Vitals

- Web Vitals

Web Vitals

{% Aside %} **New:** Interaction to Next Paint (INP) is no longer experimental! Learn more about our plans to replace FID with INP as a Core Web Vital in March 2024. {% endAside %}

Optimizing for quality of user experience is key to the long-term success of any site on the web. Whether you're a business owner, marketer, or developer, Web Vitals can help you quantify the experience of your site and identify opportunities to improve.

Overview

Web Vitals is an initiative by Google to provide unified guidance for quality signals that are essential to delivering a great user experience on the web.

Google has provided a number of tools over the years to measure and report on performance. Some developers are experts at using these tools, while others have found the abundance of both tools and metrics challenging to keep up with.

Site owners should not have to be performance experts to understand the quality of experience they are delivering to their users. The Web Vitals initiative aims to simplify the landscape, and help sites focus on the metrics that matter most, the **Core Web Vitals**.

Core Web Vitals

Core Web Vitals are the subset of Web Vitals that apply to all web pages, should be measured by all site owners, and will be surfaced across all Google tools. Each of the Core Web Vitals represents a distinct facet of the user experience, is measurable in the field, and reflects the real-world experience of a critical user-centric outcome.

The metrics that make up Core Web Vitals will evolve over time. The current set for 2020 focuses on three aspects of the user experience—*loading*, *interactivity*, and *visual stability*—and includes the following metrics (and their respective thresholds):

{% Img src="image/tcFciHGuF3MxnTr1y5ue01OGLBn2/ZZU8Z7TMKXmzZT2mCjJU.svg", alt="Largest Contentful Paint threshold recommendations", width="400", height="350" %} {% Img src="image/tcFciHGuF3MxnTr1y5ue01OGLBn2/iHYrrXKe4QRcb2uu8eV8.svg", alt="First Input Delay threshold recommendations", width="400", height="350" %} {% Img src="image/tcFciHGuF3MxnTr1y5ue01OGLBn2/dgpDFckbHwwOKdIGDa3N.svg", alt="Cumulative

Layout Shift threshold recommendations", width="400", height="350" %}

- **Largest Contentful Paint (LCP)**: measures *loading* performance. To provide a good user experience, LCP should occur within **2.5 seconds** of when the page first starts loading.
- **First Input Delay (FID)**: measures *interactivity*. To provide a good user experience, pages should have a FID of **100 milliseconds** or less.
- **Cumulative Layout Shift (CLS)**: measures *visual stability*. To provide a good user experience, pages should maintain a CLS of **0.1.** or less.

For each of the above metrics, to ensure you're hitting the recommended target for most of your users, a good threshold to measure is the **75th percentile** of page loads, segmented across mobile and desktop devices.

Tools that assess Core Web Vitals compliance should consider a page passing if it meets the recommended targets at the 75th percentile for all of the above three metrics.

{% Aside %} To learn more about the research and methodology behind these recommendations, see: Defining the Core Web Vitals metrics thresholds {% endAside %}

Lifecycle

Metrics on the Core Web Vitals track go through a lifecycle consisting of three phases: experimental, pending, and stable.

> {% Img src="image/jL3OLOhcWUQDnR4XjewLBx4e3PC3/gCO4TElL05PwDZJiu3r9.svg", alt="The three lifecycle phases of Core Web Vitals metrics, visualized as a series of three chevrons. From left to right, the phases are Experimental, Pending, and Stable.", style="background-color: transparent; min-width: 100%; height: auto;", width="300", height="31" %}

The table below reflects where all Core Web Vitals currently are in their lifecycle:

INP LCP

CLS

FID

Each phase is designed to signal to developers how they should think about each metric:

- **Experimental metrics** are prospective Core Web Vitals that may still be undergoing significant changes depending on testing and community feedback.
- **Pending metrics** are future Core Web Vitals that have passed the testing and feedback stage and have a well-defined timeline to becoming stable.

- **Stable metrics** are the current set of Core Web Vitals that Chrome considers essential for great user experiences.

