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CMSI3550

11 April 2023

How to Fix Your Internet - Why Chrome takes up so much CPU

*Abstract*

I decided to look into why Chrome takes up so much GPU because I use a Macbook, and my fan often runs pretty loud so it's pretty noticeable when my computer is struggling. A lot of people have observed that Chrome eats up a lot of CPU and can be a big factor in slowing your computer down. The reason for this is that Chrome is optimized for speed, not performance. The main focus of this paper will be explaining how Google Chrome works, sources that can contribute a lot to this CPU usage, and how to minimize it.

*General processes*

Chrome is a process-based system. Every time you open a new tab, it creates a process and runs it in the background. Multiple of these can be running at once with threads to help them work. Chrome’s overseer process is called the browser process that manages all windows, UI, and processes whenever you start it. The OS allocates some space for the process to use in some private memory space. Processes Chrome makes can be used to render web pages, manage extensions, and handle user input.

*Other processes*

Besides the Brower process, there are a few main processes that deal with specific tasks. Every time a new tab is opened, Chrome creates a renderer process. These function pretty simply by reading the website’s build to display webpages. Chrome sets aside more data for this and makes sure it's separate from the general processes to prevent crashes and security breaches. Another process Chrome manages is its GPU processes for rendering graphics. Chrome uses these to draw images, videos, and animations. These two renderers can also manage renderer plugins. The last main process is the plugin process, which is tasked with communicating between web plugins and other processes. It talks to the browser process through inter-process communication (IPC) mechanisms. As of September 2021, Chrome moved to a more modern approach, so these processes aren’t used as much anymore. Adobe Flash was one renderer plugin, but Chrome now uses APIs that have more built-in capabilities like WebGL and the HTML5 video plugin. On top of this, Chrome has a network process that acquires data like web pages and files and handles connections. It can do tasks like making network requests and handling DNS resolution which connects IPs to hosts. While this way Chrome handles computations improves stability, security, and performance, it requires a lot from your system.

*Why this can be good*

So, Chrome’s structure does have some benefits. The developers wouldn’t make a costly browser service for no reason. One of the benefits is unresponsive tabs. Since each tab is split into its own process with its own data, when one tab crashes, it doesn’t affect the other processes. You can just close the tab and use other tabs without restarting the application. Another benefit is Chrome’s contribution to security. The split process model makes it harder to access data from other processes. Operating systems also provide ways to restrict processes’ privileges so that access to private information could be denied to the processes themselves.

*Hardware acceleration*

Now, there are other ways that Chrome takes more memory, one of which is Chrome’s hardware acceleration. The issue with Chrome’s process-based model is that with each process being allocated its own separate data, some processes could be doing similar tasks with duplicate data, clouding your storage. These processes usually hit a cap in terms of allocated CPU, but they can be allocated more if hardware acceleration is turned on. With this turned on, the computer offloads some of the data in the CPU, GPUs, or DSPs (digital signal processors), and instead, gives it to the processes struggling so that they can be performed faster and more efficiently.

*How Chrome bloats this with extensions*

Another component of Chrome that eats up CPU usage is its user-installed extensions. These extensions can be added to enhance user experience and they run in the background and monitor certain activities, even when the browser is idle. These extensions are also created by multiple companies. Some of these extensions are not optimized and can take up a lot more CPU usage than necessary.

*How to make Chrome not as taxing on your computer*

From this, a claim could be made to turning off hardware acceleration, which helps somewhat. It does help a lot but feels a bit too slow at times. If you go to Chrome’s system settings, you can turn it directly off. My computer’s fan never goes off if I turn it off, however, rendering some things will be significantly slower. Videos and basic pages are fine, but I noticed a drop in frames when trying to render a 3D scene using WebGL, which is due to the GPU processes not exceeding their cap. The way I manage it is by turning it on when needed, since most of the time I’m just using Chrome for simpler pages. Another way is using Chrome’s built-in task manager to see what extensions are taking up a lot of CPU usage. The task manager is found in the more tools section on the drop-down menu on the right. For me, I have some extensions that eat at my CPU that I don’ really need. A new way to save memory is this new feature Chrome implemented called memory saver. The way to turn it on is by going to more tools and then clicking on the new performance tab. It gets data from processes and allocates them in a more reasonable way. In the future, I hope Chrome adds a way to allocate extra memory in a more precise manner. Hardware acceleration feels like a 0-100 situation. Even so, using these methods will definitely help keep Chrome’s performance in check.

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