

Case Study on Chromium Browser Application

Presentation by
Shravan Kumar B



- About Chromium
- Business Domain
- Core Features
- User Personas & Cases
- UX Flow
- Architecture
- Technologies Used
- Benchmark Against Competition
- Sources



About Chromium

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



Source: [Wikipedia/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
2) lifewire/chromium*

Functional Requirements

01

01

Basic User Interface Requirements

02



Multiple Processes for
same applications

03



Inter Process
Communication

Run Javascript
and
CSS



Recover from Crashes

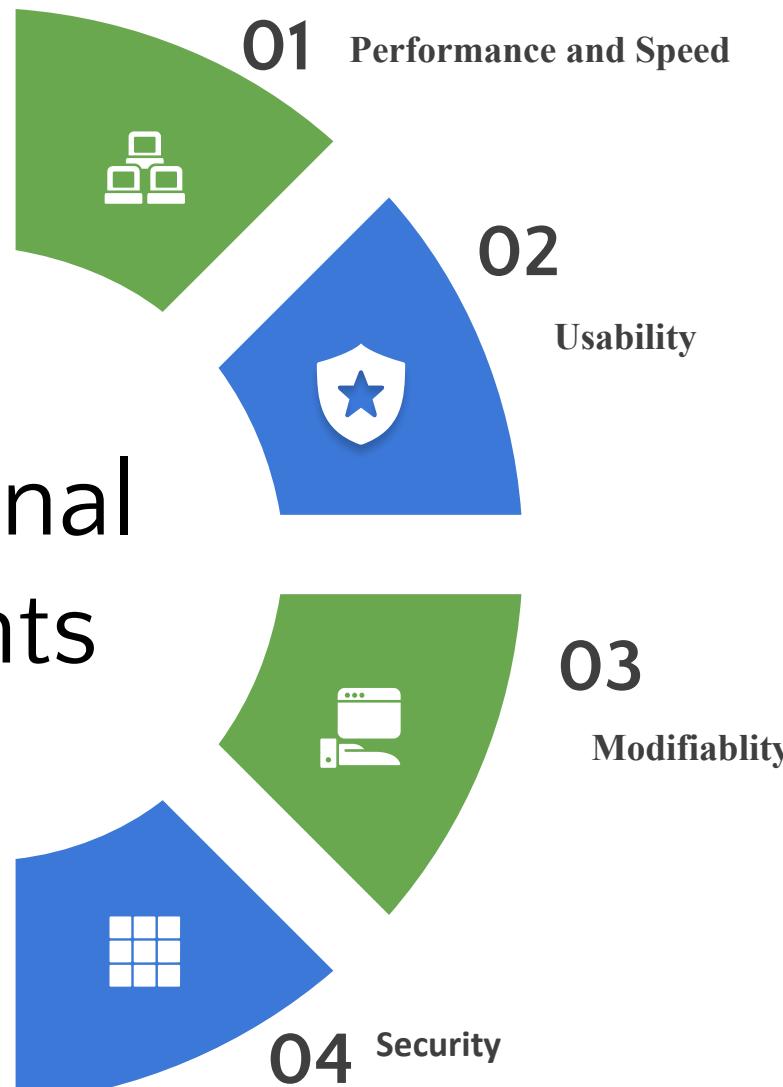
05



04

Secure & Safe Browsing

Non-Functional Requirements

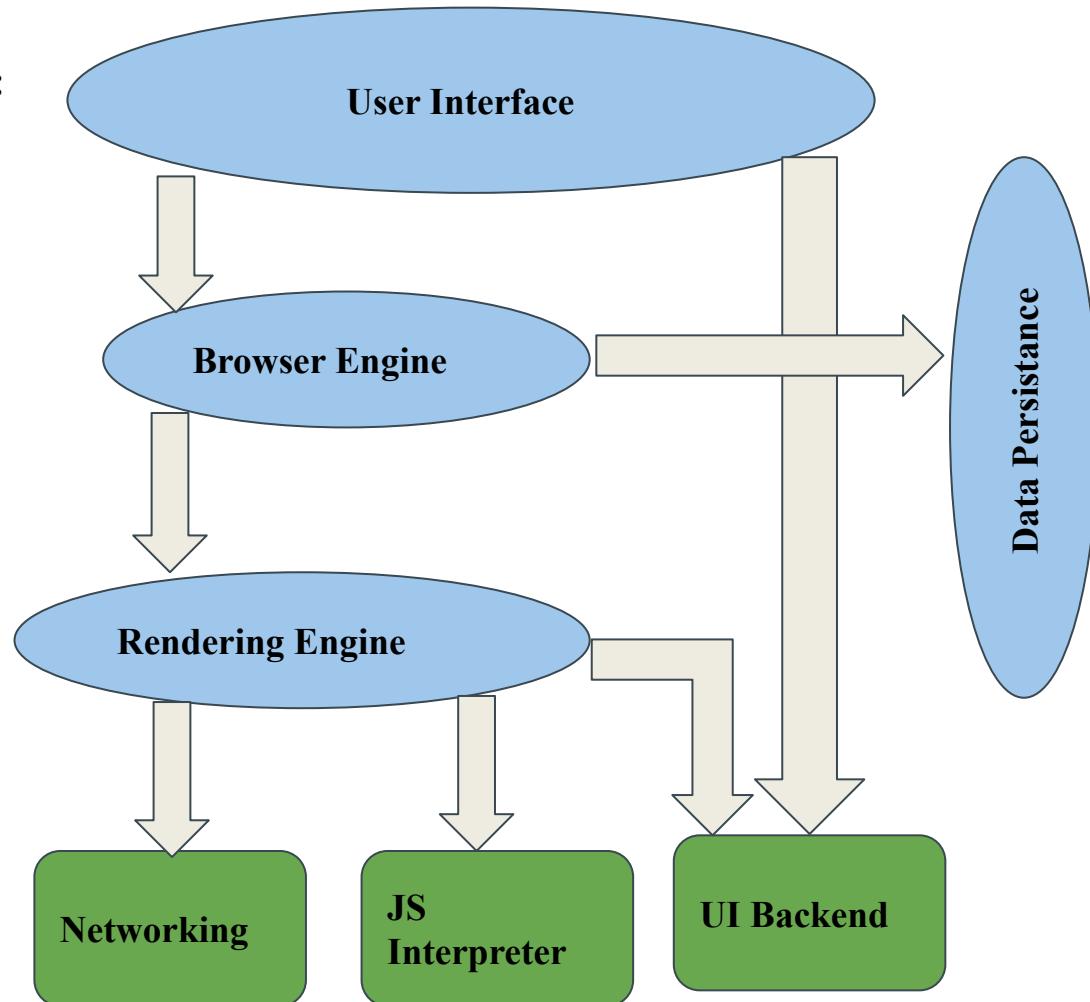


Source: 1) chromium/docs/core-principles
2) chromium/design-documents

Reference Architecture

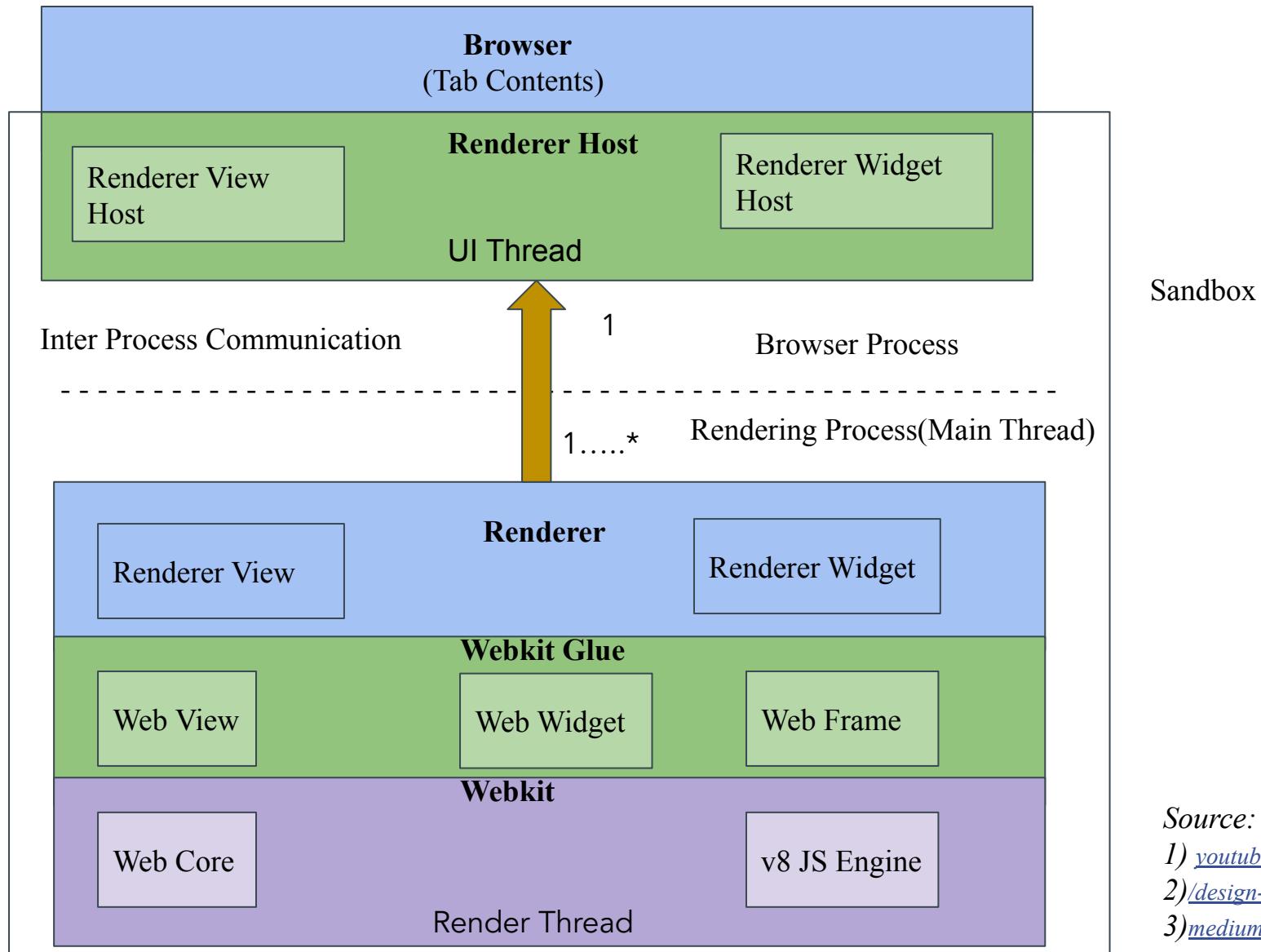
Main Components of Chromium Browser:

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



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

Logical Architecture - Chromium



Source:

- 1) youtube/archi_chromium
- 2) [/design-doc/multi-process-archi](https://design-doc/multi-process-archi)
- 3) medium.com/google-chromium

User Persona



Anyone who wants to browse 'World Wide Web'



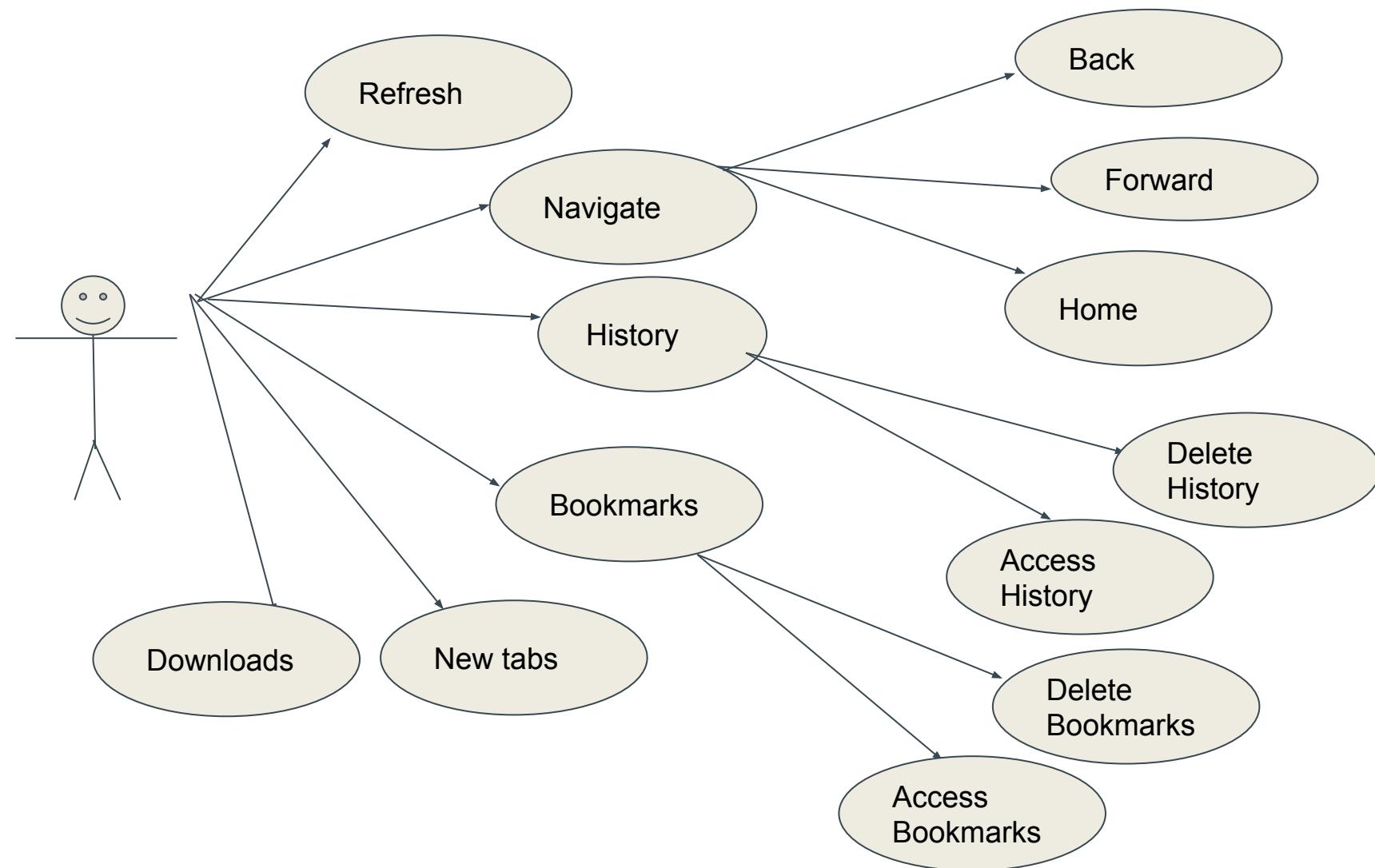
