

Ladybird @NLUUG - May 2025

Who am I

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Why create a new browser? Why now?

The browser market



Engine from Google



Money from Google

Google (ad) money







\$20 billion/yr



\$450 million/yr

What does all that money buy?

- 100s of engineers
- 10s of millions of lines of code
- ...which requires 100s of engineers to develop & maintain
- ...so you need that money to keep flowing

We're trapped in an awkward situation

- Everyone needs a browser
- Entire browser industry propped up by Google ad money
- No viable options outside this paradigm

TECH

DOJ still wants Google to part with its Chrome browser as part of antitrust case

Google used its Chrome browser and paid billions to companies such as Apple and Samsung to dominate internet search. The DOJ wants to break the monopoly by making Google sell off Chrome.



Mike Snider USA TODAY

Published 9:37 p.m. ET March 11, 2025

Google Inc

Add Topic +

Firefox could be doomed without Google search deal, says executive / "It's very frightening," a Mozilla executive testified.

by Lauren Feiner May 2, 2025, 10:01 PM GMT+2



lt's a mess.

If you wish to make a browser from scratch, you first need to invent the operating system.

Origins: Early doodles

2018: A little kernel

```
Starting Serenity Operating System...
PIT(i8253): 600 Hz, square wave (000007c4)
640 kB base memory
31744 kB extended memory
syscall: int 0x80 handler installed
ideO: Master="Generic 1234", C/H/Spt=1/16/63
VFS: mounted root on ext2fs{0x00124008}
VFS: mounting procfs{0x00121108} at /proc (inode: 43)
Serenity∕i386 on tty0
andreas@birx:/$> mf
opened /Banner.txt, calling mmap...
sys$mmap file time! fd=3
let's go with /Banner.txt
mapped file @ 0×10031000
MM: page_in_from_vnode ready to read from vnode, will write to L10031000!
MM: readInodeBytes returned 1061
contents: 20 Ze 6f 6f
munmap() returned 0
close() returned 0
andreas@birx:/$>
```

Origins: Early doodles

2018: A little GUI toolkit

Widget test Label		Clock
Button		Ø4:19:26
CheckBox	Font test	
is o ListBox	0123456789 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz !"#\$%&'()*+/:;<=>?@[N]^_(+)~	MsgBox
Hello!		This is a message box!
		OK





2019: IRC client

2019-02-12 12:46:31 anon

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D P	rocessManager						
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٢	TextEditor	1	Select	•	anon 14	4516	
9	ProcessManager	3	Running	•	anon 10	4928	
32	irc	0	Select	•	anon 9	6120	
8	sh T	0	Wait	•	anon 8	4232	
8	Terminal Idia dan Cana	IRC Clien	t: 127.0.	0.1:6667		6110	
8	WindowServer	Name	A	Time	@ Name	Text	
X	Finalizer	Server		12:42:14	Server	[265] 3	
taga artic		#test		12:42:14	Server	[266] 3	
				12:42:14	Server	[375] -	irc.localhost Message of the Day -
				12:42:14	Server	[372] -	19/8/2014 22:31
				12:42:14	Server	[372] -	[Debian GNU/Linux]
				12:42:14	Server	[372] -	
				12:42:14	Server	[372] -	This is Debian's default IRCd server configuration for irc2.1
				12:42:14	Server	[372] -	l see this and if you are the server administrator, just edit in
				12:42:14	Server	[372] -	l and ircd.motd in /etc/ircd.
				12:42:14	Server	[372] -	ا Martin Loschwitz, 1st Janı
				12:42:14	Server	[372] -	
				12:42:14	Server	[376] Er	nd of MOTD command.
				12:42:14	Server	ENOTICE:] Server is currently in split-mode.
				12:42:14	Server	[366] #	test
				12:44:14		Ping? Po	ong! irc.localhost
			L	♥ Time	Q Nama	Text	
-				12:45:22	HeatPay	Hello f	com the host machine
				12:45:42	HostBox	If you's	ce reading this that's pretty cool I guess
				12:45:54	alsohere	I'm alea	here
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2018-2019: from zero to HTML

CSS test - HTML	
This is foo	
This is bar	
This is baz	
ß	

Text Editor: /home/anon/ess.html	×
l 🖆 🛅 👗 🖻 🛍 🗙 🖒 C	
1 <html></html>	÷
2 <head></head>	
<pre>3 <title>CSS test</title></pre>	
4 <style type="text/css"></th><th></th></tr><tr><th>5 #foo 1</th><th></th></tr><tr><th>Dackground-color: #ff0000;</th><th></th></tr><tr><th></th><th></th></tr><tr><th>9 #bar {</th><th></th></tr><tr><th>10 background-color: #00ff00:</th><th></th></tr><tr><th>11 color: #ff00ff;</th><th></th></tr><tr><th>12 }</th><th></th></tr><tr><th>13 #baz {</th><th></th></tr><tr><th>14 background-color: #0000ff;</th><th></th></tr><tr><th>15 color: #ffff00;</th><th></th></tr><tr><th>16 }</th><th></th></tr><tr><th>17 </style>	
18	
19 <body></body>	
20 <div id="foo"> his is foo</div>	
21 (div id="bar">This is bar(/div>	
22 <div id="baz">inis is baz</div>	
24 / html>	
25	
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.ine: 20, Column: 27	



