



# Ladybird

Independent web browser

# Introduction

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## **My browser history**

- 2006: KHTML (KDE)
- 2009-2011: QtWebKit (Nokia)
- 2011-2017: Safari (Apple)
- 2019-Present: Ladybird

# Ladybird: Overview

- Full-stack browser & engine
- Everything from scratch
- Permissively licensed (2BSD)
- Written in modern C++20
- Part of the greater SerenityOS project
- Also runs on Linux, macOS, other \*nix, but not Windows (yet)

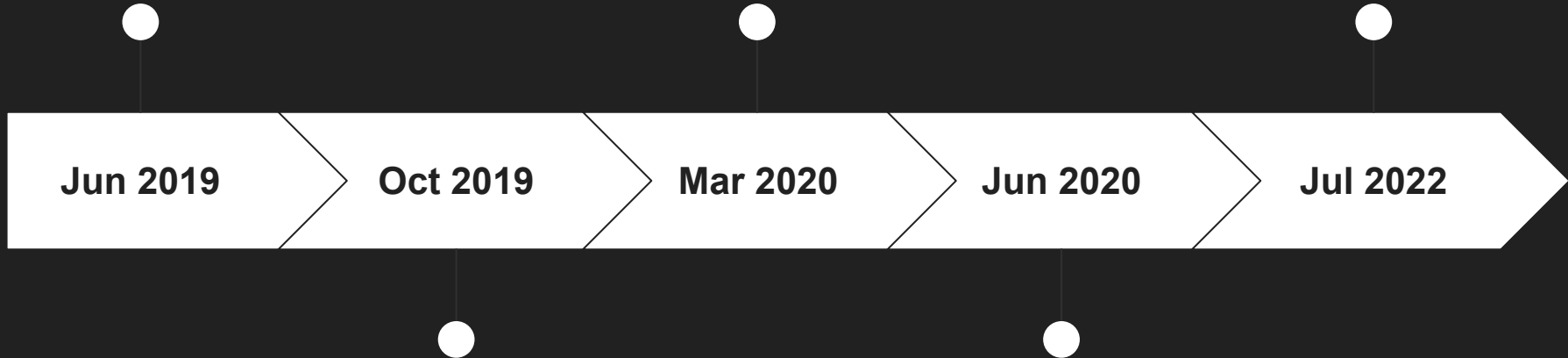
## Ladybird project goals

- **Render the live web** with acceptable stability, security and performance.
- **Advance the web platform** by filing spec bugs, writing tests, etc.
- **Add engine diversity** to the browser market.
- **Have fun!**

Simple HTML widget  
for rich text display

Start of JavaScript  
engine development

Cross-platform version  
with a Qt GUI



**Jun 2019**

**Oct 2019**

**Mar 2020**

**Jun 2020**

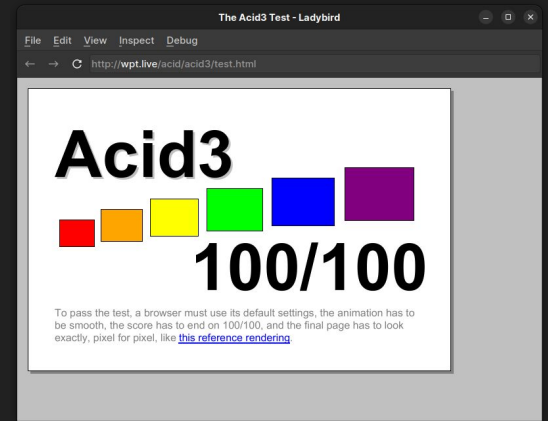
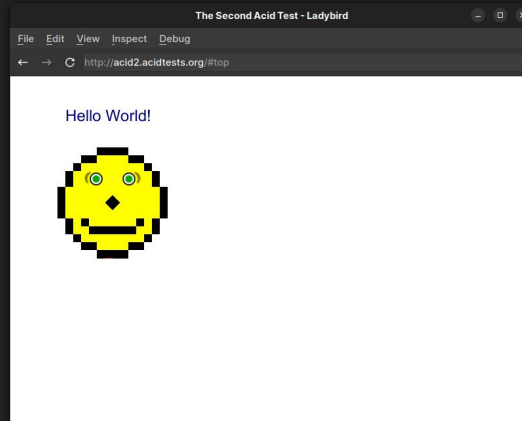
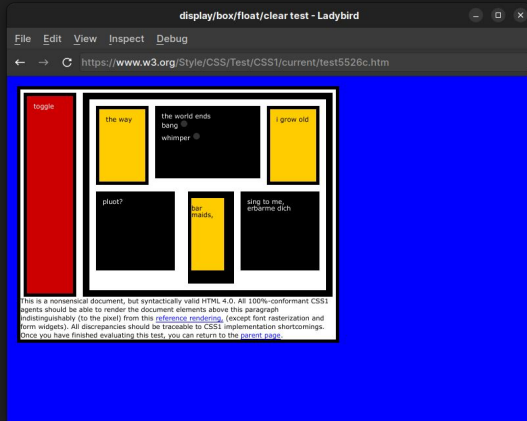
**Jul 2022**

