

# Case Study on Chromium Browser Application

Presentation by  
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- ❑ About Chromium
- ❑ Business Domain
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- Free and Open Source Web Browser
- Developed by Google
- Subset of Chrome
- Initial Release on September 2, 2008
- Lightweighted and Fast
- User Privacy Friendly
- Several Browsers Rely on Chromium



Source: [Wikipedia/Chromium](https://en.wikipedia.org/wiki/Chromium)



## OBJECTIVE

- › To provide the source code for Google Chrome.
- › Allowing Google to receive input from outside sources to iterate new ideas and technology.
- › To build a lightweight Web-Browser.

## PROBLEMS FACED

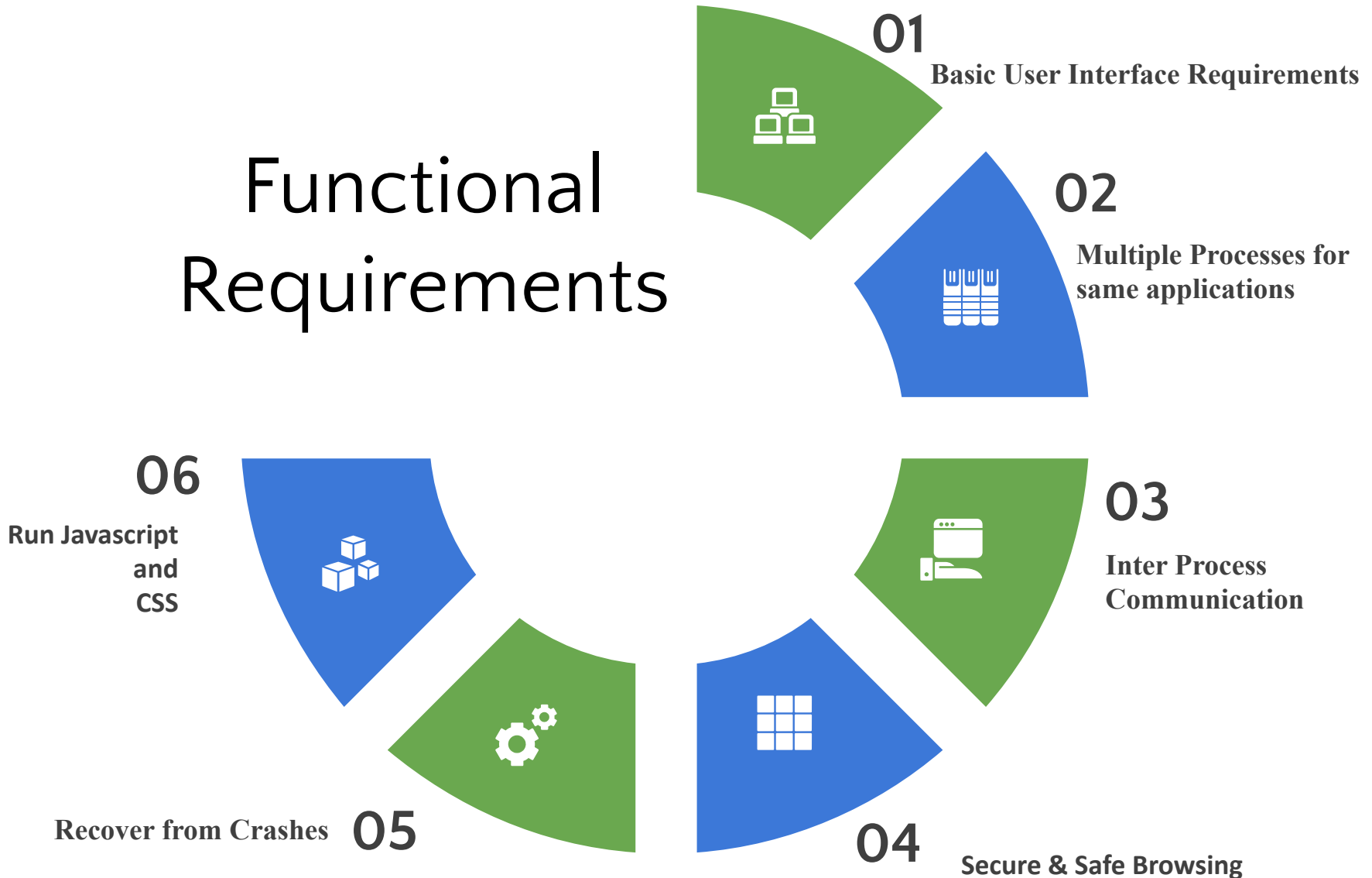
- › Impossible to build a rendering engine that never crashes or hangs.
- › It's also nearly impossible to build a rendering engine that is perfectly secure.

