

ANALYZING AND OPTIMIZING PERFORMANCE, MEMORY, AND WEB COVERAGE






STRATEGIES TO OPTIMIZE MEMORY, SPEED,
AND WEB PRESENCE

09.2024



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ABOUT ME :)

- Senior Front-end Expert 
- Curious about everything, passionate about science 
- Crazy about software engineering 
- Tool creator, sharing enthusiast 
- Inveterate technical bookworm 



01

WHY PERFORMANCE MATTERS?

Impact on user experience, engagement, and conversion rates.



03

BROWSER UNDER THE HOOD

Understanding how the browser translates code into visual representation.



02

HOW DO WE DEFINE FAST?

Web performance metrics and Core Web Vitals.



04

ANALYZING AND OPTIMIZING

Tools and optimization techniques.



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WHY PERFORMANCE MATTERS?

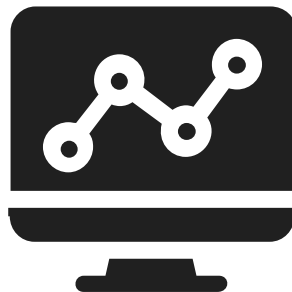


Impact on user experience,
engagement, and
conversion rates.



WORLD INSIGHTS

- “**53%** of visits are likely to be **abandoned** if pages take longer than **3 seconds** to load”.
- “**46%** of people say that **waiting for pages to load** is what they **dislike** the most when browsing the web on mobile devices”.
- “At the **BBC** we’ve noticed that, for every additional second a page takes to load, **10% of users leave**”.
- “Vodafone: A **31% improvement in LCP** increased sales by **8%**”.
- “Rakuten 24 found that a **good LCP score** can lead to an **increase** of up to **61.13% in conversion rate**, **26.09% in revenue per visitor**, **11.26% in average order value**, and a **good FID score** can lead to an **increase** of up to **55.88% in conversion rate**”.



SOLAR SYSTEM

CONVERSION RATE OPTIMIZATION (CRO)




**Conversion
Rate (%)**

=

Total Goal Completions
—
Total Website Visits

x 100

<https://nitropack.io/blog/post/improve-conversion-rates-cwv>

02.

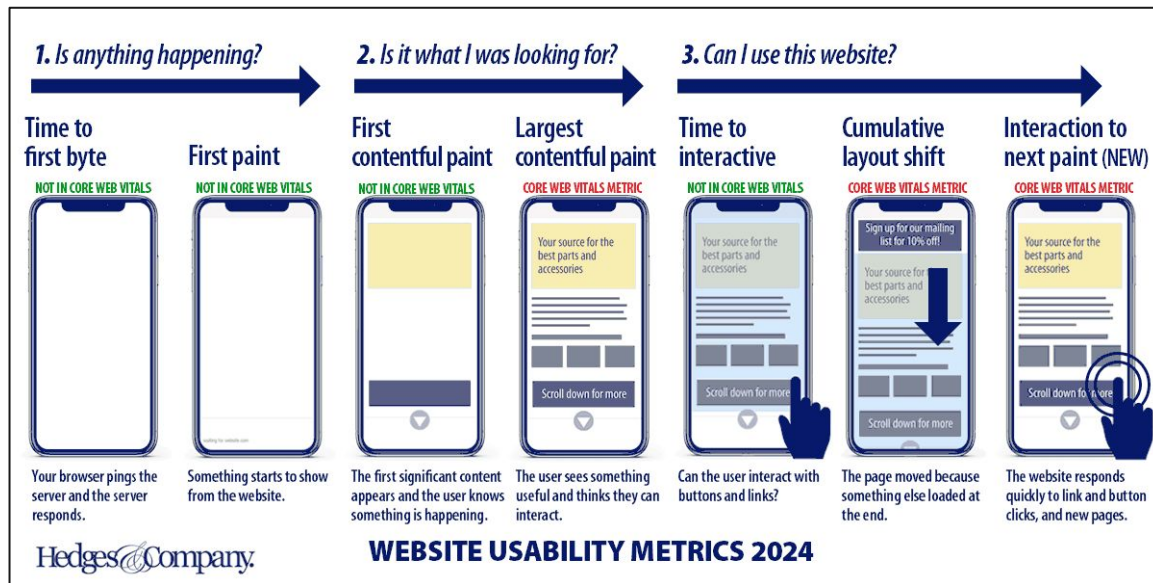
HOW DO WE DEFINE FAST?



Web performances metrics
and Core Web Vitals.



HOW DO WE DEFINE FAST?

