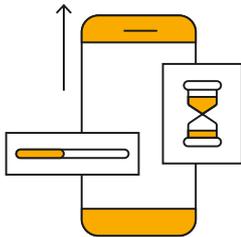
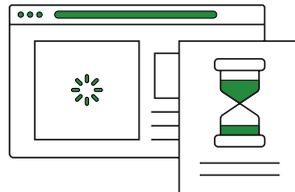




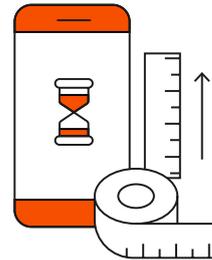
Mobile Site Speed Playbook



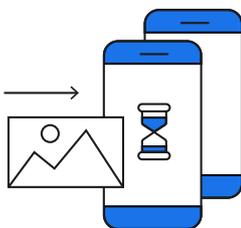
Why Speed matters?



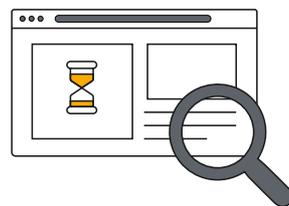
What is Speed?



How to measure Speed?



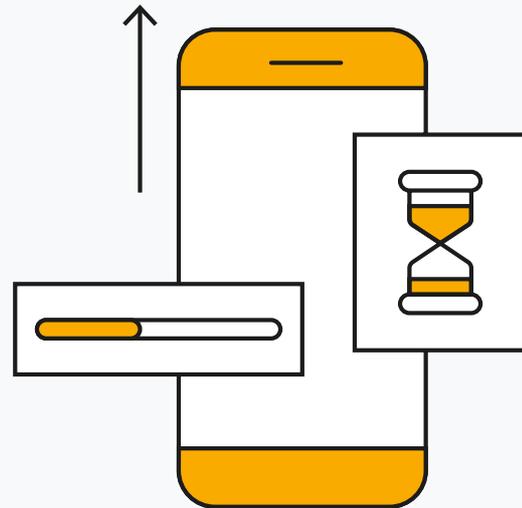
How to improve Speed?



How to stay fast?

01.

Why Speed matters?



Consumers increasingly rely on mobile to access digital content and services, and if you look at your site analytics, you'll probably see this story playing out in your own data. Consumers are also more demanding than they've ever been, and when they weigh up the experience on your site, they aren't just comparing you with your competitors, they're rating you against the best in class services they use every day.

When it comes to user experience, speed matters. A [consumer study](#) shows that the stress response to delays in mobile speed are similar to that of watching a horror movie or solving a mathematical problem, and greater than waiting in a checkout line at a retail store¹. And delays caused by mobile speed aren't just frustrating, they can also have a negative impact on business results. For example, we have seen that a one-second delay in mobile load times can impact conversion rates [by up to 20%](#)².

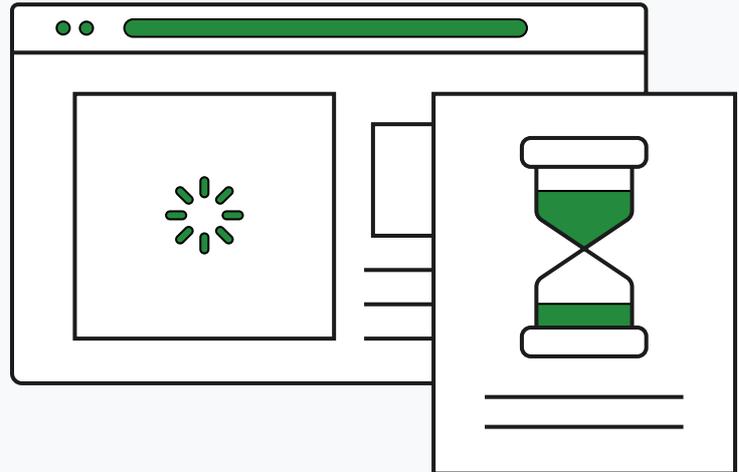
Many brands are already investing in mobile speed and achieving great results. In just [one example](#), retailer Furniture Village audited their site speed and developed a plan to address the problems they found, leading to a 20% reduction in page load time and a 10% increase in conversion rate.