Browser application for  
SerenityOS

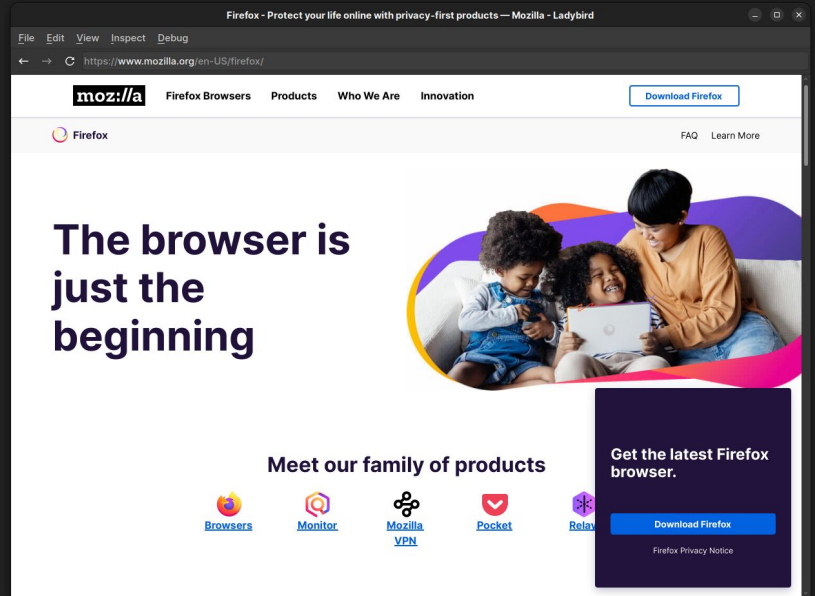
Multi-process mode

State of Ladybird

# Acid tests almost perfect