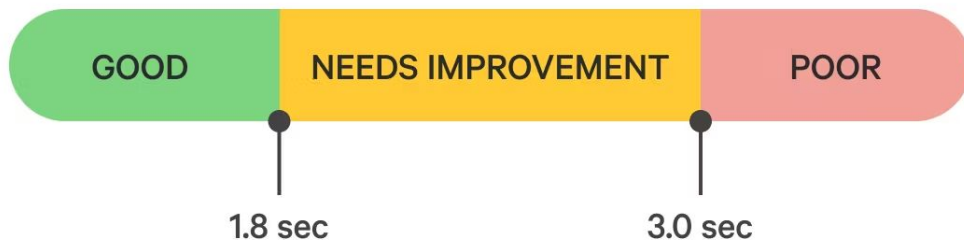


<https://hedgescompany.com/blog/2023/12/core-web-vitals-simplified/>

FIRST CONTENTFUL PAINT



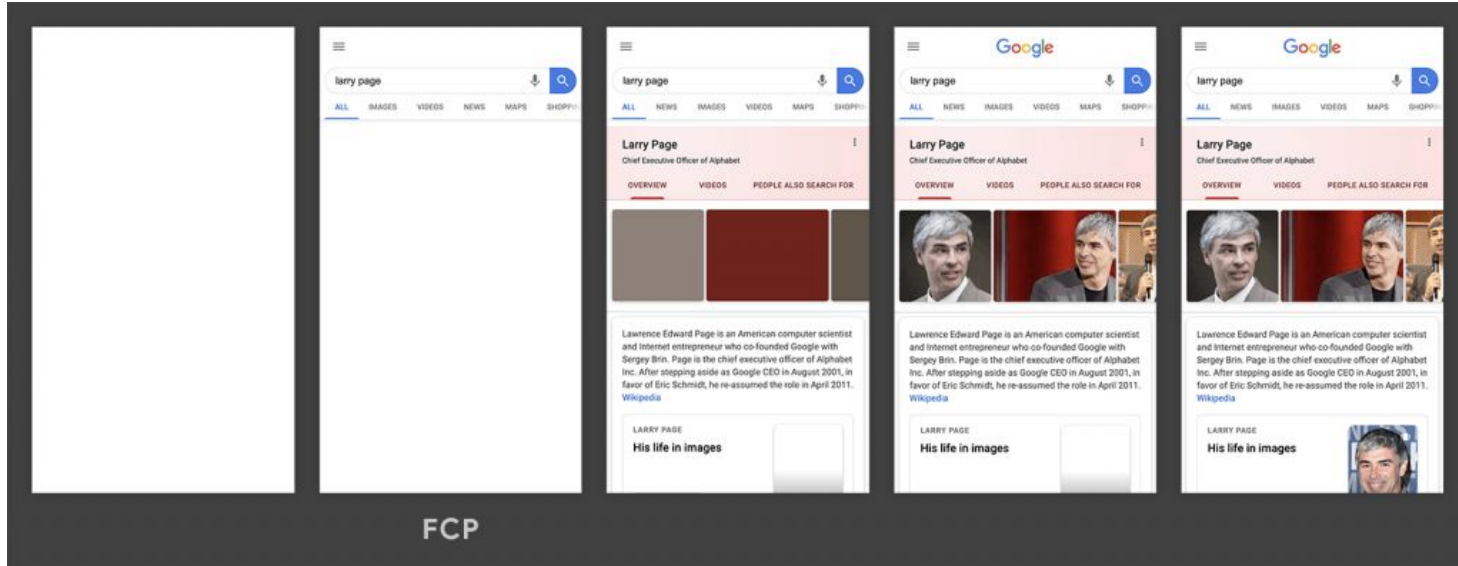
First Contentful Paint (FCP)



FCP is the time it takes for the browser to visualize the first piece of DOM content (e.g., image, SVG, non-blank canvas element) on a page.

<https://calibreapp.com/docs/metrics/first-contentful-paint>

FIRST CONTENTFUL PAINT



<https://snigel.com/blog/11-critical-ways-to-improve-first-contentful-paint-fcp>

LARGEST CONTENTFUL PAINT



(Loading)

LCP

LARGEST CONTENTFUL PAINT



2.5 SEC

4.0 SEC

LCP measures the time from when the user initiates loading the page **until the largest image or text block is rendered within the viewport.**

<https://angulargems.beehiiv.com/p/how-to-optimize-lcp>

LARGEST CONTENTFUL PAINT



The **largest element** rendered on the page determines the Largest Contentful Paint (LCP). **Initially**, it's the **header text**. **Later**, a **larger image loads** and **becomes** the LCP element.

<https://www.woorank.com/en/core-web-vitals/largest-contentful-paint>

CUMULATIVE LAYOUT SHIFT



(Visual Stability)

CLS

CUMULATIVE LAYOUT SHIFT

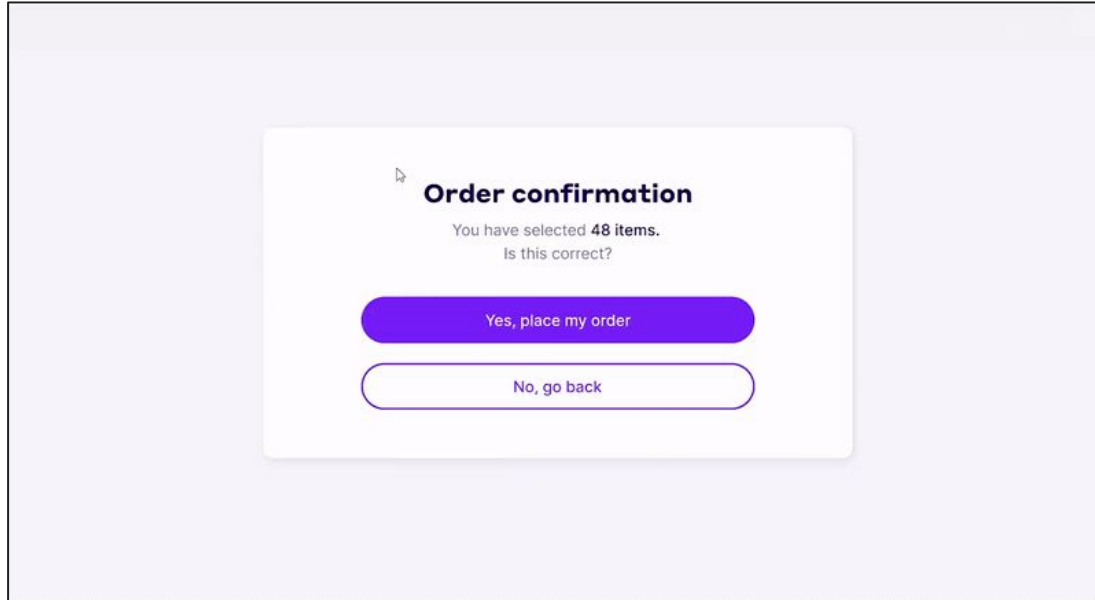


CLS is a measure of the **largest burst** of **layout shift** scores for **every unexpected layout shift** that occurs during the entire lifecycle of a page.

