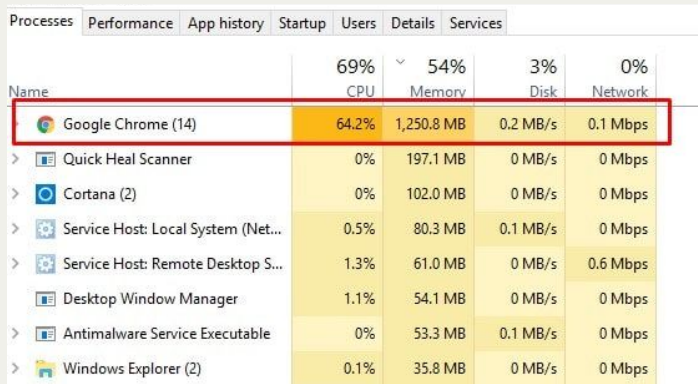


Why Google Chrome takes up so much GPU





Processes Performance App history Startup Users Details Services				
Name	69% CPU	54% Memory	3% Disk	0% Network
Google Chrome (14)	64.2%	1,250.8 MB	0.2 MB/s	0.1 Mbps
> Quick Heal Scanner	0%	197.1 MB	0 MB/s	0 Mbps
> Cortana (2)	0%	102.0 MB	0 MB/s	0 Mbps
> Service Host: Local System (Net...	0.5%	80.3 MB	0.1 MB/s	0 Mbps
> Service Host: Remote Desktop S...	1.3%	61.0 MB	0 MB/s	0.6 Mbps
Desktop Window Manager	1.1%	54.1 MB	0 MB/s	0 Mbps
> Antimalware Service Executable	0%	53.3 MB	0.1 MB/s	0 Mbps
> Windows Explorer (2)	0.1%	35.8 MB	0 MB/s	0 Mbps

Has this ever happened to any of you?

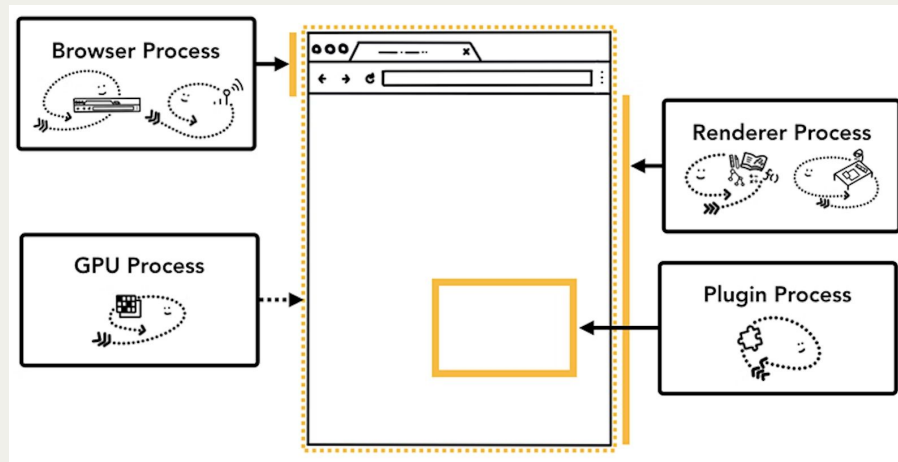
My presentation is about why it's built like this and how you can tune it down if needed


How Google Chrome Works

- Google Chrome operates by a process-based model
 - Every time you open a new tab, it creates a process and runs it in the background
 - Processes are allocated private memory space per process!
 - Processes render web pages, manage extensions, and handle user input.
- Chrome's main process is the Browser Process
 - This general process manages all windows, UI, and processes

Other Processes

- **Renderer Process**
 - Reads the website's build to display webpages
- **GPU Process**
 - Draws images, videos, and animations
- **Plugin process**
 - Communicates between web plugins and other processes
 - This was a part of Chrome's old model but they have changed to modern APIs with built-in capabilities
- **A subprocess: Network service!**
 - Acquires data like web pages and files and handles connections





Why this can be good if your computer can handle it

- When a process crashes, it doesn't stop the program
 - Since each tab is split into its own process with its own data, it doesn't affect the other processes
- The process-based model provides better security
 - Data is harder to access between processes since they are each given different memory spaces
 - Operating systems provide ways to restrict processes' privileges so that access to private information could be denied to the processes themselves

