conductor

An In-Depth Guide to Website Performance Optimization

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What is Website Performance?

Website performance optimization is the process of improving the back- and front-end of your website so that it loads quickly and properly on any device. Sometimes, website performance can get lumped in with the idea of website speed.

But website speed doesn't quite cover everything that website performance covers. After all, a good website user experience isn't just about the site loading quickly. If a page loads quickly but in a format that isn't optimized for mobile, then that's a poor user experience. And poor user experiences make for poor Google rankings, poor traffic, and poor engagement. In other words, if your website performance isn't optimized, you're leaving traffic, conversions, and ROI on the table.

Without further ado, let's talk about some actionable strategies you can employ to optimize your website performance. To begin, we'll cover some high-impact strategies.

High-impact website performance optimization strategies

1. Use a Content Delivery Network

Traditional web hosting can often be a hurdle to optimizing website performance. That's why many companies choose to employ a CDN as well. Essentially, a CDN helps to improve website performance by caching closer to end users. Traditionally, web hosts only offer users a single server location to pull content from. By contrast, CDNs use a series of servers across multiple geographic locations. This means that a CDN essentially reduces the amount of time you'll need to transport data across large distances.

You should also note that a CDN is not the same thing as, nor will it replace, a traditional web host.

Some benefits of using a CDN include:

- **Improving website load times:** If you're using a CDN, then your content is housed on multiple servers across the world. This means that users in different areas are geographically closer to a server with your content. Therefore, that content will likely load more quickly than if your content is housed on a single server, transporting insights across large distances.
- **Reducing web hosting costs:** A major expense associated with websites is bandwidth consumption costs. These costs also tend to rise the more content that you host on a specific server, but what's more important is the number of site visitors. A CDN, by breaking out the content across multiple servers rather than relying on one, is able to reduce the burden and spread traffic across different servers, causing the entire site to perform better.
- **Makes content more readily available:** Have you ever had so many people on your site that the server can't take it, and your site crashes? That kind of traffic doesn't sound all bad, actually, except for the website crashing part. That said, because of the decentralized nature of a CDN, it can handle more traffic than a single web host. With a CDN, your content is housed across multiple servers rather than putting the burden on one.
- **Boost website security:** CDNs help you protect your site and server by spreading your content across multiple different servers. This has the benefit of protecting the origin server. CDNs can also absorb large amounts of traffic, even from DDoS attacks, which can keep websites online. Instead of your website becoming unavailable, it redirects the traffic to functional edge servers.

In short, a CDN helps you create a more efficient method of hosting your content. Some of the top CDNs on the market include **Cloudflare**, **Akamai**, **Fastly**, **KeyCDN**, and plenty more.

However, one thing that's important to note about CDNs is that while they're very helpful, the actual benefits may vary depending on the size and needs of your website. In addition, CDNs also excel at delivering static content but aren't quite as adept with dynamic content. However, overall, CDNs provide a generally fast and secure content delivery experience.

> *Learn more about content delivery networks:* **Cloudflare**

2. Choose the right web server

Your web server is critical to optimizing your website's performance. After all, your web server is how you deliver content to your users' devices, and it's designed to handle multiple requests simultaneously. The two most common web server options are Apache and nginx. When deciding which one is right for you will depend on your priorities and your level of expertise.

For instance, it's common for beginners to start out by learning Apache because it's generally easy to set up and use. This user-friendly approach makes for a flexible experience that excels at delivering dynamic content, so li your website generates pages on the fly (like a blog or e-commerce site), Apache handles it well out-of-the-box. The trade-off for Apache is that can tend to use more server resources than nginx, especially when handling a lot of visitors at once.

On the other hand, nginx is designed to handle many connections at once and reduce the computing resources needed to do so. That makes nginx especially useful for sites dealing with heavy traffic. This approach also means nginx excels at delivering static content, so if your website has lots of images, videos, or other files that don't change often, nginx delivers them quickly. The trade-off here is that nginx is usually more challenging to learn than Apache.

To summarize, if you're a beginner, creating a personal website and performance isn't top-of-mind for you, then you'll be fine using Apache. But most businesses will be better off using nginx.

