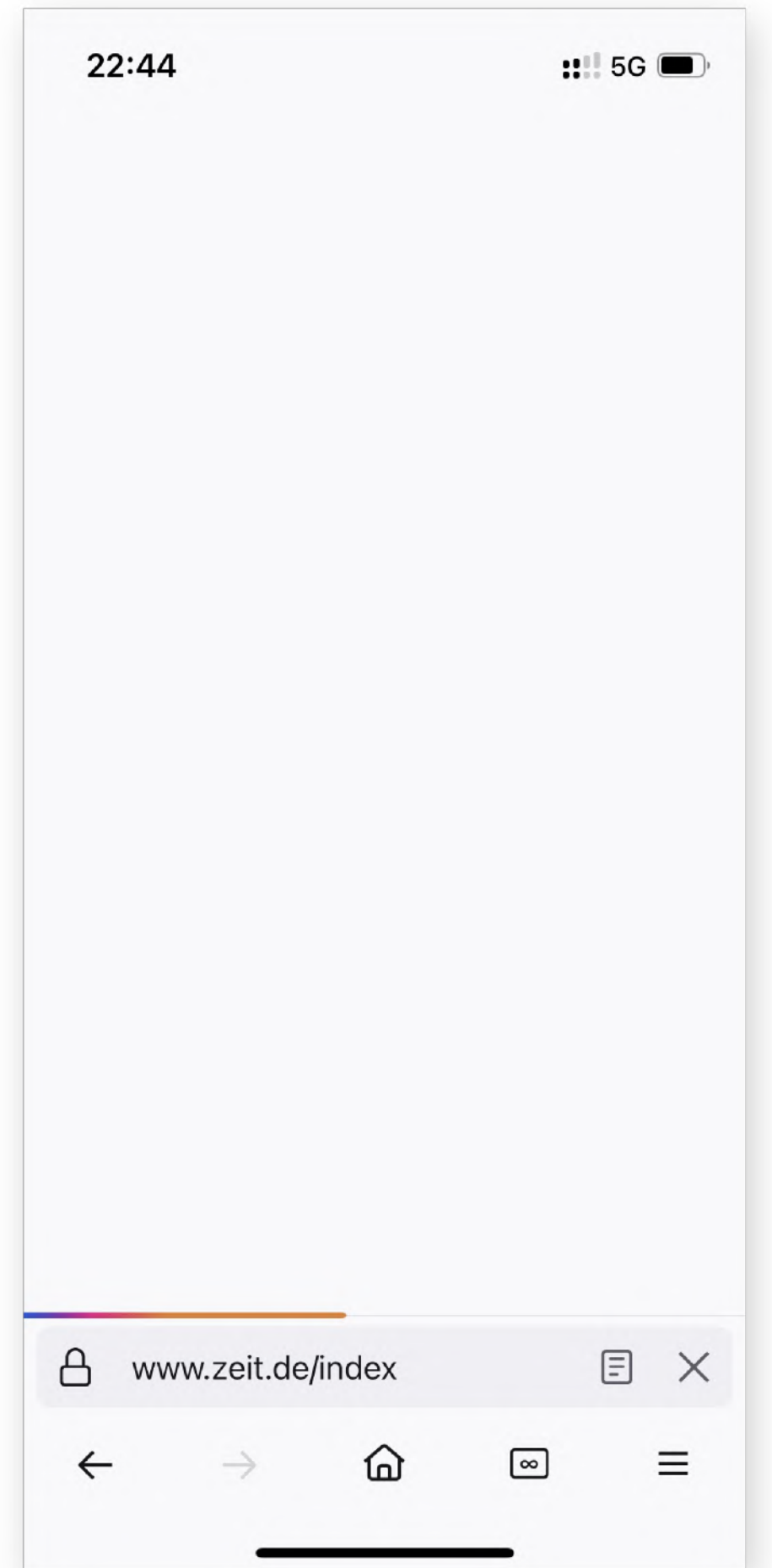
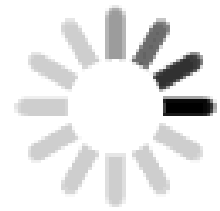
Up to 12-core CPU  
Up to 19-core GPU  
Up to 32GB unified memory  
200GB/s memory bandwidth



12-core CPU  
Up to 38-core GPU  
Up to 96GB unified memory  
400GB/s memory bandwidth



**www ~~≡~~ wealthy western web**





# Website Performance ist ein Wettbewerbsvorteil!



# WPO stats



Case studies and experiments demonstrating the impact of web performance optimization (WPO) on user experience and business metrics.

## Performance studies related to “revenue”



Carpe improved Largest Contentful Paint by 52% and Cumulative Layout Shift by 41% and saw a 10% increase in traffic, a 5% increase in online store conversion rate, and a 15% increase in revenue.

[PERMALINK](#) [SHARE ON TWITTER](#)

[#bounce rate](#) [#conversion rate](#) [#traffic](#) [#revenue](#) [#2023](#) [#core web vitals](#)



Rakuten 24 ran an A/B test showing improved vitals brought a 53.4% increase in revenue per visitor, 33.1% increase in conversion rate, 15.2% increase in average order value, 35.1% reduction in exit rate and more!

Filter by tag:

[#2006](#) [#2008](#) [#2009](#)

[#2010](#) [#2011](#) [#2012](#)

[#2013](#) [#2014](#) [#2015](#)

[#2016](#) [#2017](#) [#2018](#)

[#2019](#) [#2020](#) [#2021](#)

[#2022](#) [#2023](#)

[#abandonment](#) [#ads](#)

[#bounce rate](#) [#conversion](#)

[#conversion rate](#)

[#core web vitals](#)





# Website Performance



**TTFB**

**Download  
Size**

**Asset  
Count**

**TTFB**

**Download  
Size**

**Asset  
Count**

**window  
loaded**

**DOM  
content  
loaded**

**TTFB**

**LCP**

**window  
loaded**

**Download  
Size**

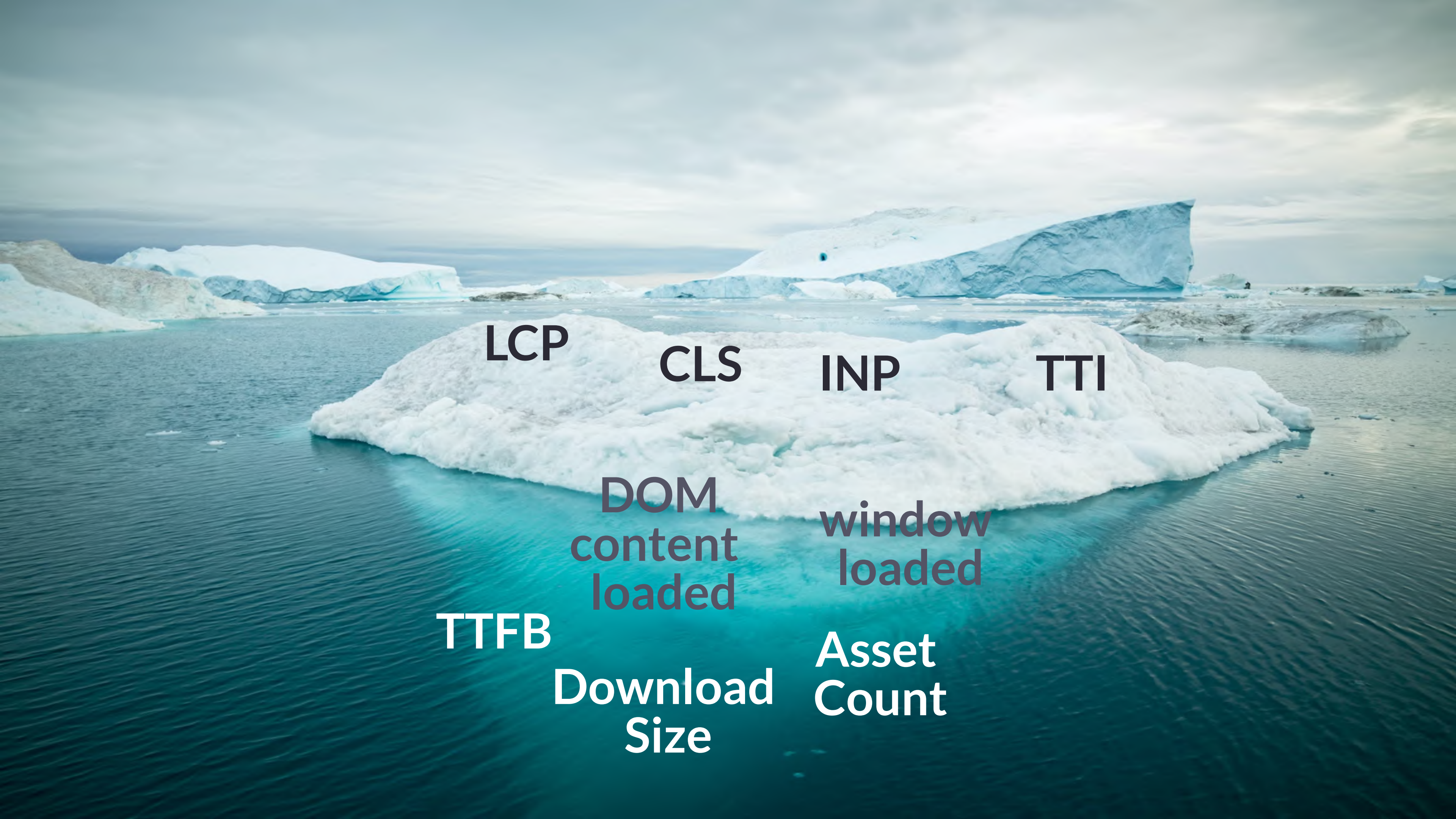
**CLS**

**DOM  
content  
loaded**

**INP**

**Asset  
Count**

**TTI**



**LCP**

**CLS**

**INP**

**TTI**

**DOM  
content  
loaded**

**window  
loaded**

**TTFB**

**Download  
Size**

**Asset  
Count**

# Aspekte von Website Performance

## Aus Usersicht

schnell / schlank / ruckelt nicht

---

## Browser / Technologien

HTML / CSS / Bilder / JavaScript / Schriften / Video / Audio

Priorisierung im Netzwerk und im Browser

---

## Build / Server

Bildformate / Komprimierung / CDN, Cloud / Caching / Netzwerk

---

## Wirkung

Objektive Zahlen / Subjektive Wahrnehmung

---

## Kontrolle

Messung / Testing / Monitoring / SEO Einfluss

## Drei Säulen von Website Performance

**A**

**R**

**O**



## Drei Säulen von Website Performance

**A**

AVOID

**R**

REDUCE

**O**

OPTIMIZE

## Drei Säulen von Website Performance

# A

**AVOID**

Benutzen wir alles?  
Brauchen wir alles?

# R

**REDUCE**

Cachen,  
Komprimieren,  
Minimieren.

# O

**OPTIMIZE**

Ladeverhalten und  
Priorisierung.

## Drei Fünf Säulen von Website Performance

**A**

**AVOID**

Benutzen wir alles?  
Brauchen wir alles?

**R**

**REDUCE**

Cachen,  
Komprimieren,  
Minimieren.

**O**

**OPTIMIZE**

Ladeverhalten und  
Priorisierung

**M**

**MEASURE**

Tooling und  
Monitoring

**A**

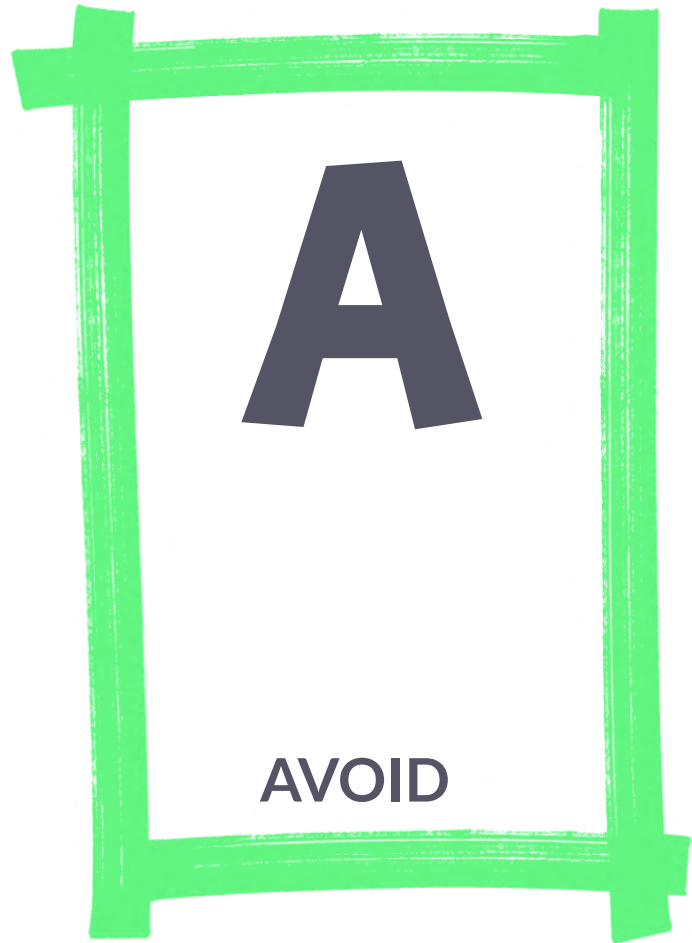
**ATTITUDE**

Performance  
Culture

**[thomaspuppe.de/talks/nconf-2023](https://thomaspuppe.de/talks/nconf-2023)**

Slides und Links

## Drei Fünf Säulen von Website Performance



**AVOID**

Benutzen wir alles?  
Brauchen wir alles?

**R**

**REDUCE**

Cachen,  
Komprimieren,  
Minimieren.

**O**

**OPTIMIZE**

Ladeverhalten und  
Priorisierung

**M**

**MEASURE**

Tooling und  
Monitoring

**A**

**ATTITUDE**

Performance  
Culture



**AVOID**

**Avoid Stuff:  
ungenutzte  
Sachen  
finden**

**Browser DevTools**

The screenshot shows the Chrome DevTools Network Tab with a filter applied: `ain:*.zeit.de larger-than:100`. The filter is highlighted with a pink circle. Other filter options include `Invert`, `Hide data URLs`, and `Hide extension URLs`. The `All` filter is selected, and other categories like `Doc`, `JS`, `Fetch/XHR`, `CSS`, `Font`, `Img`, `Media`, `Manifest`, `WS`, `Wasm`, and `Other` are visible. The table below shows the filtered requests:

Name	Status	Type	Initiator	Size	Time	Priority	Cache-Control	Waterfall
common.js idgpnmonknjnojddfkpgkljpfnnfcklj/js/tool	200 OK	script	<u>common-4aa3a322.js:6</u> Script	142 kB 142 kB	155 ms 135 ms	High High	no-cache	
theCard.js idgpnmonknjnojddfkpgkljpfnnfcklj/js/tool	200 OK	script	<u>theCard-746d34e6.js:6</u> Script	762 kB 762 kB	168 ms 134 ms	High High	no-cache	
gpt.js www.googletagservices.com/tag/js	200 OK	script	<u>VM839:1</u> Script	101 kB 101 kB	321 ms 91 ms	Low Low	private, max-age=900, sta...	
prebid8.16.0.js	200	script	<u>VM842:1</u>	131 kB	76 ms	Low		

Summary statistics at the bottom: 9 / 387 requests | 3.1 MB / 8.1 MB transferred | 7.2 MB / 20.8 MB resources | Finish: 2.2 min | DOMContentLoaded: 1.78 s | Load: 5.02 s

# Browser Developer Tools Network Tab

Filter: domain, larger-than, status-code, priority, ...

<https://developer.chrome.com/docs/devtools/network/reference/>



**Avoid Stuff:  
ungenutzte  
Sachen  
finden**

Browser DevTools

**Request Maps**

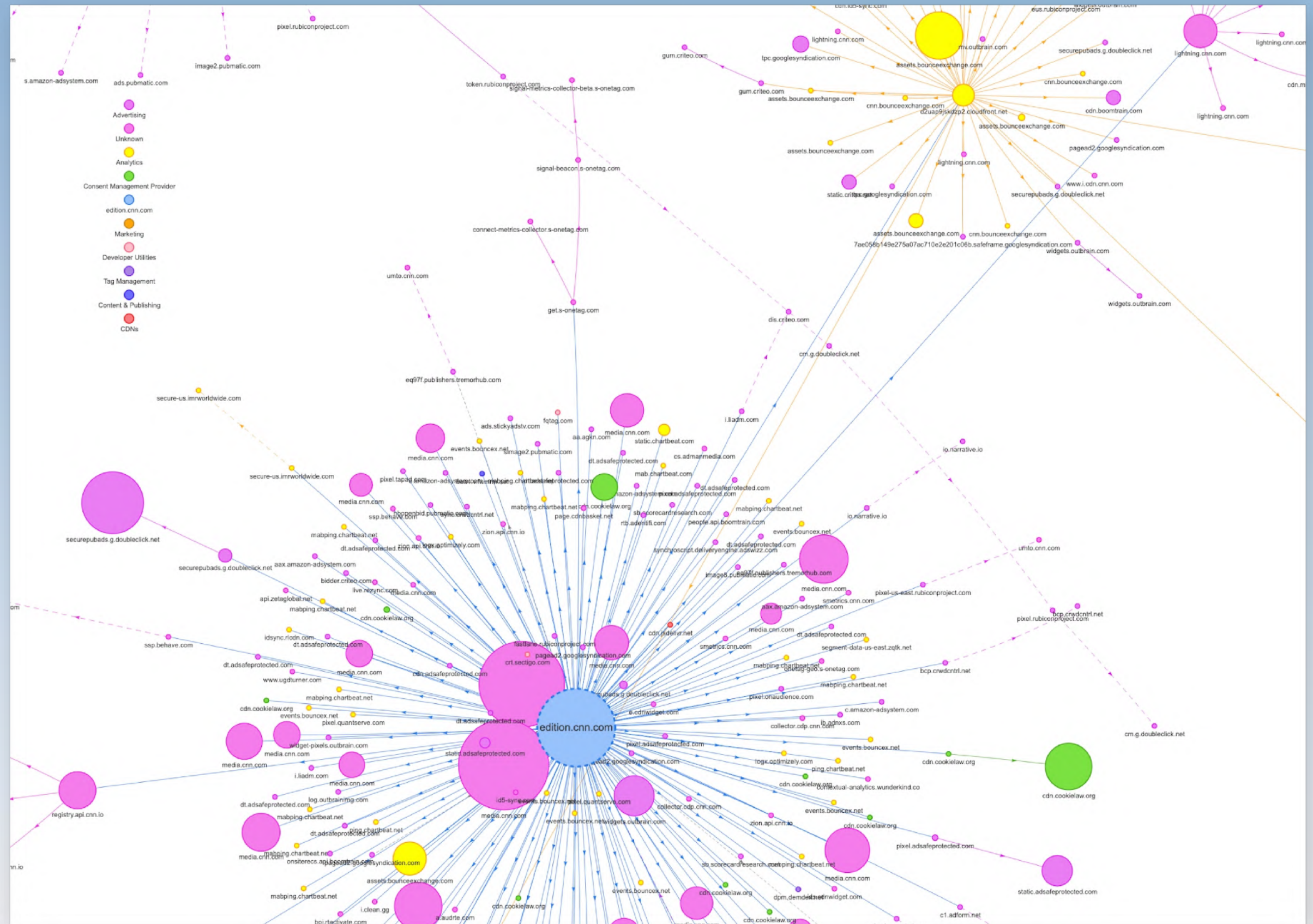
# Avoid

## Request Maps

- [requestmap.webperf.tools](http://requestmap.webperf.tools)
- [requestmap.pages.dev](http://requestmap.pages.dev)

Gute Visualisierung, wenn die Request-Liste in den DevTools nicht ausreicht.

Oder um Stakeholder zu beeindrucken!



## Avoid

### Request Maps

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Oder um Stakeholder zu beeindrucken!