## PROBLEMS SOLVED

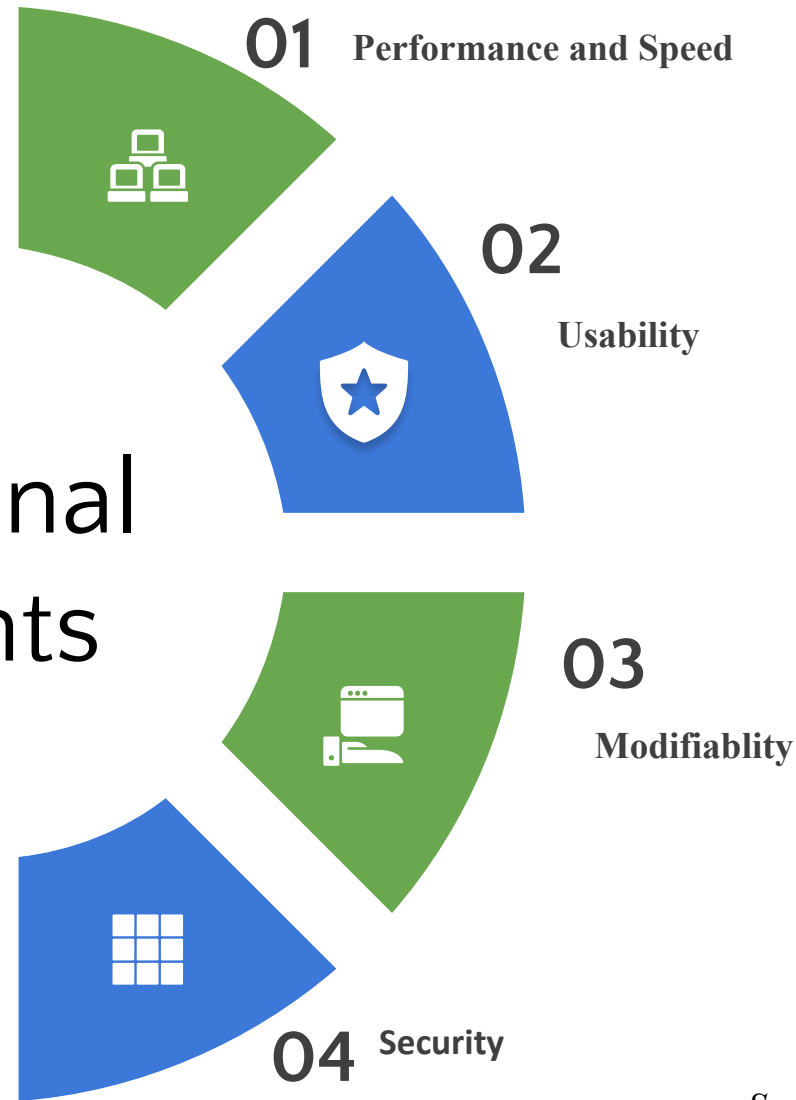
- › Separate processes for browser tabs to protect the overall application from bugs and glitches in the rendering engine.
- › Restricting access from each rendering engine process to others and to the rest of the system.
- › Bringing to web browsing the benefits that memory protection and access control brought to operating systems

Source: 1) [chromium/design/docs](https://chromium.design/docs)  
2) [lifewire/chromium](https://lifecycle.chromium)

## Functional Requirements



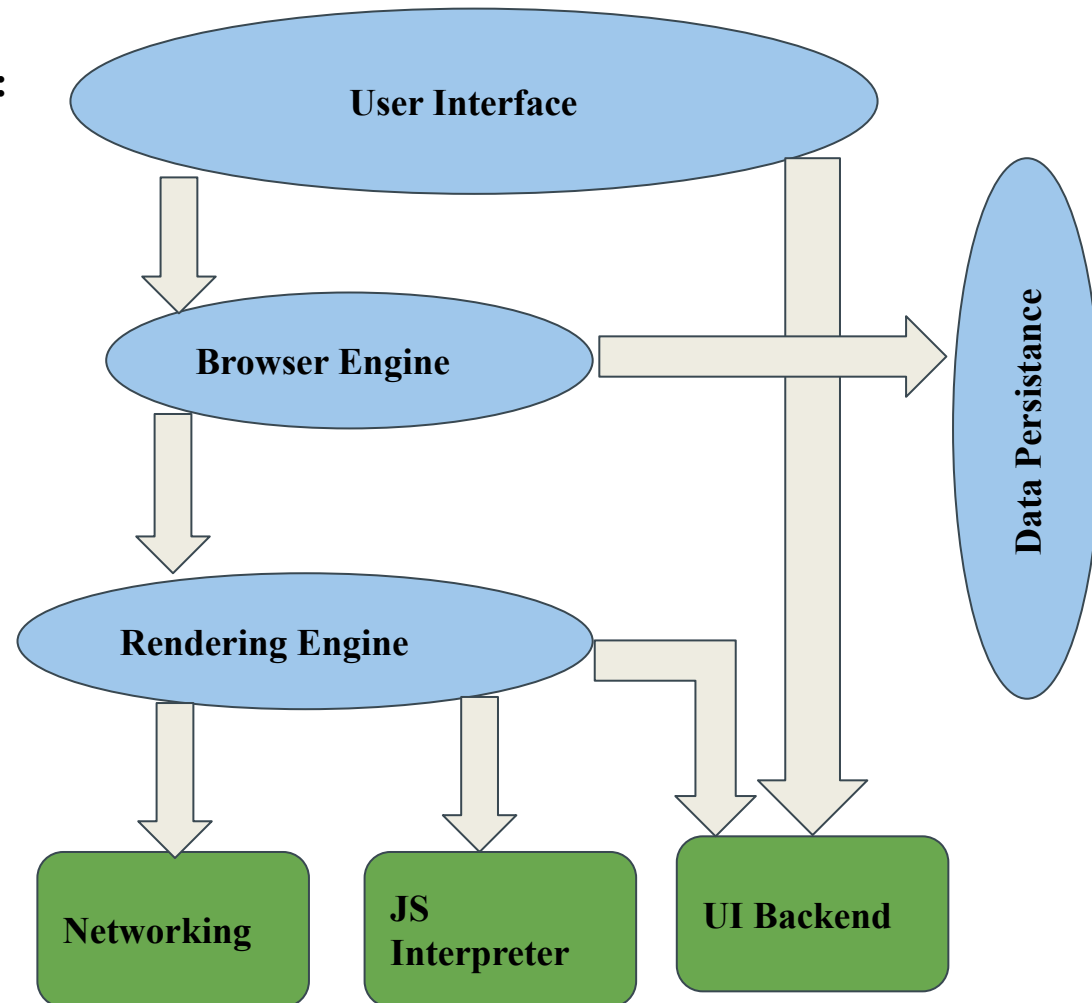
## Non-Functional Requirements



Source: 1) [chromium/docs/core-principles](https://chromium/docs/core-principles)  
2) [chromium/design-documents](https://chromium/design-documents)