<https://angulargems.beehiiv.com/p/how-to-optimize-cls>

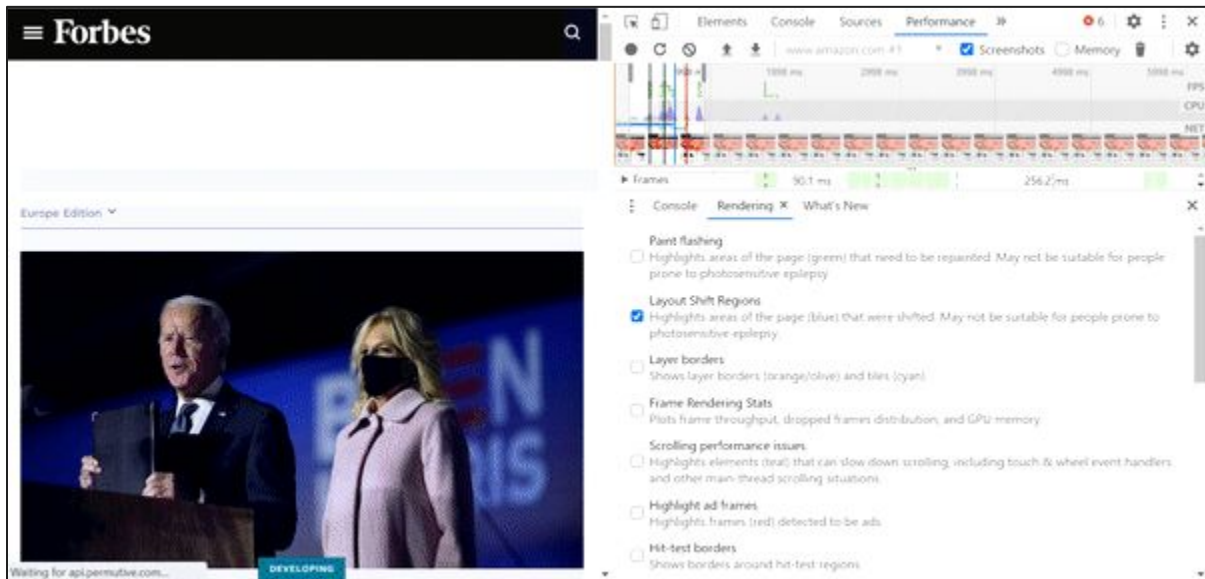
Layout shift score (**CLS**) = impact fraction (**IF**) * distance fraction (**DF**)

CUMULATIVE LAYOUT SHIFT



<https://nitropack.io/blog/post/fix-cls>

CUMULATIVE LAYOUT SHIFT



<https://nitropack.io/blog/post/core-web-vitals-assessment-failed>

INTERACTION TO NEXT PAINT



(Interactivity)

INP

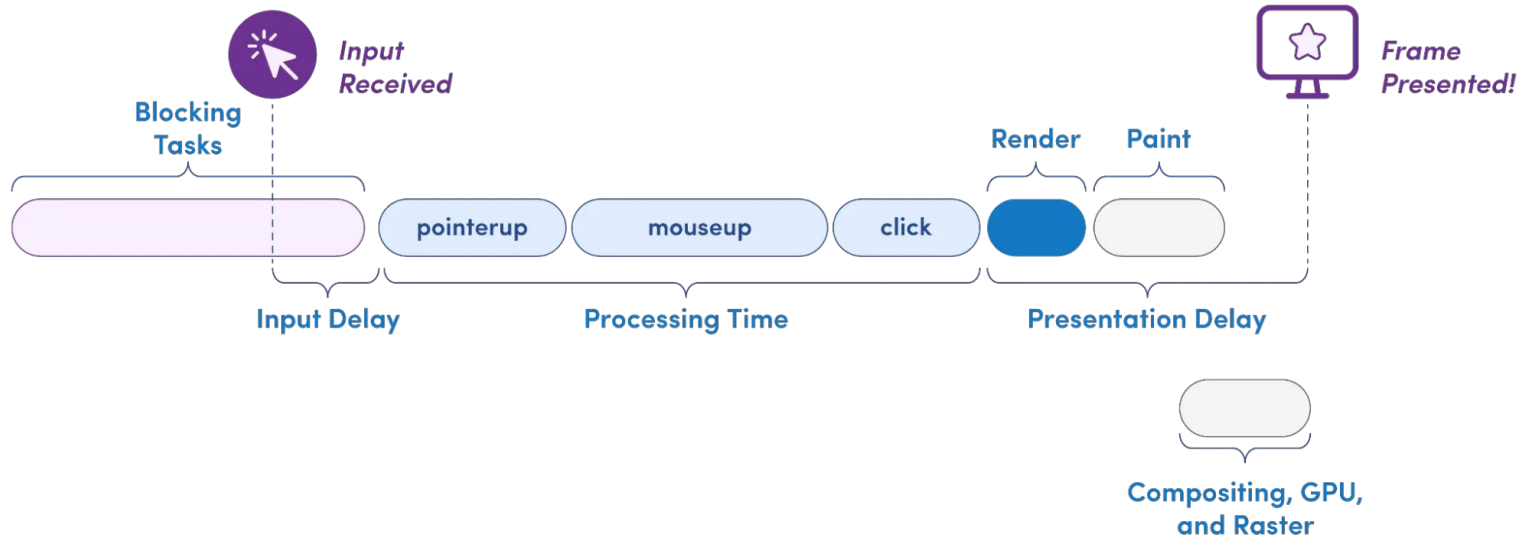
INTERACTION TO NEXT PAINT



INP is a metric that assesses a page's overall **responsiveness** to user interactions by observing the **latency** of all click, tap, and keyboard interactions that occur throughout the lifespan of a user's visit to a page.

