Topics

- Introductions! Actually join the room, please.

- Defining Interaction to Next Paint (INP)
- Let's play a bit!
- INP Opportunities for Blink
- 100ms RAIL vs 200ms INP
- Lab ⇔ Field Tooling
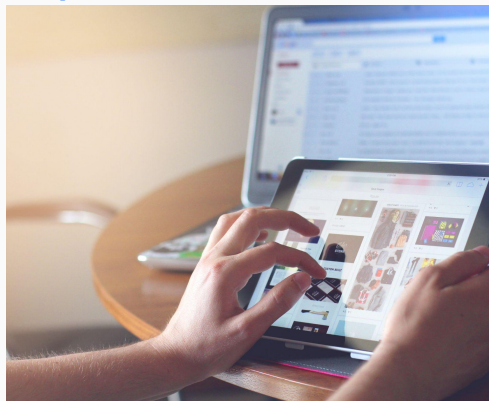- Sync vs Async Feedback
- SPA measurement effects

- Other topics?

A New Measure of Responsiveness
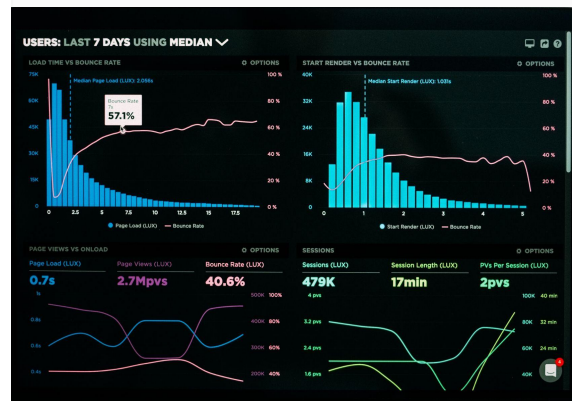
Core Web Vitals Guiding Principles

Apply to all Web Pages

Directly Measure User Experience

Measurable in the Field

Responsiveness to Discrete User Interactions

Tap touchscreen

Type on keyboard

Click mouse

Blocking tasks

Input received

Render Paint

Frame presented!

pointerup mouseup click

Input delay

Processing time

Presentation delay

Compositing, GPU, and raster
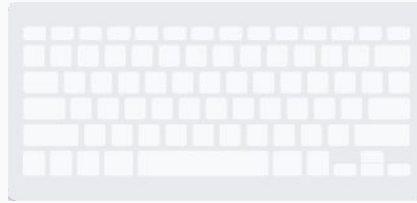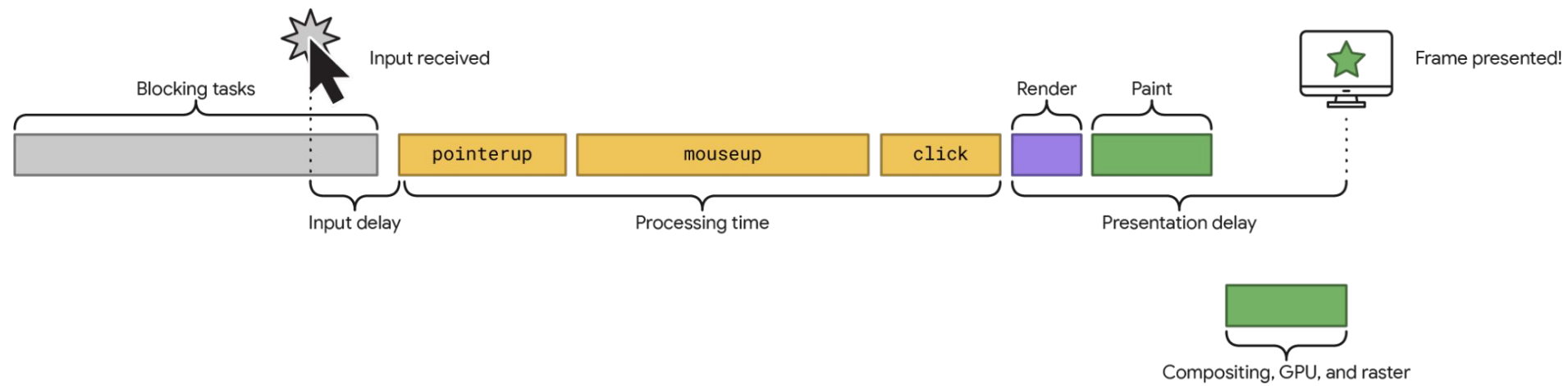
Interaction to Next Paint (INP)