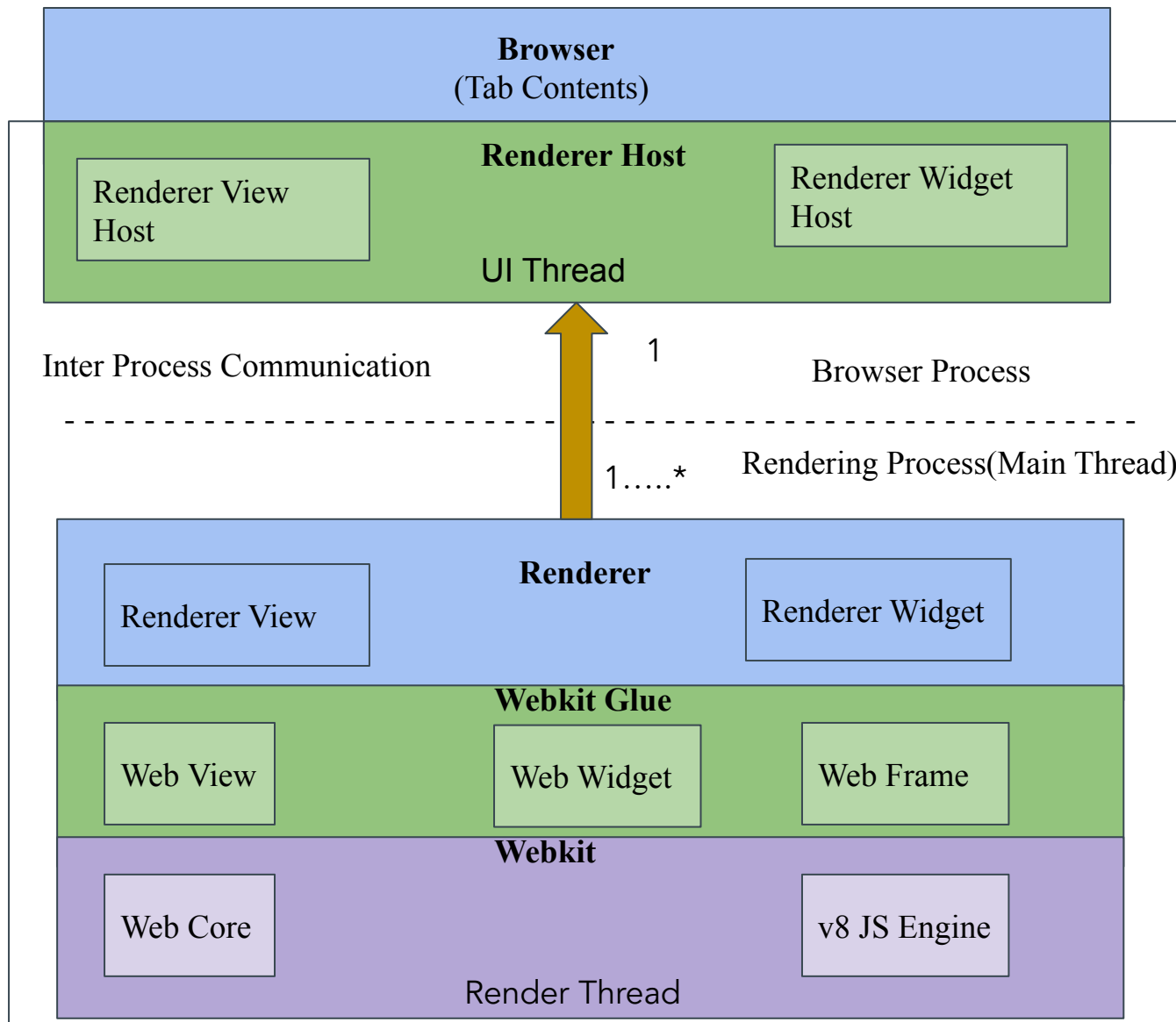
## Main Components of Chromium Browser:

- The User Interface
- Browser Engine
- Rendering Engine
- Networking
- Javascript Interpreter
- UI Backend
- Data Persistence/Storage



Source: [/how-does-web-browsers-work/medium](https://medium.com/how-does-web-browsers-work/medium)

# Logical Architecture - Chromium



Sandbox

Source:

- 1) [youtube/archi\\_chromium](https://www.youtube.com/watch?v=archi_chromium)
- 2) [/design-doc/multi-process-archi](https://design-doc/multi-process-archi)
- 3) [medium.com/google-chromium](https://medium.com/google-chromium)





Anyone who wants to browse 'World Wide Web'