<https://angulargems.beehiiv.com/p/how-to-optimize-inp>

INTERACTION TO NEXT PAINT



<https://fr.catchpoint.com/core-web-vitals/interaction-to-next-paint>

CORE WEB VITALS



Core Web Vitals



Loading



Interactivity



Visual Stability



<https://fr.catchpoint.com/core-web-vitals>

03.

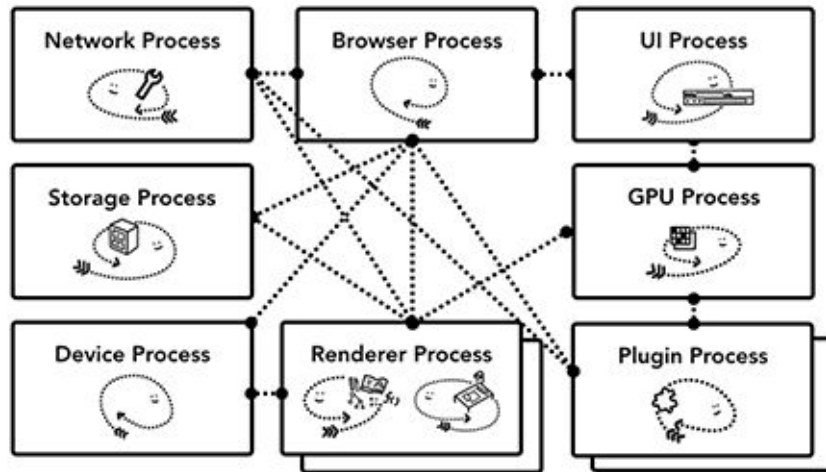
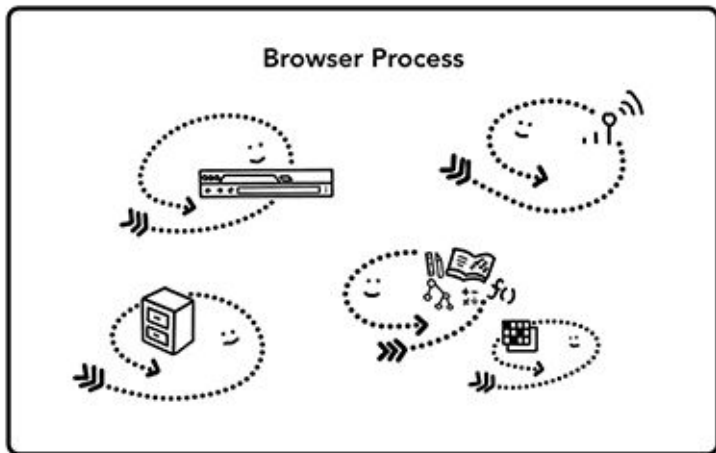
BROWSER UNDER THE HOOD



Understanding how the browser translates code into visual representation.