“Performance has directly impacted the company’s bottom line”

[Pinterest](#)

02.

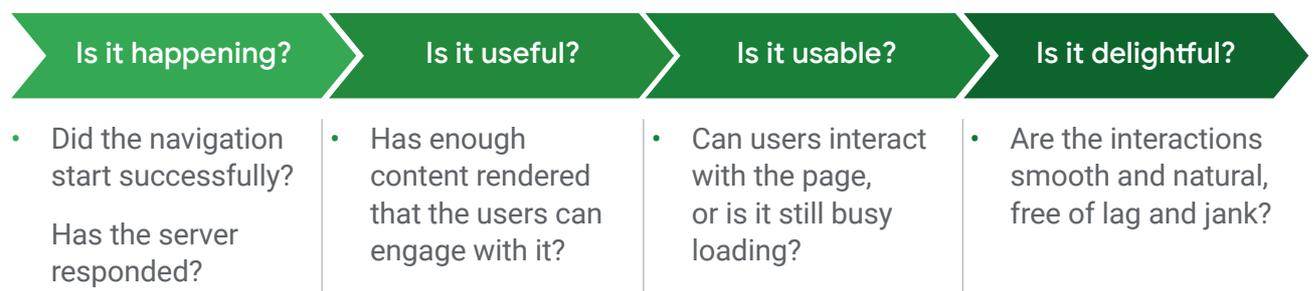
What is Speed?



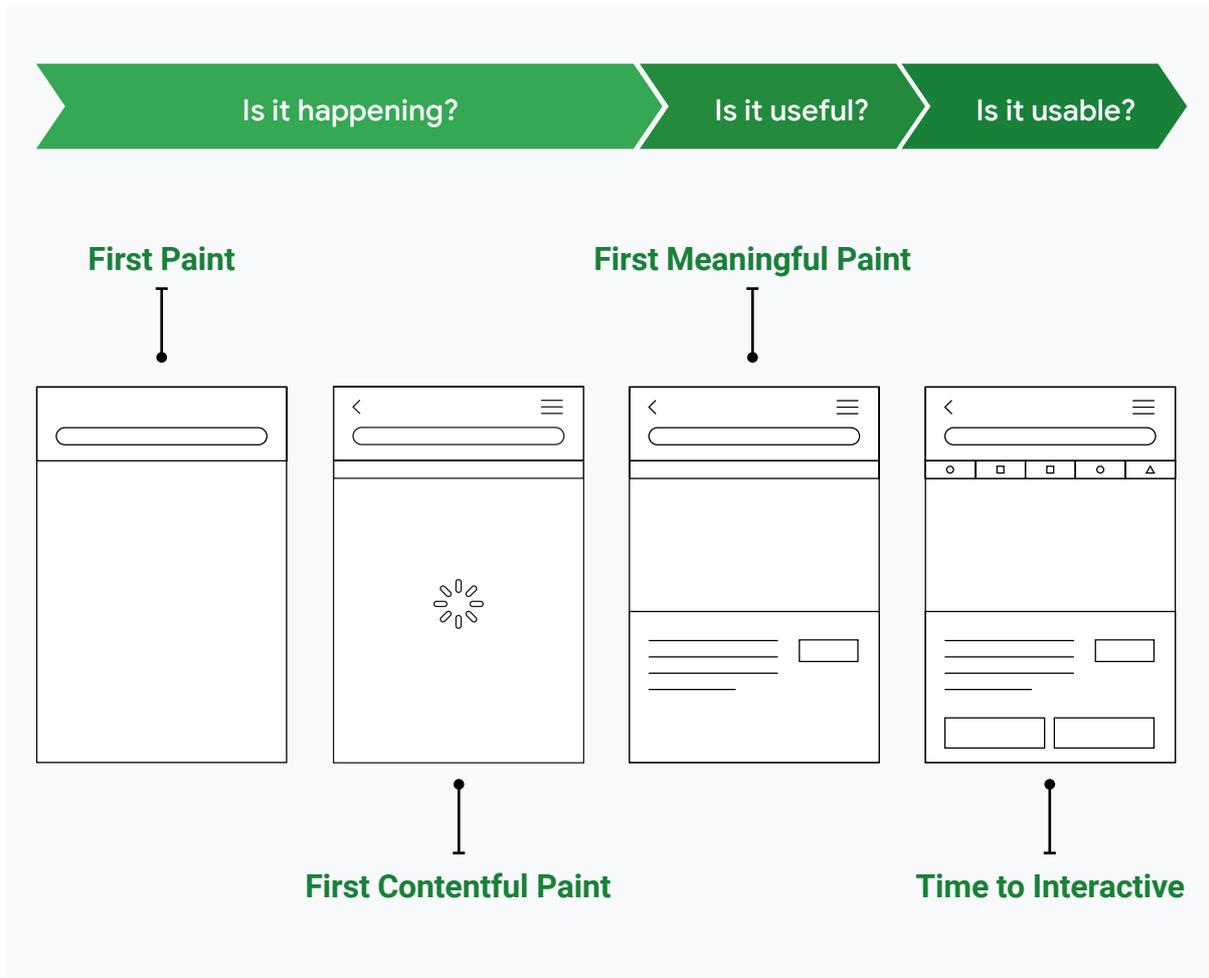
So, speed matters, but what exactly do we mean by it? What does it mean to have a fast site?