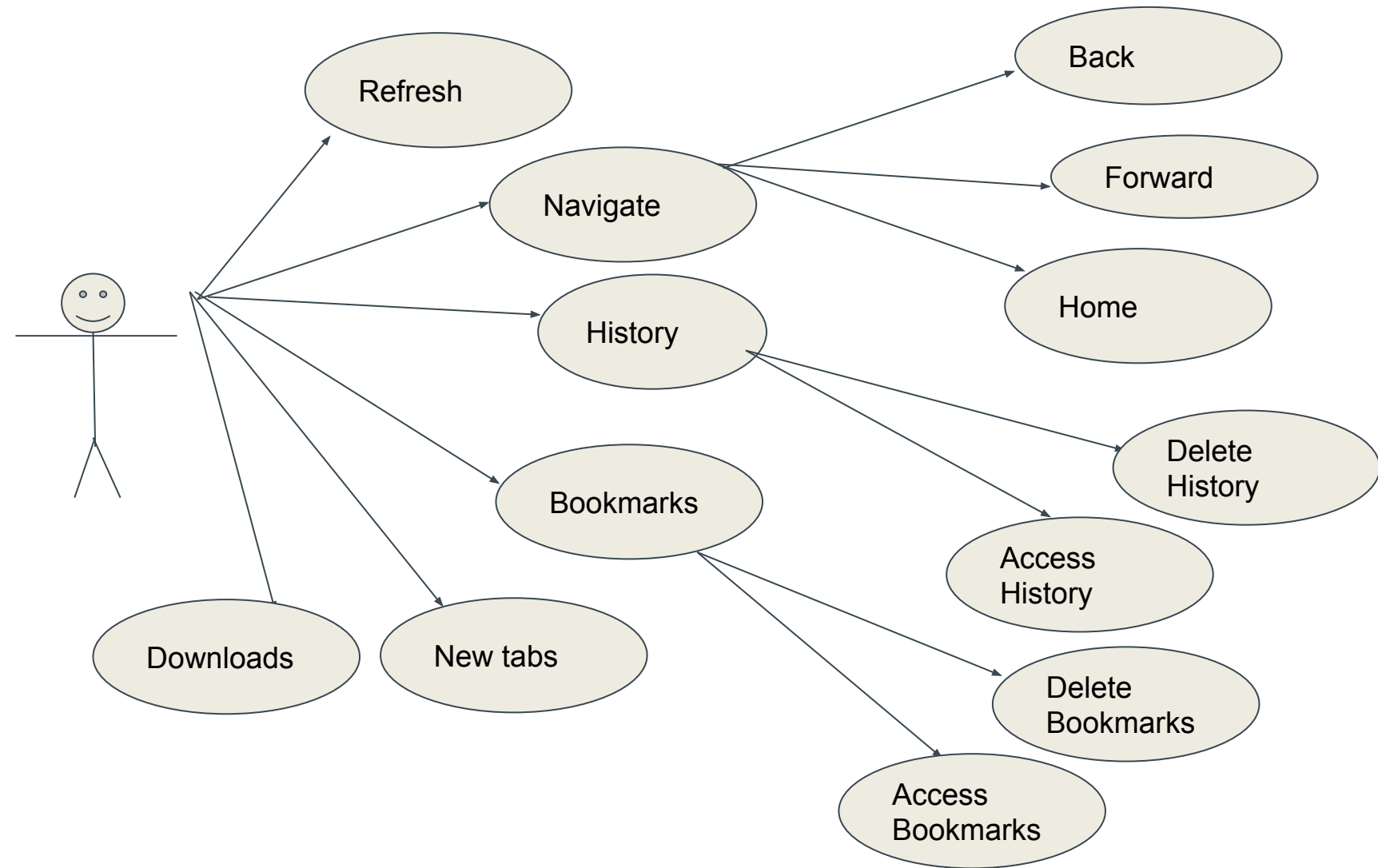


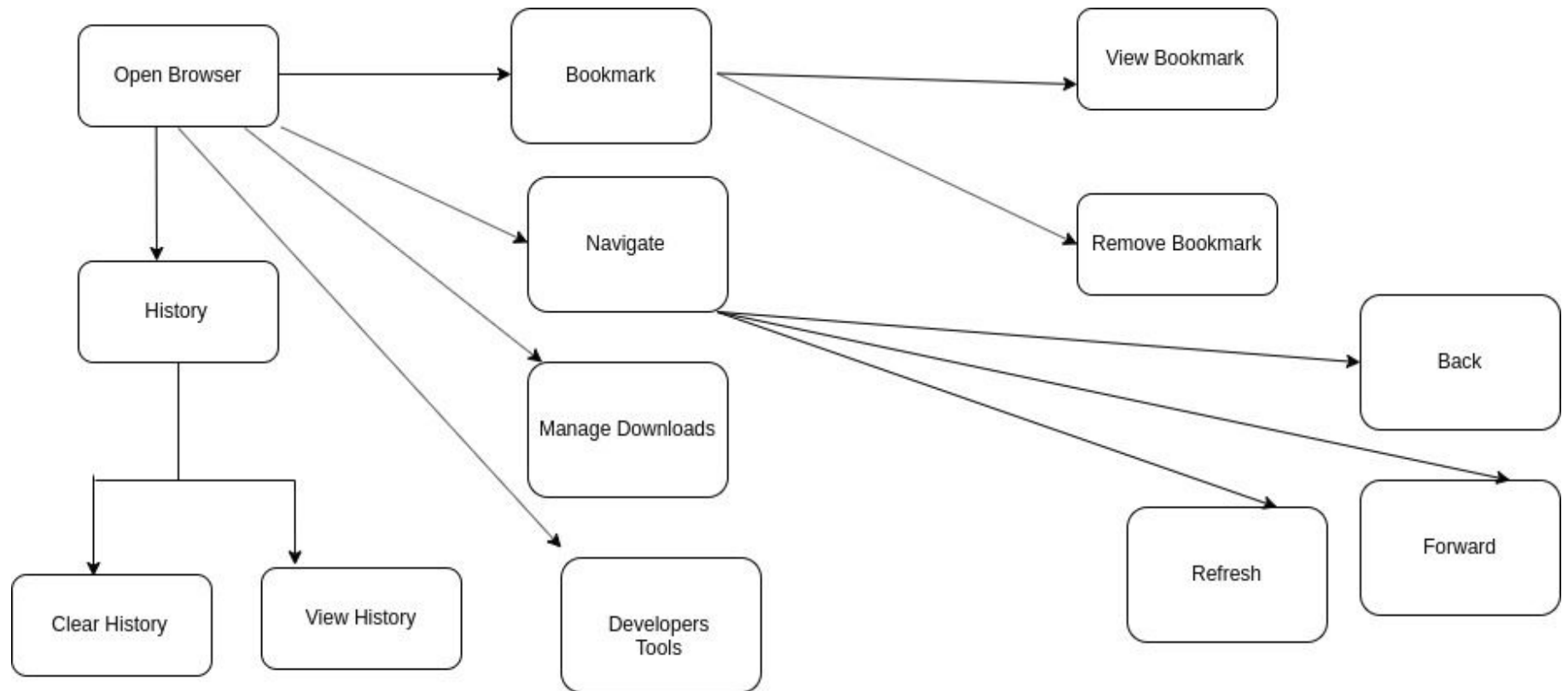