Hardware Acceleration

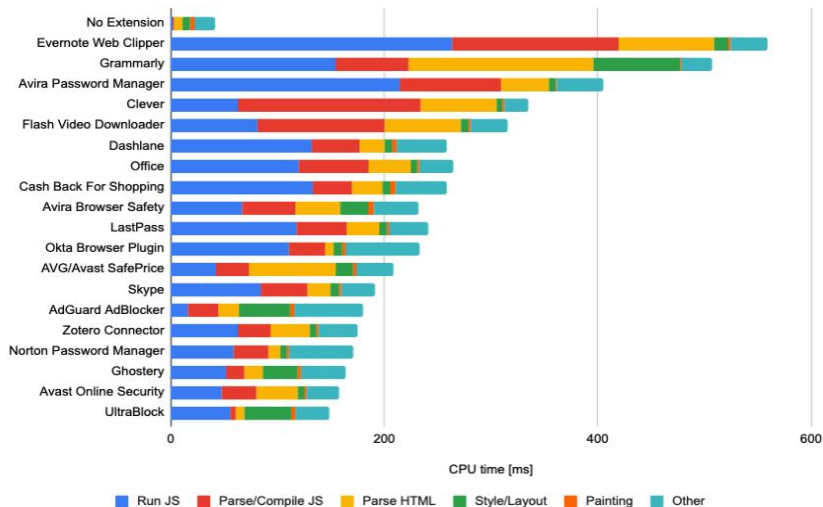
- The process-based model results in some processes doing similar tasks with duplicate data
 - These processes hit a cap in terms of allocated CPU
- Processes can be allocated more CPU if hardware acceleration is approved
 - This new space comes from offloading some of the data in the CPU, GPUs, or DSPs (digital signal processors)

Graphics Feature Status

- Canvas: Hardware accelerated
- Flash: Hardware accelerated
- Flash Stage3D: Hardware accelerated
- Flash Stage3D Baseline profile: Hardware accelerated
- Compositing: Hardware accelerated
- Multiple Raster Threads: Enabled
- Native GpuMemoryBuffers: Software only. Hardware acceleration disabled
- Out-of-process Rasterization: Disabled
- Hardware Protected Video Decode: Unavailable
- Rasterization: Unavailable
- Skia Renderer: Disabled
- Surface Control: Disabled
- Surface Synchronization: Enabled
- Video Decode: Hardware accelerated
- Viz Service Display Compositor: Enabled
- Viz Hit-test Surface Layer: Disabled
- WebGL: Hardware accelerated
- WebGL2: Hardware accelerated

Chrome Extensions

Page CPU time when loading example.com



- User-installed extensions can be added to enhance user experience
 - They run in the background and monitor certain activities, even when the browser is idle
- These extensions are offered by multiple companies
 - can be unoptimized and can take up a lot more CPU usage than necessary

Use hardware acceleration when available

Relaunch



Open your computer's proxy settings



Task Manager

Task	Memory Footprint	CPU	Network	Process ID
Tab: Inside look at modern web browser (part 1) - Chrome Dev	60.3 MB	6.7	0	2470
Browser	283 MB	3.4	0	448
GPU Process	371 MB	2.2	0	513
Extension: Super Dark Mode	72.8 MB	1.7	0	633
Utility: Network Service	29.9 MB	0.2	0	514
Service Worker: chrome-extension://kbfnbcaeplbcioakkpcpgfk	54.4 MB	0.2	0	2061
Tab: Networks Project 3 Presentation Notes - Google Docs	316 MB	0.1	0	694
Service Worker: https://docs.google.com/offline/root/servicewc				
Service Worker: https://docs.google.com/document/offline/sen				
Service Worker: https://docs.google.com/spreadsheets/offline/				
Service Worker: https://docs.google.com/drawings/offline/servi				
Service Worker: https://docs.google.com/presentation/offline/s				
Subframe: https://accounts.google.com/	46.3 MB	0.0	0	699
Subframe: https://accounts.google.com/				
Subframe: https://accounts.google.com/				
Subframe: https://accounts.google.com/				
Tab: Networks Project 3 Presentation - Google Slides	260 MB	0.0	0	2474

End Process

Performance



Memory Saver

When on, Chrome frees up memory from inactive tabs. This gives active tabs and other apps more computer resources and keeps Chrome fast. Your inactive tabs automatically become active again when you go back to them. [Learn more](#)



Always keep these sites active

Add

No sites added

How to Minimize CPU usage?

1. Turn off hardware acceleration
2. Use Chrome's task manager to find taxing extensions and disable them
3. Enable memory saver

Works Cited

- <https://www.alphr.com/chrome-hardware-acceleration-explained/>
- <https://www.debugbear.com/blog/2020-chrome-extension-performance-report>
- <https://developers.google.com/search/docs/fundamentals/how-search-works>
- <https://developer.chrome.com/blog/inside-browser-part1/>
- <https://developer.chrome.com/blog/inside-browser-part2/>
- <https://chat.openai.com/>
- <https://slidesgo.com/theme/pdca-strategy-development-project-proposal#position-205&results-1872>