Developers

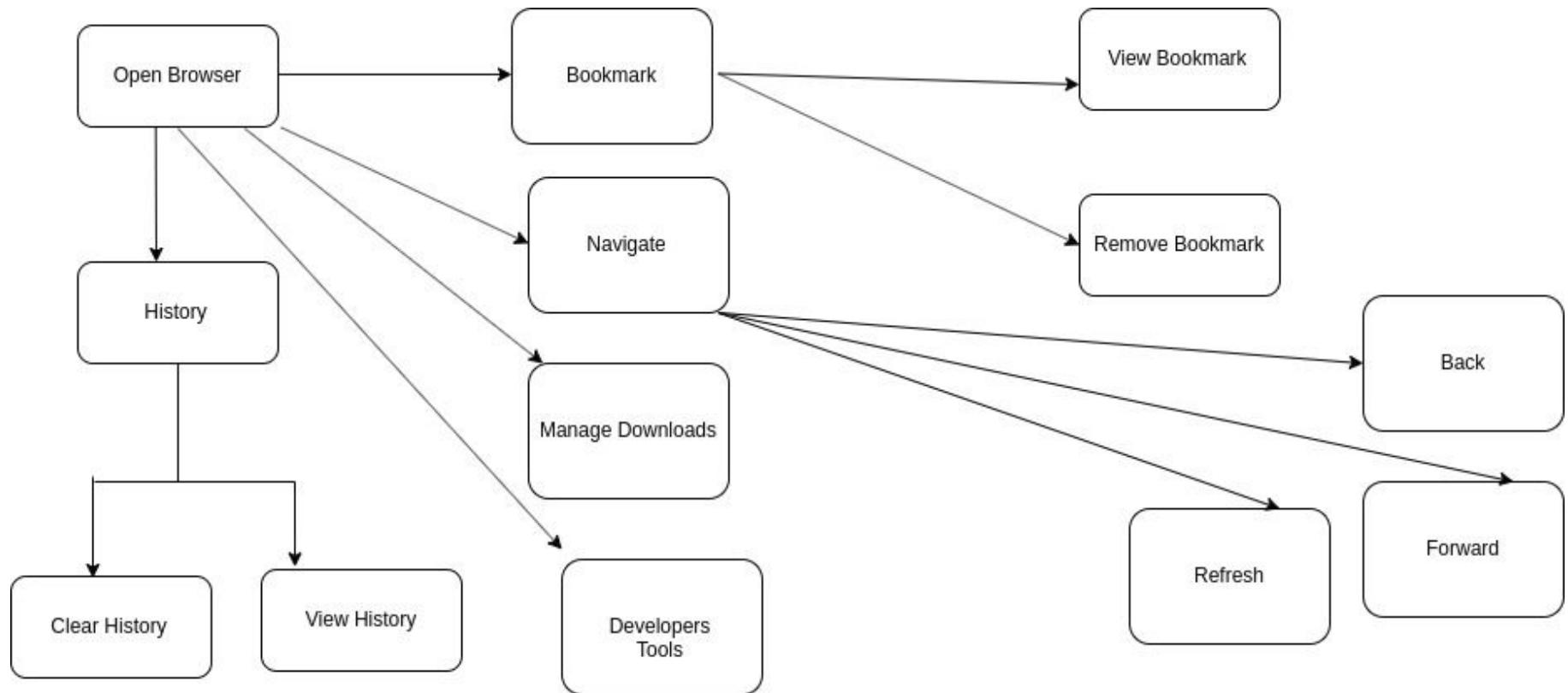


Testers

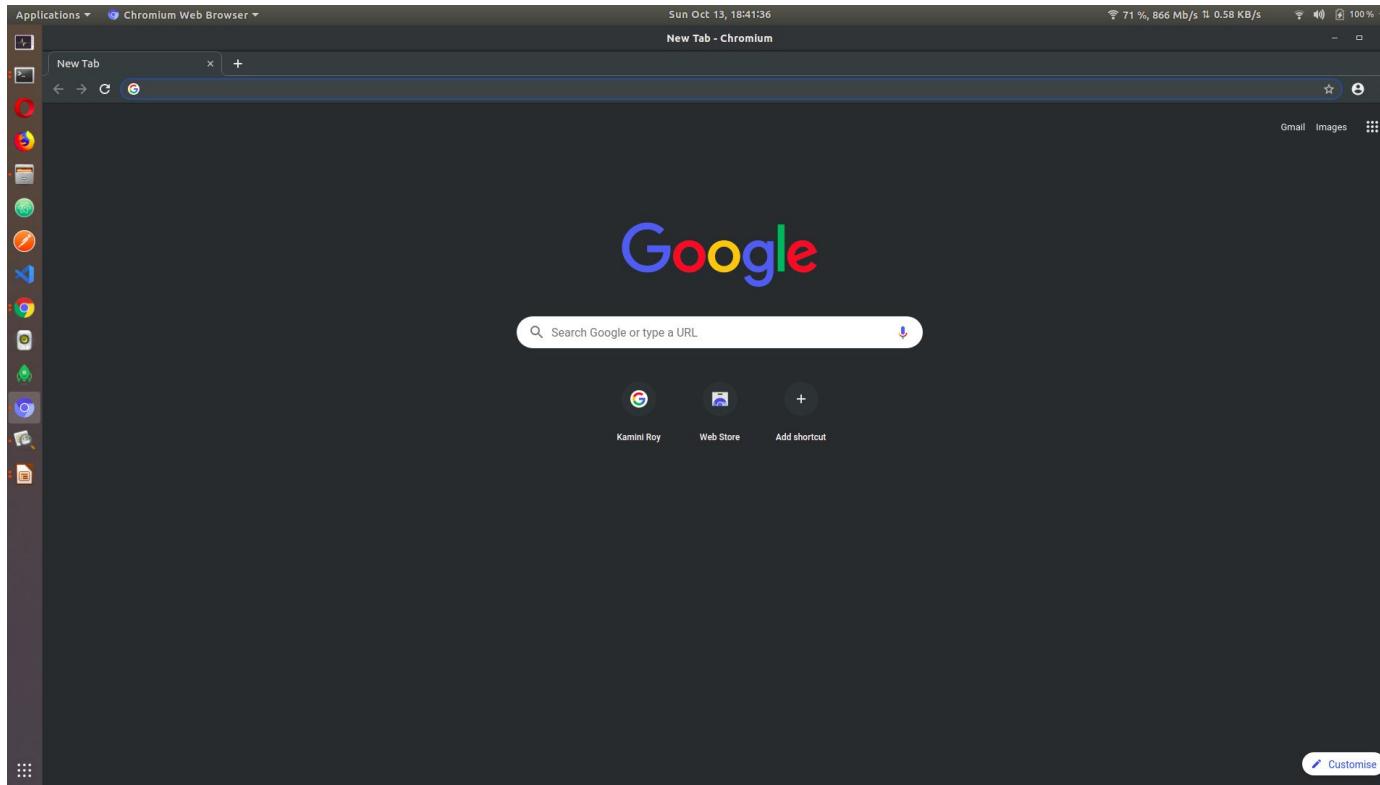


Use Case

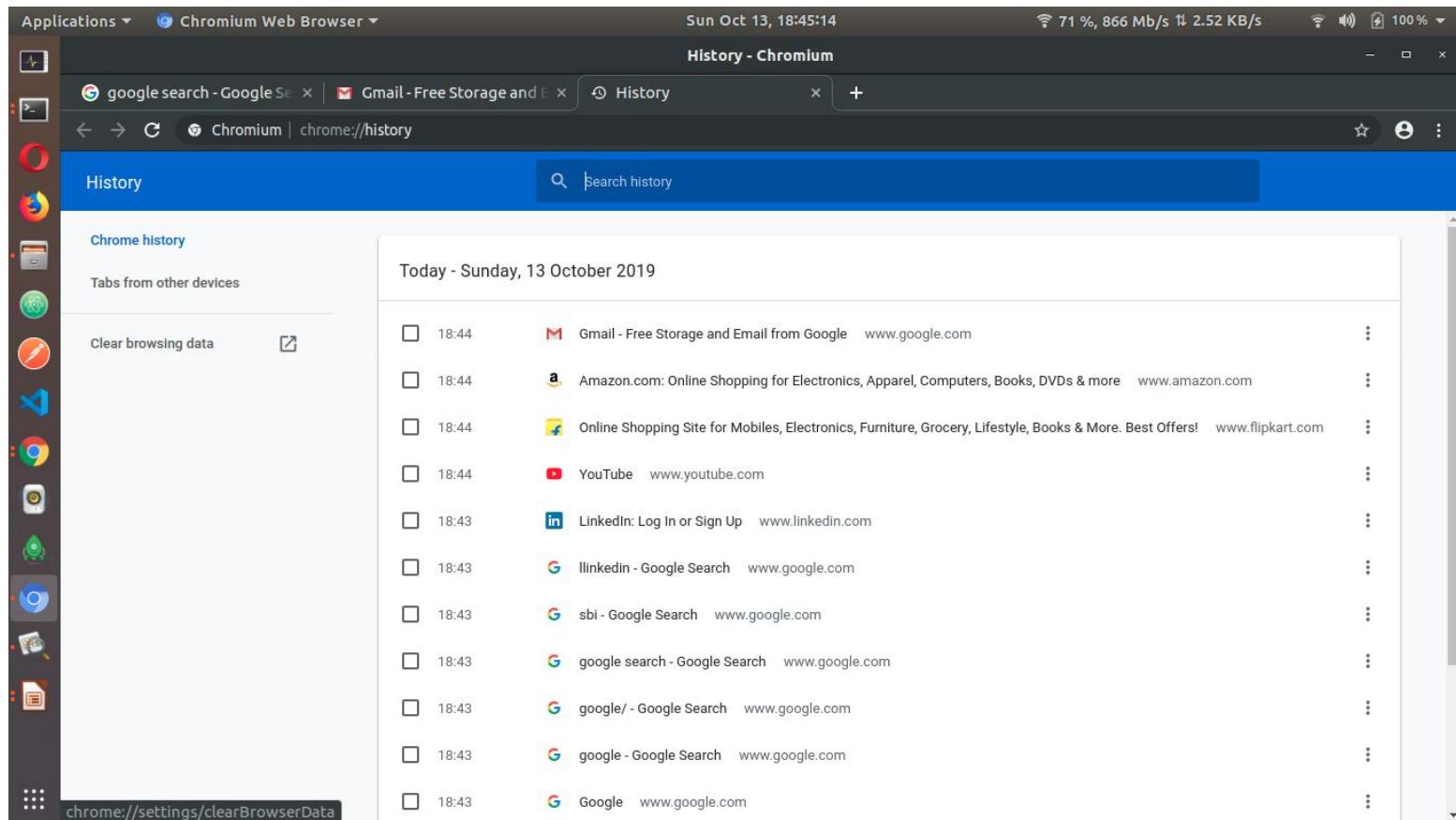




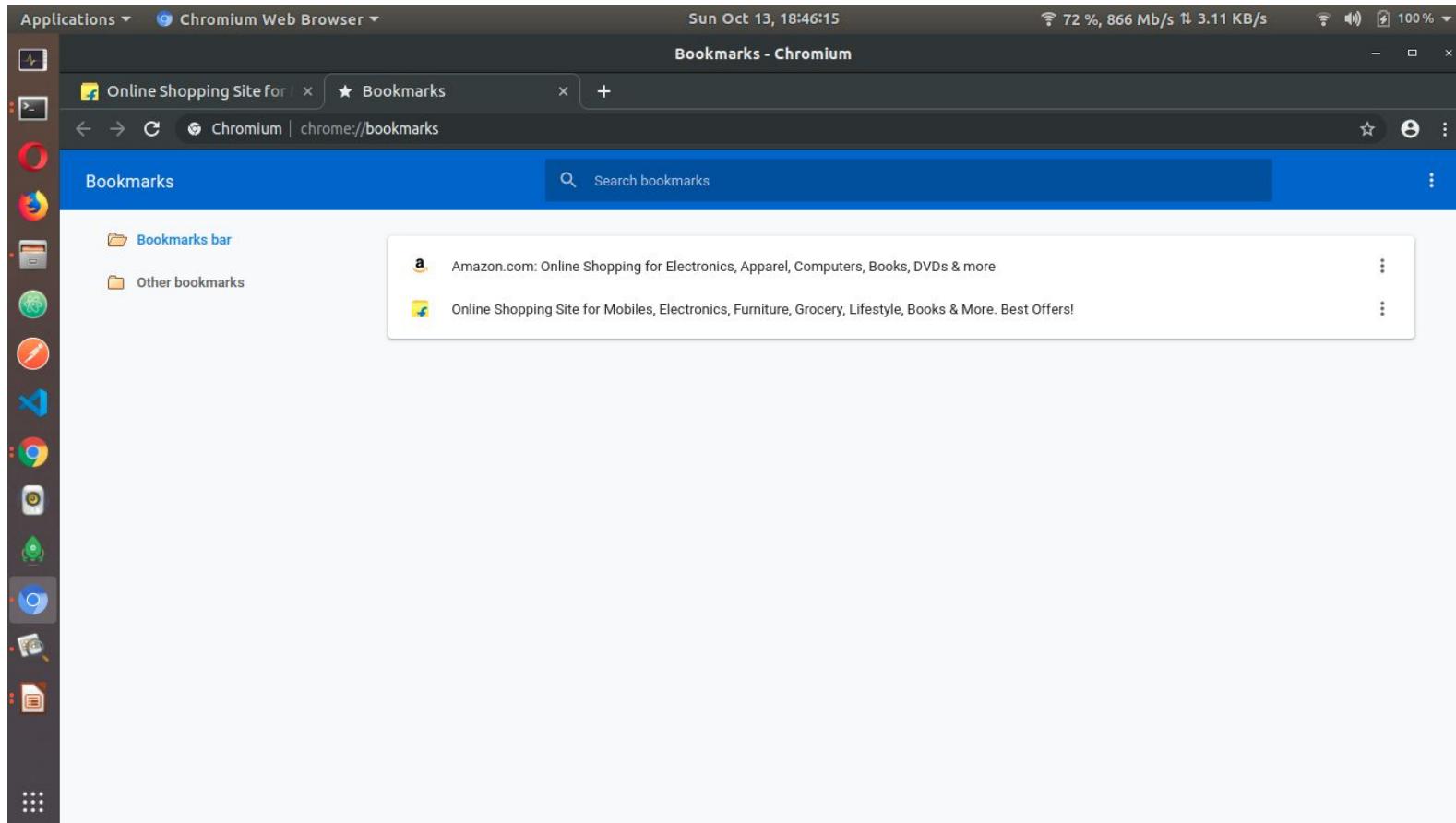
UX Flow (Cntd)



UX Flow (Cntd)



UX Flow (Cntd)



UX Flow (Cntd)



UX Flow (Cntd)

The screenshot shows a Chromium browser window with the following details:

- Title Bar:** Applications ▾ Chromium Web Browser ▾ Sun Oct 13, 18:42:32
- Address Bar:** google - Google Search + <https://www.google.com/search?q=google&oq=go&aqs=chrome.0.69i59j69i60l2j69i57j0l2.1634j0j7&client=ubuntu&sourceid=chrome&ie=UTF-8>
- Content Area:**
 - Google Search Results:** The main search results for "google" are displayed, including links to the official Google website, Google Translate, Google Drive, Google Trends, and Google News.
 - Twitter Post:** A tweet from "Google (@Google) · Twitter" is shown, discussing a teacher who created a voice-guided app for Google Maps users.
 - Google Subpage:** A snippet from the Google company page is shown, mentioning Sundar Pichai as CEO and highlighting its role as a technology company.
 - Google Accounts:** A link to "Google Accounts: Sign in" is present.
- Developer Tools:** The "Performance" tab of the developer tools is open, showing a timeline of network requests and resource loading for the Google search page. The timeline includes tasks like "Task (a)" and "Task (b)" along with various sub-tasks and events.
- Bottom Navigation:** Includes links to Twitter, YouTube, and Facebook.

Technologies Used

- Written in:
 - C++
 - C
 - JavaScript
 - Python
 - Java (Android)