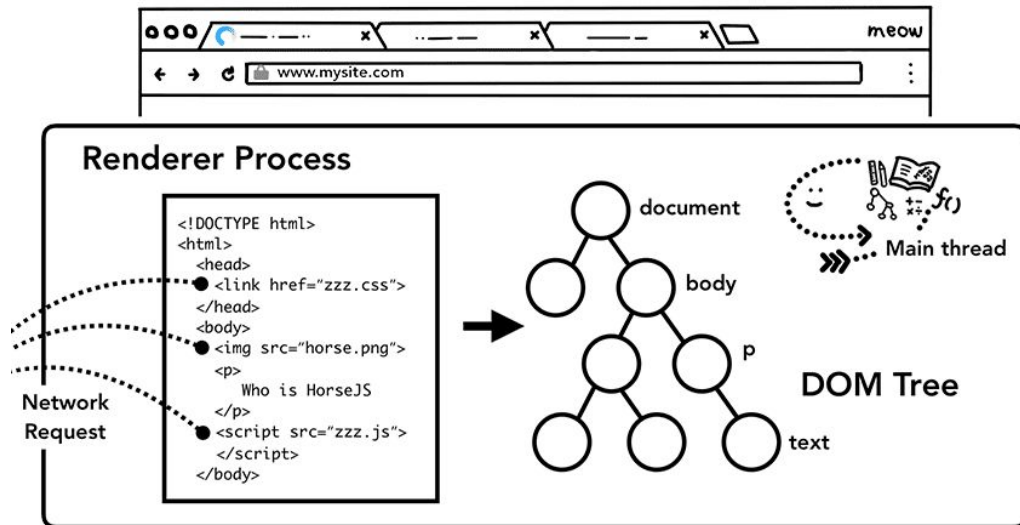


BROWSER UNDER THE HOOD



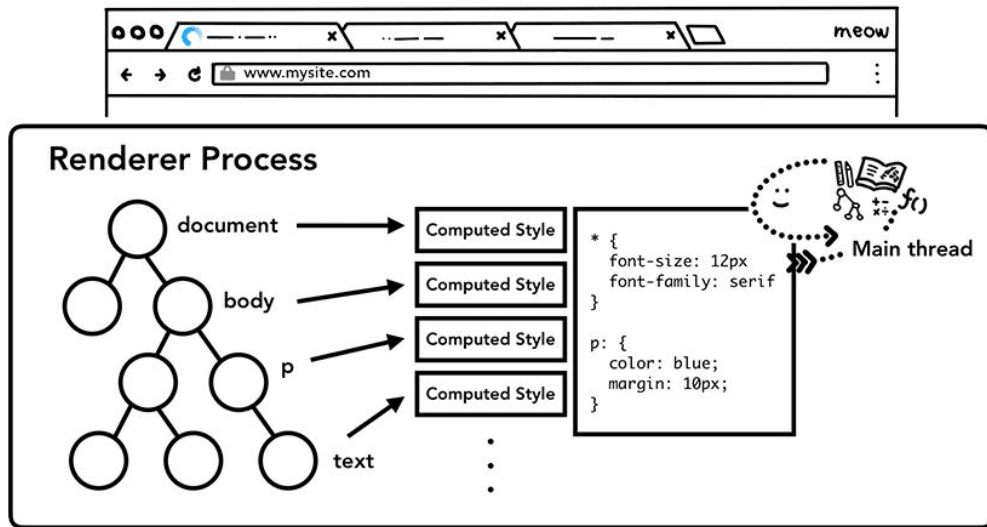
<https://developer.chrome.com/blog/inside-browser-part1>

DOM CONSTRUCTION



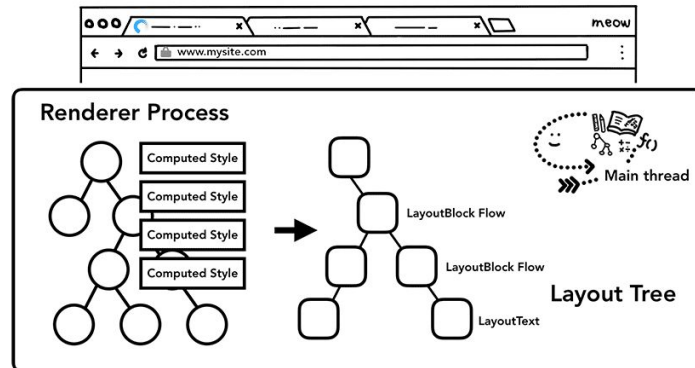
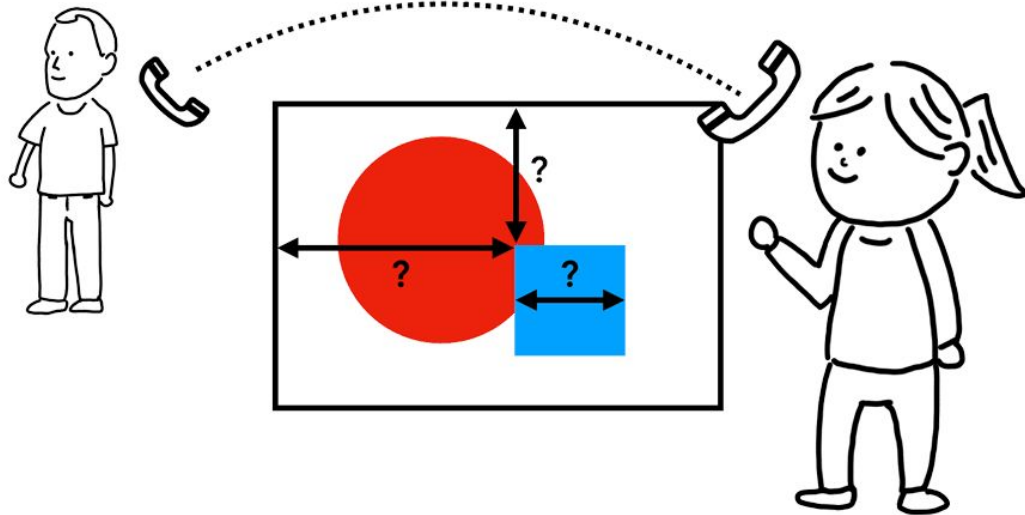
<https://developer.chrome.com/blog/inside-browser-part3>

STYLE CALCULATION



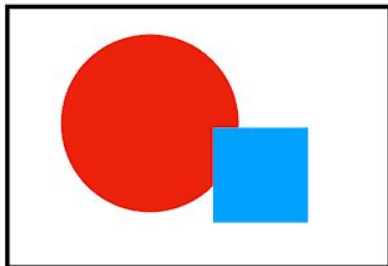
<https://developer.chrome.com/blog/inside-browser-part3>

LAYOUT

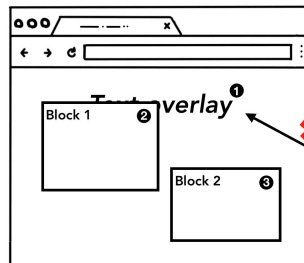
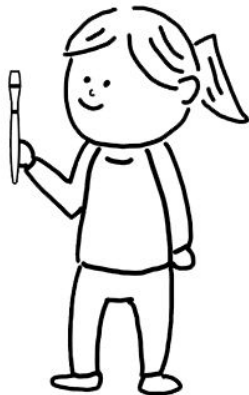


<https://developer.chrome.com/blog/inside-browser-part3>

PAINT

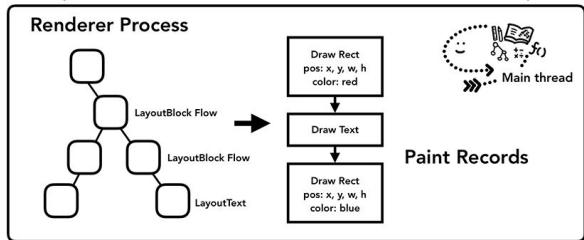
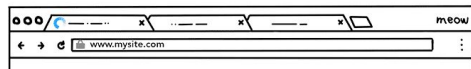


Draw Circle first
or
Square first?