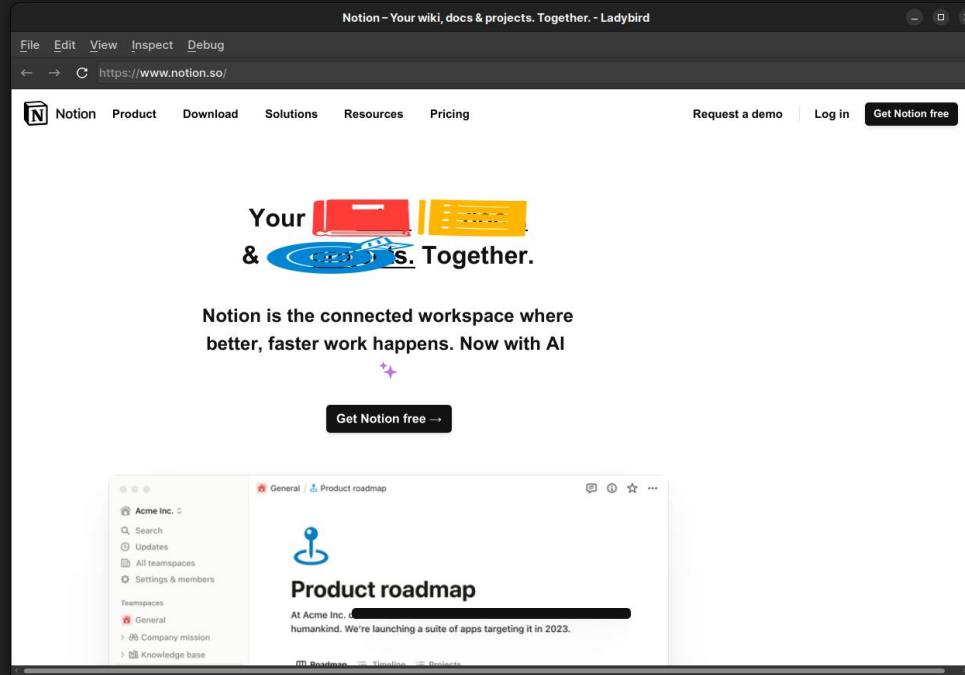


# Making progress on modern sites



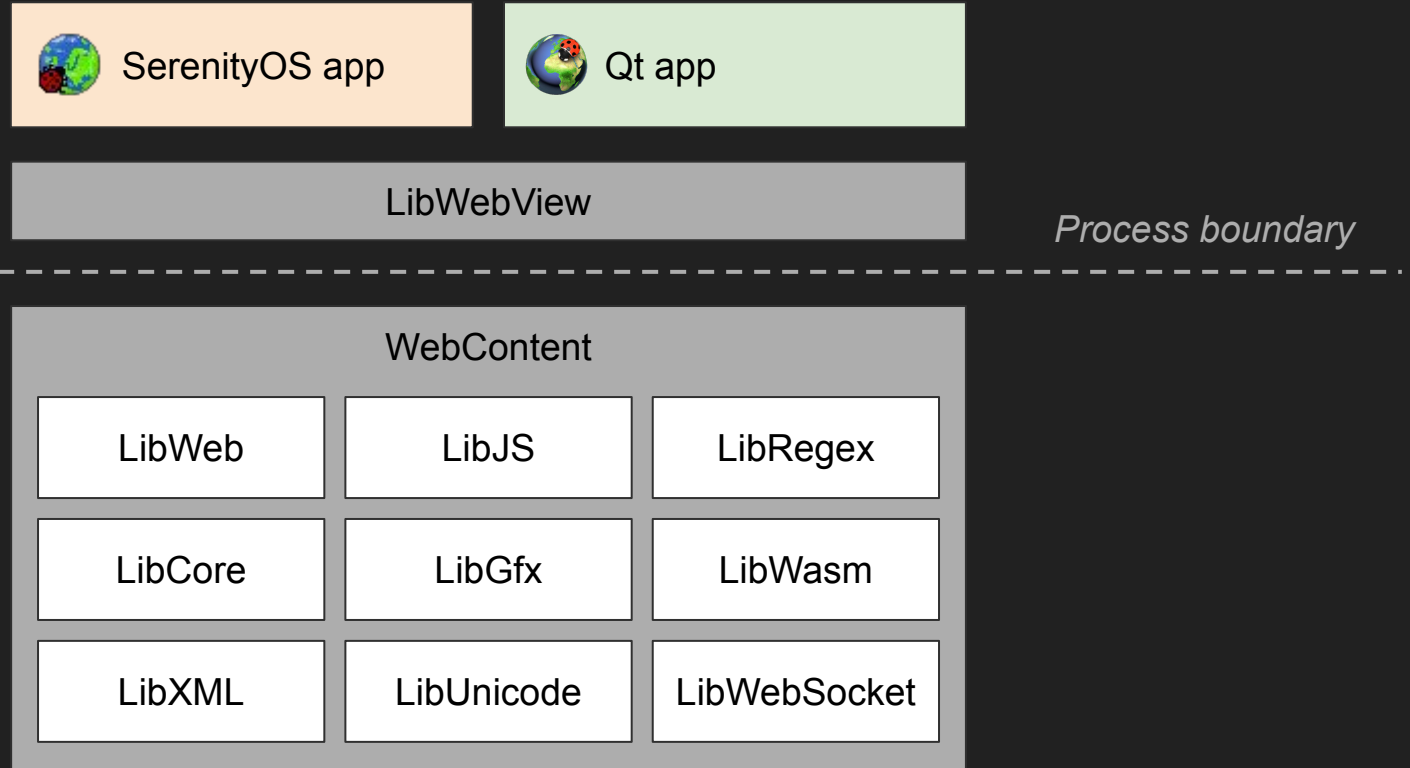


But many bugs remain :^)