Experimental

When a metric is initially developed and enters the ecosystem, it is considered an *experimental metric*.

The purpose of the experimental phase is to assess a metric's fitness, first by exploring the problem to be solved, and possibly iterate on what previous metrics may have failed to address. For example, Interaction to Next Paint (INP) was initially developed as an experimental metric to address the runtime performance issues present on the web more comprehensively than First Input Delay (FID).

The experimental phase of Core Web Vitals lifecycle is also intended to give flexibility in a metric's development by identifying bugs and even exploring changes to its initial definition. It's also the phase in which community feedback is most important.

Pending

When the Chrome team determines that an experimental metric has received sufficient feedback and proven its efficacy, it becomes a *pending metric*. Pending metrics are held in this phase for a minimum of six months to give the ecosystem time to adapt. The only remaining hurdle for a metric to advance beyond the pending phase is to wait out the transition period. Community feedback remains an important aspect of this phase, as more developers begin to use the metric.

Stable

When a Core Web Vital candidate metric is finalized, it becomes a *stable metric*—for metrics that are on the Core Web Vitals track, this means the metric becomes a Core Web Vital.

Stable metrics are actively supported, and may be subject to bug fixes and definition changes. Stable Core Web Vitals metrics won't change more than once per year. Any change to a Core Web Vital will be clearly communicated in the metric's official documentation, as well as in the metric's CHANGELOG. Core Web Vitals are also included in any assessments.

{% Aside 'important' %} Metrics that are stable are not necessarily permanent. While stable metrics are long-lived, a stable metric can be retired and replaced by another metric if it addresses the problem area more effectively. {% endAside %}

Tools to measure and report Core Web Vitals

Google believes that the Core Web Vitals are critical to all web experiences. As a result, it is committed to surfacing these metrics in all of its popular tools. The following sections details which tools support the Core Web Vitals.

Field tools to measure Core Web Vitals

The Chrome User Experience Report collects anonymized, real user measurement data for each Core Web Vital. This data enables site owners to quickly assess their performance without requiring them to manually instrument analytics on their pages, and powers tools like PageSpeed Insights, and Search Console's Core Web Vitals report.

	LCP	FID	CLS
Chrome User Experience Report	✔	✔	✔
PageSpeed Insights	✔	✔	✔
Search Console (Core Web Vitals report)	✔	✔	✔

{% Aside %} For guidance on how to use these tools, and which tool is right for your use case, see: Getting started with measuring Web Vitals {% endAside %}

The data provided by Chrome User Experience Report offers a quick way to assess the performance of sites, but it does not provide the detailed, per-pageview telemetry that is often necessary to accurately diagnose, monitor, and quickly react to regressions. As a result, we strongly recommend that sites set up their own real-user monitoring.

Measure Core Web Vitals in JavaScript

Each of the Core Web Vitals can be measured in JavaScript using standard web APIs.

{% Aside %} Note that the Core Web Vitals measured in JavaScript using public APIs may differ from the Core Web Vitals reported by CrUX. Read this article for more info. {% endAside %}

The easiest way to measure all the Core Web Vitals is to use the web-vitals JavaScript library, a small, production-ready wrapper around the underlying web APIs that measures each metric in a way that accurately matches how they're reported by all the Google tools listed above.

With the web-vitals library, measuring each metric is as simple as calling a single function (see the documentation for complete usage and API details):

```
import {onCLS, onFID, onLCP} from 'web-vitals';

function sendToAnalytics(metric) {
  const body = JSON.stringify(metric);
  // Use `navigator.sendBeacon()` if available, falling back to `fetch()`.
  (navigator.sendBeacon && navigator.sendBeacon('/analytics', body)) ||
    fetch('/analytics', {body, method: 'POST', keepalive: true});
}

onCLS(sendToAnalytics);
onFID(sendToAnalytics);
onLCP(sendToAnalytics);
```

Once you've configured your site to use the web-vitals library to measure and send your Core Web Vitals data to an analytics endpoint, the next step is to aggregate and report on that data to see if your pages are meeting the recommended thresholds for at least 75% of page visits.