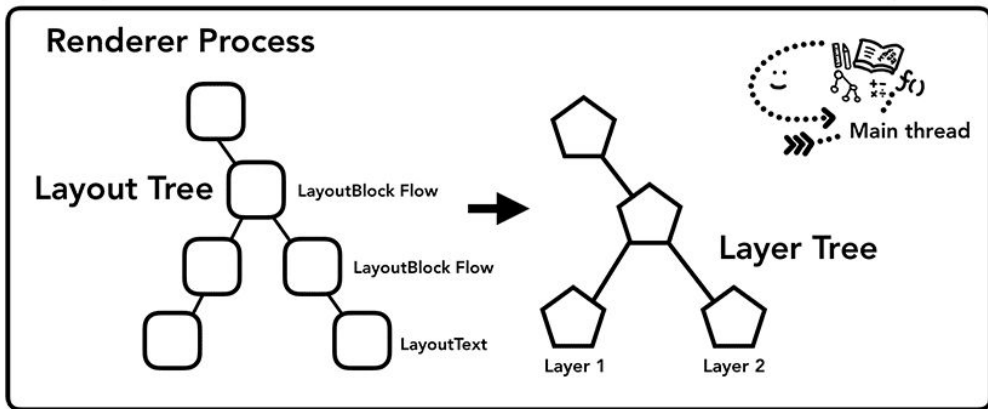
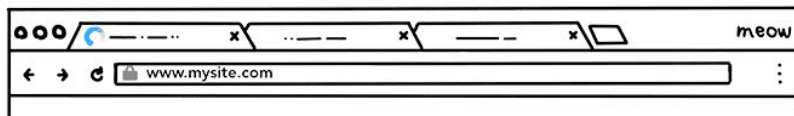
```
<h1>Text overlay</h1>
<div> Block 1</div>
<div> Block 2 <div>

h1 {
  z-index: 1;
  position: absolute;
}
div {
  z-index: 0;
}
```

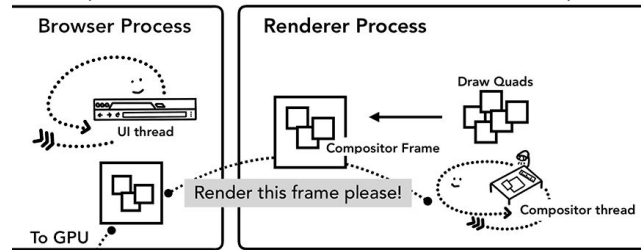
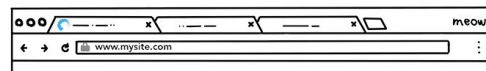
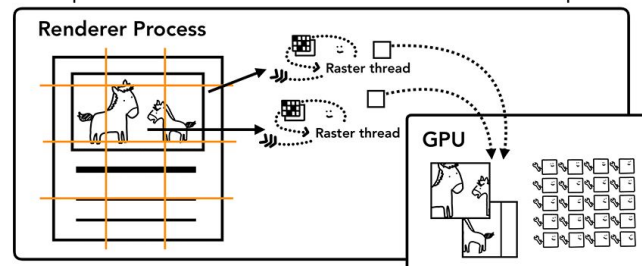
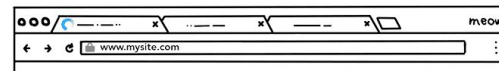