- Platforms:
 - IA - 32
 - x86-64
 - ARM



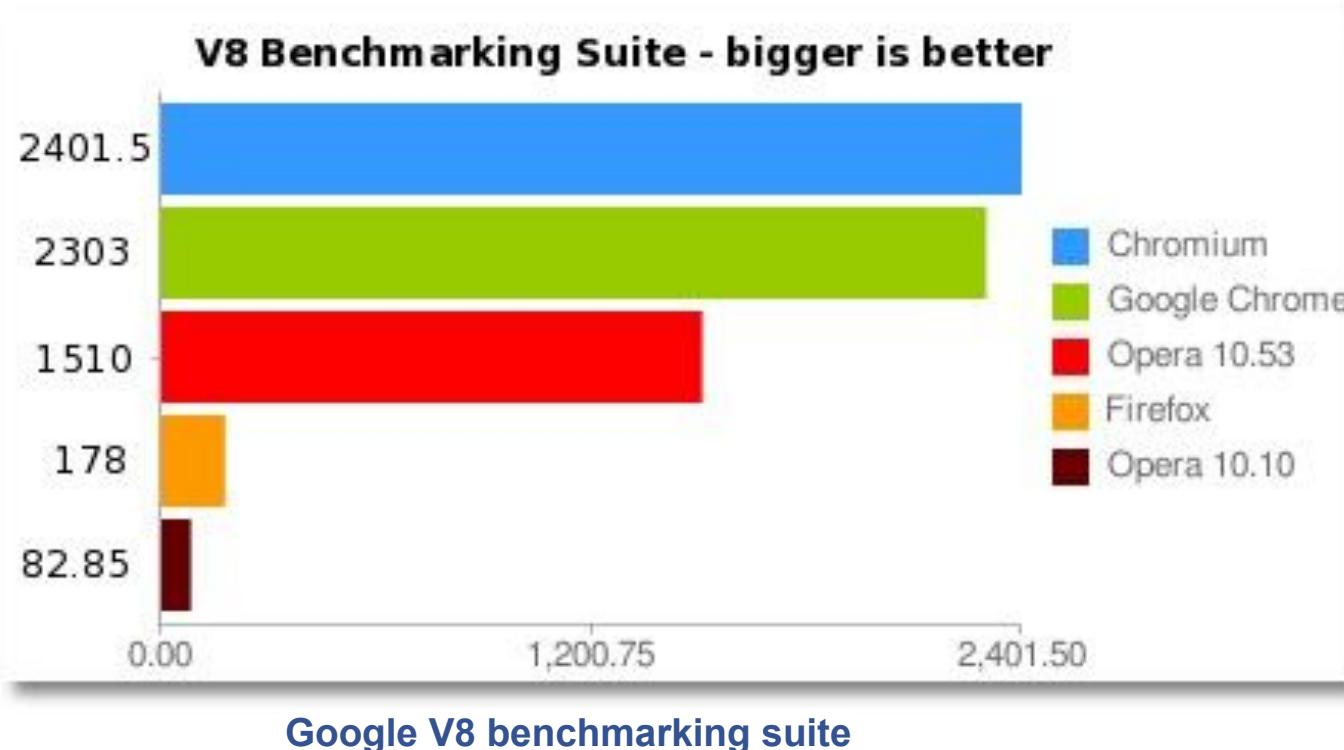
Source: [chromium/analyses/latest/languages_summary](https://chromium.org/analyses/latest/languages_summary)

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 %

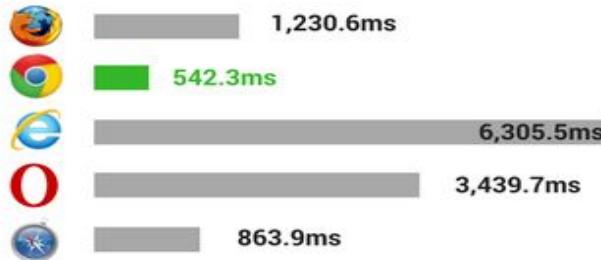
Source: [w3schools/browsers_usage/stats](https://www.w3schools.com/browsers_usage/stats)

Benchmark Against Competition

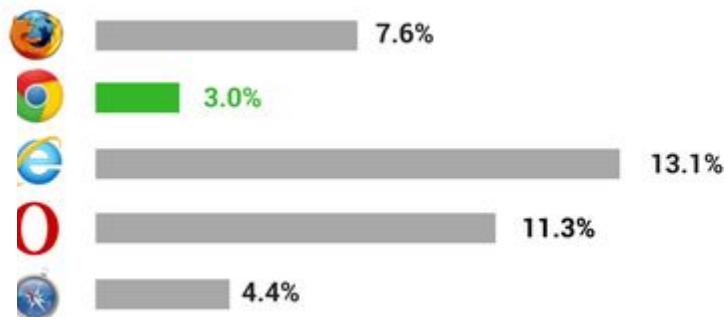


Source: softpedia.com/news/JavaScript-Benchmarking

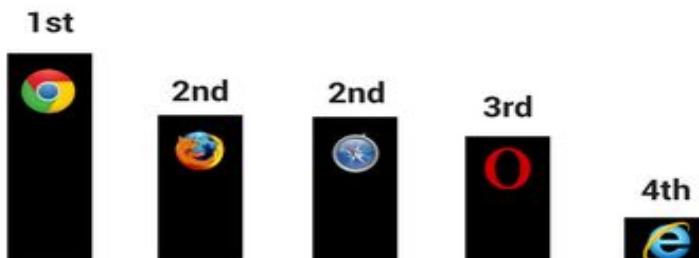
Benchmark Against Competition



JavaScript Speed



CPU Usage (Under Stress)



Overall Performance

Source: 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://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!