Developers



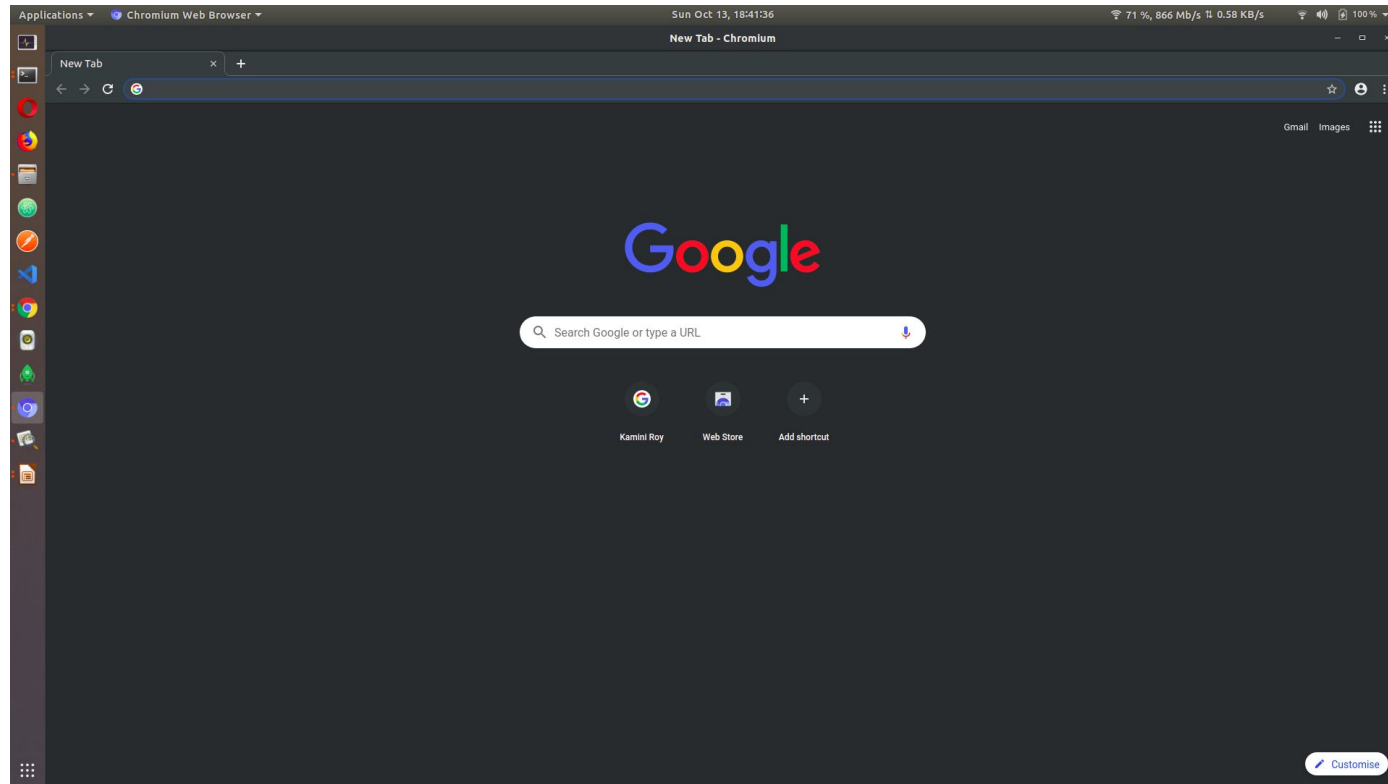
Testers