Ladybird architecture

# Ladybird application architecture



# LibJS

- Implements the ECMAScript language & runtime
- Garbage collector
- Simple AST tree-walk interpreter
- Almost entirely unoptimized

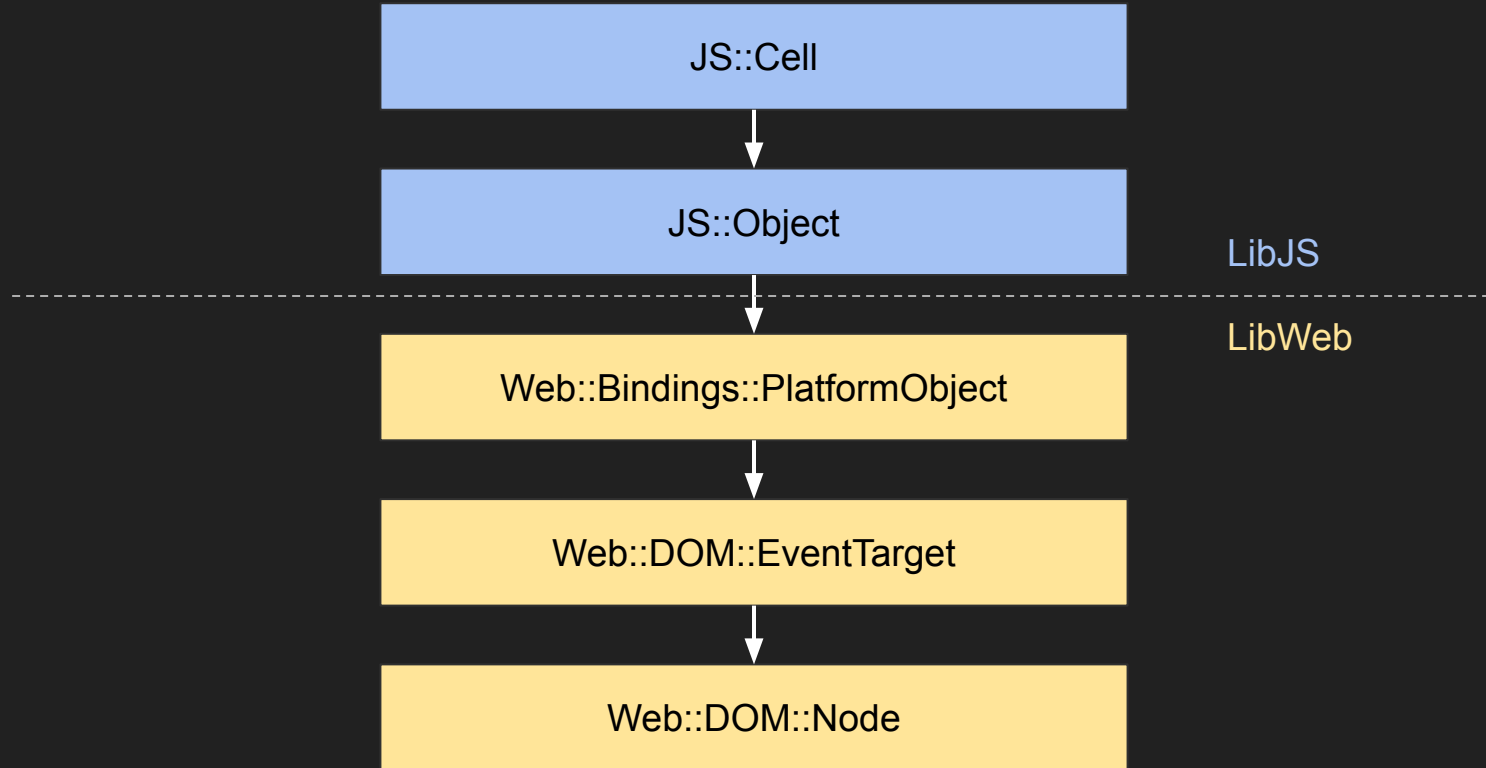
# LibWeb

- Implements most of the web platform specs:
  - DOM, HTML, CSS, SVG, Fetch, XHR, etc.
- Layout
- Painting
- Hit testing