3. Hosting

Next up is web hosting. Your web hosting impacts the speed at which your data is transferred from the server to a site visitor. Good web hosting should offer fast speeds, a secure experience, and reliability even when dealing with a lot of traffic. This comes down to a few different considerations, including the location and bandwidth of the server and the type of hosting: dedicated server, VPS, or cloud.

Dedicated servers vs shared servers

Dedicated servers are servers that are dedicated to your site alone. While a shared server has you competing for the same resources with other sites hosted on that server, a dedicated server is all yours, which right off the bat means your site will perform better on a dedicated server than a shared one. Dedicated servers do come at a higher cost, however, than shared servers.

VPS hosting

But that brings us to the middle ground of VPS hosting. VPS stands for Virtual Private Server. If a dedicated server is like renting a private home, and a shared server is living in a hostel, then think of a VPS as living in an apartment building. One server typically holds a dozen websites or more, with each website having a reserved space and an equal share of server resources.

Cloud hosting

Finally, we have cloud hosting. Cloud servers are virtual servers that are housed across multiple different physical machines. To put that in perspective, a dedicated server is a single physical machine that companies can rent to host their site. Cloud hosting is perhaps the most flexible option because it offers a pay-as-you-go model, where you only pay for the server resources you use.

To summarize, cloud hosting is flexible and pay-as-you-go, VPS is renting a dedicated portion of a single server, and a dedicated server is renting the server outright. Hence, it generally has higher costs. No matter which you choose, it will impact website performance, so choose wisely.

Pro tip:

CDNs can enhance traditional web hosting by caching content closer to the end user. For example, a website hosted in the US without a CDN may experience significantly longer loading times for visitors from other countries. A CDN can help minimize these issues by delivering content from servers closer to the user's location.

Learn more about web hosting:
Hostinger

4. HTTP 3.0

HTTP 3.0 is an updated version of HTTP 1.1 that was released in 2022. The goal of the update was to provide a faster experience and allow for seamless network switching. HTTP/3 has minimal loading delay for real-world web pages if enabled on the server and loads faster than HTTP/2, in some cases over three times faster than HTTP/1.1

If you have yet to adopt HTTP 3.0 that could very well be negatively affecting your website performance. If you're still operating with HTTP 1.1 we strongly recommend updating to HTTP 2.0 at the very least.

Learn more about HTTP 3.0
Cloudflare

5. Web caching

Web caching can be divided into two main buckets. There's server-side caching and browser-side caching.

Server caching is the process of temporarily storing a file on a server for later use. Essentially, the first visitor requests a page, the server generates the page, and then stores that final product for future users. Its benefit is that it reduces the immediate burden on the server and uses fewer resources. This is another way that you can help reduce the load you're putting on your server, which will always help your website performance.

A browser cache is similar to a server cache, except it exists on the user's side. When a visitor returns to your site, their browser will display the files it has cached, again reducing the load on your server. As a website owner, you'll need to communicate to the browser that you're using caching in order to leverage this.

> *Learn more about web caching:* **Cloudflare**

6. Enable gzip compression

First things first, a gzip file is a format that is meant to compress website content before it's delivered to a visitor. In fact, gzip compression can reduce the size of a file but 80 percent or even more in some cases, and it's designed to be lossless, so you don't lose any quality when compressing. As you can probably expect, given the other things I've rambled about until now, reducing file sizes is an excellent way to reduce the burden on your server and improve page load speeds. In turn, that's great for your website performance.

You can enable gzip compression on your site in both of the servers we mentioned previously, **Apache** and **nginx**. In addition, you can use gzip compression if you're using a CDN. In fact, many CDNs come with gzip compression capabilities out-of-the-box.

Medium-impact website performance optimization strategies

If you've taken all of the above steps to optimize your website performance and still aren't seeing the improvement you want, you may have to look a bit deeper under the hood. The following are some medium-sized needle movers when it comes to website performance optimization.