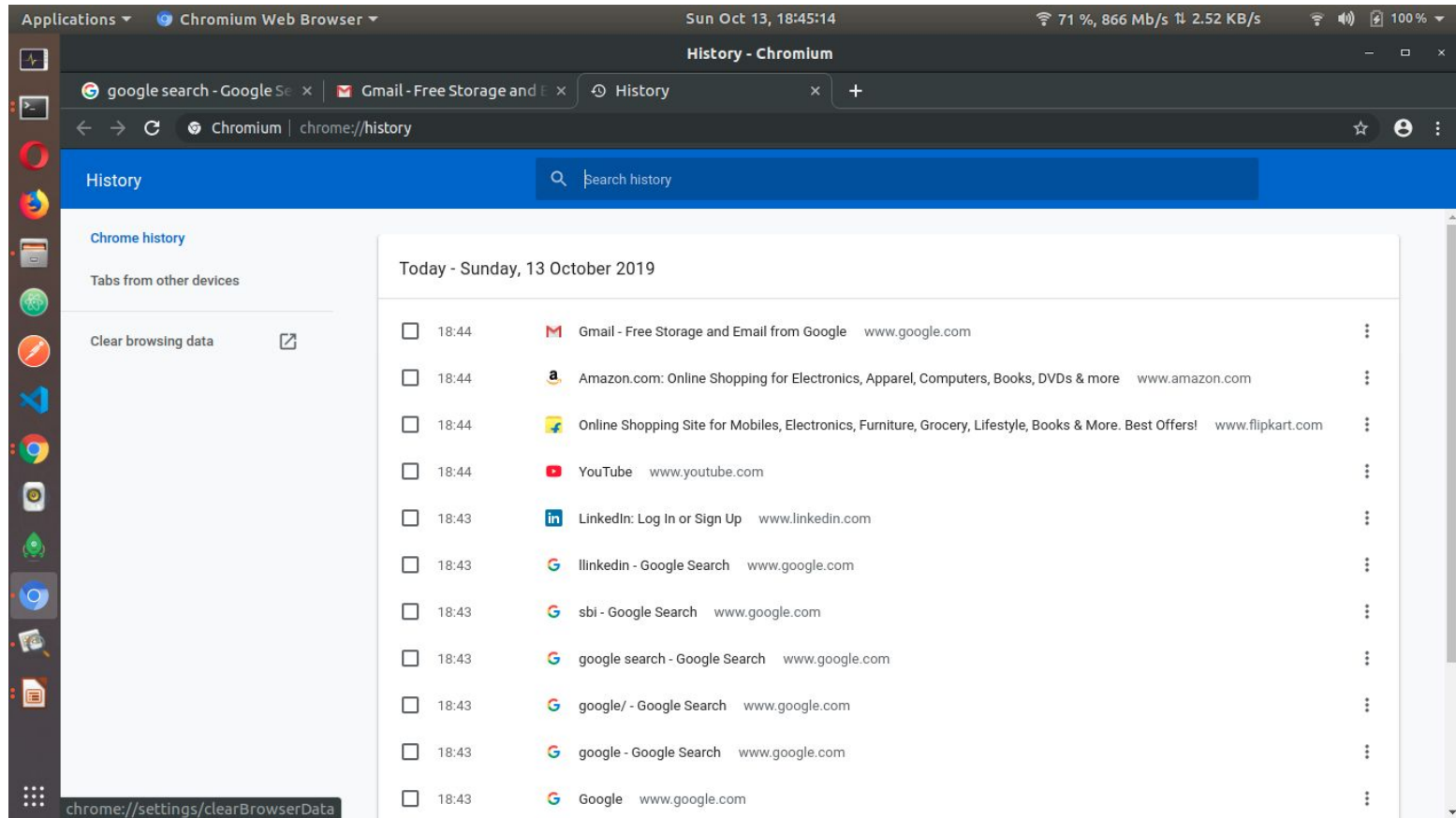




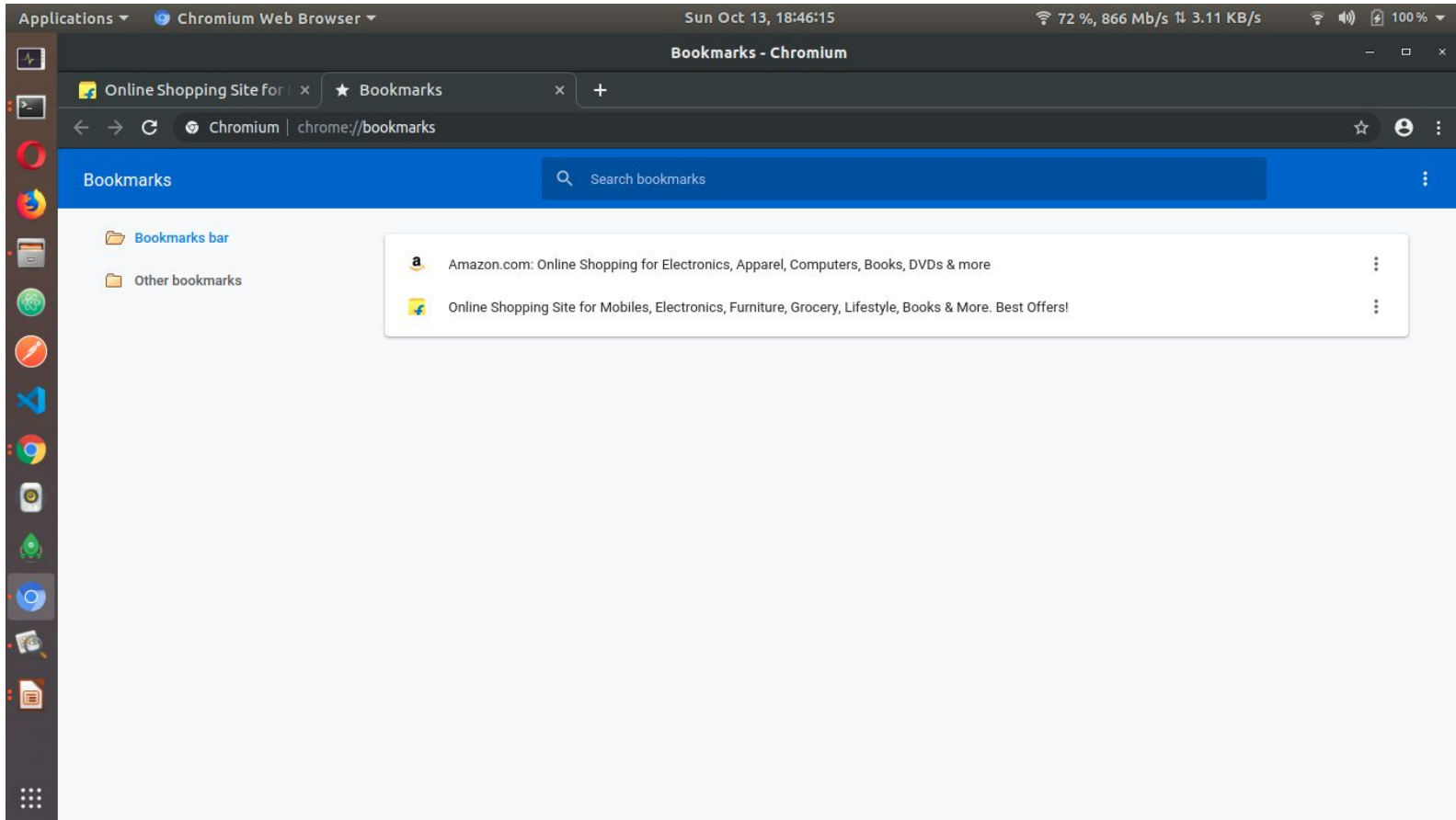
# UX Flow (Cntd)