It's common to hear people talk in terms of their website loading in x.xx seconds or similar, but a **load is not a single moment in time** - it's an experience that no single metric can fully capture. There are multiple moments during the load experience that can affect whether a user perceives it as 'fast', and if you just focus solely on one, you might miss bad experiences that happen during the rest of the time.

Rather than measuring load with just one metric, you should time each moment during the experience that affects the user's perception of load speed. When a user navigates to a web page, they're typically looking for certain types of feedback:



Traditional performance metrics like load time or DOMContentLoaded time are unreliable, since their occurrence may or may not correspond with these feedback milestones. So, additional metrics have emerged that could be used to understand when a page delivers this feedback to its users.

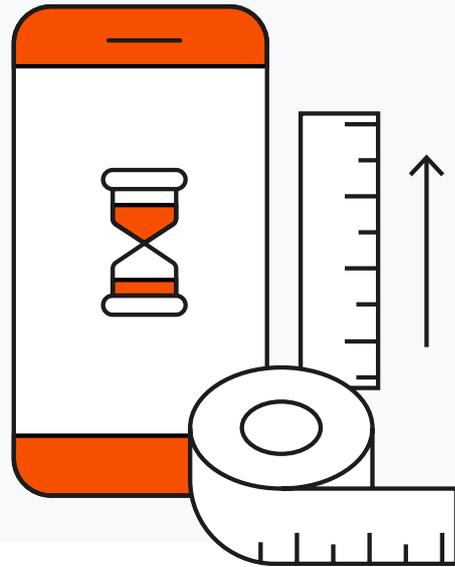


It's important to understand the different insights offered by these metrics, then establish the ones that are important to your user experience. Some brands even define additional custom metrics specific to the expectations people have of their service. In the case of Pinterest, users want to see images, so they defined a custom metric, [Pinner Wait Time](#), that combines Time to Interactive and Above the Fold Image load times.

Even though the load is more than one moment in time, it can still be useful to have a single metric for the purposes of simplified reporting or comparison: [SpeedIndex](#) and [Lighthouse score](#) can both be used in this way.