1. Avoid render-blocking resources

Render-blocking resources are webpage elements, such as CSS or Javascript files, that can reduce the speed at which content is rendered on your site if certain conditions are met. Since we've talked about website performance factors like Time to First Paint and First Colorful Paint, you can see how having a resource that blocks rendering would be an issue.

Keep an eye out for any resources that are impacting your site's ability to render content quickly. You can check in on any troublesome render-blocking resources in **Google Lighthouse** and take steps to remove them before your site's performance pays the price.

2. Optimize database performance

A website database is a collection of data tables that stores and organizes information for a website. Database performance refers to the speed at which the database can deliver requested information back to an end user.

Some common reasons for sub-par database performance are poor indexing, inefficient queries that could be rewritten to be processed faster, and memory and bandwidth issues. Standardizing the indexation of your database is key to ensuring that users are delivered the data they need quickly. In addition, enabling query caching is a great way to reduce the time it takes to deliver data to users. By caching previous queries, the database doesn't have to work as hard to surface the related information. Beyond this, some general housekeeping and proper data storage can go a long way toward optimizing your database performance.

> *Learn more about optimizing database performance:*
> **Solarwinds**

3. Removing and replacing subpar plug-ins

A plug-in is meant to add functionality to your site without changing the core code. However, sometimes, that can cause increased load times. In fact, a common adage around plug-ins is that less is more. Some plug-ins can help improve your website performance, but others will only make things worse.

Perform an audit of the plug-ins you have running. Are they adding value? Are they having the effect they're meant to? Are you even really using all of them? These are all questions you should ask yourself, as even just a single poor or unused plug-in could be working behind the scenes to drag down your site performance.

Frankly, depending on how much of a mess your plug-ins are, this could be a high-impact optimization opportunity, but let's hope—for your sake—that it's not. Dive through your plug-ins, discard the ones you don't use or aren't providing value, and see if you can replace some with higher-quality alternatives that can actually help improve your website performance.

Low-impact website performance optimization strategies

Last but certainly not least, we have low-impact website performance optimization strategies. Again, low impact does not mean low importance. Everything we're about to discuss can help you optimize your website's performance.

1. DNS

DNS stands for Domain Name System, and it's responsible for turning domain names into IP addresses. If you've ever been glad, you don't have to remember the specific IP address for Amazon.com, you can thank the DNS. DNS can also be used to block dangerous websites, filter certain website categories, and protect against ads. But what impact could the DNS possibly have on your website performance? Great question.

DNS lookup time refers to how long it takes for a DNS to receive a request for a domain's IP and return it to the browser. The faster your DNS lookup time, the faster your site will load for a user.

Pro tip:

DNS is often built directly into CDNs. For example, Cloudflare and Akamai both offer DNS within their platforms.

2. Minify HTML, Javascript, and CSS

Minifying HTML, Javascript, and CSS is the process of moving unnecessary spaces and characters from a file in order to make it load faster. Some factors that get removed include:

- Whitespace characters
- Comments
- Line breaks
- Block delimiters

The goal of minification is to remove the unnecessary noise from a file without impacting the file's core function.

So, minifying your HTML, Javascript, and CSS elements can help you reduce the amount of time they take to load, improving your website's performance. Also keep in mind from earlier that Javascript and CSS files can sometimes work as render-blocking resources, which hinder your site's load times.

3. Compress images

Compressing the images on your website is another great way to improve its performance. When the file is smaller, the site doesn't need to work as hard to load it.

There are three different options for compression: lossy, lossless, and glossy.

- **Lossy compression:** The file size is significantly reduced, but the images lose quality. This is the fastest option for image downloading.
- **Lossless compression:** The file size is moderately decreased, and the images don't lose quality. However, this option won't help you to make images load much faster.
- **Glossy compression:** The happy medium between lossy and lossless compression. This option balances decreased file size and loss of quality.

A great way to compress your images is to leverage a free tool like **Tinypng**, which allows you to compress without losing image quality.

Learn more about image compression:
Adobe

4. Optimize code execution

Streamlining your site's code can help browsers load it faster. But what we're really talking about here is the critical rendering path, which is the series of steps a browser must go through to convert the HTML, CSS, and JavaScript into pixels on the screen. Optimizing your critical render path helps you to improve your site's rendering time and quality, so users can view and interact with your site faster.