Please wait while your visualization is generated...  
This can take a while depending on the complexity of the tested page.  
We're rendering 378 nodes



## Avoid

### Request Maps

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It may take a while depending on the complexity of the tested page.  
We're rendering 378 nodes



**Avoid Stuff:  
ungenutzte  
Sachen  
finden**

Browser DevTools

Request Maps

**Google Tag Manager ausmisten**

# Avoid Stuff: ungenutzte Sachen finden

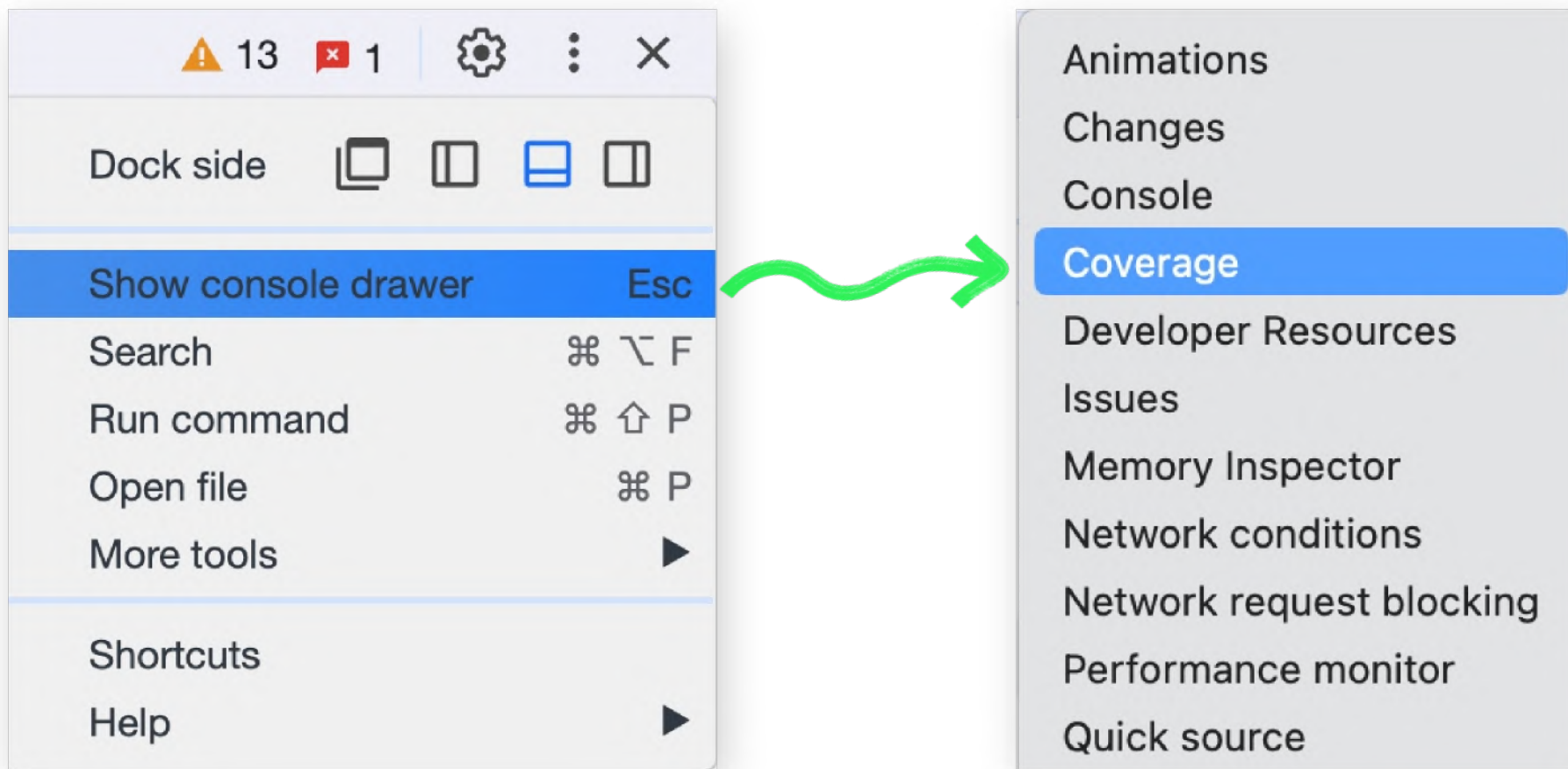
Browser DevTools

Request Maps

Google Tag Manager ausmisten

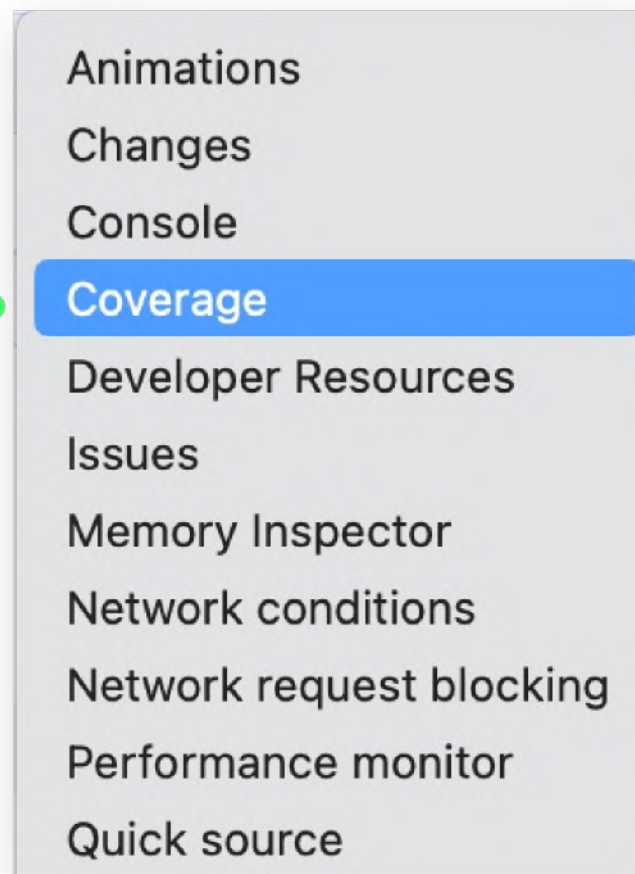
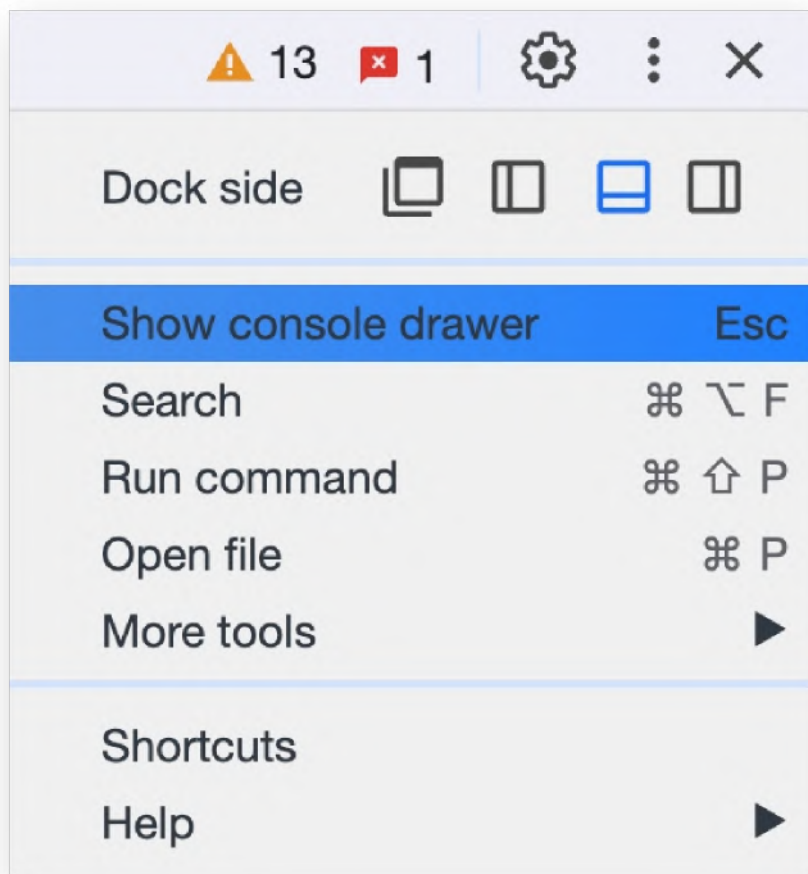
**Unused CSS/JS via DevTools**

# Unused CSS/JS



# Unused CSS/JS

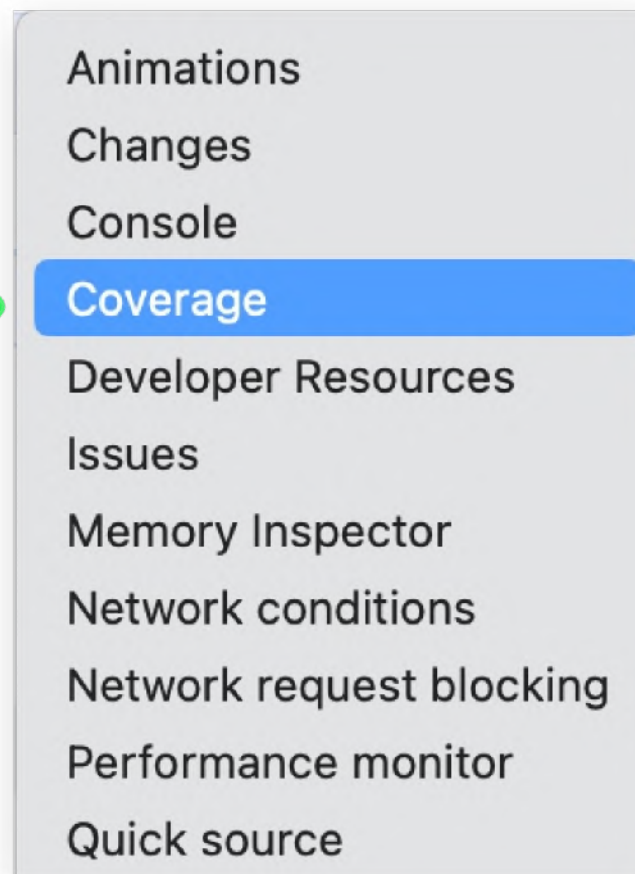
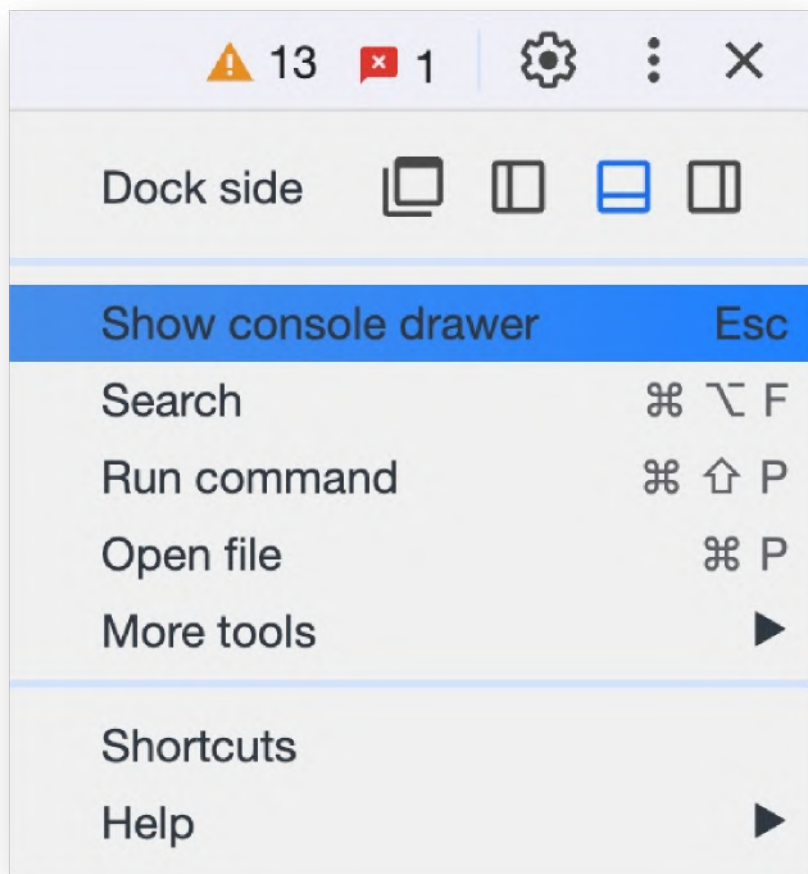




# Unused CSS/JS



URL	Type	Total Bytes	Unused Bytes	Usage Visualization
https://consent-cdn.zeit.de/wrapperMessagingWithoutDetection.js	JS (per function)	204 217	95 490 46.8%	
https://interactive.zeit.de/wiegehtesi.../app.c0381a78a97b00cf65db.cached.js	JS (per function)	156 095	75 866 48.6%	
https://interactive.zeit.de/g/2022/energiekostenmonitor/.../index.75ca3a4e.css	CSS	99 104	72 859 73.5%	
https://interactive.zeit.de/g/2022/energiekostenmonitor/.../react.8d1c6deb.mjs	JS (per function)	142 733	67 107 47%	
https://static.zeit.de/p.../centerpage.92c7290fe3f64752971581ffeb39d5b6.css	CSS	97 335	62 054 63.8%	
https://static.zeit.de/p/zeit.../base.4ac770b16c740c03c50e84fbd93f1dd9.css	CSS	49 036	38 825 79.2%	
https://static.zeit.de/static/js/webtrekk/webtrekk_v4.5.3.min-3.js	JS (per function)	75 896	30 541 40.2%	
https://static.zeit.de/iqd/cdn_zeit_async/live/iqadcontroller.js	JS (per function)	302 396	22 570 7.5%	
https://www.zeit.de/index	CSS+JS (per function)	91 860	20 860 22.7%	
https://pixel.adsafeprotected.com/rjss/st/1684785/75510779/skeleton.../index	JS (per function)	47 397	16 785 35.4%	
https://static.zeit.de/p/.../navigation.3f1caf0352cf4094c00c33fee12e352c.css	CSS	23 123	16 505 71.4%	
https://wally.zeit.de/assets/footerbar-296671a5.css	CSS	16 158	16 158 100%	



# Unused CSS/JS

URL	Type	Total Bytes	Unused Bytes	Usage Visualization
https://consent-cdn.zeit.de/wrapperMessagingWithoutDetection.js	JS (per function)	204 217	95 490 46.8%	
https://interactive.zeit.de/wiegehtesi.../app.c0381a78a97b00cf65db.cached.js	JS (per function)	156 095	75 866 48.6%	
https://interactive.zeit.de/g/2022/energiekostenmonitor/.../index.75ca3a4e.css	CSS	99 104	72 859 73.5%	
https://interactive.zeit.de/g/2022/energiekostenmonitor/.../react.8d1c6deb.mjs	JS (per function)	142 733	67 107 47%	
https://static.zeit.de/p.../centerpage.92c7290fe3f64752971581ffeb39d5b6.css	CSS	97 335	62 054 63.8%	
https://static.zeit.de/p/zeit.../base.4ac770b16c740c03c50e84fbd93f1dd9.css	CSS	49 036	38 825 79.2%	
https://static.zeit.de/static/js/webtrekk/webtrekk_v4.5.3.min-3.js	JS (per function)	75 896	30 541 40.2%	
https://static.zeit.de/iqd/cdn_zeit_async/live/iqadcontroller.js	JS (per function)	302 396	22 570 7.5%	
https://www.zeit.de/index	CSS+JS (per function)	91 860	20 860 22.7%	
https://pixel.adsafeprotected.com/rjss/st/1684785/75510779/skeleton.../index	JS (per function)	47 397	16 785 35.4%	
https://static.zeit.de/p/.../navigation.3f1caf0352cf4094c00c33fee12e352c.css	CSS	23 123	16 505 71.4%	
https://wally.zeit.de/assets/footerbar-296671a5.css	CSS	16 158	16 158 100%	



**Avoid Code: System Features nutzen**

**Avoid Code:**

**Summary / Details**

**System**

**Features**

**nutzen**

# Summary / Details: HTML Reveal Element

## Workshop reviews:

▶ **Blendan Smooth**

▼ **Hoover Sukhdeep**

Hal is brilliant. Did I mention Hal is brilliant? He didn't tell me to say that. He didn't tell me to say anything. I am here of my own free will.

▶ **Toasty McToastface**

# Summary / Details: HTML Reveal Element

## Workshop reviews:

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```
<details>
  <summary>Hoover Sukhdeep</summary>
  <p>
    Hal is brilliant. Did I mention Hal is brilliant?
    He didn't tell me to say that. He didn't tell me to say
    anything. I am here of my own free will.
  </p>
</details>
```

**Avoid Code:  
System  
Features  
nutzen**

System Fonts

Summary / Details

**Dialog / Modal Feature**

# @material/dialog

14.0.0 • Public • Published a year ago

Readme

Code Beta

15 Dependencies

106 Dependents

1.672 Versions

## Dialogs

Dialogs inform users about a task and can contain critical information, require decisions, or involve multiple tasks.

There are four types of dialogs:

1. Alert
2. Simple
3. Confirmation
4. Full-screen

## Using dialogs

A dialog is a type of modal window that appears in front of app content to provide critical information or ask for a decision. Dialogs disable all app functionality when they appear, and remain on screen until confirmed, dismissed, or a required action has been taken.

Dialogs are purposefully interruptive, so they should be used sparingly.

For additional guidance, refer to the [Material guidelines](#).

### Installation

```
npm install @material/dialog
```

### Styles

```
@use "@material/dialog";  
  
@include dialog.core-styles;
```

Note: Styles for any components you intend to include within dialogs (e.g. List, Checkboxes, etc.) must also be imported.

### JavaScript Instantiation

```
import {MDCDialog} from '@material/dialog';  
const dialog = new MDCDialog(document.querySelector('.mdc-dialog'));
```

### Install

```
> npm i @material/dialog
```

### Repository

github.com/material-components/mate...

### Homepage

github.com/material-components/mate...

### Weekly Downloads

625.809

Version	License
14.0.0	MIT

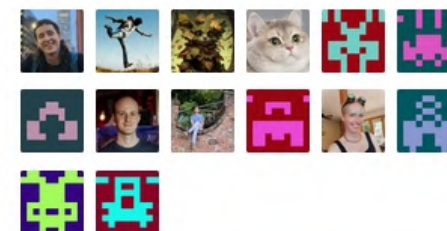
Unpacked Size	Total Files
1.3 MB	44

Issues	Pull Requests
398	91

### Last publish

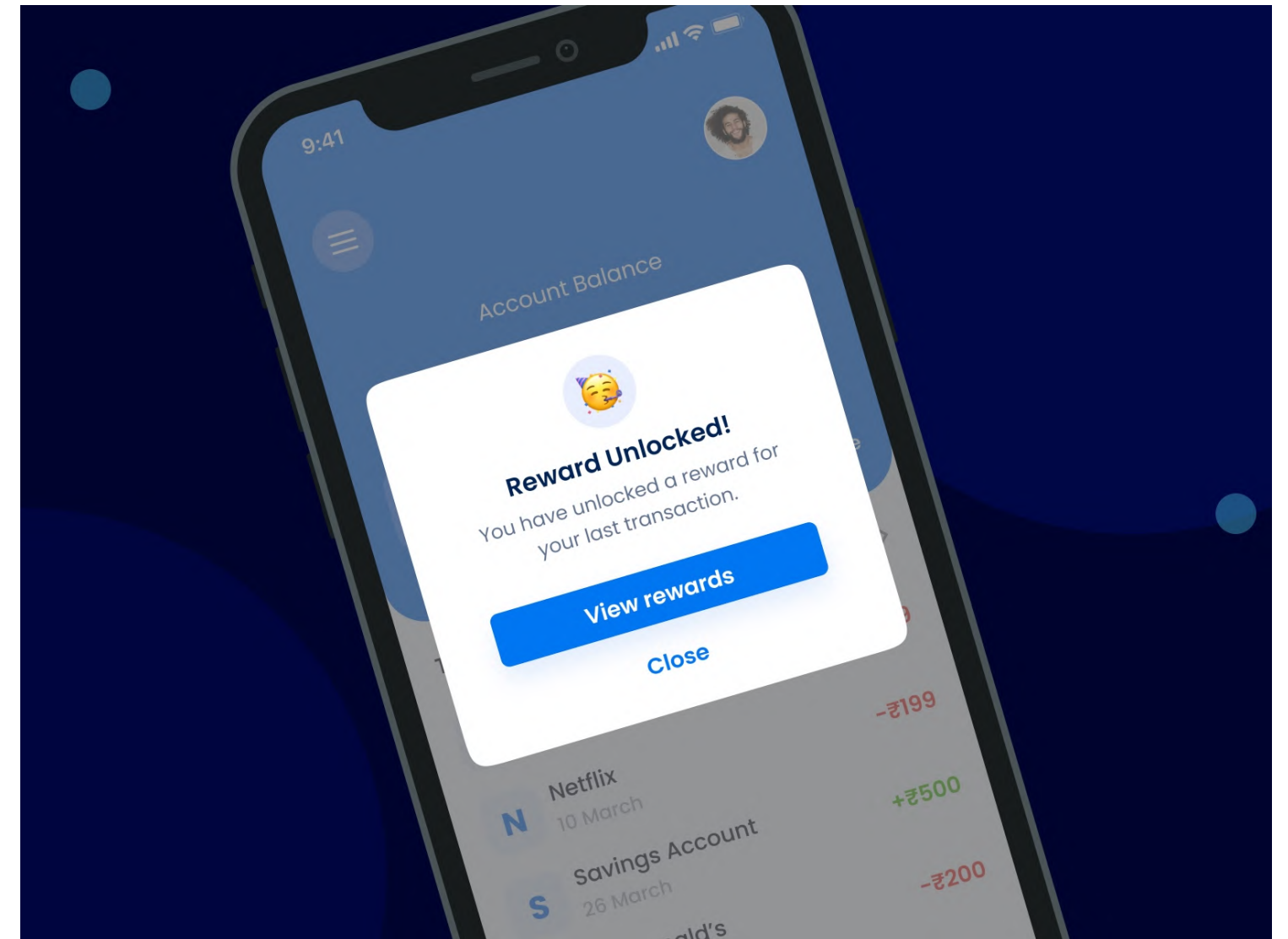
3 days ago

### Collaborators



>Try on RunKit

Report malware



Credits: Aishwarya Vijay Kumar auf Dribbble



15 Dependencies   106 Dependents   1.672 Vers

Install