web.dev/inp

DON'T BLOCK NEXT PAINT AFTER INTERACTION

Let's play a bit!

```javascript
let maxDuration = 0;

new PerformanceObserver(list => {
  for (const entry of list.getEntries()) {
    // Comment this out to show ALL event entry types (useful e.g. on Firefox).
    if (!entry.interactionId) continue;

    if (entry.duration > maxDuration) {
      // New longest Interaction to Next Paint (duration).
      maxDuration = entry.duration;
      console.log(`[INP] duration: ${entry.duration}, type: ${entry.name}`, entry);
    } else {
      // Not the longest Interaction, but uncomment the next line if you still want to see it.
      // console.log(`[Interaction] duration: ${entry.duration}, type: ${entry.name}`, entry);
    }
  }
}).observe({
  type: 'event',
  durationThreshold: 16, // Minimum supported by the spec.
  buffered: true
});
```

Usage: web-vitals.js library

- https://github.com/GoogleChrome/web-vitals/tree/next
  - Note: **next** branch only

```
import { onINP } from "web-vitals";

function sendToGoogleAnalytics(result) {
  // ...
}


onINP(sendToGoogleAnalytics);
```

PageSpeed Insights

Docs

https://www.chromium.org/events/blinkon-14/

Analyze

📱 Mobile　　💻 Desktop

Discover what your real users are experiencing

ⓘ　This URL　Origin

Core Web Vitals Assessment: Failed ⓘ

Expand view

● Largest Contentful Paint (LCP)

1.1 s

🟧 First Input Delay (FID)

248 ms

● Cumulative Layout Shift (CLS)

0.02

OTHER NOTABLE METRICS

● First Contentful Paint (FCP)

1.1 s

🟧 Interaction to Next Paint (INP)

300 ms

● Time to First Byte (TTFB)

0.6 s

📅 Latest 28-day collection period
⏱ Full visit durations

📱 Various mobile devices
📶 Various network connections

👥 Many samples (Chrome UX Report)
🌐 All Chrome versions

Diagnose performance issues

99

Performance

Values are estimated and may vary. The performance score is calculated directly from these metrics. See calculator.

https://pagespeed.web.dev/

Web Vitals Chrome Extension

A Chrome extension to measure metrics for a healthy site Install now

React – A JavaScript library for ✕ +

Update ⋮

Metrics

Local metrics only (field data unavailable)

Largest Contentful Paint — 0.275s

Cumulative Layout Shift — 0.000

First Input Delay

Your local **INP** experience is **40.000ms** and rated **good**.

Interaction to Next Paint 🧪 — 40.000ms

https://reactjs.org/

17:08:10 · Mobile performance may be significantly slower. Learn more

https://github.com/GoogleChrome/web-vitals-extension/

en.wikipedia.org/wiki/Blink_(browser_engine)

Not logged in Talk Contributions Create account Log in

Metrics   Close

Article Talk   Read Edit View history Search Wikipedia

🟢 Largest Contentful Paint   0.33 s

Blink (browser engine)

🔺 Cumulative Layout Shift   0.603

From Wikipedia, the free encyclopedia

🟢 First Input Delay   13.30 ms

"Blink (software)" redirects here. For the SIP client, see Blink (SIP client). For other uses, see Blink (disambiguation).