For example, optimizing database queries can yield faster search functions, as it takes less time to retrieve results. You can also streamline code to load the most important elements to the user, prioritizing the content that first appears before they scroll.

Learn more about optimizing code execution
Mozilla
Web.dev

5. pre-fetch/pre-connect

DNS prefetching is an attempt to resolve a domain name—translate it into an IP address—before a user follows the link. If the server resolves the domain and the user does navigate to that domain, there will be little to no delay in page loading and little impact on computing and network resources.

Preconnecting is a command that allows the browser to create early connections before an HTTP request is made. For example, you can pre-connect to a URL you're linking to in your content. This communicates to the browser to connect to that URL ahead of time, so the page loads quickly once users follow the link.

Explore more about pre-fetching and pre-connecting
Web.dev
KeyCDN

6. Optimize web fonts

The fonts you choose on your website can have a significant impact on your pages' load and rendering times. Large font files take longer to load, which will hinder First Colorful Paint (FCP) and could cause unwanted layout shifts that contribute to a page's Cumulative Layout Shift (CLS).

Aside from choosing fonts with smaller file sizes, there are a few measures you can take to optimize your web fonts, including:

- Preloading web fonts
- Inline @font-face declarations
- Self-hosting web fonts
- Only use WOFF2—and WOFF2
- Subset your web fonts

Useful resources:
Web.dev

7. Choose image formats wisely

The image format you choose will have a direct impact on the image's load time and quality.

Image Format	Best used for
JPEG (JPG)	Photos
PNG	Logos (as it supports a transparent background) and images that you want to remain sharp, such as screenshots.
GIF	Animations
SVG	To create images that can scale without ever losing quality (vector images). Maps, icons, and logos are common examples.
WebP	Developed by Google, WebP is a better-compressed alternative to JPG and PNG. We believe WebP has a lot of potential and see it as the future of image formats. Use Squoosh to convert images to the WebP format.
AVIF	AVIF is an open image file format that stores images using the AV1 video compression standard. It's supported by all major web browsers.

When it comes to website performance, SVG and WebP are especially important to consider. Both formats try to compress images without reducing the quality of the image itself. To that end, using high-quality compressed images and logos on your site will help your site load more quickly and perform better overall.

8. Serve the right image sizes

This is especially important when considering mobile vs desktop users. Serving an image at an incorrect size for a user's experience can cause reduced loading speeds, and incorrectly shifted pages, causing a poor user experience, and hindering your site's performance.

The good news is that you can define which versions of an image will be used for different devices and viewports using the ***srcset*** attribute.

> *Useful resources:*
> **Conductor**

9. Lazy-load images

Lazy-loading is the process of waiting to load certain portions of your site—images in this case—until they're needed, rather than loading everything at once. When lazy-loading, the browser will only request certain files once the user interacts with them. This saves time and computing power, helping you to boost your page load speed, and overall performance.

You can implement lazy loading by leveraging the **loading="lazy"** command within the code of your website.

> *Useful resources:*
> **Cloudflare**

10. Minimize redirects

The HTTP redirect code, or redirect for short, forwards visitors and search engines from one URL to another. Redirects are often used when moving content around but want a piece to still hold value. While they can be helpful in certain situations, it's best to avoid using redirects as much as possible because they cause webpages to load slower and can make for poor UX.

Too many redirects can quickly form redirect chains or loops, which can cause users and search engines to circle around when trying to navigate your site. So minimizing your redirects is critical when it comes to optimizing your site performance and UX.

Worried your site has excessive redirects? Find out for sure with a free trial of Conductor Website Monitoring, and get recommendations to improve that are prioritized by impact.

Website Performance Optimization in review

These methods to optimize your website performance are by no means exhaustive. There are countless things that you can do to improve how your website performs. But by following these steps, you're making clear progress towards speeding up your website's load and render times and creating a smoother user experience for site visitors and search engine crawlers.

All totaled, cleaning up your website performance will have a huge impact on your ability to drive traffic, engagement, and conversions.