```
> npm i @material/dialog
```

Repository  
[github.com/material-components/](https://github.com/material-components/material-components-dialog)

Homepage  
[github.com/material-components/](https://github.com/material-components/material-components-dialog)

Weekly Downloads  
**625.809**

Version	License
<b>14.0.0</b>	MIT

Unpacked Size	Total Files
<b>1.3 MB</b>	44

Issues: 398   Pull Requests: 91

Last publish: 3 days ago

Collaborators

dialogs (e.g. List, Checkboxes,

```
tor('.mdc-dialog');
```

>Try on RunKit

Report malware

```
<dialog>
  <form method="dialog">
    <p>
      Content
    </p>
    <button>
      Close
    </button>
  </form>
</dialog>
```

```
dialog { ... }
dialog[open] { ... }
```

```
dialog::backdrop {
  background: red;
}
```

```
const dialog = document.querySelector('dialog');


// Show the dialog as non modal
dialog.show();

// Show dialog as modal
dialog.showModal();

// Close / hide the dialog
dialog.close();
```

### Dialog element - LS

Method of easily creating custom dialog boxes to display to the user with modal or non-modal options. Also includes a `::backdrop` pseudo-element for behind the element.

Current aligned   Usage relative   Date relative   Filtered   All   

Chrome	Edge *	Safari	Firefox	Opera	IE
			2-52		
4-31			<sup>1</sup> 53-79	10-18	
<sup>2</sup> 32-36	12-18	3.1-15.3	<sup>1</sup> <sup>4</sup> 80-97	<sup>3</sup> 19-23	
37-116	79-116	15.4-16.5	98-116	24-101	6-10
117	117	16.6	117	102	11
118-120		17.0-TP	118-120		

15 Dependencies 106 Dependents 1.672 Vers

Install

```
> npm i @material/dialog
```

Repository  
github.com/material-compo

Homepage  
github.com/material-compo

Weekly Downloads  
625.809

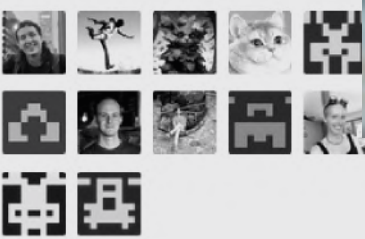
Version License  
14.0.0 MIT

Unpacked Size Total File  
1.3 MB 44

Issues Pull Req  
398 91

Last publish  
3 days ago

Collaborators



```
<dialog>
```

```
</dialog>
```



```
dialog.showModal();

// Close / hide the dialog
dialog.close();
```

dialogs (e.g. List, Checkboxes,

### Dialog element

Method of easily creating custom dialog boxes to display to the user with modal or non-modal options. Also includes a `::backdrop` pseudo-element for behind the element.

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117	117	16.6	117	102	11
118-120		17.0-TP	118-120		

**Avoid Code:  
System  
Features  
nutzen**

System Fonts

Summary / Details

Dialog / Modal Feature

**Formular Validierung**

# Formularvalidierung nativ



```
<input id="email" required />
```

# Formularvalidierung nativ



```
<input id="email" type="email" required />
```

# Formularvalidierung nativ



```
<input id="lowercaseFoodWithB" type="text"  
      required minlength="4" maxlength="20"  
      pattern="b[a-z]" />
```

```
<input name="pin" type="password" required  
      pattern="\d{4,4}" />
```

# Formularvalidierung nativ



```
<input id="email" required />
```

```
<style>
```

```
  input:invalid {  
    border: 2px dashed red;  
  }
```

```
  input:invalid:required {  
    background-image: linear-gradient(to right, pink, lightgreen);  
  }
```

```
  input:valid {  
    border: 2px solid black;  
  }
```

```
</style>
```

# Formularvalidierung nativ



```
<input type="number" min="0" step="5" max="100">  
  
<style>  
  input:invalid:out-of-range:before {  
    content: "This is not 'Nam, this is bowling. There are rules!"  
  }  
</style>
```



# Avoid Code: System Features nutzen

System Fonts

Summary / Details

Dialog / Modal Feature

Formular Validierung

**System Fonts**

# Avoid Code

## System Fonts nutzen

Vielleicht kannst du auf Webfonts verzichten. Die System-Schriften auf den Betriebssystemen sind vielfältig.

- <https://modernfontstacks.com/>
- <https://gist.github.com/don1138/5761014>
- <https://meowni.ca/font-style-matcher/>

System UI

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklm  
nopqrstuvwxyz  
1234567890

100 200 300 400 500 600 700 800 900

font-family: `system-ui, sans-serif;`

Transitional

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklm  
nopqrstuvwxyz  
1234567890

100 200 300 400 500 600 700 800 900

font-family: `Charter, 'Bitstream Charter', 'Sitka Text', Cambria, serif;`

Old Style

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklm  
nopqrstuvwxyz  
1234567890

100 200 300 400 500 600 700 800 900

font-family: `'Iowan Old Style', 'Palatino Linotype', 'URW Palladio L', P052, serif;`

Humanist

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklm  
nopqrstuvwxyz  
1234567890

100 200 300 400 500 600 700 800 900

font-family: `Seravek, 'Gill Sans Nova', Ubuntu, Calibri, 'DejaVu Sans', source-sans-pro, sans-serif;`

Geometric Humanist

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklm  
nopqrstuvwxyz  
1234567890

100 200 300 400 500 600 700 800 900

font-family: `Avenir, Montserrat, Corbel, 'URW Gothic', source-sans-pro, sans-serif;`

Classical Humanist

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklm  
nopqrstuvwxyz  
1234567890

100 200 300 400 500 600 700 800 900

font-family: `Optima, Candara, 'Noto Sans', source-sans-pro, sans-serif;`

Neo-Grotesque

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklm  
nopqrstuvwxyz  
1234567890

100 200 300 400 500 600 700 800 900

font-family: `Inter, Roboto, 'Helvetica Neue', 'Arial Nova', 'Nimbus Sans', Arial, sans-serif;`

Monospace Slab Serif

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklm  
nopqrstuvwxyz  
1234567890

100 200 300 400 500 600 700 800 900

font-family: `'Nimbus Mono PS', 'Courier New', monospace;`

Monospace Code

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklm  
nopqrstuvwxyz  
1234567890

100 200 300 400 500 600 700 800 900

font-family: `ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace;`

Industrial Display

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklm  
nopqrstuvwxyz  
1234567890

100 200 300 400 500 600 700 800 900

font-family: `Bahnschrift, 'DIN Alternate', 'Franklin Gothic Medium', 'Nimbus Sans Narrow', sans-serif-condensed, sans-serif;`

Rounded Sans Display

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklm  
nopqrstuvwxyz  
1234567890

100 200 300 400 500 600 700 800 900

font-family: `ui-rounded, 'Hiragino Maru Gothic ProN', Quicksand, Comfortaa, Manjari, 'Arial Rounded MT', 'Arial Rounded MT Bold', Calibri, source-sans-pro, sans-serif;`

Slab Serif Display

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklm  
nopqrstuvwxyz  
1234567890

100 200 300 400 500 600 700 800 900

font-family: `Rockwell, 'Rockwell Nova', 'Roboto Slab', 'DejaVu Serif', 'Sitka Small', serif;`

Antique Display

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklm  
nopqrstuvwxyz  
1234567890

100 200 300 400 500 600 700 800 900

font-family: `Superclarendon, 'Bookman Old Style', 'URW Bookman', 'URW Bookman L', 'Georgia Pro', Georgia, serif;`

Didone Display

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklm  
nopqrstuvwxyz  
1234567890

100 200 300 400 500 600 700 800 900

font-family: `Didot, 'Bodoni MT', 'Noto Serif Display', 'URW Palladio L', P052, Sylfaen, serif;`

Handwritten Display

ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklm  
nopqrstuvwxyz  
1234567890

100 200 300 400 500 600 700 800 900

font-family: `'Segoe Print', 'Bradley Hand', Chilanka, TSCu_Comic, casual, cursive;`

**Avoid Code:  
System  
Features  
nutzen**

System Fonts

Summary / Details

Dialog / Modal Feature

Formular Validierung

System Fonts

**... you get the point!**

## Drei Fünf Säulen von Website Performance

**A**

**AVOID**

Benutzen wir alles?  
Brauchen wir alles?

**R**

**REDUCE**

Cachen,  
Komprimieren,  
Minimieren.

**O**

**OPTIMIZE**

Ladeverhalten und  
Priorisierung

**M**

**MEASURE**

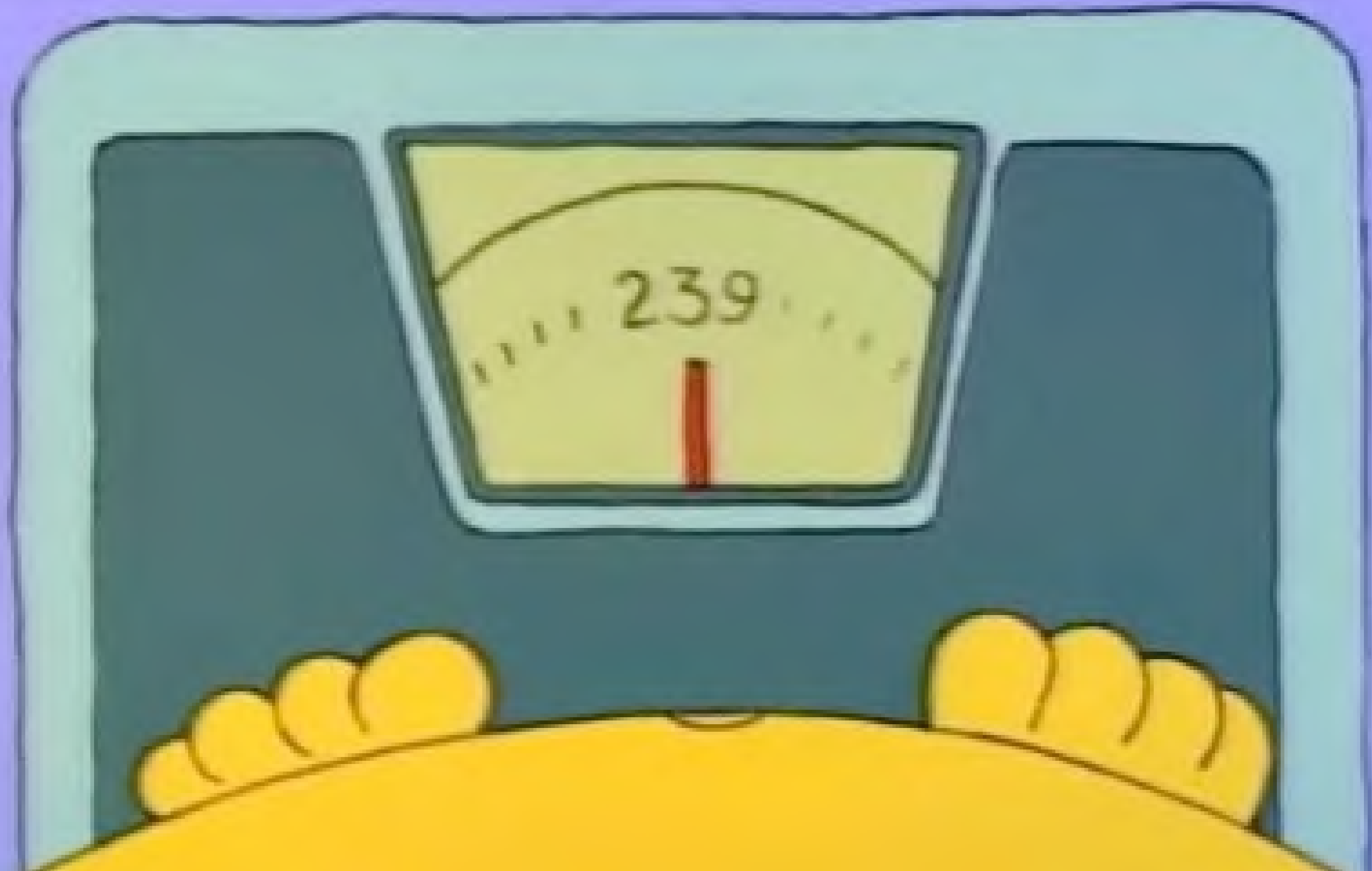
Tooling und  
Monitoring

**A**

**ATTITUDE**

Performance  
Culture

# Reduce

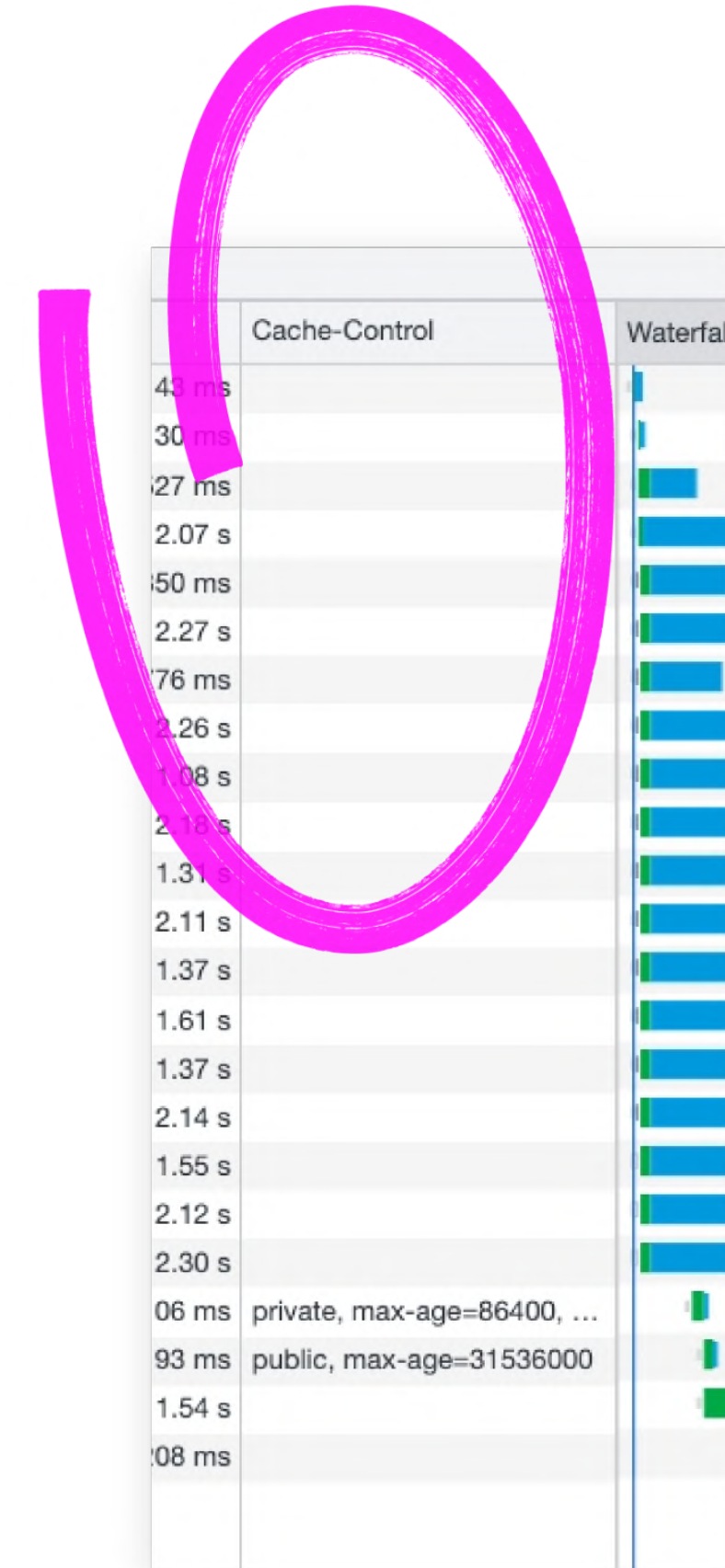


# Reduce

# Caching

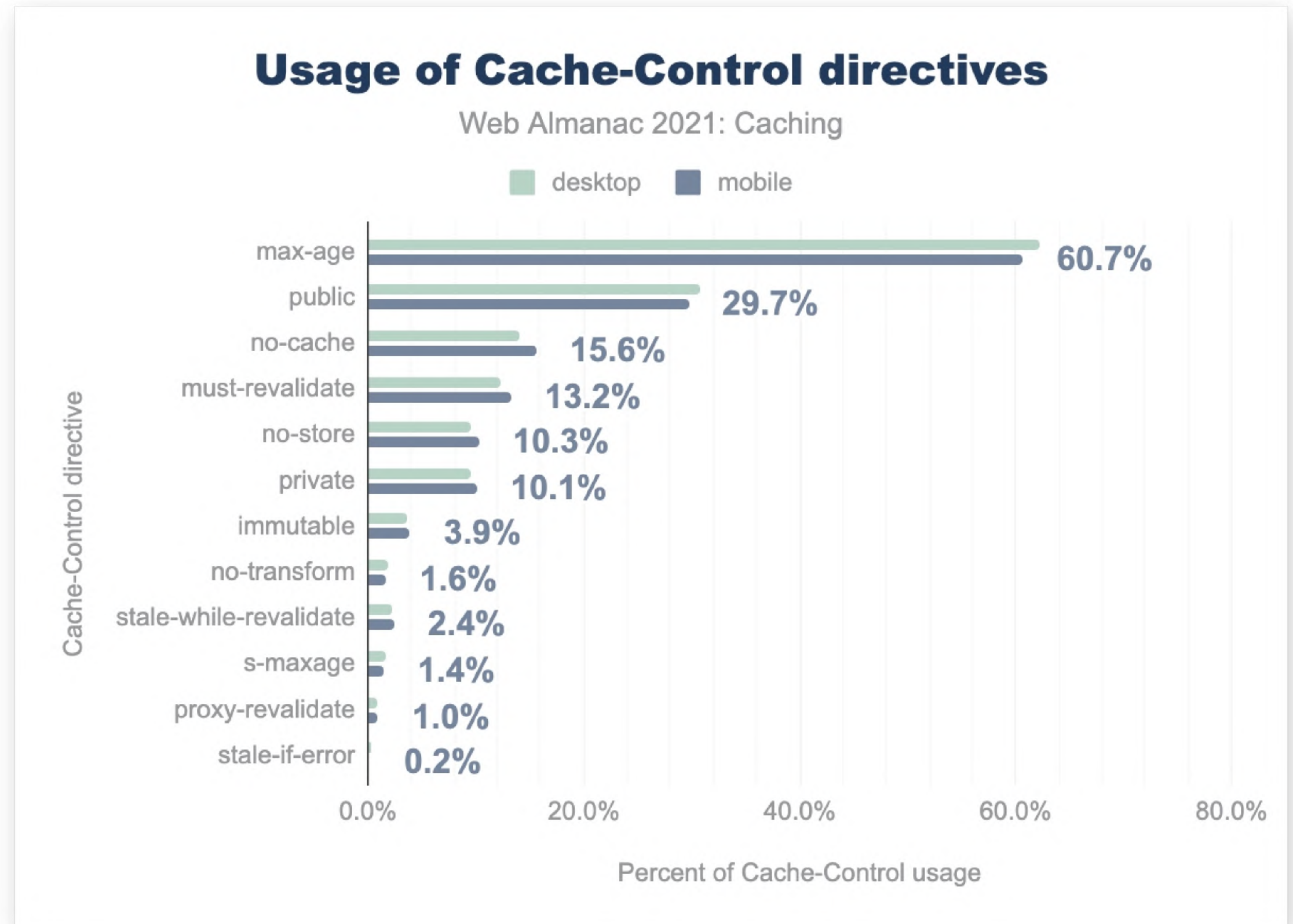
# Caching und CDN / Proxy Cache

- deutliches Alarmsignal
- wird dir von jedem Testing Tool um die Ohren gehauen
- kurze Cache-Zeiten sollten gut begründet sein
- `immutable` nutzen!



# Caching und CDN / Proxy Cache

- deutliches Alarmsignal
- wird dir von jedem Testing Tool um die Ohren gehauen
- kurze Cache-Zeiten sollten gut begründet sein
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# Reduce

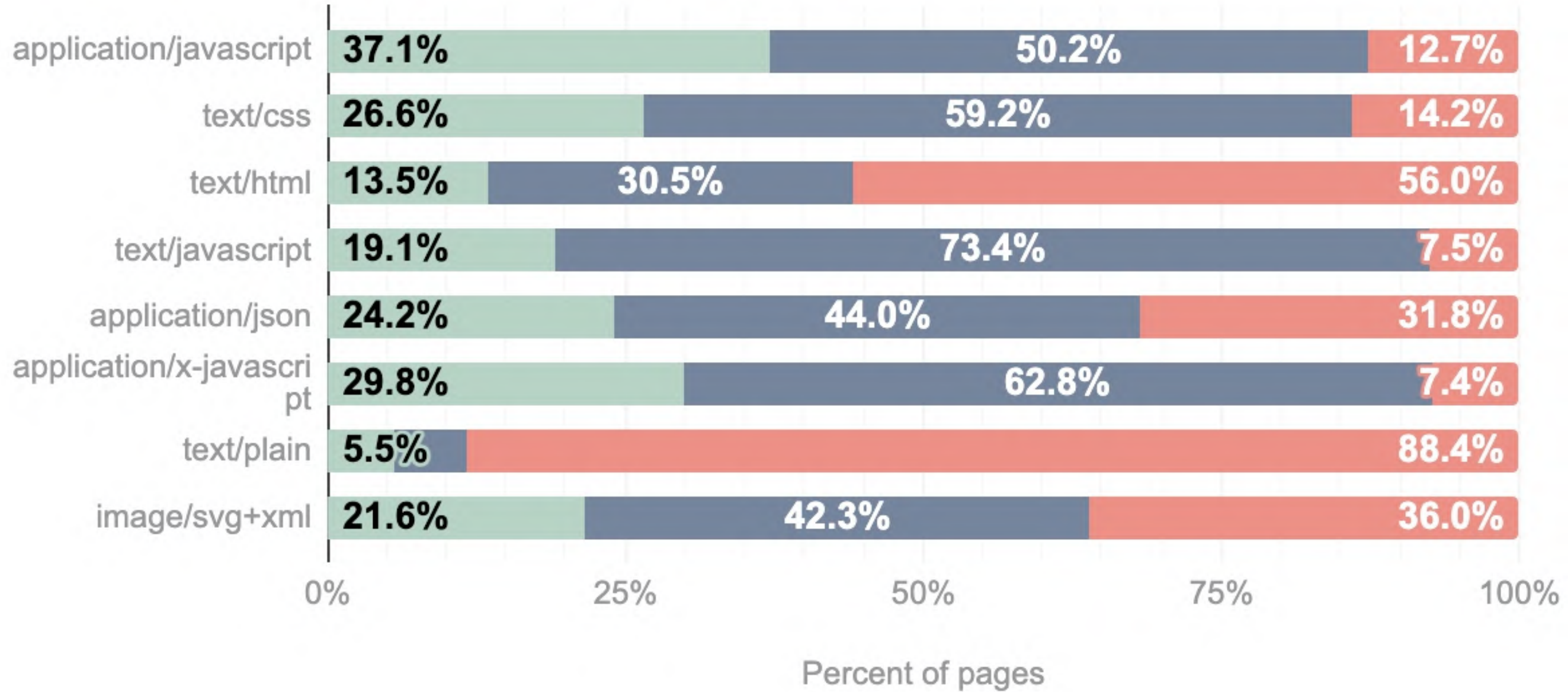
Caching

**Komprimierung**

# Compression methods for different content types

Web Almanac 2021: Compression

Brotli Gzip No text compression

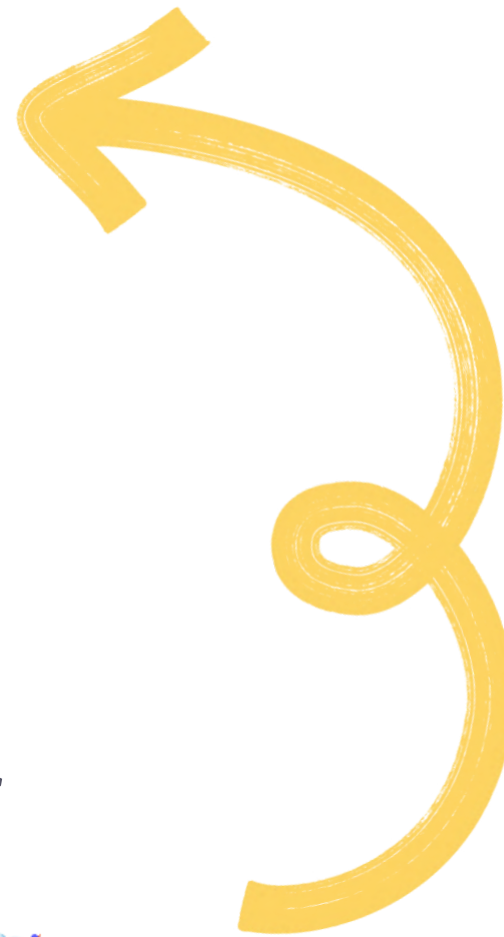


# Komprimierung: gzip, brotli

- Gzip als default, drop-in-Lösung
- brotli komprimiert 15–30% besser, aber
  - geringerer Browser-Support (93%)
  - dynamische Komprimierung dauert länger
  - Tweaking der 9 gzip und 11 brotli Stufen

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  - Tweaking der 9 gzip und 11 brotli Stufen 🤖



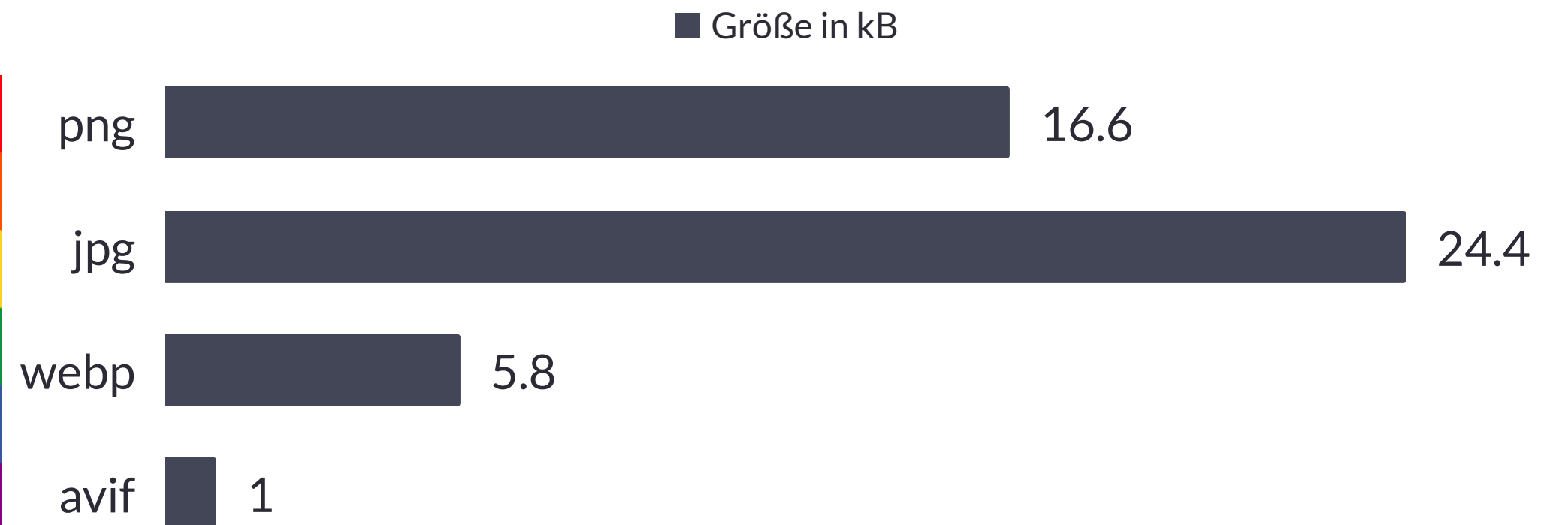
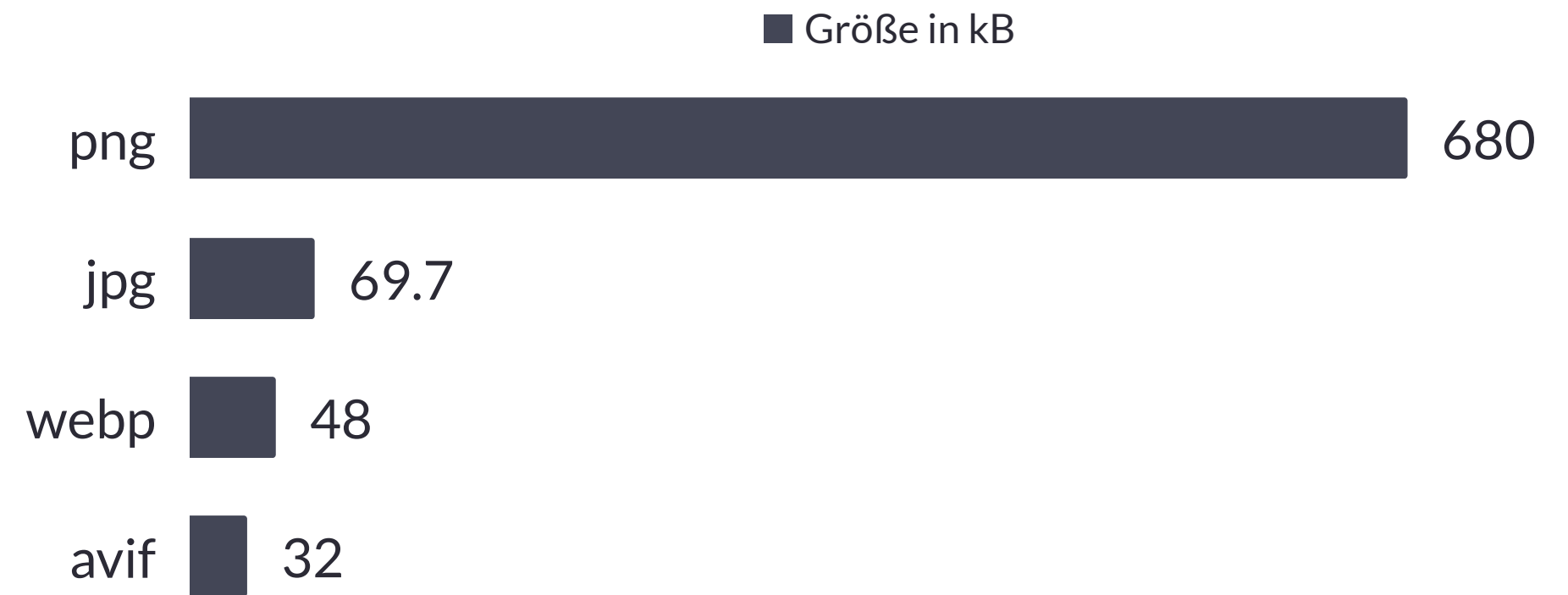
# Reduce

Caching

Komprimierung

**Bildformate**

# WebP / Avif : Vorteile



# WebP / Avif : Nutzung

## WebP image format

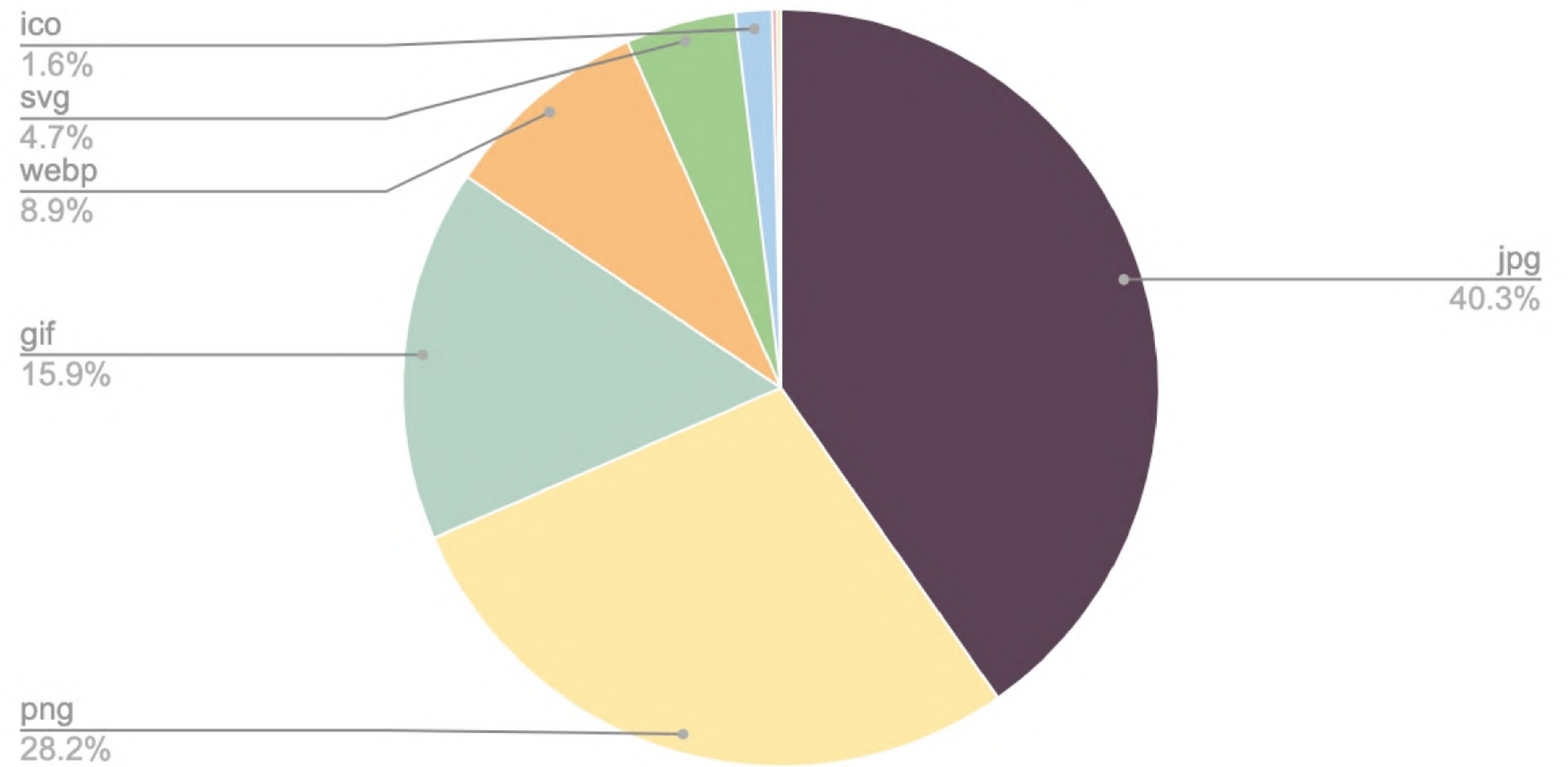
Chrome	Edge *	Safari	Firefox	Opera	IE
4-8				10.1	
<sup>1</sup> 9-22		3.1-13.1		<sup>1</sup> 11.5	
<sup>2</sup> 23-31	12-17	<sup>3</sup> 14-15.6	2-64	<sup>2</sup> 12.1-18	
32-116	18-116	16.0-16.6	65-117	19-102	6-10
117	117	17.0	118	103	11
118-120		17.1-TP	119-121		

## AVIF image format

Chrome	Edge *	Safari	Firefox	Opera	IE
			2-76		
			<sup>1</sup> 77-92		
		3.1-16.0	<sup>2</sup> 93-110		
4-84	12-113	<sup>2 3 4</sup> 16.1-16.3	<sup>5</sup> 111-112	10-70	
85-116	<sup>6</sup> 114-116	16.4-16.6	113-117	71-102	6-10
117	<sup>6</sup> 117	17.0	118	103	11
118-120		17.1-TP	119-121		

## Image format adoption

Web Almanac 2022: Media (mobile)



# WebP / Avif : Einsatz



Natural Preference for Minification



