

A Short Introduction to Servo

Web Engines Hackfest 2014

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The Modern Browser

- Fast JavaScript engines
- Optimized layout routines
- Rapidly evolving rendering pipelines
- Ever increasing concurrency

**Not Good
Enough**

Not Good Enough

- Memory safety issues leave users exposed
- Web application complexity increases
- Low amount of parallelism, leaving idle cores

Web Engine Parallelism

- Web engines use fine-grained concurrency, but little parallelism
- Data structures not designed for parallelism
- Difficult to be parallel while ensuring memory safety
- Native concurrency primitives not flexible

What We Want

A safe and parallel web engine.

Rust

- Initially Graydon Hoare's personal project, but adopted by Mozilla Research in 2009.
- Fast, concurrent, safe compiled system language
- The compiler protects you from common memory issues
- Fast approaching version 1.0

What We Want

A **safe** and parallel web engine.

Compile-time Memory Safety

```
fn main() {  
    let mut vector = vec!(1i, 2i, 3i, 4i);  
    let first_element = &vector[0];  
    vector.clear();  
  
    println!("Dereferenced pointer to cleared value: {}", *first_element);  
}
```

```
error: cannot borrow `vector` as mutable because it is also borrowed as immutable  
...  
error: aborting due to previous error
```

What We Want

A safe and **parallel** web engine.

Easy Concurrency

```
let (tx, rx) = channel();

spawn(proc() {
    tx.send("Hello from a task!".to_string());
});

let message = rx.recv();
println!("{}", message);
```

What We Want

A **safe** and **parallel** web engine.

Task Data Safety

```
let mut x = vec!(1i, 2i, 3i);

spawn(proc() {
    println!("The value of x[0] is: {}", x[0]);
});

println!("The value of x[0] is: {}", x[0]);
```

```
error: use of moved value: `x`
note: in expansion of format_args!
<std macros>:2:23: 2:77 note: expansion site
<std macros>:1:1: 3:2 note: in expansion of println!
error: aborting due to previous error
```

Servo

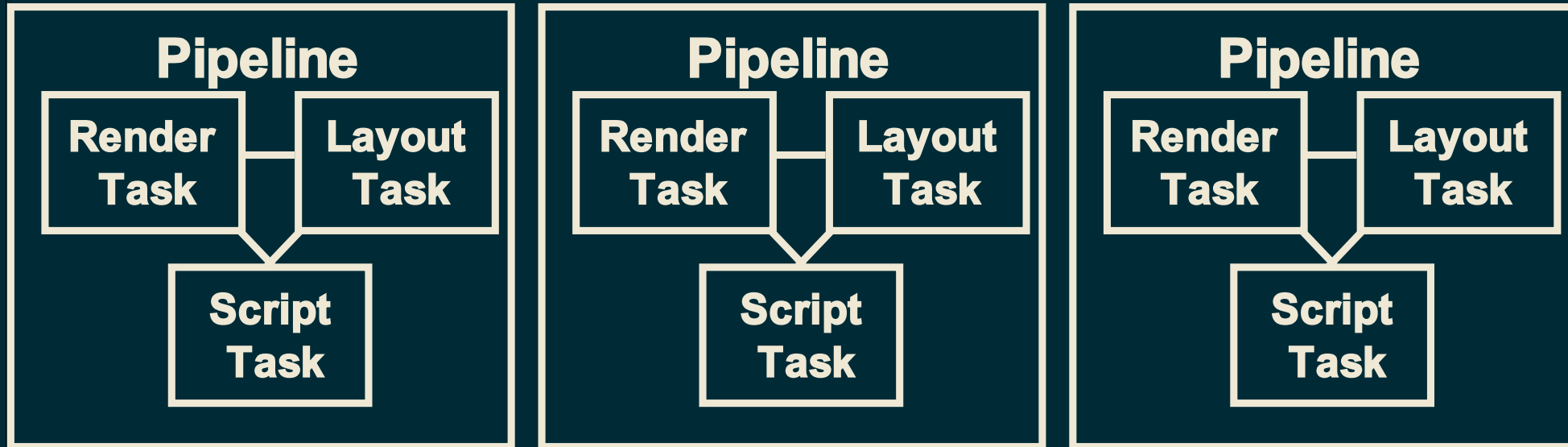
**experimental browser engine
by Mozilla Research**

Servo

- Parallel layout design from the start
- Work-stealing algorithm for task scheduling
- Use of green threads to allow creating many tasks
- Modern rendering pipeline

Architecture

Constellation



Optimistically Parallel Layout

- Parallelize layout as much as possible
- A series of bottom-up and top-down passes on a *flow tree*
- Serialize when necessary, but hopefully uncommon or limited cases
- See speedup from parallelism on typical pages

Rendering Pipeline

- Always composited, no legacy approaches
- Works divided into tasks
 - **Layout Task:** convert flow tree to display list
 - **Render Task:** rasterize display list to shared surfaces
 - **Compositor Task:** render rasterized content
- Compositor layers are tiled and double-buffered
- Pinch zoom and panning support

Status

Hello World!



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3 Commuting parking
4 Measuring walkability
5 Mapping walkability
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Definitions [edit]

One proposed definition for walkability is: "The extent to which the built environment is friendly to the presence of people living, shopping, visiting, enjoying or spending time in an area"^[3] Factors affecting walkability include, but are not limited to: [street connectivity](#); [land use mix](#); residential density (residential units per area of residential use); the presence of trees and vegetation; frequency and variety of buildings, entrances and other sensations along street frontages; "transparency" which includes amount of glass in windows and doors, as well as orientation and proximity of homes and buildings to watch over the street; plenty of places to go to near the majority of homes; placemaking; street designs that work for people, not just cars and retail [floor area ratio](#)^[4] Major [infrastructural](#) factors include access to [mass transit](#), presence and quality of [footpaths](#), buffers to moving traffic (planter strips, on-street



Mixed use pedestrian friendly street in Bitola, Macedonia. ^[5]

Status

- Missing many CSS features and HTTP caching
- Form interaction only in the early stages
- Has evolving support for vertical writing modes
- Very close to dog-foodable
- CEF API for embedding

Get Involved

- Development happens in the open, including roadmap
- Outside contributors very welcome
- Everything available on [Github](#)
- Building is easy and fast compared to other engines
- Look for bugs marked E-Easy
- Discussion at [#servo](#) on [irc.mozilla.org](#)

Demo

Questions