🟢 Interaction to Next Paint*   Blink   96.00 ms

Blink is a browser engine developed as part of the C[...]
contributions from Google, Facebook, Microsoft, Opera Software, Adobe,
Intel, IBM, Samsung, and others.[2][3] It was first announced in April 2013.[4]

	Blink
Developer(s)	The Chromium Project and contributors
Initial release	3 April 2013; 9 years ago[1]
Repository	chromium.googlesource.com /chromium/src/+/master/third _party/blink/ 🔗 ✎
Written in	C++
Type	Browser engine
License	BSD and LGPLv2.1
Website	chromium.org/blink 🔗

Contents [hide]
1 Naming
2 History
3 Internals
4 Frameworks
5 Platforms
6 See also
7 References
8 External links

Naming [edit]

Blink's naming was influenced by the non-standard presentational blink HTML element, which was introduced by Netscape Navigator, and supported by Presto- and Gecko-based browsers until August 2013. Blink has, contrary to its name, never functionally supported the element.[5][6][7]

History [edit]

Blink is a fork of the WebCore component of WebKit,[8] which was originally a fork of the KHTML and KJS libraries from KDE.[9][10] It is used in Chrome starting at version 28,[11][12] Microsoft Edge starting at version 79,[13] Opera (15+),[11] Vivaldi, Brave, Amazon Silk and other Chromium-based browsers and frameworks.[citation needed]

Much of WebCore's code was used for features that Google Chrome implemented differently such as sandboxing and the multi-process model. These parts were altered for the Blink fork, and although slightly bulkier, it allowed greater flexibility for adding new features. The fork also deprecates CSS vendor prefixes; existing prefixes will be phased out and new experimental functionality will instead be enabled on an opt-in basis.[14] Aside from these planned changes, Blink initially remained relatively similar to WebCore.[12]

By commit count, Google was the largest contributor to the WebKit code base from late 2009 until 2013 when they started work on their fork, Blink.[15]

Internals [edit]

Blink engine has the following components:[16]

- DOM, HTML DOM and CSS rendering engines
- Web IDL implementation
- Skia Graphics engine — makes calls to an underlying Graphics Library (like OpenGL, Vulkan, DirectX etc) which depends on the platform

DevTools — Performance panel

⚠9 💬1

Elements Console **Performance** ⚙ ✕

en.wikipedia.org #1 ✓ Screenshots ☐ Memory

☐ Web Vitals 🗑

☐ Disable JavaScript samples   Network: No throttling ▾

☐ Enable advanced paint instrumentation (slow)   CPU: No throttling ▾

5000 ms   2007 ms   3182 ms   8182 ms   131
CPU
NET

8362 ms 8382 ms 8402 ms 8422 ms 8442 ms 8462 ms 8482 ms 8502 ms 8

▶ Network
H checkbox-checked.svg (en.wikipedia.org)

▼ Timings

[Web Vitals] INP.duration (pointerup)
[W...p] [Web Vitals] INP.presentationDelay (pointerup)

Experience

▼ Main — https://en.wikipedia.org/wiki/Blink_(browser_engine)

Task
Timer Fired
Funct...Call
process
migh...row
(ano...ous)
refresh
init
parse
each
each

Summary Bottom-Up Call Tree Event Log

🟨 [Web Vitals] INP.duration (pointerup)

Total Time 96.00 ms

Self Time 0

Total blocking time: 0.00ms Learn more

inp-demo.glitch.me
inp-demo-ff.glitch.me

Focus → Opportunities for Blink

100ms RAIL
200ms INP

Lab ⇔ Field Tooling

Chrome DevTools Protocol

chromedevtools.github.io/devtools-protocol/

Elements | Performance | Lighthouse

Navigation   Start typing to search...