```
<picture>  
  <source srcset="img/photo.avif" type="image/avif">  
  <source srcset="img/photo.webp" type="image/webp">  
    
</picture>
```

<https://www.smashingmagazine.com/2021/09/modern-image-formats-avif-webp/>



# Reduce


## Bildkomprimierung: Testing-Tools

lokal:  
Lighthouse im Browser

online:  
[websppeedtest.cloudinary.com](https://websppeedtest.cloudinary.com)

■ Serve images in next-gen formats 0.52s ^

Image formats like WebP and AVIF often provide better compression than PNG or JPEG, which means faster downloads and less data consumption. [Learn more about modern image formats.](#)

URL	Resource Size	Potential Savings
thomaspuppe.de <span>1st Party</span>	2,178.9 KiB	1,514.9 KiB
 <span>i m g</span> ...png/event-funeral.png (lama.thomaspuppe.de)	302.3 KiB	232.4 KiB

**B** blog-both.jpg

JPEG  66.8 KB Current

**Potential Smart Compression**

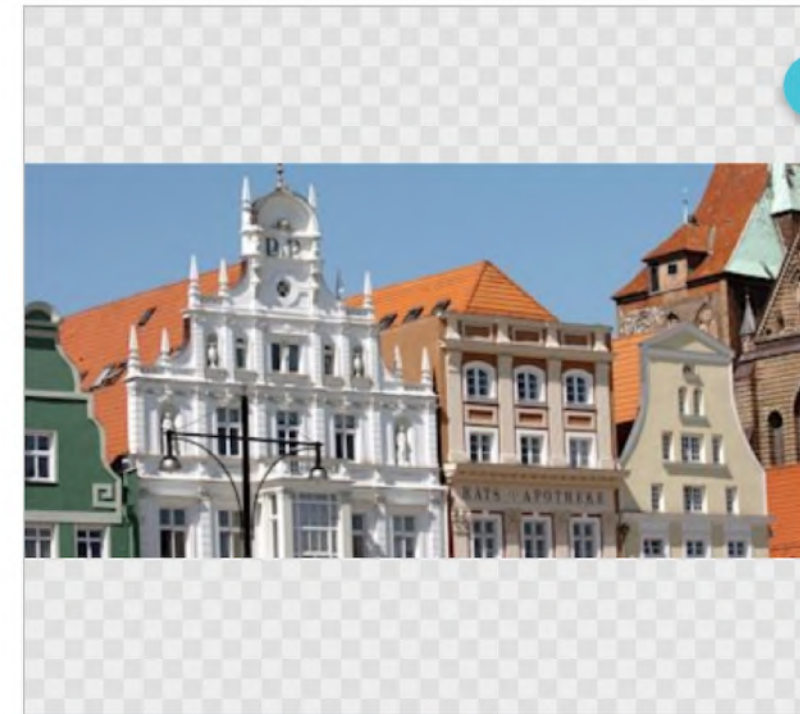
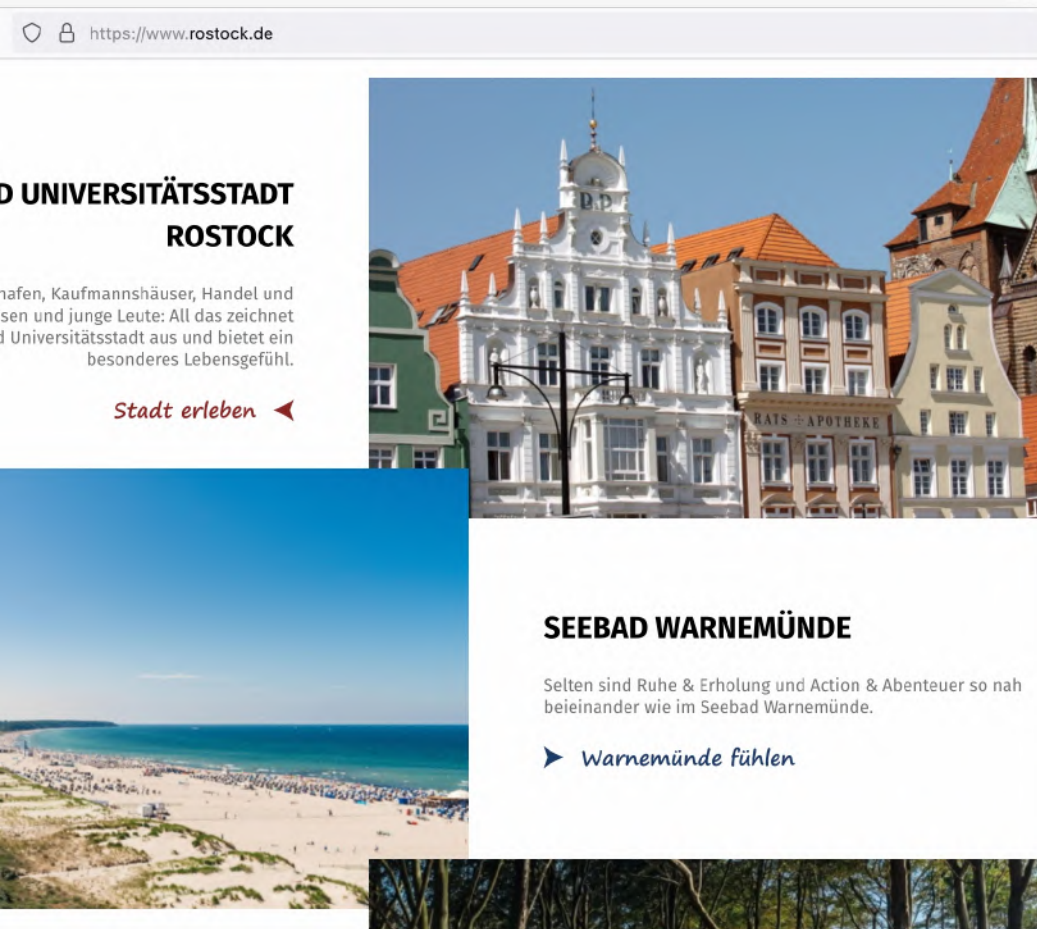
35.2%  
Reduction in image weight  
1200x384 → 1200x384

[SEE DETAILS](#)

**Image format options with file size and % compared to current**

Format	File Size	% Change
JPEG	58.3 KB	-12.7%
WEBP	50.9 KB	-23.8%
AVIF <span style="color: gold;">🏆</span>	43.2 KB	-35.2%
PNG	138.3 KB	+107.1%

# Bildformate rostock.de



**B** rostock-kaufmannshaeuser-neuer-markt-76dd2a1b.jpg

JPEG 158.2 KB Current

Potential Smart Compression

78.2%

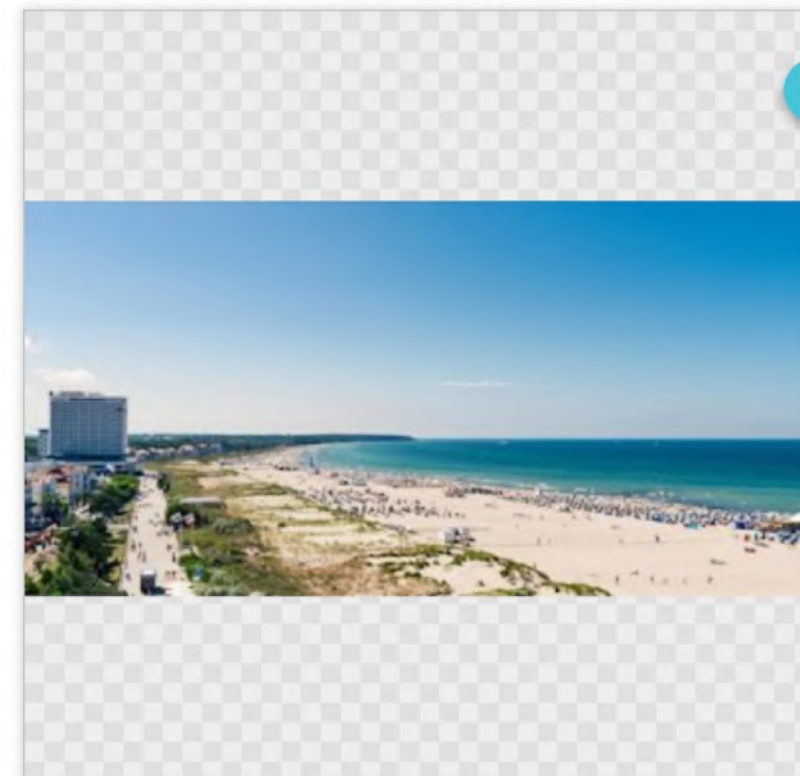
Reduction in image weight

800x400 → 656x328

[SEE DETAILS](#)

Image format options with file size and % compared to current

JPEG	<div><div style="width: 21.9%;"></div></div>	44.4 KB	(-71.9%)
WEBP	<div><div style="width: 25.2%;"></div></div>	40.2 KB	(-74.6%)
AVIF	<div><div style="width: 21.5%;"></div></div>	34.4 KB	(-78.2%)
PNG	<div><div style="width: 14.9%;"></div></div>	134.3 KB	(-15.1%)



**B** wa\_10\_strand\_von\_warnemuende\_tmv-suess-ec85db01.jpg

JPEG 102.3 KB Current

Potential Smart Compression

83.8%

Reduction in image weight

800x400 → 656x328

[SEE DETAILS](#)

Image format options with file size and % compared to current

JPEG	<div><div style="width: 24.5%;"></div></div>	25.0 KB	(-75.5%)
WEBP	<div><div style="width: 20.8%;"></div></div>	21.3 KB	(-79.2%)
JPEG2000	<div><div style="width: 23.3%;"></div></div>	23.9 KB	(-76.7%)
AVIF	<div><div style="width: 16.1%;"></div></div>	16.6 KB	(-83.8%)
JPEG-XR	<div><div style="width: 21.5%;"></div></div>	22.0 KB	(-78.5%)
PNG	<div><div style="width: 87.4%;"></div></div>	89.0 KB	(-12.9%)

# Reduce

Caching

Komprimierung

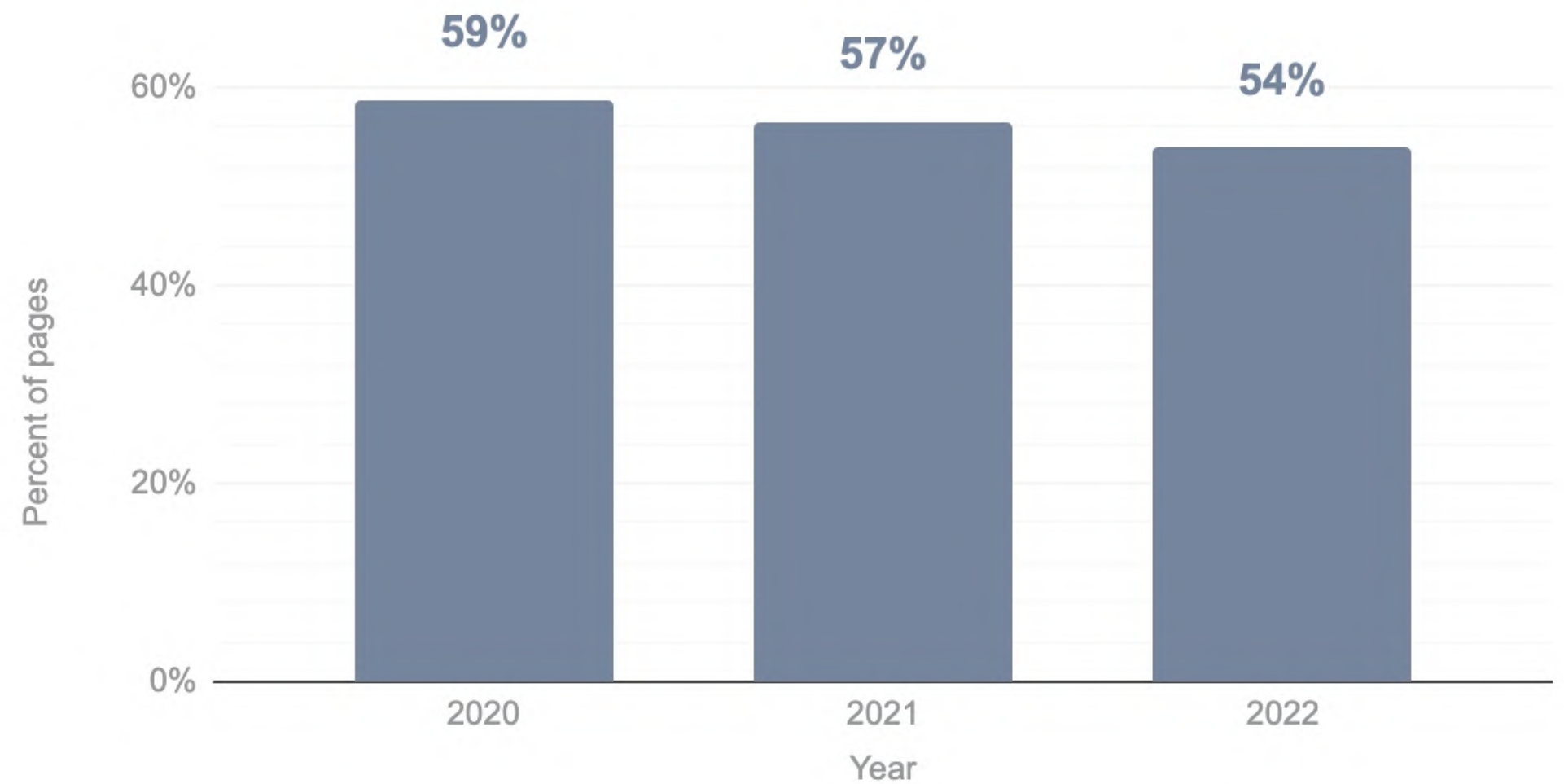
Bildformate

**Responsive Images**

# Responsive Images

## Properly sized images

Web Almanac 2022: Mobile Web

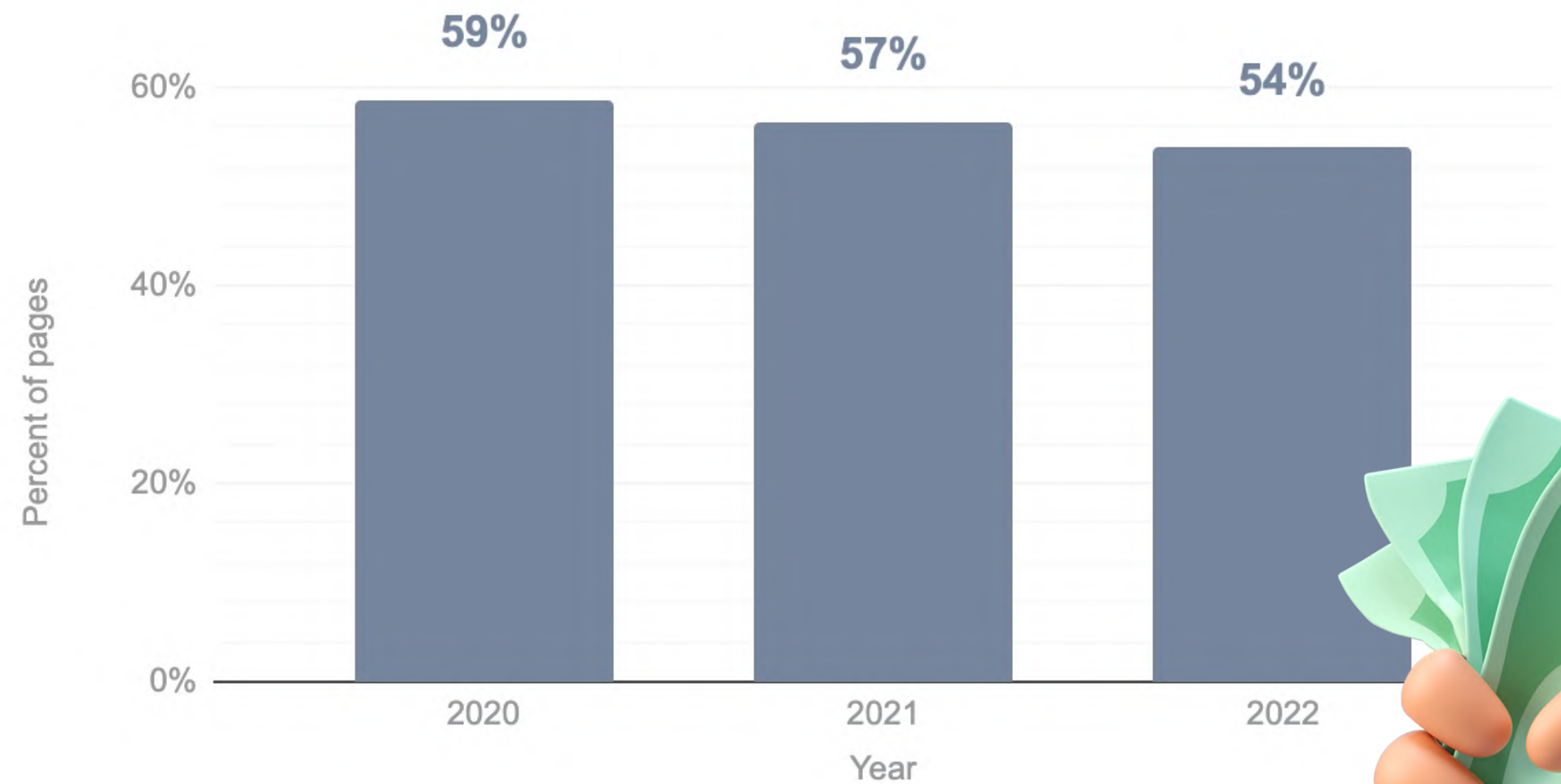


Credit: [httparchive.org](http://httparchive.org)

# Responsive Images

## Properly sized images

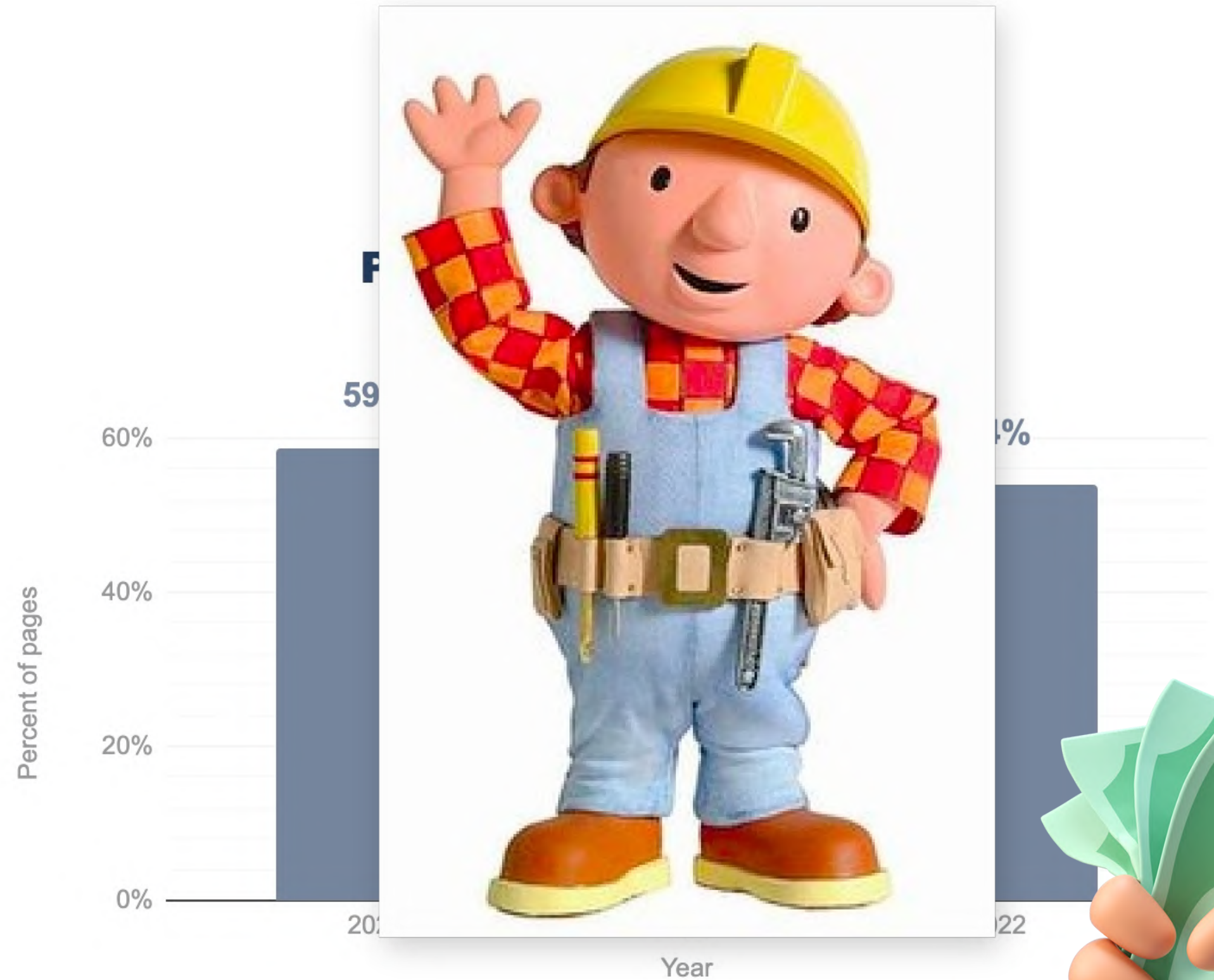
Web Almanac 2022: Mobile Web



Credit: [httparchive.org](http://httparchive.org)



# Responsive Images



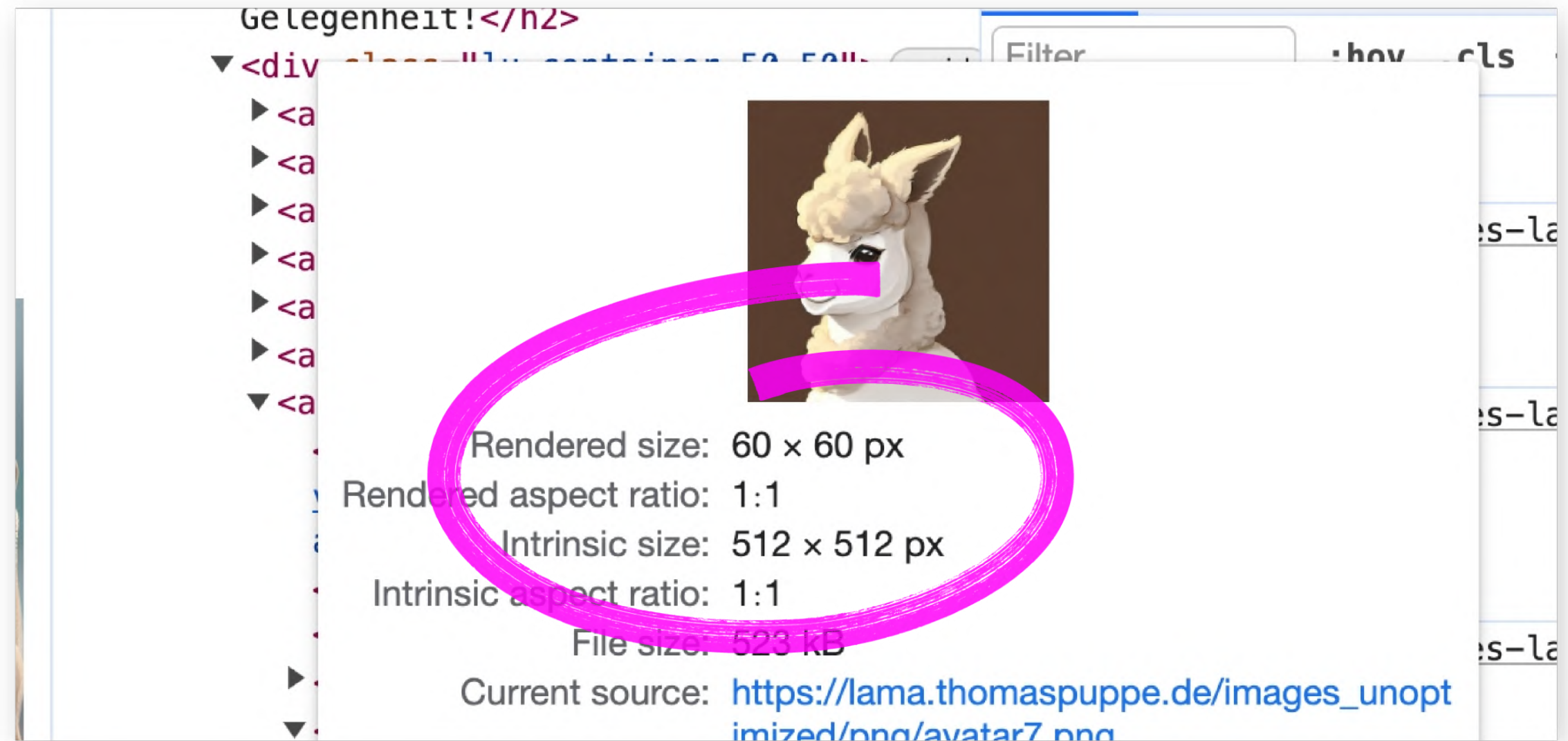
Credit: <http://archive.org>

# Responsive Images



# Responsive Images checken:

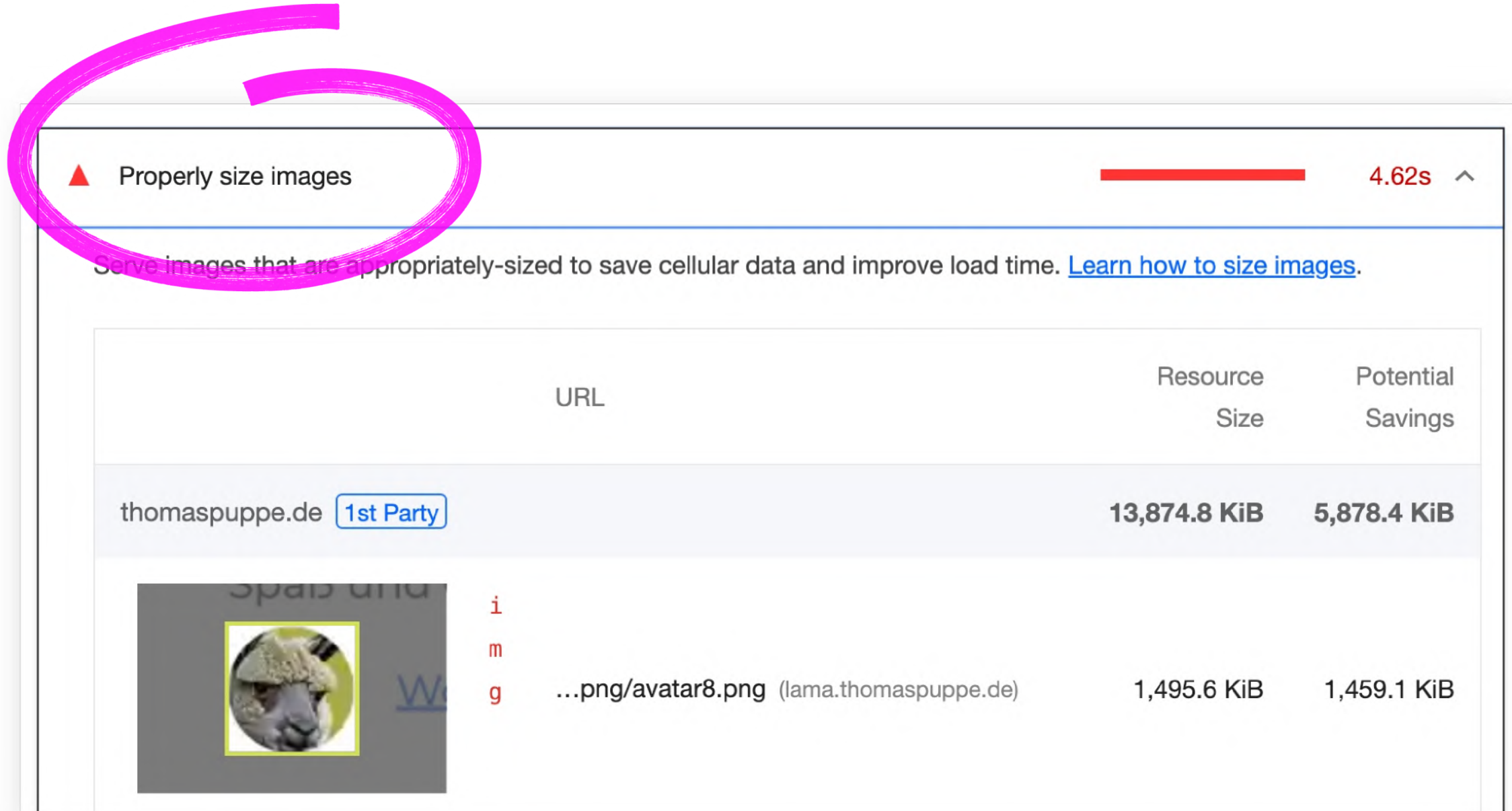
# DevTools





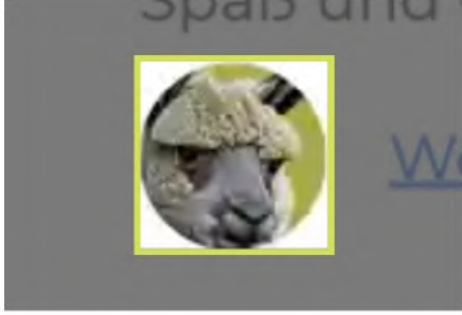
# Responsive Images checken:

# Lighthouse



▲ Properly size images 4.62s ^

Serve images that are appropriately-sized to save cellular data and improve load time. [Learn how to size images.](#)

URL	Resource Size	Potential Savings
thomaspuppe.de <span>1st Party</span>	13,874.8 KiB	5,878.4 KiB
 <span>i m g</span> ...png/avatar8.png (lama.thomaspuppe.de)	1,495.6 KiB	1,459.1 KiB

# Reduce

## Responsive Images Checker

<https://toolsaday.com/seo/responsive-image-checker>


SEO TOOLS

- Open Graph Checker
- HTTP Status Checker
- Redirect Checker
- Gzip Checker
- Web Page Size Checker
- Canonical URL Checker

Check if all of your page's images are appropriately sized for your user's viewport.