<https://developer.chrome.com/blog/inside-browser-part3>

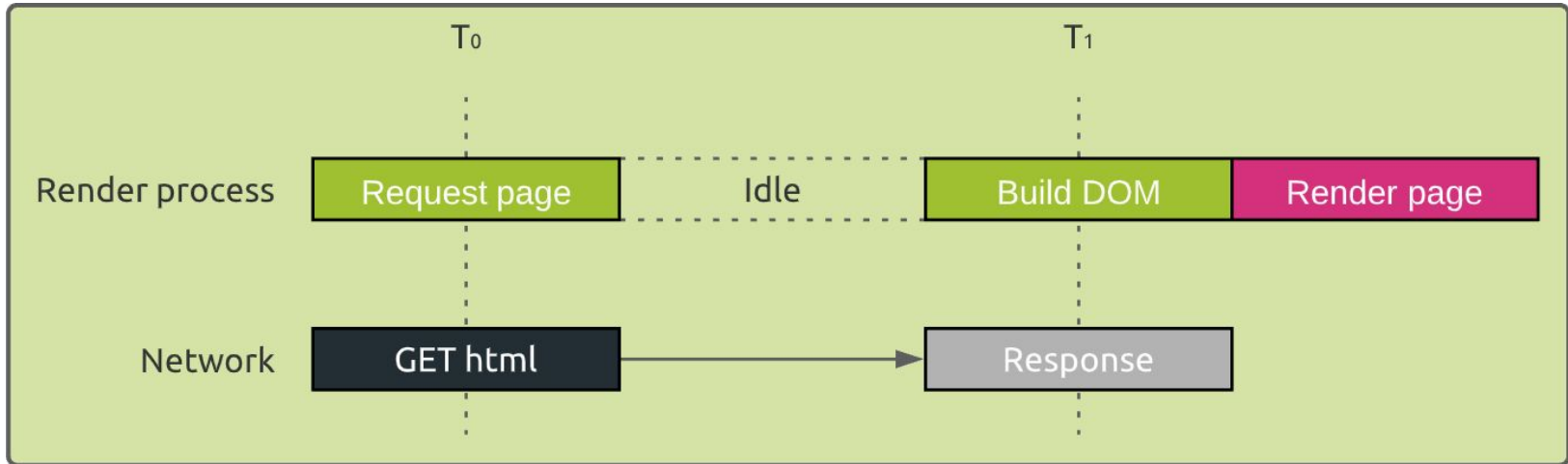
COMPOSITING



<https://developer.chrome.com/blog/inside-browser-part3>

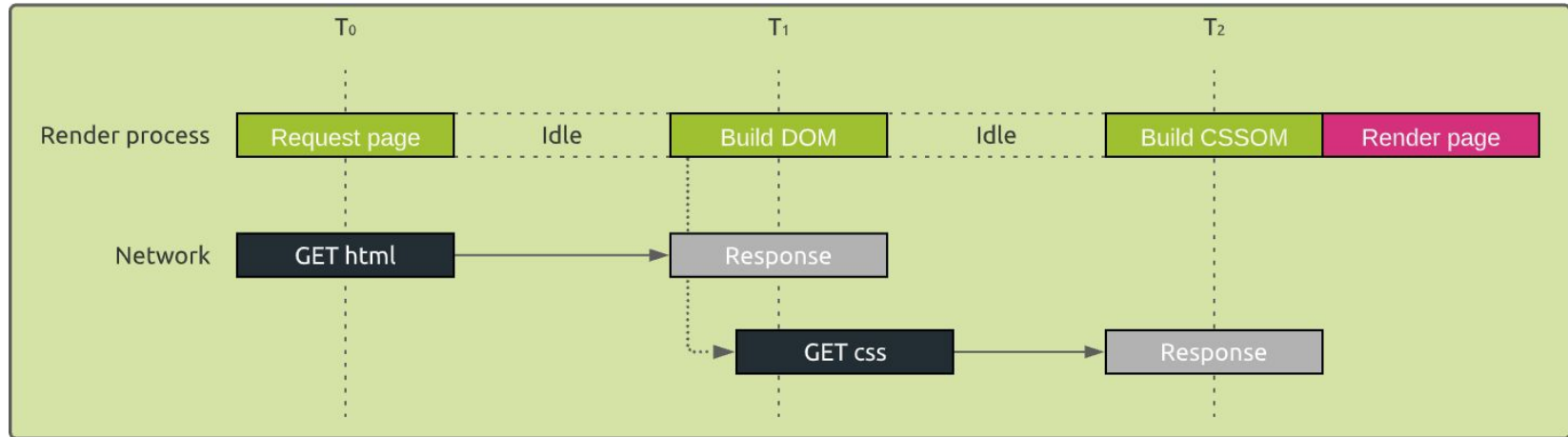


RESSOURCES IMPACTS



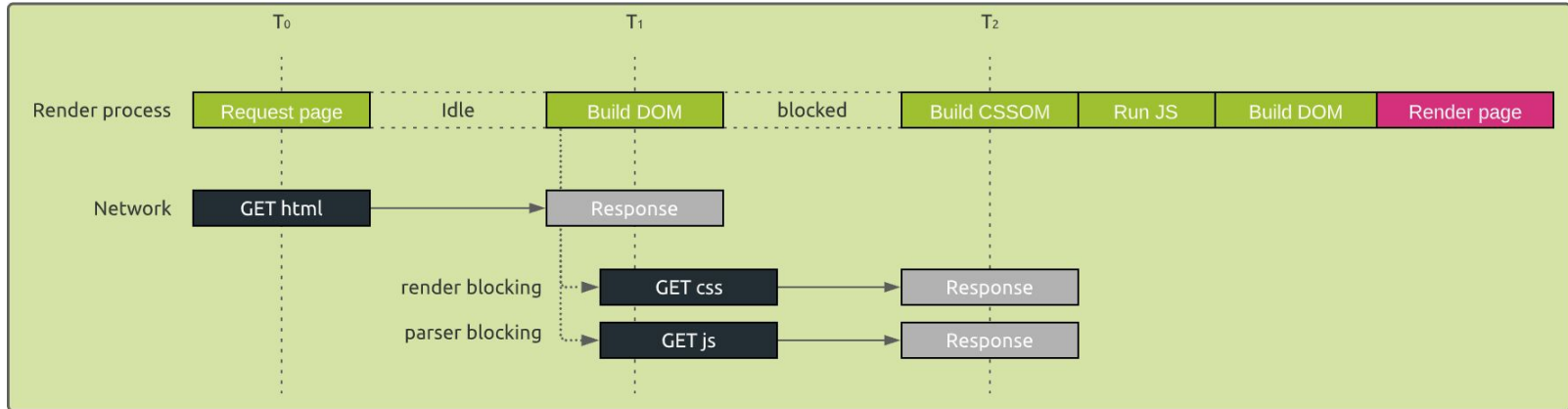
<https://kadiska.com/what-is-critical-rendering-path-in-web-performance/>