While some analytics providers have built-in support for Core Web Vitals metrics, even those that don't should include basic custom metric features that allow you to measure Core Web Vitals in their tool.

One example of this is the Web Vitals Report, which allows site owners to measure their Core Web Vitals using Google Analytics. For guidance on measuring Core Web Vitals using other analytics tools, see Best practices for measuring Web Vitals in the field.

You can also report on each of the Core Web Vitals without writing any code using the Web Vitals Chrome Extension. This extension uses the web-vitals library to measure each of these metrics and display them to users as they browse the web.

This extension can be helpful in understanding the performance of your own sites, your competitor's sites, and the web at large.

	LCP	FID	CLS
web-vitals	✔	✔	✔
Web Vitals Extension	✔	✔	✔

Alternatively, developers who prefer to measure these metrics directly via the underlying web APIs can refer to these metric guides for implementation details:

- Measure LCP in JavaScript

- Measure FID in JavaScript
- Measure CLS in JavaScript

{% Aside %} For additional guidance on how to measure these metrics using popular analytics services (or your own in-house analytics tools), see: Best practices for measuring Web Vitals in the field {% endAside %}

Lab tools to measure Core Web Vitals

While all of the Core Web Vitals are, first and foremost, field metrics, many of them are also measurable in the lab.

Lab measurement is the best way to test the performance of features during development—before they've been released to users. It's also the best way to catch performance regressions before they happen.

The following tools can be used to measure the Core Web Vitals in a lab environment:

	LCP	FID	CLS
Chrome DevTools	✔	✘ (use TBT instead)	✔
Lighthouse	✔	✘ (use TBT instead)	✔

{% Aside %} Tools like Lighthouse that load pages in a simulated environment without a user cannot measure FID (there is no user input). However, the Total Blocking Time (TBT) metric is lab-measurable and is an excellent proxy for FID. Performance optimizations that improve TBT in the lab should improve FID in the field (see performance recommendations below). {% endAside %}

While lab measurement is an essential part of delivering great experiences, it is not a substitute for field measurement.

The performance of a site can vary dramatically based on a user's device capabilities, their network conditions, what other processes may be running on the device, and how they're interacting with the page. In fact, each of the Core Web Vitals metrics can have its score affected by user interaction. Only field measurement can accurately capture the complete picture.

Recommendations for improving your scores

Once you've measured the Core Web Vitals and identified areas for improvement, the next step is to optimize. The following guides offer specific recommendations for how to optimize your pages for each of the Core Web Vitals:

- Optimize LCP
- Optimize FID
- Optimize CLS

Other Web Vitals

While the Core Web Vitals are the critical metrics for understanding and delivering a great user experience, there are other vital metrics as well.

These other Web Vitals often serve as proxy or supplemental metrics for the Core Web Vitals, to help capture a larger part of the experience or to aid in diagnosing a specific issue.

For example, the metrics Time to First Byte (TTFB) and First Contentful Paint (FCP) are both vital aspects of the *loading* experience, and are both useful in diagnosing issues with LCP (slow server response times or render-blocking resources, respectively).

Similarly, metrics like Total Blocking Time (TBT) and Time to Interactive (TTI) are lab metrics that are vital in catching and diagnosing potential *interactivity* issues that will impact FID. However, they are not part of the Core Web Vitals set because they are not field-measurable, nor do they reflect a user-centric outcome.

Evolving Web Vitals

Web Vitals and Core Web Vitals represent the best available signals developers have today to measure quality of experience across the web, but these signals are not perfect and future improvements or additions should be expected.

The **Core Web Vitals** are relevant to all web pages and featured across relevant Google tools. Changes to these metrics will have wide-reaching impact; as such, developers should expect the definitions and thresholds of the Core Web Vitals to be stable, and updates to have prior notice and a predictable, annual cadence.

The other Web Vitals are often context or tool specific, and may be more experimental than the Core Web Vitals. As such, their definitions and thresholds may change with greater frequency.

For all Web Vitals, changes will be clearly documented in this public CHANGELOG.