03.

How to measure Speed?



Real-world performance is highly variable due to differences in users' devices, network connections, and other factors. For example, if you load your website using a cable network connection in your office and compare it against the load using WiFi in a coffee shop, the experiences are likely to be very different. There are many tools on the market that can help you collect lab or field data to assess page performance.

Lab data vs Field data

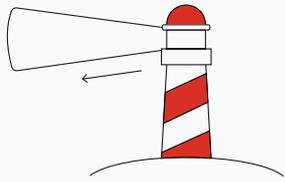
Lab data is performance data collected within a controlled environment with predefined device and network settings, while **Field data** is performance data collected from real page loads experienced by your users in the wild. Each type has its own strengths and limitations.

Lab data offers reproducible results and a debugging environment, but might not capture real-world bottlenecks and cannot correlate against real-world page KPIs. With lab data, you need to understand your users' typical devices and networks and appropriately mirror those conditions when you test performance. Have in mind that even in areas with 4G, users may still experience slower or intermittent connections when in elevators, while commuting, or in comparable environments.

Field data (also called Real User Monitoring or RUM) captures true real-world user experience and enables correlation to business KPIs, but has a restricted set of metrics and limited debugging capabilities.

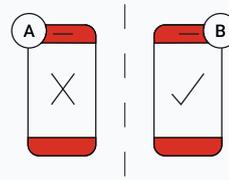
Tools

Lab Data



Lighthouse takes a URL and runs a series of audits against the page, generating a report on how well the page did. There are multiple ways to run Lighthouse, including an option to easily audit a page from within Chrome DevTools.

Lab Data



WebPageTest allows you to compare the performance of one or more pages in a controlled lab environment, deep-dive into performance stats and test performance on a real device. You can also run Lighthouse from WebPageTest.

Field Data



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

Other Tools



Page Speed Insights provides both lab and field data about a page. It uses Lighthouse to collect and analyze lab data about the page, while real-world field data is based on the Chrome User Experience Report dataset.

Other Tools



TestMySite informs website owners about their mobile speed, business impact, and potential solutions.

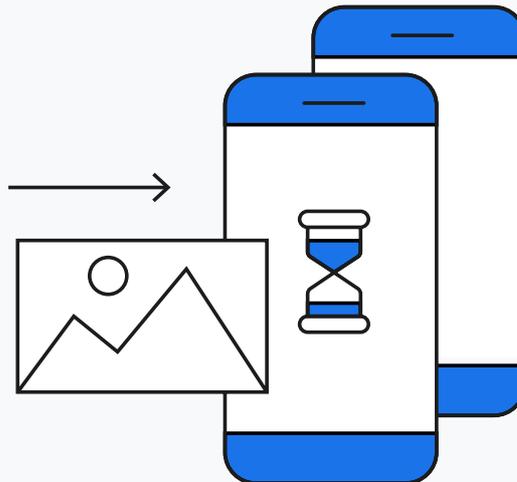
Other Tools



Chrome Developer Tools is a set of web developer tools built directly into the Google Chrome browser. It allows you to profile the runtime of a page, as well as identify and debug performance bottlenecks.

04.

How to improve Speed?



Speed Optimizations

Hopefully you've now made it your mission to improve your page speed - but how do you go about speeding up?

The metrics we want to move are influenced by multiple factors, many of which can be improved by implementing best practices. Tools like Lighthouse are a good starting point: along with a score for each metric, they also provide a list of potential speed-enhancement opportunities, such as optimizing images or JavaScript.

	Opportunity	Estimated Savings
1	Properly size images	 1.54s 
2	Eliminate render-blocking resources	 1.41s 
3	Serve images in next-gen formats	 0.9s 
4	Minify JavaScript	 0.61s 
5	Defer unused CSS	 0.3s 
6	Enable text compression	 0.3s 

[Web.dev](#) is another resource for developers that contains actionable guidance and analysis.