RESSOURCES IMPACTS



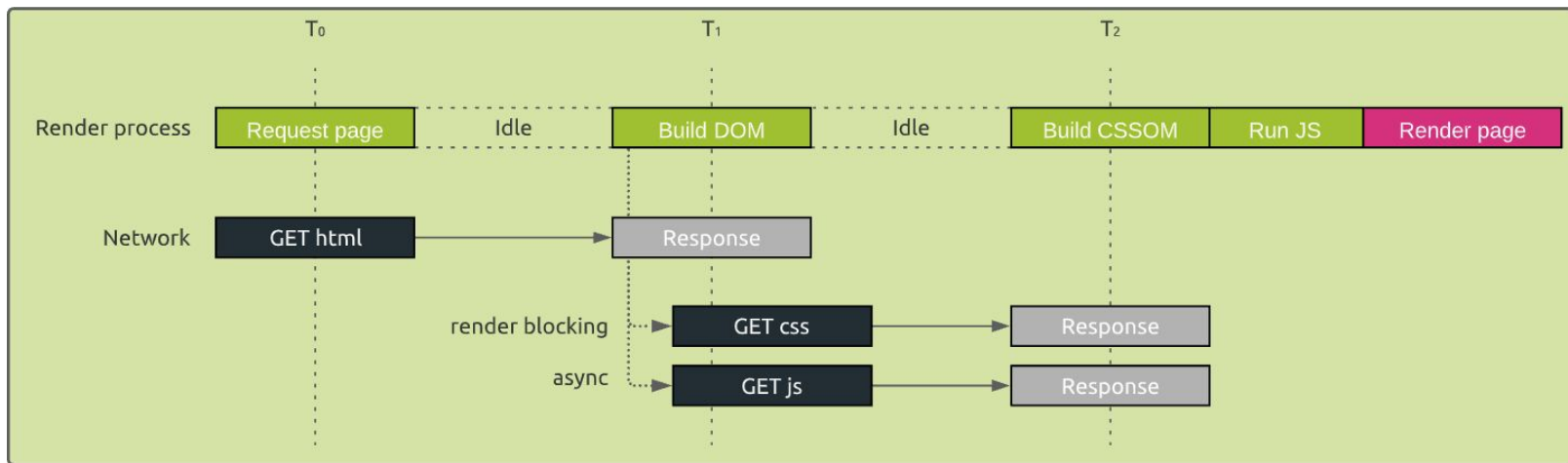
<https://kadiska.com/what-is-critical-rendering-path-in-web-performance/>

RESSOURCES IMPACTS



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SCRIPT PRIORITIES

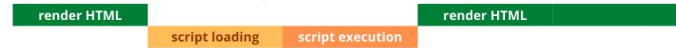


<https://kadiska.com/what-is-critical-rendering-path-in-web-performance/>

SCRIPT PRIORITIES



Synchronous JavaScript



Async attribute



Defer attribute

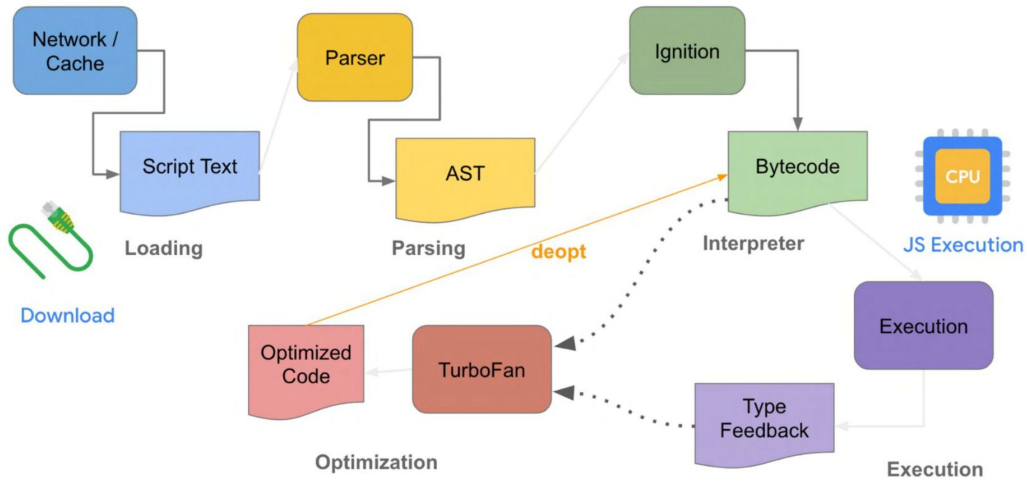


<https://addyosmani.com/blog/script-priorities/>

JAVASCRIPT ENGINE



LIFE OF A SCRIPT




<https://speakerdeck.com/addyosmani/the-cost-of-javascript-in-2023?slide=28>

JAVASCRIPT COST



WHEN JAVASCRIPT BLOCKS THE MAIN THREAD, NOTHING ELSE CAN HAPPEN ON IT*

Block the main thread

Element	Example
<code></code>	
<code><a></code>	https://example.com
<code><input></code>	<input type="checkbox"/> Check me <input type="text" value="Type here"/>



<https://philipwalton.com/articles/why-web-developers-need-to-care-about-interactivity/>

<https://speakerdeck.com/addyosmani/the-cost-of-javascript-in-2023?slide=28>

04.

ANALYZING AND OPTIMIZING



Tools and optimization techniques.



ANALYSIS TOOLS



- ★ Chrome Network Devtool.
- ★ Chrome Performance Devtool.
- ★ Chrome Memory Devtool.
- ★ Chrome Lighthouse.
- ★ Bundle analyzer.
- ★ CI/CD.
- ★ Performance budget.

OPTIMIZATION TECHNIQUES



- ★ Split long tasks.
- ★ Optimize loading third-parties.
- ★ Bundle splitting.
- ★ Dynamic Import.
- ★ Routes based splitting.
- ★ Import On Visibility.
- ★ Import On Interaction.
- ★ Preload/Prefetch.
- ★ Tree shaking.
- ★ Adaptive loading.



```
// import MonComposant from './' // import sync: présent
```

```
import {Suspense, lazy} from 'react';
```

```
const MonComposant = lazy(() => {
```

```
{condition && ()}
```

SOME CODE ...



FINAL WORDS ...



Performance is a feature!

THANKS



Do you have any questions?

- **Medium:** helabekhalfallah.medium.com
- **Twitter:** [b_k_hela](https://twitter.com/b_k_hela)
- **LinkedIn:** [hela-ben-khalfallah-4a104014](https://www.linkedin.com/in/hela-ben-khalfallah-4a104014)

See you soon! :)