**Responsive Image**

**Serve images larger than the user's viewport**

Preview	Display Size	Natural Size
	397x224	1000x566

# Reduce

Caching

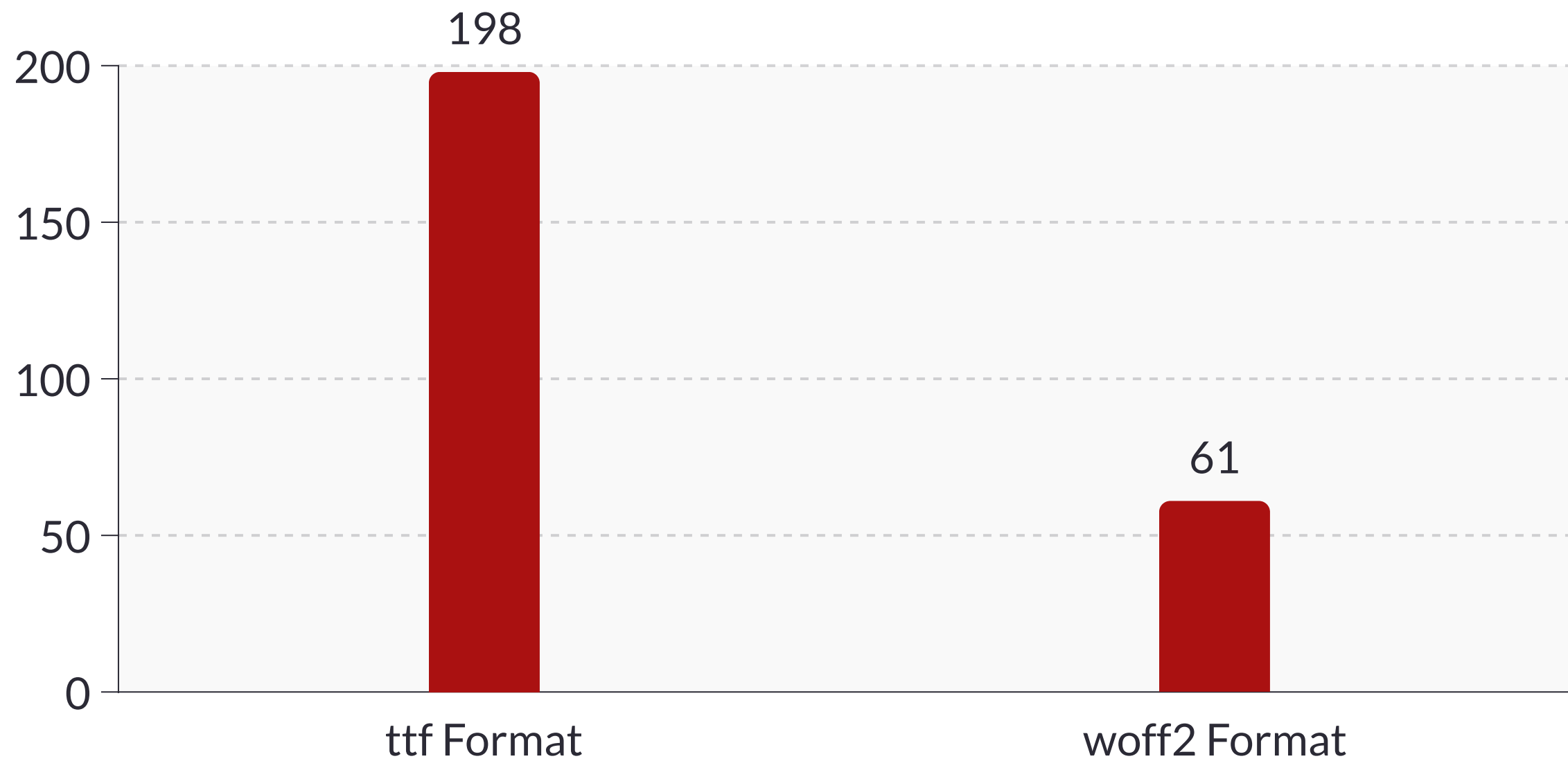
Komprimierung

Bildformate

Responsive Images

**Schriften: woff2 Format**

# Schriften: Woff 2 Format



- **Vergesst andere Formate!**
- Browser-Support
- Kompatibilität mit alten Browsern wollen wir nicht.

# Reduce

Caching

Komprimierung

Bildformate

Responsive Images

Schriften: woff2 Format

**Schriften: Subsetting**

## Reduce

### Schriften: Subsetting

- <https://wakamaifondue.com>  
für Schriften-Eigenschaften

# Montserrat Regular

This is a **TrueType** font with **969 characters**. It has **24 layout features**.

#### Characters

969

#### Glyphs

1909

#### Layout features

24

#### Languages

50

#### Filename

Montserrat-Regular.woff2

#### Size

60 KB

#### Format

WOFF2

#### Designed by

Julieta Ulanovsky

#### Manufactured by

Julieta Ulanovsky

#### Copyright

Copyright 2011 The Montserrat Project Authors (<https://github.com/JulietaUla/Montserrat>)

#### Version

Version 8.000

#### License

This Font Software is licensed under the SIL Open Font License, Version 1.1. This license is available with a FAQ at: <http://scripts.sil.org/OFL>

#### Language support

50 languages: Afrikaans, Albanian, Azerbaijani, Basque, Belarusian, Bosnian, Bulgarian, Catalan, Croatian, Czech, Danish, Dutch, English, Estonian, Faroese, Filipino, Finnish, French, Galician, German, Hungarian, Icelandic, Indonesian, Irish, Italian, Kazakh, Kyrgyz, Latvian, Lithuanian, Macedonian, Malay, Mongolian, Norwegian Bokmål, Polish, Portuguese, Romanian, Russian, Serbian, Slovak, Slovenian, Spanish, Swahili, Swedish, Tongan, Turkish, Ukrainian, Uzbek, Vietnamese, Welsh, Zulu

*Wakamai Fondue might fail to detect some languages. I'm working on a better system—stay tuned!*

#### Layout features

aalt c2sc case ccmp dlig dnom frac liga lnum locl numr onum ordn pnum salt sinf smcp ss01 subs sups  
tnum kern mark mkmk

Reduce

## Schriften: Subsetting

- <https://wakamaifondue.com>  
für Schriften-Eigenschaften
- <https://everythingfonts.com/subsetter> als Subsetting-GUI
- <https://transfonter.org/>

# Montserrat Regular

This is a **TrueType** font with **969 characters**. It has **24 layout features**.

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### Copyright

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### Version

Version 8.000

### License

This Font Sc

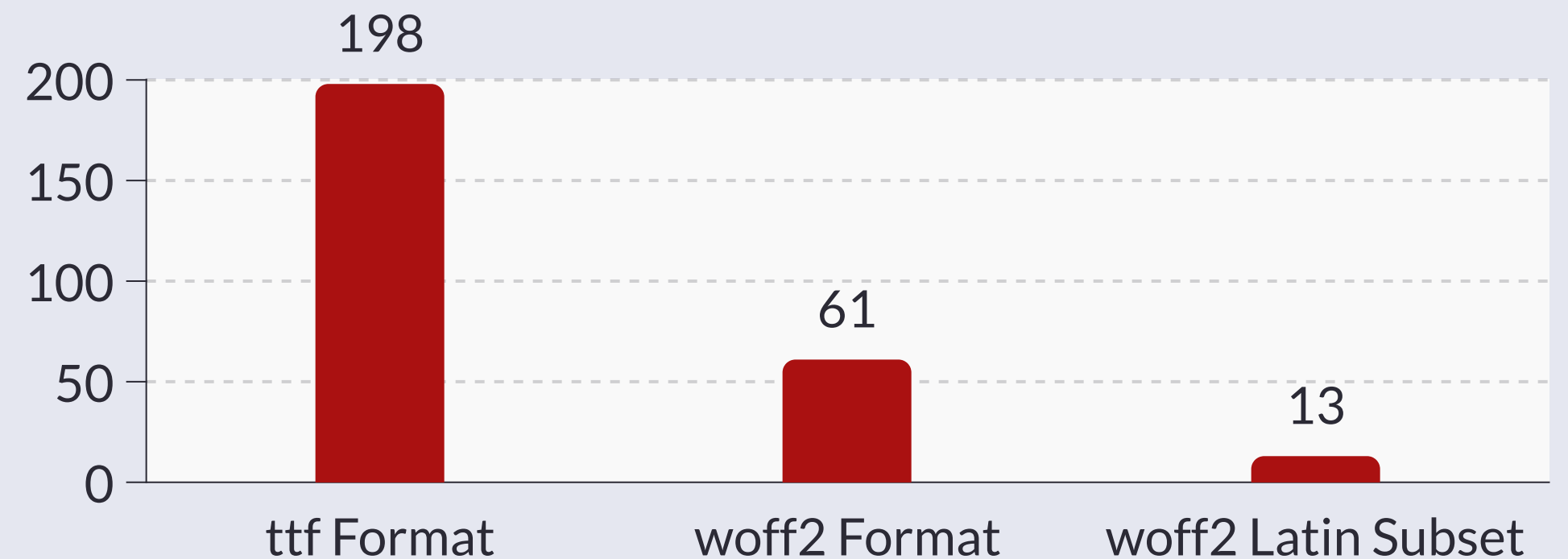
### Language s

50 language  
Estonian, Fa  
Macedonian  
Swedish, To

Wakamai Fo

### Layout feat

aalt c2sc  
tnum kern



# Reduce

Caching

Komprimierung

Bildformate

Responsive Images

Schriften: woff2 Format

Schriften: Subsetting



## Fünf Säulen von Website Performance

**A**

**AVOID**

Benutzen wir alles?  
Brauchen wir alles?

**R**

**REDUCE**

Cachen,  
Komprimieren,  
Minimieren.

**O**

**OPTIMIZE**

Ladeverhalten und  
Priorisierung

**M**

**MEASURE**

Tooling und  
Monitoring

**A**

**ATTITUDE**

Performance  
Culture



Optimize

# Optimize

## Lazy Loading

# Lazy Loading

The screenshot shows the top navigation bar of the npm website with links for 'Newly Purchased Memories', 'Pro', 'Teams', 'Pricing', and 'Documentation'. Below the navigation is the npm logo, a search bar containing the text 'lazy load', and buttons for 'Search', 'Sign Up', and 'Sign In'. The search results section indicates '1464 packages found' and includes a pagination control showing page 1 of 74.

Unpacked Size	Total Files
<b>219 kB</b>	<b>12</b>
Issues	Pull Requests
<b>7</b>	<b>3</b>
Last publish	
<b>7 months ago</b>	

Unpacked Size	Total Files
<b>14.3 kB</b>	<b>5</b>
Issues	Pull Requests
<b>71</b>	<b>38</b>
Last publish	
<b>4 years ago</b>	

Unpacked Size	Total Files
<b>336 kB</b>	<b>80</b>
Issues	Pull Requests
<b>165</b>	<b>34</b>
Last publish	
<b>2 years ago</b>	

# Lazy Loading via JavaScript