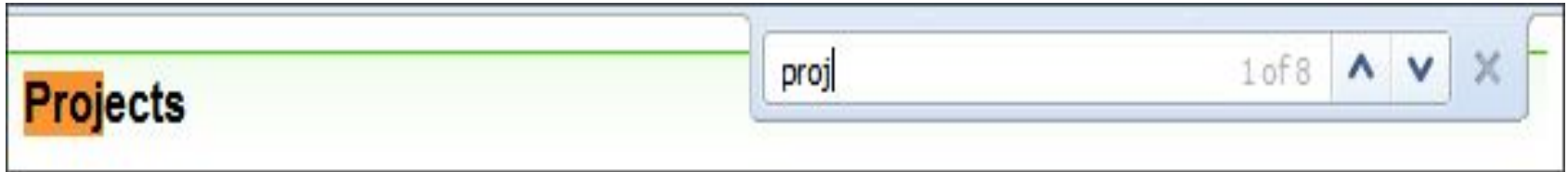


# UX Flow (Cntd)



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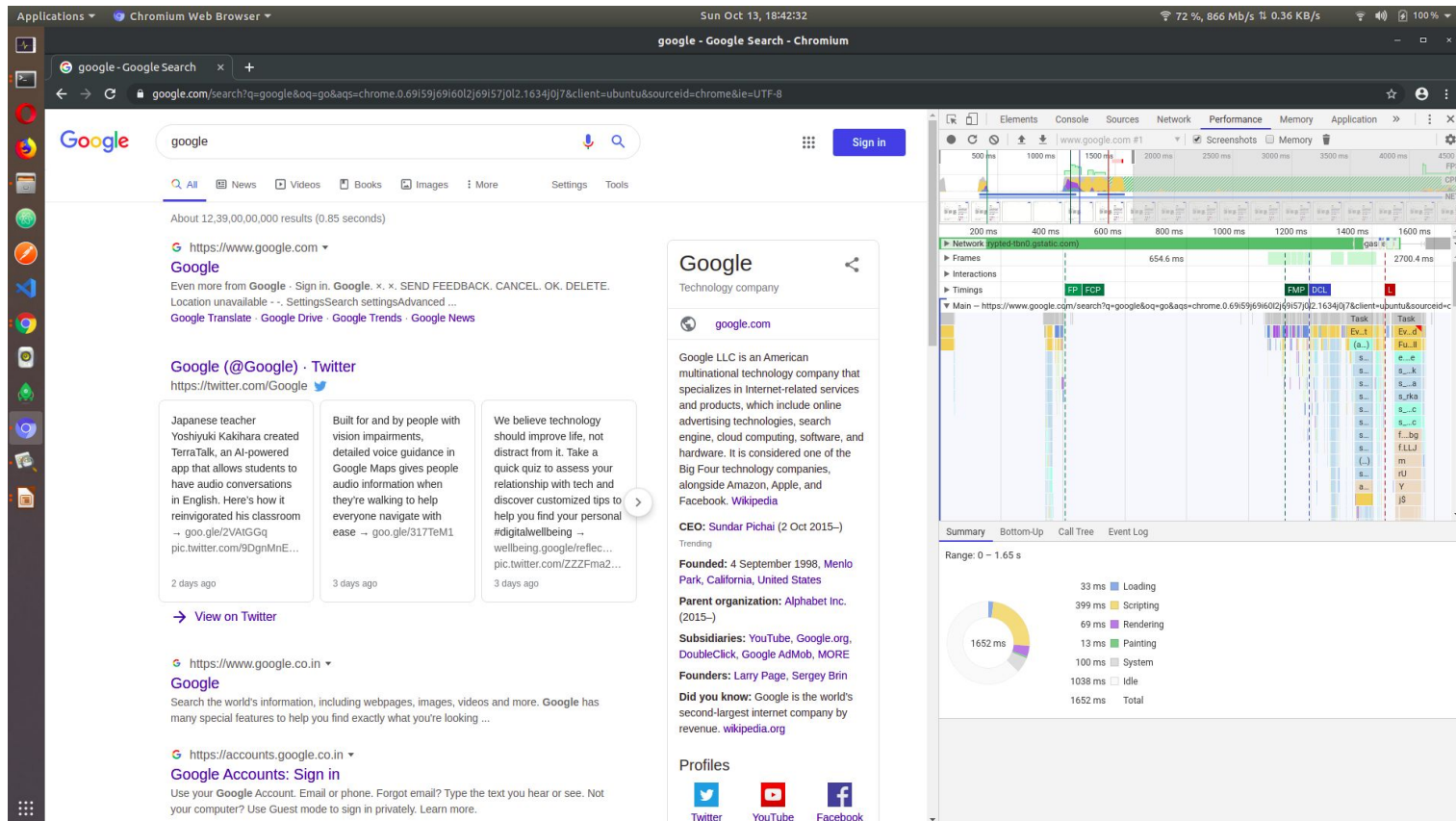


Projects

proj 1 of 8 ^ v X



# UX Flow (Cntd)





- Written in:
  - C++
  - C
  - JavaScript
  - Python
  - Java (Android)
- Platforms:
  - IA - 32
  - x86-64
  - ARM



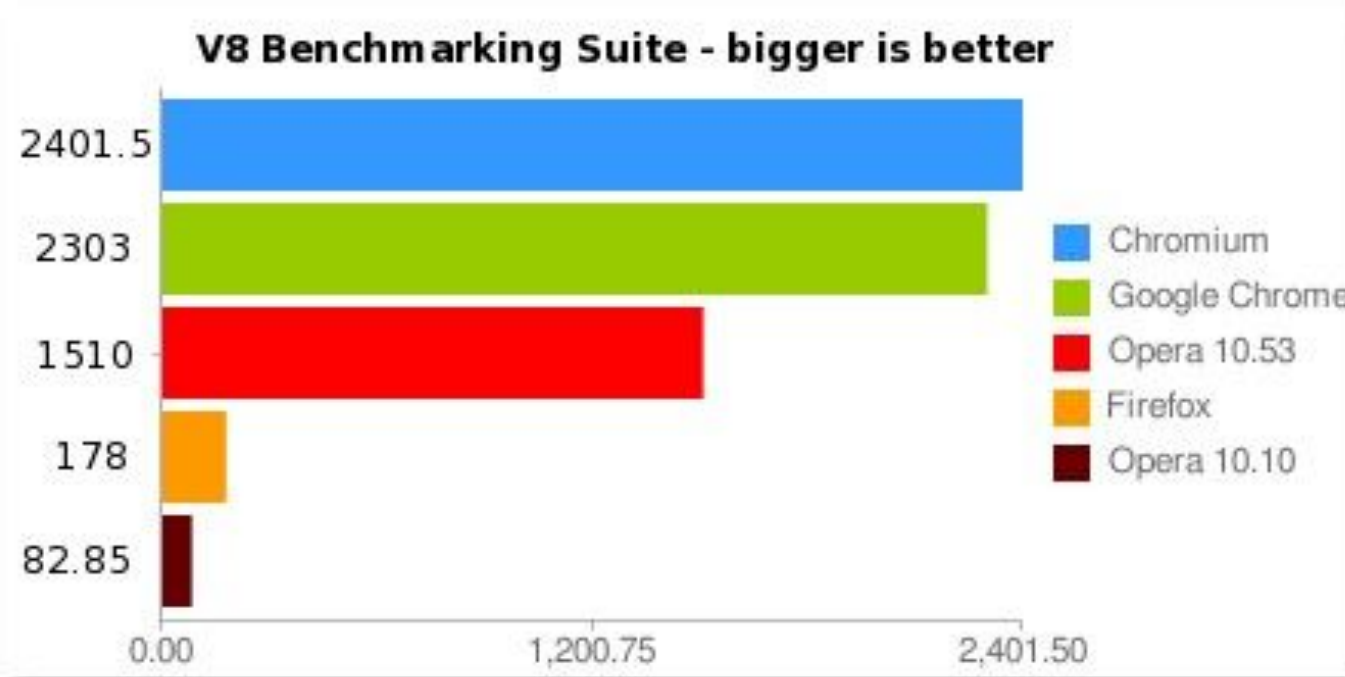
Source: [chromium/analyses/latest/languages\\_summary](https://chromium.org/analyses/latest/languages_summary)