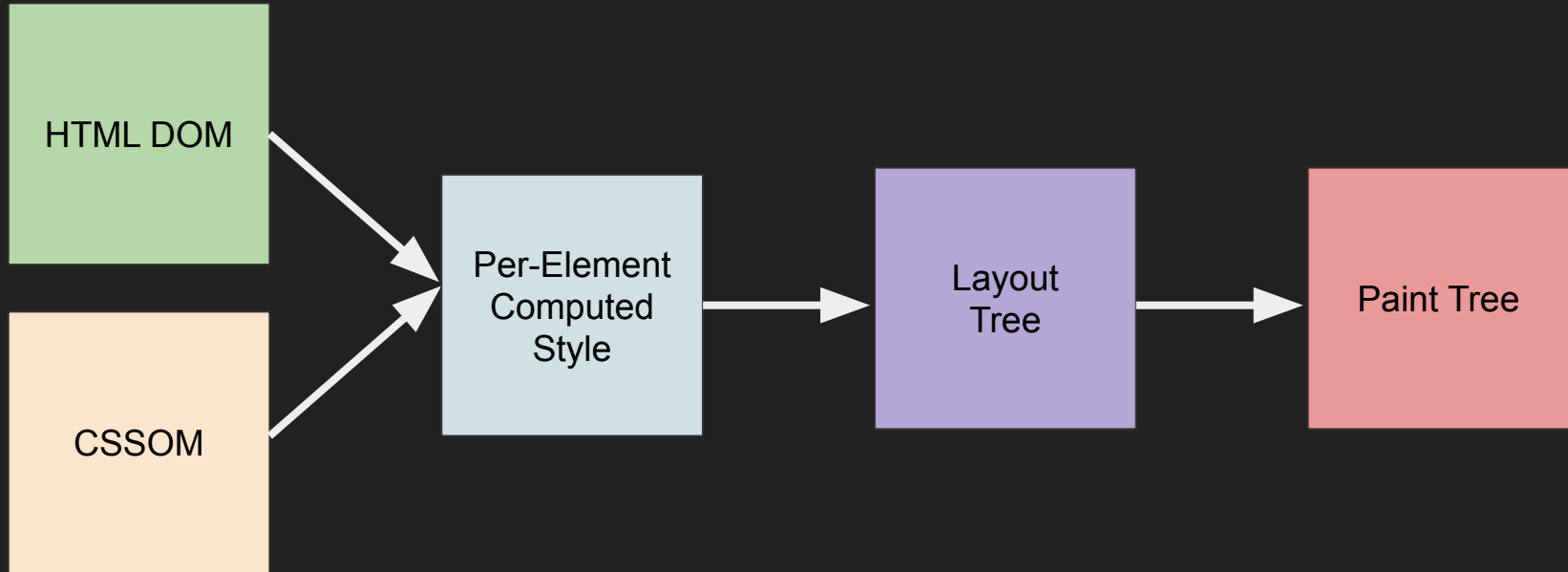
## Other libraries

- LibCore: Event loops, shared memory
- LibIPC: Inter-process communication
- LibGfx: 2D graphics, OpenType rasterizer
- LibRegex: Regular expression bytecode VM
- LibUnicode: Unicode support
- LibXML: XML parsing
- LibWasm: Wasm interpreter
- ... and others

# LibWeb DOM node class hierarchy



# LibWeb rendering pipeline





# Layout implementation

- Organized around CSS spec concepts:
  - FormattingContext (with subclasses for BFC, FFC, GFC, ...)
  - AvailableSpace
  
- Two layout modes:
  - Normal
  - Intrinsic sizing

# Ladybird testing

- LibJS:
  - test-js: In-house regression test suite
  - libjs-test262: test262 runner
- LibWasm:
  - test-wasm: Wasm spec tests
- LibWeb:
  - Layout tests
  - Text tests
  - WPT runner under construction (actively)

## Upcoming work

- Performance
- Memory safety
- Implement specs
- Fix bugs

# So many contributors

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Gunnar Beutner

Idan Horowitz

Igor Pissolati

Jamie Mansfield

Jelle Raaijmakers

Jonah

Karol Kosek

Kenneth Myhra

Leon Albrecht

Linus Groh

Luke Wilde

Martin Falisse

Matthew Olsson

Max Wipfli

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Tim Schumacher

Tobias Christiansen

Thank you!

Q&A

Ask me anything!