```

```



```
const images = document.querySelectorAll('img[data-src]');
const options = { rootMargin: '0px', threshold: 0.5 };
const observer = new IntersectionObserver((entries, observer) => {
  entries.forEach(entry => {
    if (entry.isIntersecting) {
      const image = entry.target;
      const src = image.getAttribute('data-src');
      image.setAttribute('src', src);
      image.removeAttribute('data-src');
      observer.unobserve(image);
    }
  });
}, options);
images.forEach(image => {
  observer.observe(image);
});
```

# Lazy Loading via JavaScript

```

```

**Error** Element `img` is missing required attribute `src`.

From line 72, column 17; to line 72, column 69

```

```

```
const images = document.querySelectorAll('img[data-src]');
const options = { rootMargin: '0px', threshold: 0.5 };
const observer = new IntersectionObserver((entries, observer) => {
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      const image = entry.target;
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      image.setAttribute('src', src);
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```

# Lazy Loading via JavaScript

```

```

**Error** Element `img` is missing required attribute `src`.

From line 72, column 17; to line 72, column 69

```

```

auf JavaScript angewiesen

```
const images = document.querySelectorAll('img[data-src]');
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# Lazy Loading via JavaScript

```

```

**Error** Element `img` is missing required attribute `src`.

From line 72, column 17; to line 72, column 69

```

```

auf JavaScript angewiesen

responsive Bilder und Retina?

```
const images = document.querySelectorAll('img[data-src]');
const options = { rootMargin: '0px', threshold: 0.5 };
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      image.removeAttribute('data-src');
      observer.unobserve(image);
    }
  });
}, options);
images.forEach(image => {
  observer.observe(image);
});
```



# Lazy Loading nativ

Natives Lazyloading im Browser:



```

```

# Lazy Loading nativ

Natives Lazyloading im Browser:



```

```



```
<iframe src="datawrapper.html" loading="lazy" >
```

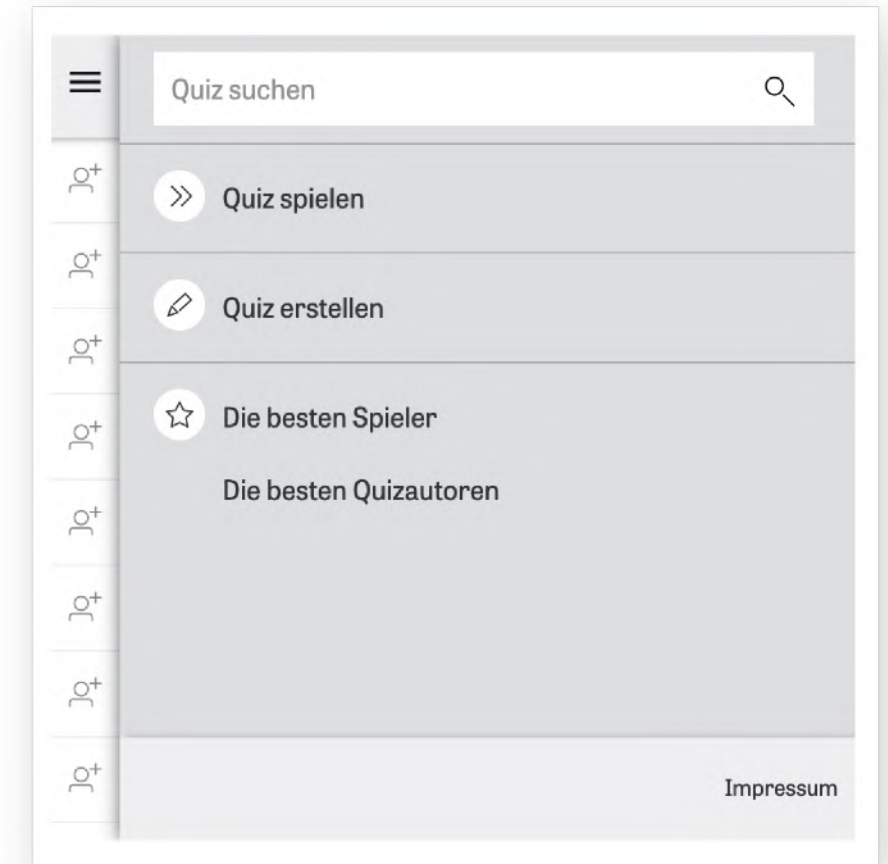
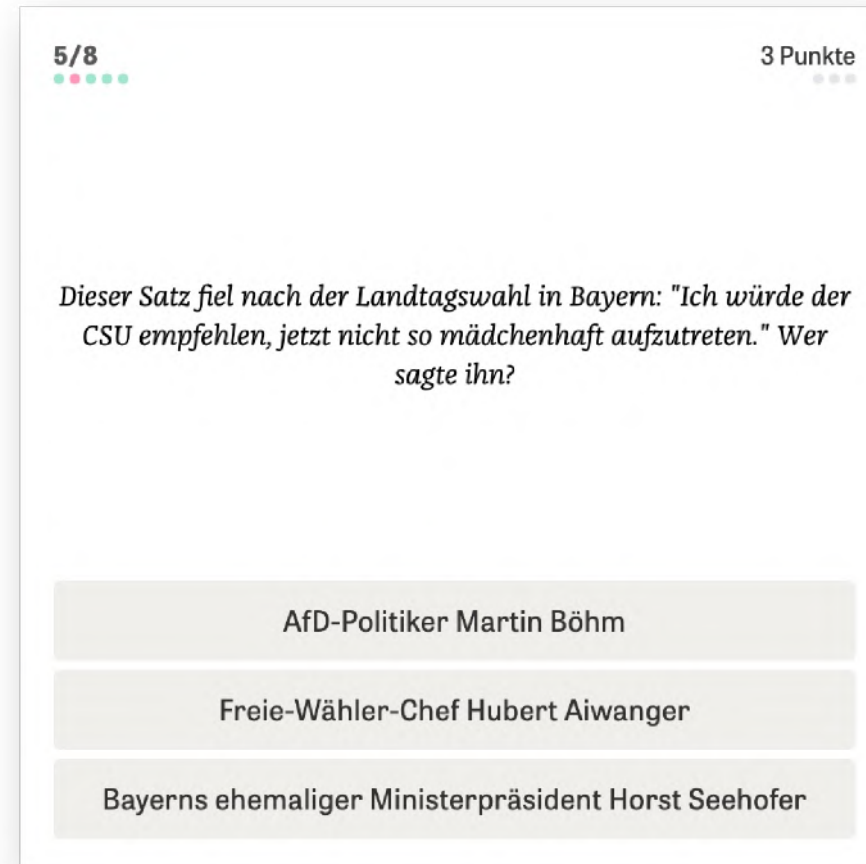


# Optimize

Lazy Loading

**Fassaden**

# Fassaden



# Fassaden



Bombenanschlag in Ankara

## PKK soll sich zu Anschlag in Ankara bekannt haben

Recep Tayyip Erdoğan bezeichnet die Explosion in Ankara als "letztes Zucken des Terrors". Einem Bericht zufolge soll die PKK für den Anschlag verantwortlich sein.

**Wortiger**  
Das beliebte Worträtsel jetzt auch auf ZEIT ONLINE:  
Finden Sie in 6 Versuchen das richtige Wort.

STARTEN

QUIZ

**Wissenstest des Tages**

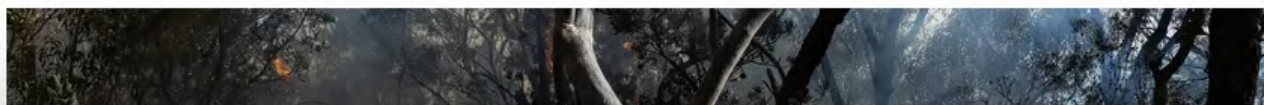
Von ZEIT ONLINE  
01. Oktober 2023

SPIELEN

Gesellschaft [Letzte Generation](#) • [Rechtsextremismus](#) • [Extremwetter](#)

Australien

## Behörden ordnen wegen Buschbränden Evakuierungen an



# Fassaden



Bombenanschlag in Ankara

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STARTEN

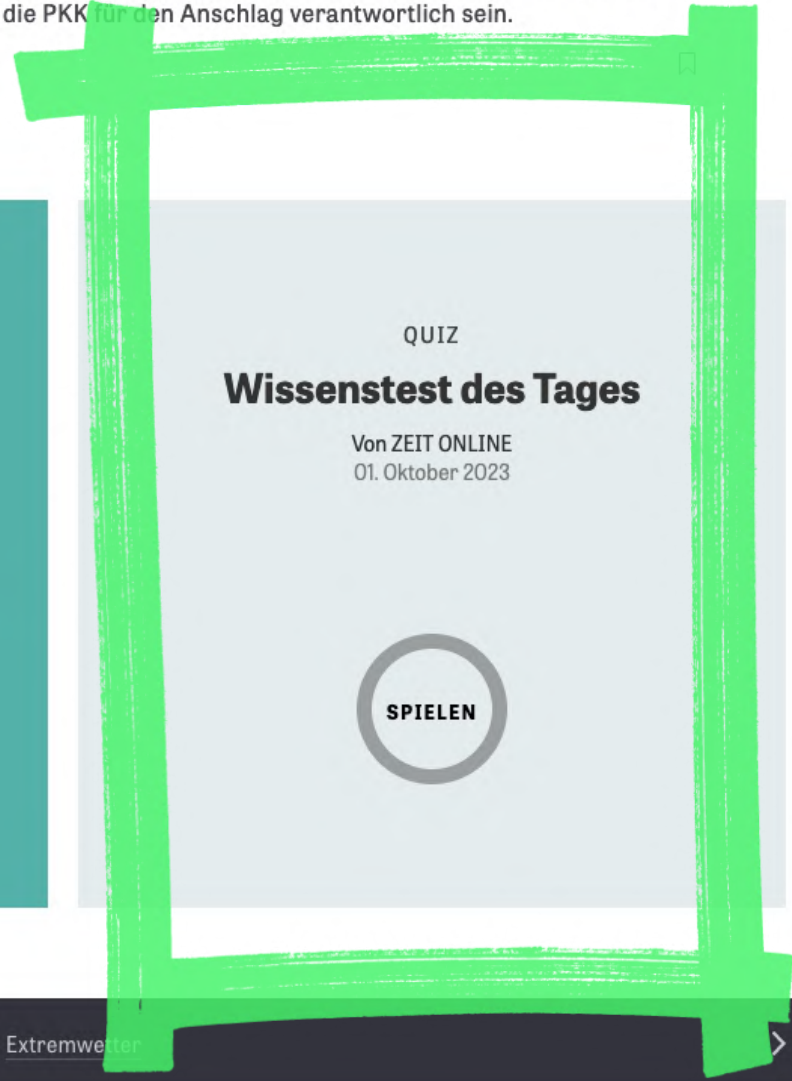
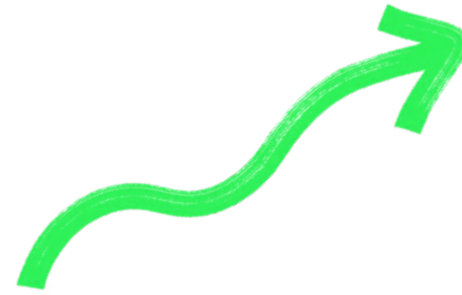
QUIZ

### Wissenstest des Tages

Von ZEIT ONLINE  
01. Oktober 2023

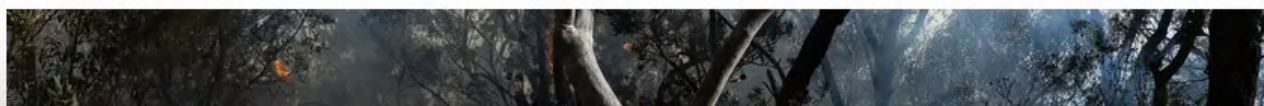
SPIELEN

Host	Datei	Typ	Übertra...	Größe
quiz.z...	daily?embedded=true&fix=4	html	1,15 kB	846 B
quiz.z...	teaser.6aa74084.css	css	6,98 kB	39,34 kB



Australien

## Behörden ordnen wegen Buschbränden Evakuierungen an



# Fassaden



Bombenanschlag in Ankara

## PKK soll sich zu Anschlag in Ankara bekannt haben

Recep Tayyip Erdoğan bezeichnet die Explosion in Ankara als "letztes Zucken des Terrors". Einem Bericht zufolge soll die PKK für den Anschlag verantwortlich sein.

**Wortiger**  
Das beliebte Worträtsel jetzt auch auf ZEIT ONLINE:  
Finden Sie in 6 Versuchen das richtige Wort.

STARTEN

5/9 3 Punkte

Dieser Satz fiel nach der Landtagswahl in Bayern: "Ich würde der CSU empfehlen, jetzt nicht so mädchenhaft aufzutreten." Wer sagte ihn?

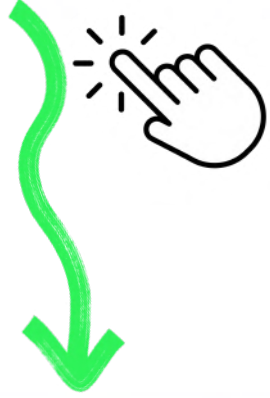
- AfD-Politiker Martin Böhm
- Freie-Wähler-Chef Hubert Aiwanger
- Bayerns ehemaliger Ministerpräsident Horst Seehofer

Australien

## Behörden ordnen wegen Buschbränden Evakuierungen an



Host	Datei	Typ	Übertra...	Größe
quiz.z...	daily?embedded=true&fix=4	html	1,15 kB	846 B
quiz.z...	teaser.6aa74084.css	css	6,98 kB	39,34 kB



Host	Datei	Typ	Übertra...	Größe
quiz.z...	daily?embedded=true&fix=4	html	1,15 kB	846 B
quiz.z...	teaser.6aa74084.css	css	6,98 kB	39,34 kB
quiz.z...	/	html	1,69 kB	1,73 kB
quiz.z...	quiz.d16f76ce.css	css	24,40 kB	131,03 kB
quiz.z...	modernizr.c2ed6eb5.js	js	3,08 kB	4,98 kB
quiz.z...	quiz.d0c7b3f4.js	js	146,76 kB	447,48 kB
respo...	981949533494636?url=https:	js	7,60 kB	26,53 kB
quiz.z...	/-/	json	590 B	356 B
quiz.z...	daily	json	4,98 kB	4,74 kB
quiz.z...	rad-grad.ded4378d.png	png	35,39 kB	34,63 kB
audev...	wt?p=453,redaktion.homepage	gif	782 B	43 B

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WORT

**Wortiger**

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STARTEN

QUIZ

**Wissenstest des Tages**

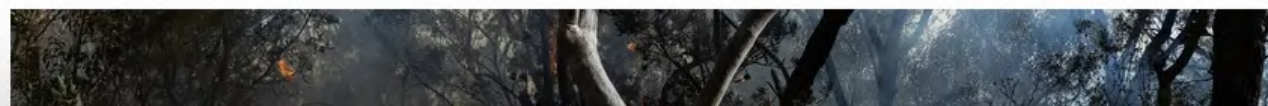
Von ZEIT ONLINE  
01. Oktober 2023

SPIELEN

Gesellschaft Letzte Generation · Rechtsextremismus · Extremwetter

Australien

## Behörden ordnen wegen Buschbränden Evakuierungen an



- Videos (youtube/vimeo-lite)
- Social Media Widgets
- Chats, Support-Messenger
- Spiele, Interaktives
- Dashboards in Apps
- Formular-Logik



# Optimize

Lazy Loading

Fassaden

**Rel=Preload**

# Hero-Image

This site is part of a Website Performance Workshop. [Source code](#) and [presentation slides](#) are available on GitHub.

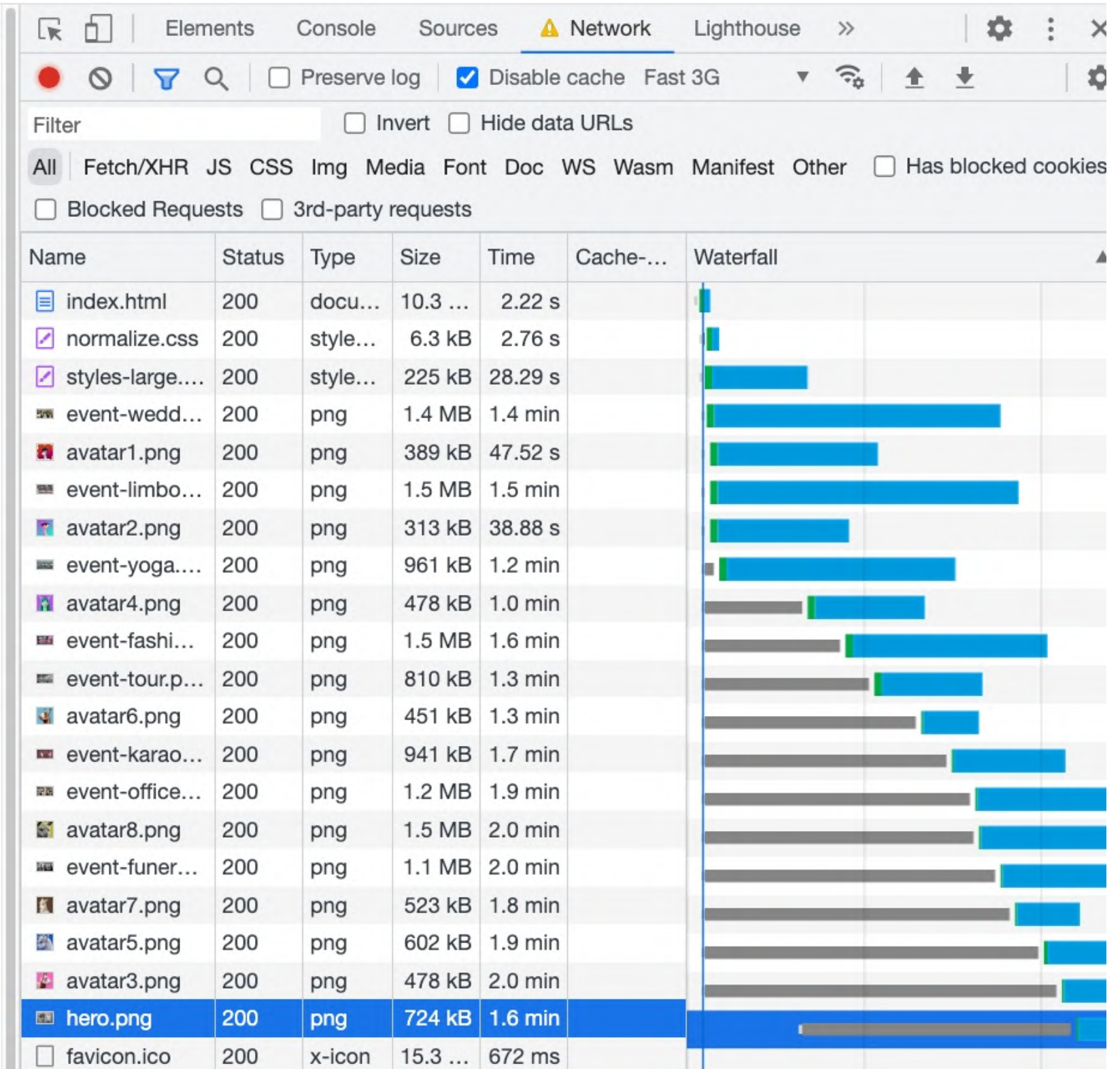
## Rent a llama

Even a static website can be slow.



### Willkommen beim professionellen Lamaverleih

Ob für Firmenevents, Hochzeiten, Geburtstagsfeiern oder Naturausflüge - unsere Lamas sind die perfekte Ergänzung und garantieren Ihnen und Ihren Gästen ein besonderes Erlebnis. Unsere Lamas sind gut ausgebildet und bestens gepflegt. Wir stellen sicher,



# Preload



```
<head>
```

```
  <link rel="preload" as="image" href="/images_optimized/png/hero.png">
```

```
  {... CSS usw usf ...}
```

```
</head>
```

```
<body>
```

```
  ...
```

**Mit Preload-Links können wir im Head einer HTML-Seite dem Browser schon Hinweise geben auf Ressourcen, die während dem Rendern gebraucht werden.  
Unterstützt: Bilder, Videos, CSS, JS. Schriften!**

# Hero-Image mit rel=preload

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Name	S...	Type	Initiator	Size	Time	C...	Waterfall
hero.png	200	png	index.html	724 kB	24.2...		
normalize.css	200	style...	index.html	6.3 kB	804 ...		
styles-large.css	200	style...	index.html	225 kB	7.89 s		
event-wedding.png	200	png	index.html	1.4 ...	47.2...		
avatar1.png	200	png	index.html	389 kB	13.4...		
event-limbo.png	200	png	index.html	1.5 ...	51.2...		
avatar2.png	200	png	index.html	313 kB	18.8...		
event-fashion.png	200	png	index.html	1.5 ...	49.7...		
avatar3.png	200	png	index.html	478 kB	35.2...		
event-office.png	200	png	index.html	1.2 ...	51.9...		
avatar4.png	200	png	index.html	478 kB	51.4...		
event-funeral.png	200	png	index.html	1.1 ...	59.7...		
avatar5.png	200	png	index.html	602 kB	59.7...		
event-tour.png	200	png	index.html	810 kB	59.7...		
avatar6.png	200	png	index.html	451 kB	59.7...		
event-yoga.png	200	png	index.html	961 kB	59.7...		
avatar7.png	200	png	index.html	523 kB	59.7...		
event-karaoke.png	200	png	index.html	941 kB	55.4...		
avatar8.png	200	png	index.html	1.5 ...	59.7...		
favicon.ico	200	x-icon	Other	15.3...	672 ...		

# Preload Browsersupport und Verbreitung

## Resource Hints: preload - CR

Using `<link rel="preload">`, browsers can be informed to prefetch resources without having to execute them, allowing fine-grained control over when and how resources are loaded.

Current aligned Usage relative Date relative Filtered All 

Chrome	Edge *	Safari	Firefox	Opera	IE
			2-55		
	12-16	3.1-10.1	<sup>1</sup> 56		
4-49	<sup>4</sup> 17-18	<sup>2</sup> 11	<sup>3</sup> 57-84	10-36	
50-110	79-110	11.1-16.2	85-110	37-94	6-10
111	111	16.3	111	95	11
112-114		16.4-TP	112-113		

## Fonts resource hints usage

Web Almanac 2022: Fonts

 desktop  mobile



# Optimize

Lazy Loading

Fassaden

Rel=Preload

**Layout Shift**

# Cumulative Layout Shift

Der Cumulative Layout Shift (CLS) ist eine Maßeinheit für unerwartetes Verschieben des Layouts einer Website.

CLS ist einer der Core Web Vitals von Google und fließt mit in das Google-Ranking ein!

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## Rent a Llama

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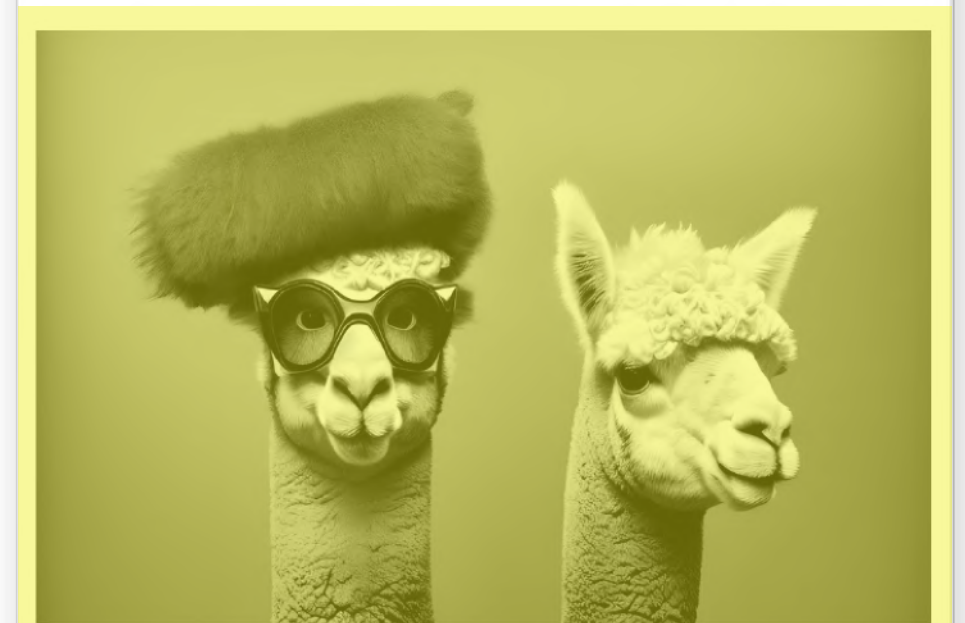
### Willkommen beim professionellen Lamaverleih

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### Willkommen beim professionellen Lamaverleih

# Cumulative Layout Shift

## Performance studies related to “core web vitals”

---



Carpe improved Largest Contentful Paint by 52% and Cumulative Layout Shift by 41% and saw a 10% increase in traffic, a 5% increase in online store conversion rate, and a 15% increase in revenue.

[PERMALINK](#)

[SHARE ON TWITTER](#)

[#bounce rate](#)

[#conversion rate](#)

[#traffic](#)

[#revenue](#)

[#2023](#)

[#core web vitals](#)



# Cumulative Layout Shift

## Performance studies related to “core web vitals”

---



Carpe improved Largest Contentful Paint by 52% and Cumulative Layout Shift by 41% and saw a 10% increase in traffic, a 5% increase in online store conversion rate, and a 15% increase in revenue.

PERMALINK

SHARE ON T

#bounce rate

#conversion rate

#traffic

#revenue

#2023

#core web



Credit: <https://wpostats.com/>

# Optimize

## Layout Shift

- Chrome DevTools:
  - → Console Drawer
  - → Rendering
  - → Layout Shift
  - → Core Web Vitals
- Chrome Plugins
- <https://defaced.dev/tools/layout-shift-gif-generator/>
- `npm install -g layout-shift-gif`
- JS Performance Observer  
API → Tracking



# Platz freihalten gegen Layout-Shift

`aspect-ratio` definiert für Box-Elemente  
automatisch die Höhe anhand der Breite.

Der Wert ist eine Dezimalzahl, die man aber auch  
durch einen Bruch angeben kann.