The **Chrome DevTools Protocol** allows for tools to instrument, inspect, debug and profile Chromium, Chrome and other Blink-based browsers. Many existing projects currently use the protocol. The Chrome DevTools uses this protocol and the team maintains its API.

Instrumentation is divided into a number of domains (DOM, Debugger, Network etc.). Each domain defines a number of commands it supports and events it generates. Both commands and events are serialized JSON objects of a fixed structure.

Protocol API Docs

The latest (tip-of-tree) protocol (tot) — It changes frequently and can break at any time. However it captures the full capabilities of the Protocol, whereas the stable release is a subset. There is no backwards compatibility support guaranteed for the capabilities it introduces.

v8-inspector protocol (v8) — It is available in node 6.3+ and enables debugging & profiling of Node.js apps.

stable 1.3 protocol (1-3) — The stable release of the protocol, tagged at Chrome 64. It includes a smaller subset of the complete protocol compatibilities.

stable 1.2 protocol (1-2) — The stable release of the protocol, tagged at Chrome 54. It includes a smaller subset of the complete protocol compatibilities.

Resources

Getting Started with CDP

The devtools-protocol repo issue tracker can also be used for concerns with the protocol. It also hosts the canonical copy of the json files.

(new report)

Generate a Lighthouse report   **Analyze page load**

Legacy navigation   ☑ Clear storage   ☐ Simulated throttling   Learn more

Mode Learn more   Device
● Navigation (Default)   ○ Mobile
○ Timespan   ● Desktop
○ Snapshot

Categories
☑ Performance
☑ Accessibility
☑ Best practices
☑ SEO
☑ Progressive Web App

Plugins
☐ Publisher Ads

Query results

⬇ SAVE RESULTS   📈 EXPLORE DATA ▾

Query complete (2.5 sec elapsed, 1.2 GB processed)

Job information   **Results**   JSON   Execution details

Row	page_path	debug_target	CLS	count
1	/Google+Redesign/Clearance	body#category>footer.page-footer.center-on-small-only	2.162	182
2	/Google+Redesign/Lifestyle	body#category>footer.page-footer.center-on-small-only	1.911	201
3	/Google+Redesign/Apparel	body#category>footer.page-footer.center-on-small-only	0.965	372
4	/Google+Redesign/Apparel/Mens	body#category>footer.page-footer.center-on-small-only	0.694	261
5	/Google+Redesign/Stationery	body#category>footer.page-footer.center-on-small-only	0.694	169
6	/Google+Redesign/Lifestyle/Bags	body#category>footer.page-footer.center-on-small-only	0.643	153
7	/Google+Redesign/Apparel/Mens/Mens+T+Shirts	body#category>footer.page-footer.center-on-small-only	0.627	153
8	/store.html	body#category>footer.page-footer.center-on-small-only	0.555	391
9	/	ul#slide-out	0.501	531
10	/Google+Redesign/Apparel/Mens/Mens+T+Shirts	ul#slide-out	0.482	139
11	/Google+Redesign/Shop+by+Brand/YouTube	ul#slide-out	0.065	249
12	/Google+Redesign/Shop+by+Brand/YouTube	body#category>footer.page-footer.center-on-small-only	0.046	327
13	/signin.html	div.row-1.row>div.col-md-10.col-md-offset-1>div.col-xs-12.col-sm-6.col-lg-6>div.card.col-xs-12.row	0.024	183
14	/	div.warning.alert.z-depth-1.info-color-dark>p.text-center>#text	0.004	154