AMP

Another way to speed up and stay fast is [AMP](#). AMP is an open-source library that provides a straightforward way to create web pages that load near-instantaneously for users.

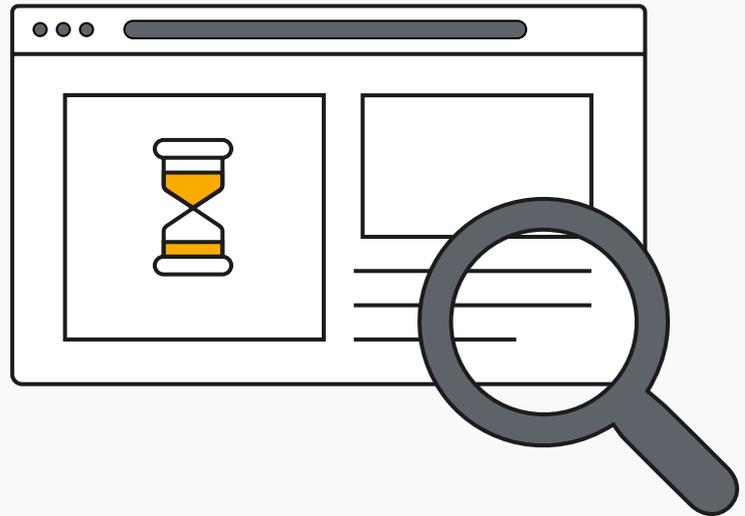
AMP by itself is very fast, but it can also speed up your website on additional levels through caching in the AMP Caches and by pre-rendering. You can find more details about this and a method that could be used to measure AMP performance [here](#).

You can also use AMP with Google Ads. Combining speed and smoother loading, AMP landing pages can provide a better landing page experience, which is an important factor in your Quality Score. Two different ways of A/B testing AMP campaigns are described [here](#).

If you're ready to start building an AMP page, the [AMP documentation](#) contains a step-by-step guide, or you can visit the [AMP conversion documentation](#), where you'll find information on key concepts and how AMP documents differ from traditional HTML. AMP supports integration with many third-party publishing platforms, with individual details on the [AMP CMS compatibility list](#).

05.

How to stay fast?



Brands that optimize speed will often find they regress quickly. This is because website performance is a lot like getting fit: it's not enough to make a one time effort - you have to change your lifestyle.

Performance budgets are one way to address this. A performance budget is a set of limits on metrics that affect site performance. The concept is similar to a financial budget - you set a limit and make sure you stay within it. In general, a good performance budget combines different types of metrics; so, for example, the performance budget for a product page might look as follows:

Time to Interactive (TTI) on slow 3G	<	5 seconds
First Contentful Paint (FCP) on slow 3G	<	2 seconds
Lighthouse Performance score	>	80
Size of JavaScript	<	170kb

Once set, a performance budget has to be enforced, which means for example incorporating the budget into your build process and reporting. Tools like Lighthouse can be included in your continuous integration, and you can write tests that fail a build if key metrics drop below a set threshold. Additionally, regular reporting through dashboards or summary reports can help with visibility and accountability. [Pinterest](#) are one example of a business that have implemented performance budgets to make sure their fast experience stays fast, while brands like [Experian](#) are now using site speed as a key metric in their monthly executive KPI reports.

You can find more details on performance budgets [here](#).

Sources:

1. Ericsson Mobility Report
<https://www.ericsson.com/en/press-releases/2016/2/streaming-delays-mentally-taxing-for-smartphone-users-ericsson-mobility-report>
2. Think with Google:
Milliseconds earn millions: Why mobile speed can slow or grow your business
<https://www.thinkwithgoogle.com/intl/en-gb/advertising-channels/mobile/milliseconds-earn-millions-why-mobile-speed-can-slow-or-grow-your-business/>