```
.img {  
    aspect-ratio: 1.777;  
    aspect-ratio: 16/9;  
}
```

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# Optimize

Lazy Loading

Fassaden

Rel=Preload

Layout Shift

## Fünf Säulen von Website Performance

**A**

**AVOID**

Benutzen wir alles?  
Brauchen wir alles?

**R**

**REDUCE**

Cachen,  
Komprimieren,  
Minimieren.

**O**

**OPTIMIZE**

Ladeverhalten und  
Priorisierung

**M**

**MEASURE**

Tooling und  
Monitoring

**A**

**ATTITUDE**

Performance  
Culture

# Measure



# Measure

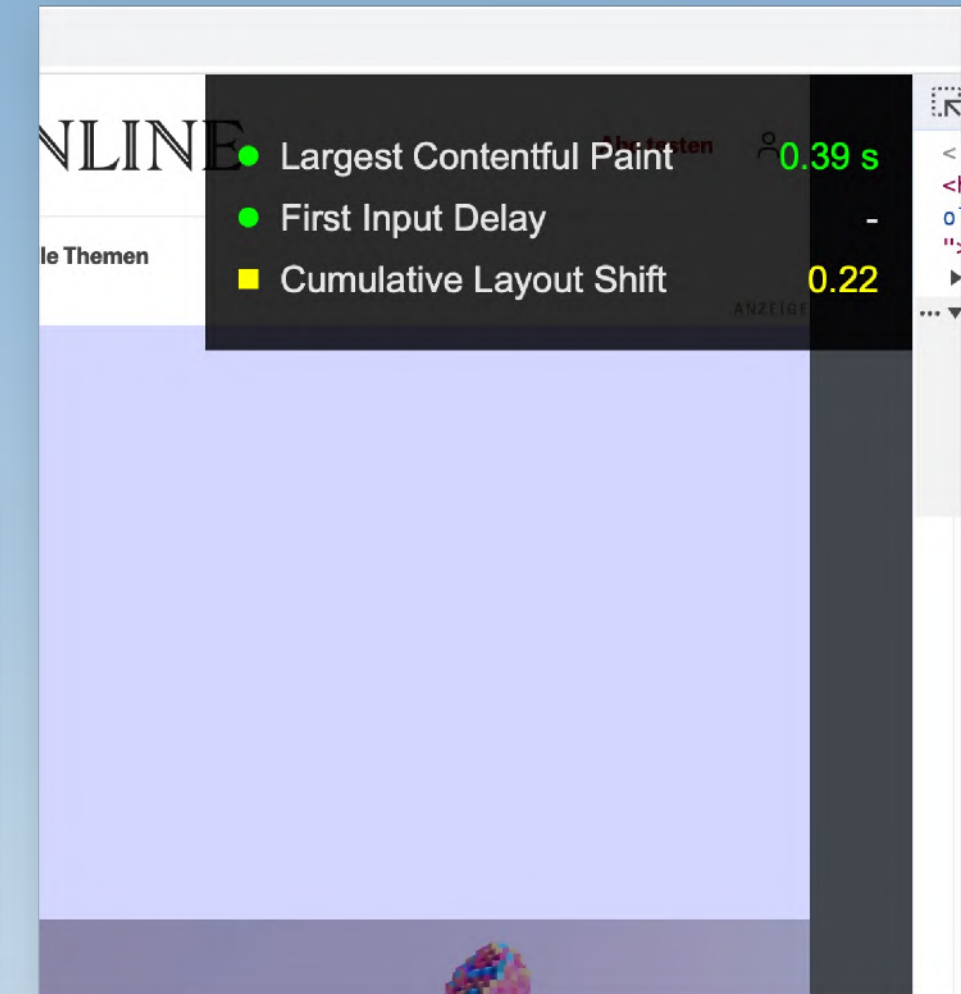
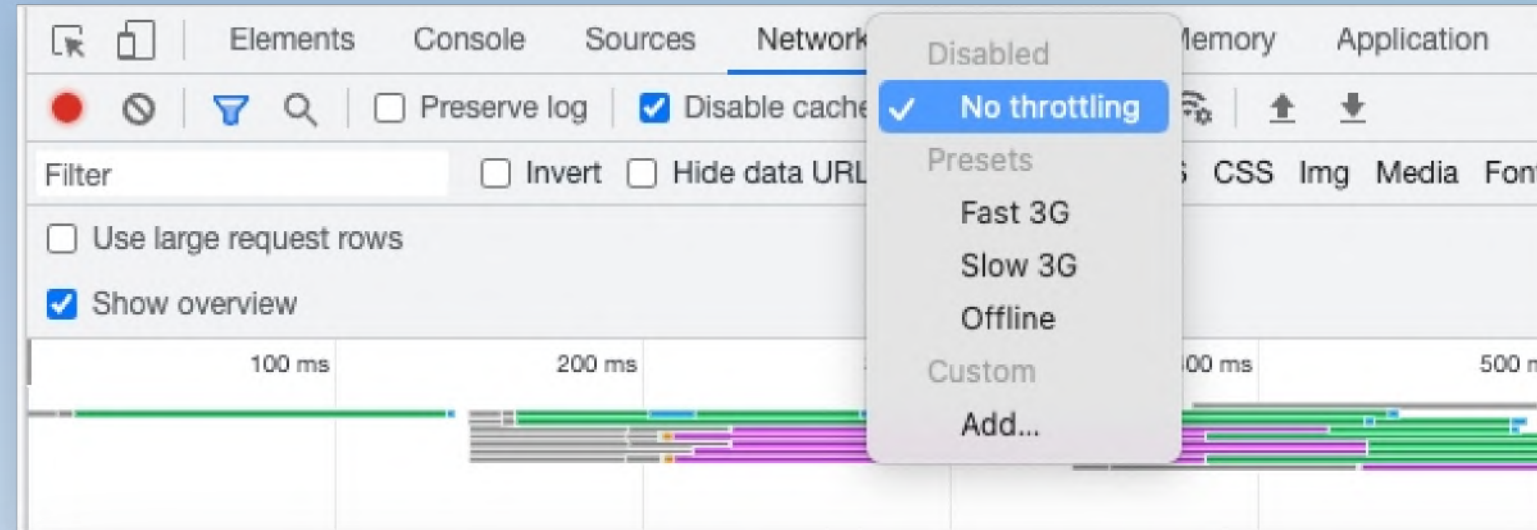
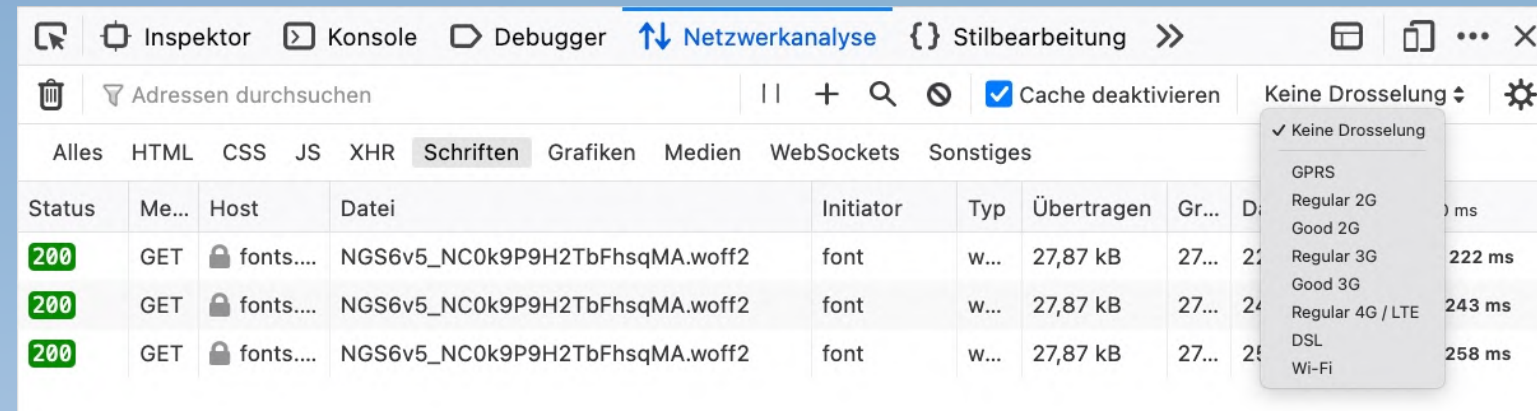
# DevTools



# Measure

## DevTools

- Throttling
- Local Source Overrides
- Web Vitals Score
- Layout Shift
- Unused CSS/JS
  
- **JavaScript:** Memory, Frame Rate, CPU Flame Graphs



Name	Status	Type	Size	Time	Priority	Waterfall
after.html	304	document	80 B	70 ms	Highest	
Montserrat-Regular.woff2	200	font	(disk cache)	16 ms	High	
normalize.css	200	stylesheet	(disk cache)	15 ms	Highest	
styles-optimized.css	200	stylesheet	(disk cache)	8 ms	Highest	
hero.webp	200	webp	(disk cache)	12 ms	Low	

URL	Type	Total Bytes	Unused Bytes	Usage Visualization
https://consent-cdn.zeit.de/wrapperMessagingWithoutDetection.js	JS (per function)	204 217	95 490 46.8%	
https://interactive.zeit.de/wiegehtesi.../app.c0381a78a97b00cf65db.cached.js	JS (per function)	156 095	75 866 48.6%	
https://interactive.zeit.de/g/2022/energiekostenmonitor/.../index.75ca3a4e.css	CSS	99 104	72 859 73.5%	
https://interactive.zeit.de/g/2022/energiekostenmonitor/.../react.8d1c6deb.mjs	JS (per function)	142 733	67 107 47%	
https://static.zeit.de/p.../centerpage.92c7290fe3f64752971581ffeb39d5b6.css	CSS	97 335	62 054 63.8%	
https://static.zeit.de/p/zeit.../base.4ac770b16c740c03c50e84fbd93f1dd9.css	CSS	49 036	38 825 79.2%	
https://static.zeit.de/static/js/webtrekk/webtrekk_v4.5.3.min-3.js	JS (per function)	75 896	30 541 40.2%	

# Measure

DevTools

Lighthouse

# Measure

## Lighthouse

- Web Vital Scores
- konkrete Todos zur Verbesserung

- DevTools

- CLI  
`npm install -g lighthouse`

- npx lighthouse

The screenshot shows a Lighthouse performance report for a website. At the top, a large green circle displays a score of 100. Below this, the word "Performance" is written in bold. A note states: "Values are estimated and may vary. The performance score is calculated directly from these metrics. See calculator." A legend indicates that scores of 90-100 are represented by a green dot. To the right, a small thumbnail of the website is shown with the text "BLOG VON THOMAS PUPPE, WEB DEVELOPER." and "Quotes from SmashingConf 2022 in Freiburg" and "Quotes from Fronteers 2019 in Amsterdam".

The "METRICS" section lists the following scores:

- First Contentful Paint: 0.3 s
- Largest Contentful Paint: 0.4 s
- Total Blocking Time: 0 ms
- Cumulative Layout Shift: 0
- Speed Index: 0.3 s

Below the metrics, there are buttons for "View Treemap" and "View Original Trace". A treemap visualization shows a grid of small thumbnails, each representing a different page or resource, with the same text as the main thumbnail.

The "DIAGNOSTICS" section lists several issues:

- Ensure text remains visible during webfont load
- Page prevented back/forward cache restoration — 4 failure reasons
- Serve static assets with an efficient cache policy — 3 resources found
- Avoid chaining critical requests — 1 chain found
- Keep request counts low and transfer sizes small — 5 requests · 44 KiB
- Largest Contentful Paint element — 1 element found

At the bottom, it says "More information about the performance of your application. These numbers don't directly affect the Performance score." and "PASSED AUDITS (34) Show".

# Measure

## Pagespeed Insights

- Lighthouse, aber online

[pagespeed.web.dev](https://pagespeed.web.dev)

PageSpeed Insights [Link kopieren](#) [Dokumentation](#)

Mobil Computer

**98**  
Leistung

Die Werte sind geschätzt und können variieren. Die Leistungsbewertung wird direkt aus diesen Messwerten berechnet. [Siehe Rechner.](#)

▲ 0-49    ■ 50-89    ● 90-100

**Rent a Llama**  
Even a static website can be slow.  
Willkommen beim professionellen Lamaverleih

MESSWERTE [Ansicht maximieren](#)

- First Contentful Paint **1,1 s**
- Largest Contentful Paint **2,2 s**
- Total Blocking Time **0 ms**
- Cumulative Layout Shift **0.021**
- Speed Index **1,1 s**

Captured at 15. Okt. 2023, 21:01 MESZ    Emulation eines Moto G Power with Lighthouse 11.0.0    Einzelner Seitenaufbau  
Erster Seitenaufbau    Langsame 4G-Drosselung    Using HeadlessChromium 117.0.5938.149 with lr

[Strukturkarte anzeigen](#)

Prüfungen anzeigen, die für folgende Messwerte relevant sind: [All](#) [FCP](#) [LCP](#) [TBT](#) [CLS](#)

EMPFEHLUNGEN [Geschätzte Einsparung](#)

Empfehlung

- ▲ Bilder in modernen Formaten bereitstellen **4,41 Sek** ↓
- ▲ Bilder richtig dimensionieren **4,25 Sek** ↑

Stelle Bilder bereit, die eine angemessene Größe haben, um mobile Daten zu sparen und die Ladezeit zu verbessern. [Weitere Informationen.](#)

# Measure

DevTools

Lighthouse

Page Speed Insights

**Webpagetest**

# Measure

## Webpagetest

- genauere Analysen und Empfehlungen
- instant-Experimente

The screenshot displays the WebPageTest Pro interface for a specific experiment. At the top, the URL is <https://javascript-days.de/berlin/> and the date is 15.10.2023, 21:18:58. The experiment is titled 'WebPageTest Pro Experiment'. Settings include 'DESKTOP', 'v118', 'Cable', and 'Frankfurt, Germany'. A comparison between 'Experiment' (18.7) and 'Original (Control Run)' (19.1) is shown with a pause button. Below this, there are options to 'View' the 'Experiment Results & Filmstrip' and 'Tools' like 'Export'. The 'Experiment Results' section shows applied experiments: 'Defer Render-Blocking Scripts', 'Async Render-Blocking Scripts', 'Inline Render-Blocking Scripts', and 'Add loading="lazy" to images'. Links for 'Experiment Results', 'Experiment', 'Control', and 'Original' are provided. The 'Experiment Impact' section highlights notable changes between the experiment and control:

Metric	Experiment	Control	Impact
Start Render	0.2s	2s	FASTER
First Contentful Paint	0.15s	1.93s	FASTER
Speed Index	0.48s	14.33s	SLOWER
Total Blocking Time	0.16s	0.88s	FASTER
Page Weight	69 KB	8794 KB	HEAVIER

# Measure

DevTools

Lighthouse

Page Speed Insights

Webpagetest

**Speedcurve**

# Measure

## Speedcurve

- kontinuierliches Monitoring
- Benchmark mit Konkurrenz

speedcurve.com

### VITALS

Your site's current performance in key areas of user experience.

Loading (LCP)	Interactivity (FID)	Visual Stability (CLS)
<b>1.35s</b>	<b>32ms</b>	<b>0</b>

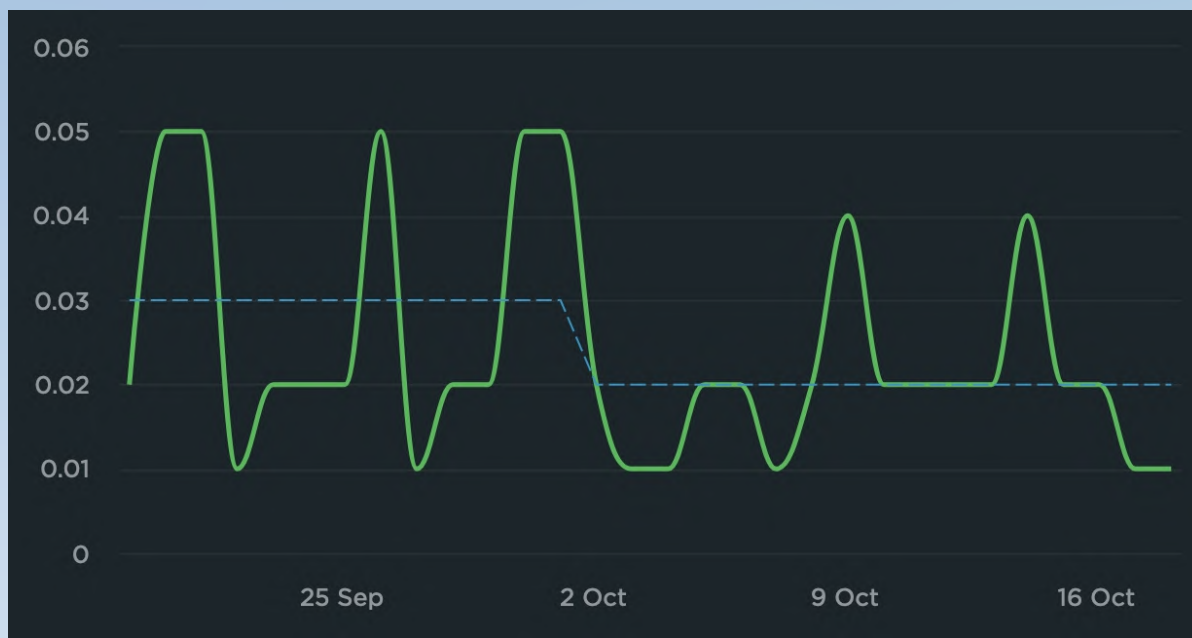
[Explore your Web Vitals](#)

### USER HAPPINESS

How real users experience the way your site loads.

Happy	Okay	Unhappy
<b>24%</b>	<b>62%</b>	<b>14%</b>

[Learn about your visitors](#)



0s	2s	4s	6s	8s	10s	12s

RECOMMENDATIONS	Synthetic Impact
Page prevented back/forward cache restoration	100%
Image elements do not have explicit `width` and `height` <span>CLS</span>	100%
Does not use passive listeners to improve scrolling performance	100%
Some third-party resources can be lazy loaded with a facade <span>TBT</span>	100%
Reduce the impact of third-party code <span>TBT</span>	100%
Ensure text remains visible during webfont load <span>LCP</span>	100%
Avoid an excessive DOM size <span>TBT</span>	100%
Serve static assets with an efficient cache policy	100%



## Fünf Säulen von Website Performance

# A

**AVOID**

Benutzen wir alles?  
Brauchen wir alles?

# R

**REDUCE**

Cachen,  
Komprimieren,  
Minimieren.

# O

**OPTIMIZE**

Ladeverhalten und  
Priorisierung

# M

**MEASURE**

Tooling und  
Monitoring

# A

**ATTITUDE**

Performance  
Culture

# Table Captain

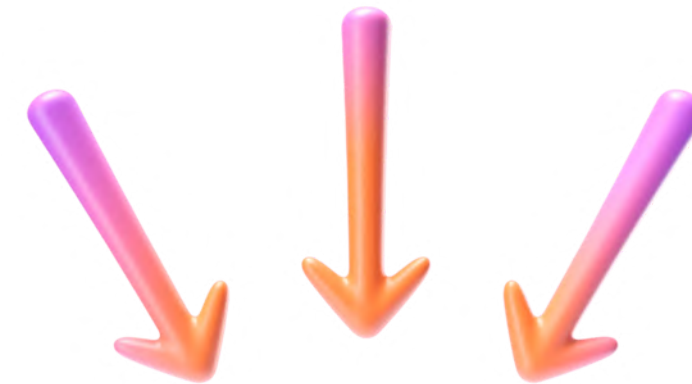
13:15 – 14:00 Uhr

- How to Start, actually?
- Performance Culture: Wie baue ich Performance in unsere Prozesse ein?
- Wie bleibe ich schnell?
- Best-Practice von ZEIT Online.



# Up-to-date bleiben

- [web.dev/fast](https://web.dev/fast)
- [github.com/davidsonfelli/awesome-wpo](https://github.com/davidsonfelli/awesome-wpo)
- [www.smashingmagazine.com/category/performance/](https://www.smashingmagazine.com/category/performance/)
- [perfplanet.com](https://perfplanet.com)
  
- [calibreapp.com/blog](https://calibreapp.com/blog)
- [speedcurve.com/blog](https://speedcurve.com/blog)
- [debugbear.com/blog](https://debugbear.com/blog)
  
- [simonhearne.com/posts](https://simonhearne.com/posts)
- [csswizardry.com/archive](https://csswizardry.com/archive)
- [timkadlec.com/remembers](https://timkadlec.com/remembers)



**[thomaspuppe.de/talks/nconf-2023](https://thomaspuppe.de/talks/nconf-2023)**

Slides und Links



Dankeschön ❤️



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Thomas is hiring @ ZEIT Online: [dev.zeit.de](https://dev.zeit.de)



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[www.thomaspuppe.de](https://www.thomaspuppe.de)

<https://webperf.social/@thomaspuppe>