Lab: Correlation with TBT and main thread blocking JS

- [Colab](#) comparing CrUX (field) with HttpArchive + Lighthouse (lab) results
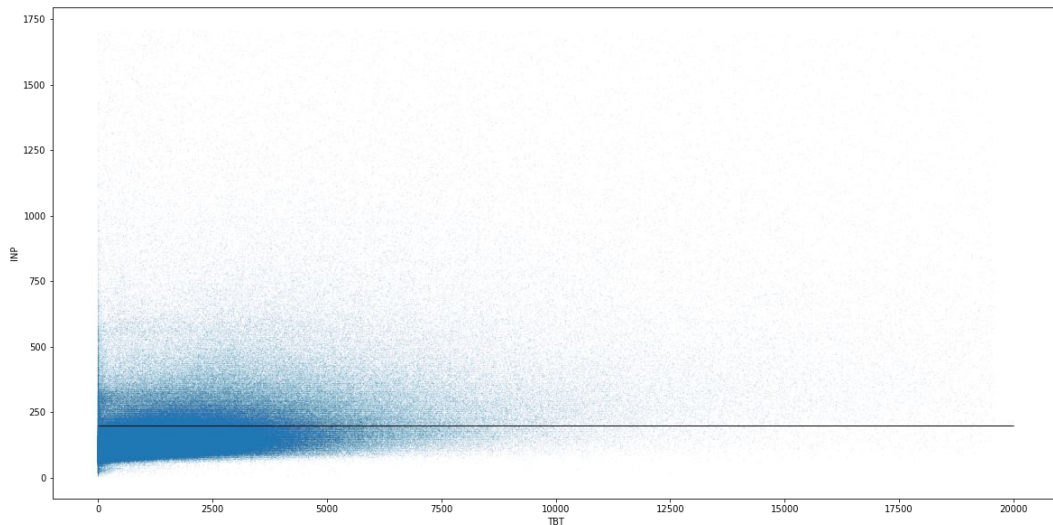
Sync vs Async feedback

Letters typed: audi r8

All sections ⌄   audi r   🔍

Updates

audi*... (1165)
"audi" (1121)
Audi Quattro (491)
Audi R8 (215)
Audi A4 (71)
Audi R10 (40)
Audi 80 (39)
Painting (Lacquer) | audi* (34)
Audi 200 | audi* (31)

Tim Vereecke
@TimVereecke

#INP is maybe not what you expect it to be!
Take this autocomplete example:

The page responds to user input as soon as the keystroke is painted in the <input> field.

The latency to fetch+paint the suggestions are not taken into account for INP!
#webperf

10:41 AM · May 16, 2022 · Twitter Web App

Letters typed: **audi r8**

| All sections ⌄ | audi r | 🔍 |

s | Updates

audi*... (1165)

"**audi**" (1121)

Audi Quattro (491)

Audi R8 (215)

Audi A4 (71)

Audi R10 (40)

Audi 80 (39)

Painting (Lacquer) | **audi*** (34)

Audi 200 | **audi*** (31)

Michal Mo... @mmo... · May 16 ···
Replying to @TimVereecke
That's a great example.

You are right, INP won't measure the time for autocomplete to update- just that first text update to the input field. If you blocked the text update on autocomplete, it would tank INP.

In this case we consider that a desirable effect. How about you?

💬 1   🔁   ♡ 3   ⬆   📊

Tim Vere... @TimVere... · May 16 ···
Yes I agree, it is a desirable effect for INP.

💬   🔁   ❤️ 2   ⬆

Dan Shap... @DanSh... · May 17 ···
Replying to @TimVereecke
It's exactly what I expected. But maybe I'm funny that way 🤷

💬   🔁   ❤️ 3   ⬆

SPA measurement effects

► Animation

▼ Timings

DCL

Next.js-before-hydration | Next.js-hydration

Experience | Layout Shift

▼ Main — https://demo.vercel.store/

Task | Task

Ev...t | Evaluate Script | Eva...pt | Ru...s
(a...s) | Run Microtasks | Ru...ks
t | R...
(a...s) | u | u
n.O | (...) | (...
(a...) | (...) | (...
n | (...) | (...
6932 | h | h
n | (...) | (...
4...8 | No | No
n | fi | fi
HI | HI
QI | QI
$I | $I
t... | t...
(...) | (...
vi | vi
Oi | Oi
$I | $I

Summary | Bottom-Up | Call Tree | Event Log

■ Task

Warning Long task took 1.39 s.