# Benchmark Against Competition

2019	<u>Chrome</u>	<u>Edge/IE</u>	<u>Firefox</u>	<u>Safari</u>	<u>Opera</u>
August	81.4 %	3.3 %	9.2 %	2.8 %	1.7 %
July	80.9 %	3.3 %	9.3 %	2.7 %	1.6 %
June	80.7 %	3.6 %	9.4 %	3.1 %	1.7 %
May	80.4 %	3.6 %	9.5 %	3.3 %	1.7 %
April	80.3 %	3.6 %	9.6 %	3.3 %	1.7 %
March	80.0 %	3.8 %	9.6 %	3.3 %	1.7 %
February	79.7 %	4.0 %	10.0 %	3.4 %	1.6 %
January	79.5 %	4.0 %	10.2 %	3.3 %	1.6 %

Source: [w3schools/browsers\\_usage/stats](https://w3schools.com/browsers/browsers_stats/)

# Benchmark Against Competition



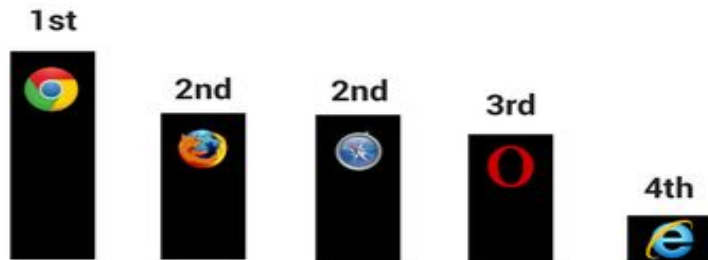
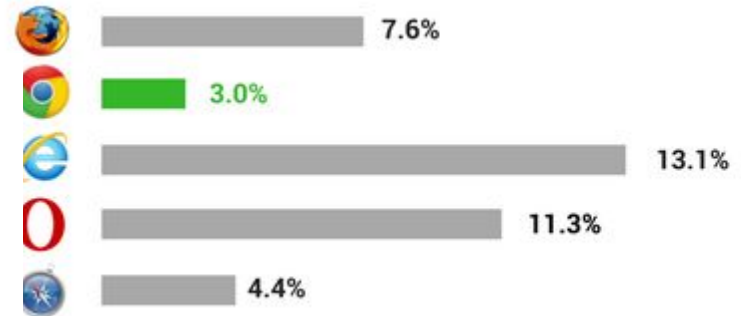
Google V8 benchmarking suite

Source: [softpedia.com/news/JavaScript-Benchmarking](http://softpedia.com/news/JavaScript-Benchmarking)



## JavaScript Speed

## CPU Usage (Under Stress)



## Overall Performance

Source: [web-design/browser-performance/](http://web-design/browser-performance/)

# Other sources of Information

- ❖ <https://www.lifewire.com/chromium-and-chrome-differences-4172101>
- ❖ <https://www.pcworld.com/article/3052560/vivaldi-browser-review-powerful-features-outshine-slightly-sluggish-performance.html>
- ❖ <https://www.zdnet.com/article/firefox-54-is-out-faster-but-no-memory-hog-like-chrome-so-is-it-time-to-try-it-again/>
- ❖ <https://wsvincent.com/what-happens-when-url/>
- ❖ <https://www.careerride.com/view/what-is-the-purpose-of-web-browser-3184.aspx>
- ❖ <https://www.chromium.org/user-experience/keyboard-access>
- ❖ <https://www.howtogeek.com/202825/what%E2%80%99s-the-difference-between-chromium-and-chrome/>
- ❖ <https://superuser.com/questions/1205231/why-does-chrome-has-so-many-processes-running-when-i-have-just-opened-the-appli>
- ❖ <https://www.makeuseof.com/tag/use-web-without-browser/>
- ❖ <https://www.computerworld.com/article/3261009/googles-chromium-browser-explained.html>
- ❖ <https://medium.com/@monica1109/how-does-web-browsers-work-c95ad628a509>
- ❖ <http://www.chromium.org/Home>
- ❖ <https://medium.com/@aboodman/in-march-2011-i-drafted-an-article-explaining-how-the-team-responsible-for-google-chrome-ships-c479ba623a1b>
- ❖ [https://en.wikipedia.org/wiki/Comparison\\_of\\_web\\_browsers](https://en.wikipedia.org/wiki/Comparison_of_web_browsers)
- ❖ <https://www.lifewire.com/chromium-and-chrome-differences-4172101>
- ❖ <https://www.lifewire.com/chromium-web-browser-4171288>
- ❖ <https://www.howtogeek.com/202825/what%E2%80%99s-the-difference-between-chromium-and-chrome/>
- ❖ <https://www.computerworld.com/article/3261009/googles-chromium-browser-explained.html>
- ❖ <https://medium.com/@monica1109/how-does-web-browsers-work-c95ad628a509>
- ❖ <https://www.chromium.org/developers/design-documents/multi-process-architecture>
- ❖ <https://dev.to/kenbellows/chromium-and-the-browser-monoculture-problem-420n>
- ❖ <https://dev.chromium.org/developers/design-documents>
- ❖ <https://medium.com/@zicodeng/explore-the-magic-behind-google-chrome-c3563dbd2739>
- ❖ <https://www.webfx.com/blog/web-design/browser-performance/>

# Thank you!