2020: "real" websites begin to work; start of multiprocess



i - Browser	•
https://old.reddit.com/r/SerenityOS/	
org 🍺 SerenityOS @ GitHub 🍺 Google 🍺 DuckDuckGo 🍺 HTML spec	ACID2
DOMUSERS ASKREDDITFUNNYGAMINGNEWS-PICS-MOVIES-EXPLAINLIKEIMFIV&/ORI	LDNEWSAWW-TODAYILEARNEWIDEOSIAMA-JOKESSCIENCEMI
SerenityOS hot new rising controversial top gilded	Want to join? Log : or sign up in seconds.l English
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e of thousands of communities.	reset Submit a new link
SerenityOS update (November 2020)Qoutube.com submitted 5 days ago by SerenityOS commentsharesavehidereport	password Submit a new text post
SerenityOS update (October 2020)Qoutube.com submitted 1 month ago by SerenityOS commentsharesavehidereport	
InCell Insertion Mode (sorry in advance)&.redd.it submitted 1 month ago by rektdeckard 2 comments share save hide report	Get an ad-free experience with special benefits, and directly support Reddit. get reddit premium
SerenityOS: The second year@serenityos.org submitted 1 month ago by SerenityOS commentsharesavehidereport	Serenity0S
SerenityOS update (September 2020)Qoutube.com submitted 2 months ago by SerenityOS commentsharesavehidereport	346readers 5users here now
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2022: Acid3 conquered

Acid3 Acid3 Acid3 Acid3 Acid3 Acid3 100/100	
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Acid3 100/100	v <u>G</u> o <u>I</u> nspect <u>S</u> ettings <u>D</u> ebug <u>H</u> elp
Acid3 100/100	😭 🧇 🎧 http://wpt.live/acid/acid3/test.html 📃 🧖
Acid3 100/100	
	Acid3 100/100

smooth, the score has to end on 100/100, and the final page has to look exactly, pixel for pixel, like this reference rendering.



Origins: Ladybird

2022: A separate project with a Qt chrome



A browser is born

The Ladybird browser came to life on July 4th, when I recorded a video of myself making a simple Qt GUI for the LibWeb browser engine. Thanks to some recent work by Dex and others, we had LibWeb building on Linux in headless mode, so I decided to push ahead and build a simple GUI around it.

I originally imagined Ladybird as a debugging tool that made it easier for people to remain in Linux while working on LibWeb if they wanted to. It's now two months later, and I find myself using Ladybird for most of my own browser development work.

At this point, we might as well tweak the scope from "browser engine for SerenityOS" to "cross-platform browser engine" and build something that many more people could potentially have use for some day. :^)

Note that LibWeb started back in 2019, then called LibHTML:

commit a67e823838943b31fb7cea68bd592093e197cf16 Author: Andreas Kling Date: Sat Jun 15 18:55:47 2019 +0200



2024: the initiative

Andreas Kling | Mon, 01 Jul 2024

Announcing the Ladybird Browser Initiative



Principles behind Ladybird

- A new browser engine based on web standards
- No monetization of user data, no default search deals, etc.
- Independent; donations and sponsorships are no-strings-attached
- Just the browser, no side quests

Ladybird's goals

- Advance the web platform by implementing and improving web specs
- Increase browser engine diversity
- Find a sustainable way to develop browsers with limited funding.

• Render the actual web with acceptable stability, security and performance

Timeline



2024 - Start of the Ladybird Browser Initiative (you are here) 2026 - Alpha release (Linux, macOS) 2027 - Beta release 2028 - Production release (all platforms)

Where's Ladybird now?

Status quo



LibJS: Pretty amazing

SpiderMonkey 97.6% LibJS 97.1% GraalJS ⁄ ⁄ ⁄ 96.4% JavaScriptCore ⁄ ⁄ ⁄ 92.8% Boa 91.7% JavaScriptCore 88.9% V8 88.5%

XS 84.9%

Results from 2025-05-22 https://test262.fyi



LibJS: Tracking performance



https://linegodown.lol

Web platform tests



Web platform tests - no encoding tests



Results from 2025-05-22

Ladybird team





Architecture

Quick technical overview

- ~500 KLOC
- Web tech written from scratch using spec-driven development
- Runs on Linux and macOS

• Full-stack browser & engine written in C++, licensed under 2-Clause BSD

• 3rd party libraries used for non-web tech (e.g. rasterization, audio/video, etc.)

Multi-process architecture

Spec-driven development

To **pre-remove** a *child* from a *parent*, run these steps:

- 1. If *child*'s <u>parent</u> is not *parent*, then <u>throw</u> a "NotFoundError" DOMException.
- 2. <u>Remove</u> child.
- 3. Return child.

```
// https://dom.spec.whatwg.org/#concept-node-pre-remove
WebIDL::ExceptionOr<GC::Ref<Node>> Node::pre_remove(GC::Ref<Node> child)
{
    // 1. If child's parent is not parent, then throw a "NotFoundError" DOMException.
    if (child->parent() != this)
   // 2. Remove child.
    child->remove();
    // 3. Return child.
    return child;
```


return WebIDL::NotFoundError::create(realm(), "Child does not belong to this node"_string);

Future work

- Web compatibility (make real websites work better)
- Spec compliance (pass more spec tests)
- Site isolation, sandboxing
- Fingerprinting prevention, other privacy features
- Performance work
- Staying on top of ever-moving specifications

Thank you!

Questions?

Ladybird

https://ladybird.org