Total Time 1.39 s

Self Time 9.83 ms

▼ Timings

DCL

Next.js–before–hydration   Next.js–hydration   [Web Vita...nterdown)
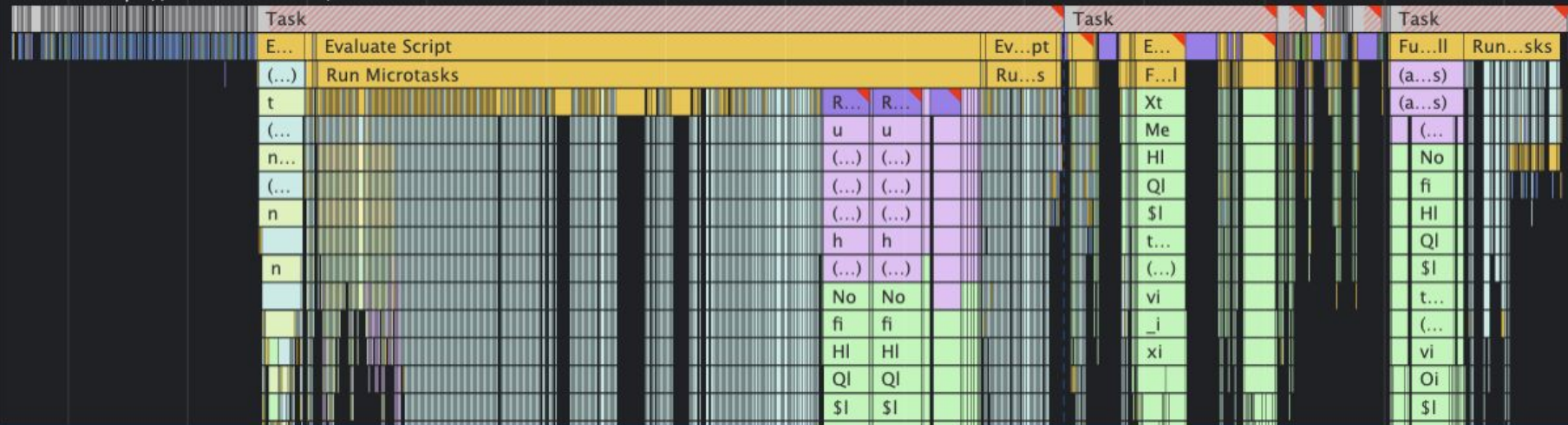
[Web Vitals Extension] FID (pointerdown)

[Web Vitals] INP.duration (pointerdown)

[Web Vitals] INP.inputDelay (pointerdown)

Experience   Layout Shift

▼ Main — https://demo.vercel.store/

Task   Task   Task

E...   Evaluate Script   Ev...pt   E...   Fu...ll   Run...sks

(...)   Run Microtasks   Ru...s   F...l   (a...s)

t   Xt   (a...s)

(...   u   u   Me   (...

n...   (...)   (...)   Hl   No

(...   (...)   (...)   Ql   fi

n   (...)   (...) $l   Hl

h   h   t...   Ql

n   (...)   (...)   (...) $l

No   No   vi   t...

fi   fi   _i   (...

Hl   Hl   xi   vi

Ql   Ql   Oi

$l $l $l

Summary   Bottom-Up   Call Tree   Event Log

■ [Web Vitals] INP.duration (pointerdown)

Total Time   4.10 s

Self Time   0

Other effects

Good:
- Measures real effects, not an artificial score
- Doesn't grow over time (unless responsiveness tanks over time)

It's complicated:
- Route transitions measured as interactions, not navigations
- Longer time on page

Not so good:
- "Bleed" across routes
- Fewer Page Loads